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TABLE OF ERRATA.

Month.	Page.	Column.	Line.	Description.
1901. February	145	1	16 from top	*For* "1899" *read* "1898," and *insert before* 1,148, the year "1899."
March	255	2	First equation	*For* "Co_2" in both cases, *read* "CO_2."
April	356	2	38 from top	*For* "igniting" *read* "diazotising."
May	425	1	32 from bottom	*For* "no" *read* "not."
"	435	2	17 from top	*For* "Oakbark" *read* "Oakbark tannage."
"	437	2	26 from top	*For* "sulphate" *read* "sulphide."
"	437	2	20 from bottom	*For* "averagely" *read* "on the average."
"	438	1	30 from top	*For* "aqneous" *read* "aqueous."
"	445	2	30 from top	*After* "Ceylon" *insert* "graphite."
July	727	1	Middle	In title, *after* "Elect. Rev." *insert* "(U.S.)."
"	727	1	23 from bottom	*Before* "Engineer" *insert* "Electr. World and."
September	902	1	27 from bottom	*For* "palæzoic" *read* "palæozoic."
"	941	1	Table, col. 5, line 11 of figures.	*For* "99·4" *read* "99·0." Also in col. 1, *for* "Linseed III. after three weeks' exposure" *read* "Linseed II. after three weeks' exposure."
"	940	2	First table, second heading.	*For* "Thermomter" *read* "Thermometer."
"	941	2	Line 10 above second table.	*For* "strength of acids" *read* "strengths of acid."
October	1037	2	Table, line 14 under "*Exports*."	*For* "Silver in ore, silver, and lead," *read* "Silver in silver and lead ores."
"	1043	2	18, 10, and 4 from bottom, and next page.	*For* "ground nut" *read* "earth nut."
"	1044	1 and 2		
December	1237	1	7 from bottom	*After* "In addition to" *insert* "other derivatives of."
"	1227	1	6 from bottom	*For* "finds that" *read* "prepared."
"	1237	1	5 and 4 from bottom	*Delete* "is also present."

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10,287	.. ..	von Schlichtegroll, C. F.	Rectifying Spirit	827
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10,303	.. ..	M[illegible], O.	Crucible Furnace	1118
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No. of Patent.	Agent.	Inventor.	Short Title.	Page for Abstract.
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10,461	Johnson	Cereal Sugar Co.	Apparatus for Refining Sugar	824
10,505	.. ..	Edison, T. A.	Storage Batteries (Alkaline)	1002
10,524	Page	Grenier Art Co.	Photographic Fabrics, and Process for Preparing same	1020
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10,883	.. ..	Steffen, C.	Extraction of Sugar from Lime Scum, &c.	916
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10,963	Day	Coleman International Coppering Co. ..	Antifouling Coating for Metal Structures	925
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10,976	Justice	Castner Electric Alkali Co.	Oscillating Electrolytic Cells	907
10,977	.. ..	Woolley, H. S.	Furnaces	788
10,983	.. ..	Wassell, E. D.	Manufacture of Wrought Iron	905
11,022	.. ..	Rahtjen, A.	Preparing Monobrom-Indigo, Dibrom-Indigo, Monochlor-Indigo, Dichlor-Indigo, &c.	1205
11,045	.. ..	Pfister, J.	Dyeing or Preserving Timber	900
11,052	.. ..	Arndt, M.	Pyrometers	788
11,085	.. ..	Budzinski, S. L.	Acetylene Lamps	976
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11,354	.. ..	Koyle, C. H.	Purification of Water	830
11,359	.. ..	Aloy, L.	Manufacture of Dyeing Compositions	893
11,400	Edwards	Kent, W.	Smokeless Gunpowders	932
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11,466	.. ..	Jaubert, G. F.	Preparation of Oxygen Gas	931
11,529	.. ..	Boehm, W.	Manufacture of Electric Lighting, Heating, and Resistence Bodies.	1199
11,687	.. ..	Schramm, O.	Process for Hardening Iron	903
11,715	.. ..	Lorenc, C.	Production of Mortar, Treatment of Stone, and Construction of Masonry Work therewith.	992
11,745	Bayerthal Ewers, Fr.	Ewers, Fr.	Printing Tinplate in Dull Colours	1208
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11,903	.. ..	Seifert, C. M.	Gas Burners for Heating Purposes	975
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11,933	.. ..	Blackmore, H. S.	Reduction of Metals and Production of Alloys of the Same.	1118
11,941	.. ..	Miller, J. C.	Process for Sterilising, &c., Milk, &c.	924
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12,073	.. ..	Sborowitz, S.	Imitation Marble	992
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12,181	Lake	Berrigan, J. J.	Centrifugal Apparatus for Separating Solids from Liquids.	1095
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12,588	.. ..	Classen, A.	Converting Wood, &c., into Sugar	1008
12,617	.. ..	Da Silva, A. A.	Explosives	1240
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12,858	.. ..	Van der Made, P. R.	Process and Apparatus for Carburetting Air with Carboretted Hydrogen.	976
12,905	Allison	Selg, Otto, and others	Converting Wort into Beer and Ale	1012
12,933	.. ..	Garrison, J. M.	Separating Molten Glass from Impurities	1114
12,940	.. ..	McClurg, W. J.	Gas Generators	975
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13,204	.. ..	Mitchell, G.	Extraction of Gutta-Percha from Leaves	912
13,300	.. ..	Nodon, A.	Electrode Plates of Secondary Batteries	1120
13,365	.. ..	Steinweg, C. E.	Separating Matrices	908
13,367	.. ..	Winter, R., and Pappenheim, V.	Electric Furnaces for Dental and other Purposes	1120
13,379	.. ..	Taddei, G.	Process for Obtaining (part Electrolytic) Aluminium and other Metals.	1121
13,398	.. ..	Davis, J. W.	Machines for Recarburising Iron or Steel	1118
13,403	.. ..	Waite, C. N.	Manufacture of Purified Lactic Acid from Crude Solutions.	931
13,579	Thompson	Simonini, A.	Devices for Automatic Gas Lighting	1198
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13,894	Haddan	Desurmont, F.	Apparatus for Dyeing Slivers, &c., from Combing Machines.	985
14,085	Sefton-Jones	Feder, S., and van der Bucken, J.	Apparatus for Making Carpet Cleaning Soap	1192
14,090	Lake	Hiorth, F.	Drying Fibrous Material. Pulp, Yarn, &c., and Apparatus therefor.	1095
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14,188	.. ..	Taylor, M.	Gas Producers	975
14,250	.. ..	Zehnpfund, K.	Bunsen or like Burners for Lighting, &c.	975
14,411	.. ..	Sander, W. E.	Manufacture of Filaments, &c., for Incandescent Electric Lamps and Heaters.	1199
14,453	Heyes	Plantru, E.	Apparatus for Treating Textile Materials with Liquids	985
14,507	.. ..	Froehling, H.	Extracting Alkaloids, &c., from Vegetable Substances	1019
14,513	.. ..	Karfunkelstein, C.	Carburetting Apparatus	1100
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1897. Ablett, A. W., Salvador Mines, Ltd., Sta. Rosa, Salvador, Central America, Cyanide Works Manager.

1897. Ackermann, Eugene, 165, Cambridge Street, Warwick Square, S.W., Analytical Chemist and Civil Engineer.

1900. Ackroyd, Wm., Borough Laboratory, and (communications) Crossley Street, Halifax, Yorks, Analytical Chemist.

1892. Adams, Arthur, Kelvin House, Edgbaston Road, Smethwick, near Birmingham, Science Lecturer.

1881. Adams, M. A., Ashford Road, Maidstone, Kent, Public Analyst.

1897. Adams, Thos. H., 107, Crewe Street, Derby, Analyst.

1901. Adams, Walter O., 1776, Massachusetts Avenue, North Cambridge, Mass., U.S.A., Soap Works Chemist.

1895. Adamson, G. P., 233, Reeder Street, Easton, Pa., U.S.A., Manufacturing Chemist.

1891. Adcock, S. R., St. Helen's Smelting Co., Atlas Court, St. Helen's, Lancashire, Analytical Chemist.

1901. Addison, Leonard, 78, Cantwell Road, Plumstead, S.E., Chemist.

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1886. Aitken, J. B., Gerard's Fold Chemical Works, Widnes, Chemical Manufacturer.

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1890. Aldrick, Edwin John, 53, Alpha Road, West Ferry Road, Millwall, E., Chemical Works Clerk.

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1900. Alexander, Jerome, c/o National Gum and Mica Co., 502–510, West 45th Street, New York City, U.S.A., Chemist.

1883. Alexander, W. T., 20, Booth Street, Mosley Street, Manchester; and Crummock Bank, Victoria Crescent, Eccles, Drysalter.

1901. Allan, Dr. F. B., Chemical Laboratory, University of Toronto, Canada, Lecturer on Chemistry.

1891. Allan, F. H. Tielke, Portobello House, Wakefield, Analytical Chemist.

1898. Allan, John, 57, Mabfield Road, Fallowfield, Manchester, Chemist.

O.M. Alldred, C. H., 8, St. Margaret's Road, Plumstead Common, Kent, Analytical Chemist.

1898. Alleman, Dr. G., Washington University, St. Louis, Mo., U.S.A., Instructor in Chemistry.

O.M. Allen, A. H., Broomfield Road, Sheffield, Consulting Chemist.

1902. Allen, Chas. D., jun., 475, 4th Street, Brooklyn, N.Y. U.S.A., Chemist.

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1889. Allen, R. L., Crewe Road, Sandbach, Cheshire, Analytical Chemist.

1886. Allen, Walter S., 34, South Sixth Street, New Bedford, Mass., U.S.A., Chemist.

1892. Allen, Walter W., Room 1001, 71, Broadway, New York City, U.S.A., Metallurgical Manager.

1900. Allen, Wilfrid T., c/o Hugh Wallace and Co., Ltd., 5, Fenchurch Street, London, E.C., Director.

1884. Allen, Wm., Evenley Hall, Brackley, North Hants.

O.M. Allhusen, A., Gateshead-on-Tyne, Chemical Manufacturer.

1886. Allibon, G. H., c/o Richardson Bros. & Co., 30, Donegall Place, Belfast, Chemical Works Manager.

1900. Allingham, Jno., Assayer.

1887. Alliott, J. B., Messrs. Manlove, Alliott, and Co., Ltd., Nottingham, Mechanical Engineer.

1900. Allison, Thos. McGregor, 54, St. John's Road, Clifton, Bristol, Tanner.

1895. Allison, Wm. O., 100, William Street, New York City, U.S.A., Publisher of "Oil Paint and Drug Reporter."

1889. Alpiar, Agop, Smyrna, Asia Minor, Morphia Manufacturer.

1899. Alsop, Wm. K., 30, Ferry Street, New York City, U.S.A., Chemist.

1901. Alston, Robt. A., 44, Margaret Street, Greenock, N.B., Mining Engineer

1899. Althouse, C. Scott, 315, North 6th Street, Reading, Pa., U.S.A., Analytical Chemist.
1898. Ambler, Chas. Taaffe, Dharhara Station, E.I. Ry., Bengal, India, Mine Owner and Contractor.
1897. Amend, Otto P., 205—211, Third Avenue, New York City, U.S.A., Chemist.
1899. Anderson, Gilbert L., London Portland Cement Works, Northfleet, Kent, Works Manager.
1900. Anderson, Jas. W., 1, Preston Villas, Halling, near Rochester, Kent, Analytical Chemist.
1889. Anderson, Robt. T. R., 80, Seedhill Road, Paisley, Technical Chemist.
1894. Anderson, Dr. W. Carrick, 2, Florentine Gardens, Hillhead, Glasgow, University Lecturer.
1895. Anderson, Wm., 19—21, Blackfriars Street, Edinburgh, Drysalter.
O.M. Anderton, G. H., Howendyke, Howden, Yorks, Chemical Manufacturer.
1896. Andreoli, Gabriel, P.O. Box 3725, Johannesburg, Transvaal Colony, South Africa, Electro-chemist.
1889. Andrews, C. W., c/o The John Crerar Library, Wabash Avenue and Washington Street, Chicago, Ill., U.S.A., Librarian.
O.M. Angell, J., 6, Beaconsfield, Derby Road, Withington, Manchester, Chemical Lecturer.
1892. Annandale, C. J. R., The Briary, Shotley Bridge, Co. Durham, Paper Maker.
1883. Annandale, Jas. H., The Vale, Polton, Midlothian, N.B., Paper Maker.
1897. Annis, Dr. E. G., Public Health Dept., Town Hall, Greenwich, S.E., Medical Officer of Health.
1887. Annison, R. H., 16, Water Lane, Tower Street, London, E.C., Master Lighterman.
1894. Ansbacher, L. A., P.O. Box 1934, New York City, U.S.A., Colour Manufacturer.
O.M. Ansdell, G., 3, Cross Lane, St. Mary-at-Hill, E.C., Analytical Chemist.
O.M. Ansdell, T. C., Kearsley Cottage, Farnworth, Bolton, Manufacturing Chemist.
1902. Anthony, John, 82, Bay Street, Toronto, Canada.
1901. Anty, Albert M., c/o John Smith and Sons, Field Head Mills, Bradford, Chemist.
1899. Appleby, C. W., Farnworth, near Widnes, Lancashire, Pith and Size Manufacturer.
1895. Appleby, Prof. W. R., 911, 5th Street, S.E., Minneapolis, Minn., U.S.A., Professor of Mining and Metallurgy.
1894. Appleton, H. A., c/o Vinolia Co., Ltd., Carpenter's Road, Stratford, E., Analytical Chemist.
1897. Appleton, Jno. Howard, 209, Angell Street, Providence, R.I., U.S.A., Professor of Chemistry.
1900. Appleyard, Geo. H., c/o British Oil and Cake Mills, Ltd., 151, Cleveland Street, Hull, Chemist.
1901. Archbold, Dr. Geo., Imperial Starch Co., Ltd., Prescott, Canada, Consulting Chemist and Manager.
O.M. Archbutt, L., The Yews, Madeley Street, Derby, Analytical Chemist.
1899. Archdale, T. Henry, 77, Queen's Road, Blackburn, Manager of Tar and Ammonia Works.
1901. Ardagh, Edw. G. R., 28, Leopold Street, Parkdale, Toronto, Canada, Chemist.
1900. Ardern, Edw., 2, Atkinson Road, Urmston, near Manchester, Chemist.
1901. Argall, Philip, P.O. Box 843, Denver, Col., U.S.A., Manager (Gold Extraction Works).
1899. Armstrong, Richard, Saul Street Soap Works, Preston, Lancashire, Soap Manufacturer.
1901. Arnold, G. Edmund, 6, Kingsfield Terrace, Faversham, Kent, Manager (Cotton Powder Co., Ltd.).
1899. Arnott, G. W. Campbell, Confederation Life Building, Toronto, Canada, Chemical Agent.
1901. Arundel, Arthur S. D., Penn Street Works, Hoxton, N., Paper Box Manufacturer.
1901. Asano, K. 25, Kitachonyachō, Kyobashi, Tokyo, Japan, Mining Chemist.
1900. Ashley, Harrison Everett, West Wareham, Mass., U.S.A., Chemical Engineer (Tremont Nail Co.).
1900. Ashton, Jas., Hacken Sewage Works, Great Lever, Bolton, Chemist and Manager.
1890. Ashton-Bost, W. D., Cartvale Chemical Works, Paisley, N.B., Chemical Manufacturer.
1885. Ashwell, H., 117, Waterloo Crescent, The Forest, Nottingham, Bleacher and Dyer.
1885. Ashwell, J. H., 117, Waterloo Crescent, The Forest, Nottingham, Bleacher and Dyer.
1894. Ashworth, Arthur, Fernhill Chemical Works, Bury, Lancs., Chemical Manufacturer.
1898. Aspinall, Thos., 12, Gilnow Road, Bolton, Analytical and Manufacturing Chemist.
1897. Aspinwall, H. C., Pompton Lakes, Passaic Co., N.J., U.S.A., Explosives Manufacturer.
1900. Aston, Bernard C., Agricultural Department, Wellington, New Zealand, Chemist.
1898. Aston, Miss M. Evelyn, Minne Laboratorium, Minne, Norway, Metallurgical Chemist.
1891. Atkins, C. E., Teigngrace, Bycullah Park, Enfield, N., Chronometer Maker.
1885. Atkinson, A. J., 44, Loudoun Square, Cardiff, Analytical Chemist.
1900. Atkinson, Jno. W., Betteravia, Cal., U.S.A., Chemist.
O.M. Atkinson, R. W., 44, Loudoun Square, Cardiff, Technical Chemist.
1899. Atteaux, F. E., 176, Purchase Street, Boston, Mass., U.S.A., Importer of Dyestuffs and Chemicals.
O.M. Attfield, Dr. J., F.R.S., Ashlands, Watford, Herts., Chemical Consultant and Analyst.
1900. Atwood, Frank W., 216, Milk Street, Boston, Mass., U.S.A., Chemist.
1895. Auchterlonie, Wm., jun., c/o Burgess, Ledward and Co., Walkden, near Manchester, Chemist.
1901. Auden, Dr. H. A., Municipal Technical Institute, Romford Road, West Ham, E., Head of Chemical Department.
1897. Auger, Chas. L., 425, Park Avenue, Paterson, N.J., U.S.A., Silk Dyer.
1887. Austen, Prof. Peter T., 218, St. John's Place, Brooklyn, N.Y., U.S.A., Professor of Chemistry.
1901. Austin, Herbert, c/o George Scott and Son, Ltd., 67, Lord Street, Liverpool, Engineer.
1901. Ayer, Harold O., 503, Whitaker Street, Savannah, Ga., U.S.A., Chemist.
1890. Aykroyd, H. E., Oakwood Dye Works, Bradford, Yorks, Dyer.
1899. Aylsworth, Jonas W., 223, Midland Avenue, East Orange, N.J., U.S.A., Chemist.

B

1892. Bachke, A. Anker, Ringoe, pr. Trondhjem, Norway, Metallurgical Engineer.
1895. Bacon, Nathaniel T., Peace Dale, Rhode Island, U.S.A., Chemical Engineer.
1897. Bacon, Wm., 4, New Court, Lincoln's Inn, W.C., Chemist.
1897. Badock, Stanley H., 41, Downleaze Road, Stoke Bishop, near Bristol, Smelter.
1898. Baekeland, Dr. Leo, Snug Rock, North Broadway, Yonkers, N.Y., U.S.A., Manufacturing Chemist.
1885. Bailey, Edwin M., 6, Pumpherston, Midcalder, N.B., Technical Chemist.
1883. Bailey, Dr. G. H., Marple Cottage, Marple, Cheshire, Chemical Lecturer.
1898. Bailey, Henry, 18, Lavender Sweep, Lavender Hill, S.W., Analytical Chemist.
1888. Bailey, Dr. T. L., University College, Brownlow Street, Liverpool, Lecturer on Technological Chemistry.
1888. Bailey, Sir W. H., Albion Works, Salford, Manchester, Chemical Engineer.
1888. Bailey, Walter P., Fabrica de Productos Amoniacales, 2A, Aguada, Cadiz, Spain, Manufacturing Chemist.
1902. Bain, Jas. Watson, School of Practical Science, Toronto, Canada, Chemist.
1890. Baird, H. Harper, 14, Cross Street, Hatton Garden, London, E.C., Laboratory Furnisher.

1902. Baird, Dr. Julian W., Massachusetts College of Pharmacy, Boston, Mass., U.S.A., Professor of Chemistry.

1891. Baird, Wm., c/o Lewis Berger and Sons, Ld., Homerton, N.E., Technical Chemist.

1895. Baird, W. Raymond, 271, Broadway, New York City, U.S.A., Patent Lawyer.

1890. Bairstow, John, Burley, Queen's Park, Chester, Chemical Works Manager.

1902. Baker, Chas. F., Technical College, Sunderland, Lecturer in Chemistry.

1901. Baker, F. Guy Stirling, Marryatt's Lodge, The Forest, Snaresbrook, Essex, Student.

1883. Baker, Harry, Epworth House, Moughland Lane, Runcorn, Analytical Chemist.

1899. Baker, H. Fenimore, c/o General Chemical Co., 32, Liberty Street, New York City, U.S.A., Chemist.

1892. Baker, Julian L., 7, Addison Road, Bedford Park, W., Sugar Chemist.

1886. Baker, Theodore, c/o G. Henry, Pompton Lakes, N.J., U.S.A., Analytical Chemist.

1901. Baker, Wm. T., White House, Wouldham, near Rochester, Cement Works Chemist.

1900. Balbach, Wm., 100, William Street, New York City, U.S.A., Chemical Merchant.

1898. Baldwin, Abram T., Solvay Process Co., Syracuse, N.Y., U.S.A., Alkali Manufacturer.

1900. Ball, Arthur, 37, Tufnell Park Road, London, N., Manufacturing Chemist.

1901. Ball, Edward, c/o B. Young and Co., Spa Road, Bermondsey, S.E., Glue and Size Manufacturer.

1889. Ballantyne, H., 75, Chancery Lane, London, W.C., Analytical Chemist.

1892. Ballard, Ernest, Colwall, Great Malvern, Malt Vinegar Brewer.

O.M. Ballard, E. G., Greenfield Cottage, Hoole Road, Chester, Alkali Works Inspector.

1891. Ballinger, Jno., Free Library, Cardiff, Librarian.

1890. Baly, E. C. C., University College, Gower Street, London, W.C., Analytical Chemist.

O.M. Bamber, H. K., 9, Victoria Street, London, S.W., Consulting Chemist.

1894. Bamber, H. K. G., Ingress House, Greenhithe, Kent, Cement Works Chemist and Manager.

1898. Bamford, Harry, 1, Farcliffe Place, Bradford, Yorks, Dyer.

O.M. Banister, H. C., Elmhurst, Blundellsands, near Liverpool, Chemical Works Manager.

1890. Banks, Jno. H., c/o Ricketts and Banks, 104, John Street, New York City, U.S.A., Mining Engineer.

1895. Bannan, John F., North Andover, Mass., U.S.A., Chemist (Woollen Mill).

1885. Banner, Samuel, 4, Ivanhoe Road, Liverpool, Petroleum Merchant.

O.M. Bannister, R., 59, Tregunter Road, South Kensington, S.W., Analytical Chemist.

O.M. Bannister, W., Victoria Lodge, Cork, Ireland, Manufacturing Chemist.

1901. Barber, René R., Georgetown, Ont., Canada, Analytical Chemist.

1892. Barden, Alf., Far Bank, Shelley, near Huddersfield, Glue and Size Maker.

1894. Barden, Sam, Woodhouse Mills, Shelley, near Huddersfield, Glue and Size Manufacturer.

1886. Bardsley, Robt., Messrs. Jewsbury and Brown, Ardwick Green, Manchester, Mineral Water Manufacturer.

1895. Bardwell, Fred. L., Massachusetts Institute of Technology, Boston, Mass., U.S.A., Assistant Professor of Chemistry.

1895. Barlow, Clinton W., 103—105, Greene Street, New York City, U.S.A., Merchant.

1901. Barlow, John J., 177, Manchester Road, Accrington, Calico Printer's Chemist.

1900. Barlow, Walter H., 152, Osbaldeston Road, Stoke Newington, N., Analytical Chemist.

1899. Barlow, Wm., 311, Market Street, Droylsden, near Manchester, Analytical Chemist.

1891. Barnes, Edw. A., Technical Chemist.

1901. Barnes, Fred., 46, Park Road, Sittingbourne, Kent, Paper Mill Chemist.

1884. Barnes, H. J., Phœnix Chemical Works, Hackney Wick, E., Manufacturing Chemist.

O.M. Barnes, Jos., Rock Mount, Whalley Road, Accrington, Lancashire, Analytical Chemist.

1884. Barnes, Jonathan, 301, Great Clowes Street, Manchester, Analytical Chemist.

1897. Barnett, Robt. E., Leeds Technical School, Cookridge Street, Leeds, Headmaster.

1898. Barnicott, Jas. A., Messrs. May and Baker, Ltd., Garden Wharf, Church Road, Battersea, S.W., Chemical Manufacturer.

1901. Barr, Geo., The Dunnell Manufacturing Co., Pawtucket, R.I., U.S.A., Calico Printer.

O.M. Barr, J., Dinting Vale, Dinting, Derbyshire, Chemical Manager.

1890. Barraclough, Wm. H., Mortomley, near Sheffield, Analytical Chemist.

1900. Barralet, Edgar S., 2, Green Street, Bethnal Green, London, E., Chemist.

1896. Barratt, J. Treeby, "Normanhurst," Chingford, Essex, Chemist and Manager.

1890. Barrett, Arthur A., 5, Strada del Pozzo Leone, Messina, Sicily, Manufacturer of Essential Oils.

1898. Barrett, Jesse M., 618, Packard Street, Kansas City, Kansas, U.S.A., Chemist (G. H. Hammond Co.).

1890. Barrie, D. McLaurin, Analytical Chemist

1900. Barrow, Jos., 1, Townfield Lane, Bebington, Cheshire, Chemist.

1898. Bartlett, Saml. A., c/o The Commercial Development Corporation, 34, Castle Street, Liverpool, Secretary.

1893. Barton, G. E., c/o Whitall, Tatum, and Co., Flint Glass Works, Millville, N.J., U.S.A., Technica Chemist.

1900. Barton, L. Edward, 283—285, Broadway, Albany N.Y., U.S.A., Chemist.

1895. Baskerville, Dr. Chas., University of North Carolina Chapel Hill, N.C., U.S.A., Professor of Chemistry

1884. Bassett, H., 26, Belitha Villas, Barnsbury, N.

1899. Bassett, Wm. H., c/o New Jersey Zinc Co., Passaic Avenue, Newark, N.J., U.S.A., Chemist.

1890. Bate, William, c/o National Explosives Co., Ltd. Hayle, Cornwall, Technical Chemist.

1884. Bateson, Percy, Cuckoo Lane, Gateacre, near Liverpool, Technical Chemist.

1885. Batty, R. B., Wharncliffe, Erdington, near Birmingham, Nickel Works Manager.

1900. Battye, Charles, Meltham, Swanston Street, South Geelong, Victoria Australia, Lecturer on Chemistry

1900. Baur, Jacob, 76—82, Illinois Street, Chicago, Ill. U.S.A., Liquid Carbonic Acid Manufacturer.

1890. Bavay, Aug de, Foster's Brewery, Collingwood, Melbourne, Australia, Brewer.

1898. Baxter, John G., c/o Mrs. Kitchell, Cemetery Lodge Heckmondwike, Yorks., Chemist.

O.M. Baxter, W. H., 11, High Road, Streatham, S.W. Brewery Director.

1899. Bayly, Francis W., Royal Mint, Sydney, N.S.W. Australia, Assayer.

O.M. Baynes, J., Royal Chambers, Scale Lane, Hul County and Borough Analyst.

1897. Beadle, Alec A., Greenheys, Granville Road, Hig Barnet, Herts., Electro-Chemist.

1886. Beadle, Clayton, Melrose, Hatherley Crescent, Sidcup Kent, Consulting Chemist.

1890. Bealey, Adam C., c/o R. Bealey & Co., Radcliffe, Lancashire, Bleacher and Alkali Manufacturer.

O.M. Beanes, E., Moatlands, Paddock Wood, Kent, Manufacturing Chemist.

1883. Beaven, E. S., 5, Boreham Terrace, Warminster Wilts, Maltster.

1897. Beaver, Chas. J., Somerleyton, Sherwood Avenue Sale, Cheshire, Chemist.

1895. Bechi, G. de, c/o Messrs. W. Blythe and Co., Church, Lancs., Chemical Engineer.
1898. Beck, Herbert H., 105, South Queen Street, Lancaster, Pa., U.S.A., Chemist.
O.M. Beckett, G. H., Glendys Cottage, Stevenston, Ayrshire, Analytical Chemist.
1898. Beckett, Jos. H., Brymbo Hall Farm, Brymbo, near Wrexham, North Wales, Analytical Chemist.
1889. Becnel, Lezin A., 721, Herman Building, New Orleans, La., U.S.A., Sugar Engineer.
1899. Bedford, Alf. C., 26, Broadway, New York City, U.S.A., Chemical Merchant.
1891. Bedford, Chas. S., Broomleigh, Chapel Lane, Headingley, Leeds, Manufacturing Chemist.
1891. Bedford, Jas. E., Messrs. Wood and Bedford, Kirkstall Road, Leeds, Manufacturing Chemist.
O.M. Bedson, Prof. P. Phillips, Durham College of Science, Newcastle-on-Tyne, Professor of Chemistry.
1901. Beebe, Murray C., Nernst Lamp Co., Pittsburg, Pa., U.S.A., Engineer.
1901. Beevers, Clifford J., c/o Brotherton and Co., Holmes Street, Dewsbury Road, Leeds, Analyst.
1899. Behr, Dr. Arno, Pasadena, Cal., U.S.A., Chemist.
O.M. Beilby, G., St. Kitts, Slateford, N.B., and (Journals) 8, University Gardens, Glasgow, Chemical Engineer.
1881. Bell, C. Lowthian, Free Library, Middlesbrough-on-Tees, Soda and Iron Manufacturer.
O.M. Bell, Sir Lowthian, Bart., F.R.S., (Journals) Rounton Grange, Northallerton; and (subs.) c/o Bell Bros., Middlesbrough, Iron and Chemical Manufacturer.
1900. Bell, Hugh P., 30, Egerton Crescent, London, S.W., Chemist.
O.M. Bell, J. Carter, Bank House, The Cliff, Higher Broughton, Manchester, Public Analyst.
1886. Bell, J. Ferguson, Derby Gas Light and Coke Co., Derby, Gas Engineer.
1881. Bell, T. Hugh, Middlesbrough-on-Tees, Soda and Iron Manufacturer.
O.M. Bendix, D., The British Alizarin Co., Limited, Silvertown, Victoria Docks, E.; Journals to 371, Romford Road, Forest Gate, E., Managing Chemist.
1898. Bendixen, Julius C., 61, Trafalgar Road, Old Kent Road, S.E., Leather Manufacturer.
1897. Benfey, Dr. Hans, 2, Sunnyside Terrace, Clayton, Manchester, Manufacturing Chemist.
O.M. Benger, F. B., The Grange, Knutsford, Cheshire, Manufacturing Chemist.
O.M. Benjamin, Dr. M., Smithsonian Institution, Washington, D.C., U.S.A., Consulting Chemist, A.M.
1899. Bennett, Alex. H., Chemical Laboratory, 39, Lime Street, E.C., Works Chemist.
1901. Bennett, Arnold, c/o Saml. Osborn and Co., Clyde Steelworks, Sheffield, Chemist.
1902. Bennett, Jas. Moss, 302, Upper Richmond Road, Putney, S.W., Metallurgist.
1884. Bennett, Thos., Birch Vale, near Stockport, Calico Printer.
1886. Bennie, J. W., Mountain Copper Co., Keswick, Shasta Co., Cal., U.S.A., Metallurgist.
1899. Bent, Edw., 11, Dulverton Road, Leicester, Manager (Pickle Manufactory).
1901. Bentley, Wm. H., 6, Woodbine Terrace, Irlam, near Manchester, Technical Chemist.
1890. Bentz, Ernest, 107, Shaw Lane, Dinting, near Manchester, Lecturer on Dyeing.
1897. Berg, Julius, Elsässischer Petroleum Gesellschaft, Waburg, Elsass, Germany, Oil Refinery Manager.
1884. Beringer, J. J., Basset Road, Camborne, Cornwall, Metallurgist.
1893. Berk, Fred. W., 1, Fenchurch Avenue, London, E.C., Chemical Manufacturer.
1900. Bermingham, Jno., jun., c/o California Powder Works, Pinole, Contra Costa Co., Cal., U.S.A., Powder Works Superintendent.
1889. Bernard, Jas., jun., Casal das Rolas, Olivaes, near Lisbon, Chemical Works Manager.
O.M. Bernays, J., 96, Newgate Street, London, E.C., Civil Engineer.
1900. Berolzheimer, D. D., 317, South 18th Street, Philadelphia, Pa., U.S.A., Chemist.
1897. Berry, Albert E., c/o Boake, Roberts, and Co., Chemical Works, Stratford, E.; and 95, Osborne Road, Forest Gate, E., Works Manager.
1883. Berry, E. E., Casa Balestra, Bordighera, Italy, Technical Chemist.
1889. Berry, G. F., Atlas Chemical Works, West Ferry Road, Millwall, E., Chemical Works Manager.
1898. Berwick, D. C., 62, Trinity Road, West Bromwich, and (Journals) c/o Chance Bros. & Co., Ltd., Glass Works, near Birmingham, Electro Metallurgist.
1900. Best, Alf. W., 177, Cowley Road, Oxford, Sugar Planter.
1898. Best, Dr. Otto, 16, Mastick Terrace, Alameda, Cal., U.S.A., Chemist.
1886. Best, Dr. T. T., Hardshaw Brook Chemical Works, St. Helens, Lancashire, Technical Chemist.
1901. Betts, Anson G., Troy, N.Y., U.S.A., Chemist.
O.M. Bevan, E. J., 4, New Court, Lincoln's Inn, London, W.C., Public Analyst and Consulting Chemist.
1900. Bevan, Jno. W., Risedale, St. James' Crescent, Swansea, Manager of Metallurgical Works.
O.M. Beveridge, J., 11, New Market Lane, Manchester, Pulp and Paper Manufacturer.
1900. Bevington, Col. S. B., 42, St. Thomas Street, Southwark, S.E., Leather Dresser.
1893. Bhaduri, Prof. K., Canning College, Lucknow, India Professor of Chemistry.
1898. Bhattacharyya, Haripada, Foundry and Shell Factory, Cossipore, Calcutta, India, Chemist.
1896. Bibby, John, c/o J. Bibby & Sons, Formby Street, Liverpool, Student.
O.M. Bickerdike, W. E., Bryer's Croft, Wilpshire, near Blackburn, Manufacturing Chemist.
1901. Bielecki, Dr. Jan, "Chemik Polski," 118, Marszalkowska Street, Warsaw, Russian Poland, Chemist.
1895. Bicknell, G. Arthur, 839, East Madison Avenue, Cleveland, Ohio, U.S.A., Analytical Chemist.
1901. Bigelow, C. A., 85, Wilson Avenue, Flushing, N.Y., U.S.A., Chemist.
1884. Biggart, J. Wm., 29, Cathcart Street, Greenock, N.B., Analytical Chemist.
1891. Biggart, Wm. L., c/o Western Chemical Co., Inchgreen Street, Bogston, Greenock, Public Analyst.
O.M. Biggs, B., 110, Cannon Street, London, E.C., Chemical Merchant.
1883. Bihn, G. F., Pennsylvania Salt Manufacturing Co., Philadelphia, Pa., U.S.A., Chemical Manufacturer.
O.M. Billing, H. S., 11, Devon Terrace, Ford Park, Plymouth, Analytical and Managing Chemist.
1896. Billings, Edgar F., 404, Atlantic Avenue, Boston, Mass., U.S.A., Manufacturing Chemist.
1896. Billington, Chas., jun., Studleigh, Longport, Staffordshire, Metallurgist.
1898. Binney, Harold, Bank of Commerce Building, 31, Nassau Street, New York City, Patent Lawyer.
1902. Binning, Stevenson, 101, Shooter's Hill Road, Blackheath, S.E., Technical Chemist.
1896. Bird, Arthur W., 10, Norfolk Square, London, W., Works Engineer.
1898. Bird, Frank W., Vinegar Works, Cambridge, Vinegar Brewer.
1897. Bird, Fred. C. J., 52, Cambridge Gardens, Notting Hill, W., Chemist.
1896. Bird, Jno. B., Minver House, 61, Bateman Street, Cambridge, Manure Manufacturer.
1885. Bird, R., Ellerslie, Roath, Cardiff, Tar Distiller.
1895. Bird, Wm. R., 125, Goddard Avenue, Swindon, Wilts, Analytical Chemist.
1885. Birley, R. K., c/o Chas. Macintosh and Co., Ltd., Cambridge Street, Manchester, India-rubber Manufacturer.
1884. Bischof, Gustav, 9, Hythe Road, Willesden Junction, N.W., Technical Chemist.
1895. Bischoff, Dr. Ernst, 87–89, Park Place, New York City, U.S.A., Chemist.

1883. Bishop, A. Conway, Three Mills Lane, Bromley-by-Bow, E., Manufacturing Chemist.
188[illegible]. Bishop, Fred, c/o Burmah Oil Co., Rangoon, Burmah, Technical Chemist.
O.M. Bishop, G. A., Gartverrie Fireclay Works, Glenboig, N.B., Mining Engineer.
[illegible]. Bixby, G. L., c/o Electric Storage Battery Co., 19th Street and Allegheny Avenue, Philadelphia, Pa., U.S.A., Chemical Engineer.
18[illegible]4. Blackmore, H. S., 206, South Ninth Avenue, Mount Vernon, N.Y., U.S.A., Chemist (Pure Aluminium and Chemical Company).
18[illegible]. Blackwell, G. G., 44–47, The Albany, Liverpool, Mineral and Metal Merchant.
[illegible]. Blagden, Victor, 50–51, Lime Street, London, E.C., Chemical Merchant.
188[illegible]. Blagden, W. G., 4, Fenchurch Avenue, London, E.C., Chemical Merchant.
18[illegible]7. Blair, Andrew A., 406, Locust Street, Philadelphia, Pa., U.S.A., Analytical Chemist.
1884. Blake, Jas., Thames Sugar Refinery, Silvertown, London, E., Sugar Refinery Manager.
1890. Blakey, A. J., Dudbridge Mills, Stroud, Gloucestershire, Dyer.
18[illegible]1. Blass, Edw., Essen (Ruhr), Germany, Civil Engineer.
1893. Blears, John, c/o Langworthy Bros. and Co., Lim., Greengate Mills, Salford, Dyer and Calico Printer.
O.M. Bles, A. J. S., 32, Chorlton Street, Manchester, Chemical Merchant.
1889. Bloede, Victor G., Station D., Baltimore, Md., U.S.A., Manufacturing Chemist.
1891. Bloomer, Fred. J., Penpont, Clydach, R.S.O., Glamorgan, Technical Chemist and Nickel Works Manager.
1886. Blount, Bertram, Chemical Laboratory, 2, Broadway, Westminster, S.W., Analytical Chemist.
1888. Bloxam, A. G., Birkbeck Bank Chambers, Chancery Lane, W.C., Analytical Chemist.
1890. Bloxam, W. Popplewell, Presidency College, Madras, India, Professor of Chemistry.
1886. Blundstone, E. R., 14, Great Smith Street, Westminster, S.W., and (Journals) Heathfield, Park Road, Hampton Hill, Middlesex, Consulting and Analytical Chemist.
O.M. Boake, A., Warton Road, Stratford, E., Manufacturing Chemist.
1888. Boake, Edmund J., Aberffraw, Nursery Road, Loughton, Essex, Manufacturing Chemist.
1885. Board, J. T., Distillery, Cheese Lane, Bristol, Distiller.
18[illegible]. Boehm, Fred., 16, Jewry Street, London, E.C., Chemical Agent and Merchant.
1900. Bohm, Dr. L. K., 320, Broadway, New York City, U.S.A., Expert in Patent Law.
1895. Bohm, Jos. A., c/o Actien Gesellschaft für Chemische Industrie, Rheinau bei Mannheim, Germany, Manager.
1898. Bogert, Marston T., Department of Organic Chemistry, Columbia University, New York City, U.S.A., Instructor in Organic Chemistry.
1901. Bolton, E. Richards, 11A, Selwood Terrace, South Kensington, S.W., Manufacturing Chemist.
1902. Bookman, Dr. S., 9, East 62nd Street, New York City, U.S.A., Chemist.
1[illegible]. Boor, Leonard G., 1 and 2, Artillery Lane, London, E.C., Chemical Merchant.
[illegible]. B[illegible]t, John C., Klatten, Java, Netherlands Indies, Chemist.
1884. [illegible], Geo., Irk Vale Dyeworks, Middleton, near Manchester, Yarn Dyer.
1891. Bo[illegible], R[illegible], 110, Cannon Street, London, E.C., Engineer.
1891. Boothby, C[illegible], [illegible], Vicarage Road, Lea Bridge Road, London, E., Analytical Chemist.
1897. Borland, C. R., Oakland, Bergen Co., N.J., U.S.A., Chemist (Powder Works).
O.M. Borland, W. D., Beacon Lodge, Bean, *viâ* Dartford, Kent, Explosives Chemist.
1900. Boseley, L. K., c/o J. Keiller and Son, Ltd., Tay Wharf, Silvertown, E., Analytical Chemist.
1898. Boss, Julian St. L., 45, Lupus Street, St. George's Square, London, S.W., Engineer.
O.M. Bothamley, C. H., Hurst Knoll, Weston-super-Mare, Somerset, County Director of Technical Instruction.
1890. Bott, Dr. W. Norman, 14, Great Smith Street, Westminster, S.W., Science Lecturer.
1884. Böttinger, Dr. H. T., Elberfeld, Germany; and (subs.) c/o The Bayer Co., Ltd., 19, St. Dunstan's Hill, E.C., Colour Manufacturer.
O.M. Bottle, Alex., 4, Godwyne Road, Dover, Pharmaceutical Chemist.
1901. Bottomley, Dr. J. Frank, 21, Wentworth Place, Newcastle-on-Tyne, Consulting Chemist.
O.M. Boulton, H. E., 64, Cannon Street, London, E.C., Chemical Manufacturer.
1890. Boulton, James, Crayford Mills, Stratford, E., Manufacturing Chemist.
O.M. Boulton, S. B., 64, Cannon Street, London, E.C., Chemical Manufacturer.
1883. Boulton, T. S., 14, Freegrove Road, Caledonian Road, N., Manager.
1900. Bourcoud, Augustin E., Gijón, Spain, Civil Engineer.
1902. Bousfield, E. Geo. P., St. Swithin's, Hendon, N.W., Electro-Chemist.
1884. Bow, R. H., 7, South Gray Street, Edinburgh, Civil Engineer.
1885. Bowen, S. B., Brickfield Chemical Works, Llanelly, South Wales, Chemical Manufacturer.
1899. Bowen, Wm., 45, Woodend Road, Erdington, Birmingham, Chemist.
1888. Bower, Frank, Truman's Brewery, Spitalfields, E., Analytical Chemist.
1897. Bower, Wm. H., 29th Street and Gray's Ferry Road, Philadelphia, Pa., U.S.A., Chemical Manufacturer.
1892. Bowes, Harry, 53, Moss Bank, Higher Crumpsall, Manchester, Analytical Chemist.
1889. Bowing, Jno., Fuel Works, Tilbury, Essex, Consulting Chemist.
1883. Bowley, Jos. John, Wellington Works, Battersea Bridge, London, S.W., Chemical Manufacturer.
1899. Bowley, J. Plunkett, 1, Wellington Road, Battersea, S.W., Varnish Manufacturer.
1883. Bowman, Dr. F. H., Spinningfield, Deansgate, Manchester, Chemical Manufacturer.
1894. Bowman, Jas. H., Canada Chemical Manufacturing Co., London, Ont., Canada, Professor of Chemistry.
1884. Bowman, R., Bowman and Co., Ltd., Victoria Chemical Works, Widnes, Chemical Manufacturer.
1896. Bowman, Walker, 39, Cortlandt Street, New York City, U.S.A., Chemist.
1899. Bowtell, Norman E., 144, Greenway Road, Runcorn, Cheshire, Works Chemist.
1893. Boyce, Frank, c/o Goodall, Backhouse, and Co., White Horse Street, Leeds, Technical Chemist.
1884. Boyd, Pythagoras, 6, Union Street, North Adams, Mass., U.S.A., Print Works Superintendent.
O.M. Boyd, W., P.O. Box 1829, Johannesburg, South Africa, Technical Chemist.
1899. Boyes, Herb. J., 9, Rua Episcopal, São Paulo, Brazil, Chemist.
1899. Brackett, E. R., 116, Haverhill Street, Lawrence, Mass., U.S.A., Chemist (International Paper Co.).
1885. Bradburn, J. A., 401, Lowell Avenue, Syracuse, N.Y., U.S.A., Chemical Engineer.
1883. Bradbury, A., Queen Buildings, 11, Dale Street, Liverpool, Chemical Broker.
1898. Bradford, Ernest, Ohio State University, Columbus, Ohio, U.S.A., Metallurgical Chemist.
1895. Bradford, Henry, c/o W. H. Gorringe, Woodcote, Chichester, Analytical Chemist.
1894. Bradley, Edw. F., The Star Brush Co., Ltd., Eden Grove, Holloway, N., Engineer.
1896. Bragg, Everett B., 1116, Michigan Avenue, Evanston, Ill., U.S.A., Manufacturing Chemist.

1891. Braithwaite, Isaac, Kendal, Westmoreland, Drysalter.
1897. Braithwaite, Jno. O., Hilika, Warren Road, Chingford, Essex, Pharmaceutical Research Chemist.
1897. Brakes, Jas., c/o Chateaugay Ore and Iron Co., Lyon Mountain, N.Y., U.S.A., Analytical Chemist.
O.M. Bramham, W., 115, Bow Road, London, E., Chemical Engineer.
O.M. Bramwell, Major E., Morpeth Road, Hoylake, Cheshire, Chemical Manufacturer.
1883. Bramwell, Sir F., Bart., F.R.S., 5, Great George Street, Westminster, S.W., Civil Engineer.
O.M. Bramwell, G. H., Cowley Hill, St. Helens, Lancashire, Alkali Manufacturer.
1900. Brandwood, John, 175, Walshaw Road, Bury, Lancashire, Dyeworks Manager.
O.M. Branson, F. W., Wynneholme, Far Headingley, Leeds, Pharmaceutical Chemist.
1901. Brearley, Harry, 53, Bower Road, Sheffield, Analytical Chemist.
1888. Breffitt, Wm., Glasshoughton, Castleford, Yorks, Glass Manufacturer.
1900. Breneman, Harry C., 320, Manhattan Avenue, New York City, U.S.A., Chemical Student.
1888. Bressey, Edw., 209, Romford Road, Stratford, E., Gold and Silver Refiner.
1901. Brewer, Dr. C. E., Wake Forest, N.C., U.S.A., Professor of Chemistry.
1900. Brewis, E. Theodore, 7, Cowper Street, Finsbury, E.C., Chemist.
1894. Breyer, Theodor, 105, Main Street, Peoria, Ill., U.S.A., Chemist (American Glucose Co.).
1885. Briant, L., 24, Holborn Viaduct, London, E.C., Analytical Chemist.
1890. Brierley, J. T., Highfield, Golden Hill, Leyland, near Preston, Lancs., Analytical Chemist.
1894. Briggs, J. Burnett, Vauxhall Soap Works, 6, Blackstock Street, Liverpool, Soap Manufacturer.
1893. Briggs, J. F., c/o Miss Dockrill, 114, Week Street, Maidstone, Sugar Works Chemist.
1885. Briggs, T. Lynton, 188, Central Avenue, Flushing, Long Island, N.Y., U.S.A., Technical Chemist.
1886. Briggs, Wm., Mount Pleasant, Blackness Avenue, Dundee, Manufacturing Chemist.
1890. Brindley, G. F., c/o Niagara Electro-Chemical Co., Niagara Falls, N.Y., U.S.A., Chemical Engineer.
1891. Bristed, John, c/o Minnett and Co., Stansted, Essex, Manager.
1886. Bristow, G. W., 10, Philpot Lane, London, E.C., Chemical Manager.
1887. Broadbent, H., c/o Goodall, Backhouse, & Co., Sovereign Street, Leeds, Chemist.
1896. Broadhurst, W. Homer, 294, Lafayette Avenue, Brooklyn, N.Y., U.S.A., Chemist.
1889. Brock, Arthur, Firework Factory, Sutton, Surrey, Firework Manufacturer.
O.M. Brock, J., Gwern-Tyno, Colwyn Bay, North Wales, Chairman of United Alkali Co., Ld.
1896. Brooke, C. B., jun., Colne House, Brantham, near Manningtree, Xylonite Manufacturer.
1900. Brooke, Jno. R., 36–37, Mincing Lane, London, E.C., Chemist.
1881. Brookes, E. A., c/o The Chilian Mills Co., Ltd., Chiguayante, Concepcion, Chile, Analytical Chemist.
1895. Brookman, Fred. W., 6, West Street, Rochdale, Manure Works Manager.
1893. Broome, F.S.J., Leaholme, Holloway, near Matlock Bath, Derbyshire, Assayer.
1901. Broome, Jos., 38, West 35th Street, Bayonne, N.J., U.S.A., Chemical Engineer.
O.M. Brotherton, E. A., Commercial Buildings, Leeds, Ammonia Distiller.
1884. Brown, Prof. A. Crum, F.R.S., 8, Belgrave Crescent, Edinburgh, Professor of Chemistry.
1891. Brown, Cæsar R., 23, Gower Road, Forest Gate, E., Works Foreman.
O.M. Brown, D., 93, Abbey Hill, Edinburgh, Chemical Manufacturer.
O.M. Brown, D., Donaghmore, Tyrone, Ireland, Soap Manufacturer.
1890. Brown, Edw. Hilton, Tannin Extract Works, Zelonie-Dol Station, Moscow-Kazan Railway, Russia, Analytical Chemist.
O.M. Brown, F. W., 81, Abbey Road, N.W., Science Tutor.
1894. Brown, G. E., 8, Palace Terrace, Palace Gates Road, Wood Green, N., Chemist.
O.M. Brown, Henry, Cannon Brewery, Watford, Herts, Brewing Chemist.
1899. Brown, Dr. Henry C., The Chemical Works, King's Lynn, Chemical Manufacturer.
O.M. Brown, Dr. Horace T., F.R.S., 52, Nevern Square Kensington, S.W., Brewing Chemist.
O.M. Brown, Dr. J. Campbell, 8, Abercromby Square, Liverpool, Professor of Chemistry.
1891. Brown, J. Henry, Minas d'Aljustrel Alemtejo, Portugal, Technical Chemist.
1901. Brown, Jos., Ashleigh House, Savile Town, Dewsbury, Manufacturing Chemist.
1892. Brown, Reginald B., 3, Alexandra Terrace, Headingley, Leeds, Dyer's Chemist.
·1889. Brown, Robt., The Firs, Hartford, Northwich, Engineer.
1890. Brown, R. J., Technical School, Stockport, Principal.
1901. Brown, Samuel B., Oakdene, Whaley Bridge, Stockport, Calico Printer's Manager.
O.M. Brown, T., The Chemical Works, King's Lynn, Chemical Manufacturer.
O.M. Brown, Walter, c/o Jas. H. Dennis and Co., Ltd., Widnes, Technical Chemist.
1900. Brown, Walter B., c/o Nelson, Morris, and Co., U.S. Yards, Chicago, Ill., U.S.A., Chemist.
1897. Brown, Wm., The Firs, Urmston, near Manchester, Engineer.
1901. Browne, Dr. Arthur L., 13-15, North Street, Baltimore, Md., U.S.A., Analytical Chemist.
O.M. Browning, W., Broad Oak, Accrington, Calico Printer.
1901. Brownlie, David, 4, Park Road, Monton, Eccles, near Manchester, Chemist.
1890. Bruce, Jas., Vauxhall Distillery, Liverpool, Distiller.
1900. Bruce, Wm. T., c/o Hugh Wallace and Co., Ltd., 5, Fenchurch Street, London, E.C., Director.
1892. Bruckmann, G. T., 192, 18th Street, Brooklyn, N.Y., U.S.A. Chemical Engineer.
O.M. Brunner, H., Holly Mount, Tarbock Road, Huyton, near Liverpool, Chemical Manufacturer.
1894. Brunner, H. Bertram, Winnington Park, Northwich, Chemist and Electrician.
1887. Brunner, J. F. L., 23, Wetherby Gardens, London, S.W., Chemical Manufacturer.
O.M. Brunner, Sir J. T., Bart., M.P., Druid's Cross, Wavertree, Liverpool, Chemical Manufacturer.
1894. Brunton, J. Dixon, Wire Mill, Musselburgh, N.B., Wire Manufacturer.
1890. Bryce, John Annan, Messrs. Wallace Bros., 8, Austin Friars, London, E.C., Merchant.
1894. Bryce, Thos., Tharsis Mines, Huelva, Spain, Chemist.
1897. Bryson, Jas., Pumpherston Oil Works, Midcalder, N.B., Oil Works Manager.
1892. Buchanan, D. G., Mount Vernon House, Glasgow, and (Journals) c/o Gibbs and Co., Iquique, Chile, Analyst.
1888. Buchanan, Jas., jun., Caledonia Foundry, Brasenose Road, Liverpool, Engineer.
1897. Bucher, Prof. John E., Brown University, Providence, R.I., U.S.A., Assistant Professor.
1897. Buck, Chas. A., 521, Locust Street, South Bethlehem, Pa., U.S.A., Chief Chemist (Bethlehem Iron Co.).
1897 Bucknill, Jno. A. S., 3, Crown Office Row, Temple, E.C., Barrister-at-Law.
O.M. Budden, E. R., 28, Church Row, Hampstead, N.W., Consulting Chemist.
1900. Bull, Dr. Benjamin S., 26, Westcombe Rise, Humber Road, Blackheath, S.E., Technical Chemist.

1902. Bull, Irving C., P.O. Box, 294, Middletown, N.Y., U.S.A., Chemist.
1892. Bull, Johannes C., Athelstone, Havelock Street, Helensburgh, N.B., Chemical Engineer.
O.M. Bullock, J. L., 3, Hanover Street, Hanover Square, London, W., Manufacturing Chemist.
1899. Bult, Herbert J., 18 Billiter Street, London, E.C., Chemist.
O.M. Bunty, H., Coltness Ironworks, Newmains, N.B., Ironworks Manager.
O.M. Bunker, H. E., 56, Church Road, Farnworth, near Bolton, Technical Chemist.
1901. Bunting, Henry H., c/o Peruvian Corporation, Ltd., Lima, Peru, Analyst.
1894. Bunting, W. Lightfoot, Forest Bank, Crawshawbooth, near Manchester, Calico Printer.
1893. Burbridge, Jas., India-rubber Mills, Tottenham, N. India-rubber Manufacturer.
1886. Burdekin, G., jun., Park Villa, Prescot Road, St Helens, Chemical Works Manager.
1896. Burford, Samuel F., The Firs, Kirby Muxloe, near Leicester, Analytical Chemist.
1898. Burge, Chas. H., Government Laboratory, Clement's Inn Passage, Strand, W.C., Analyst.
1889. Bürger, Dr. J., 1, Birch Avenue, Talbot Road, Old Trafford, Manchester, Technical Chemist.
1901. Burgess, Prof. C. F., University of Wisconsin, Madison, Wis., U.S.A., Electro-chemical Engineer.
1889. Burgess, Geo., Hale Road, Ditton, Widnes, Chemist.
1897. Burgess, G. E., Thornbank, Ellesmere Park, Eccles, Manchester, Dyer.
1894. Burgess, Herb. E., The London Essence Co., George Street, Camberwell Green, S.E., Chemist.
1889. Burgess, Wm. T., 46, Portland Road, Holland Park, London, W., Analytical Chemist.
O.M. Burghardt, Dr. C. A., Fern Cottage, Alderley Edge, Cheshire, Consulting Chemist.
1902. Burkard, Dr. Ernst, The Heyden Chemical Works, Garfield, N.J., U.S.A., Chemist.
1899. Burkhardt, Dr. G. A., c/o H. R. Simons, Strada Principatele Unite, 2, Bucarest, Roumania, Chemist.
1897. Burland, Lt.-Col. Jeffrey H., 824, Sherbrooke Street. Montreal, Canada, Paper and Card Manufacturer.
1896. Burland, Richard O., Bishopgate, Wigan, Manufacturing Chemist.
1900. Burleigh, Wm. F., c/o Murphy Varnish Co., Newark, N.J., U.S.A., Technical Chemist.
1897. Barls, Frank B., 19, Cleveland Mansions, Chapel Street, Brixton Road, S.W., Chemist.
1898. Burls, Herbert T., 206, Lewisham High Street, St. John's, S.E., Mechanical Engineer.
1901. Burnand, Sydney, Manbré Saccharine Co., Ltd., Hammersmith, W., Manager.
O.M. Burnard, R., Plymouth Chemical Works, Plymouth, Chemical Manufacturer.
1891. Burnet, Henry K., North Brook Vitriol Works, Bradford, Yorks., Vitriol Maker.
1897. Burnet, Jno. Jas., 18, University Avenue, Glasgow, Architect.
1893. Burnham, J. C., 51, Leyland Road, Lee, S.E., and (after March, 1902) Cordite Factory, Wellington, Nilgiri Hills, India, Analytical Chemist.
1900. Burnside, Chas. F., c/o International Smokeless Powder Co., Parlin, N.J., U.S.A., Chemist.
1890. Burn-Murdoch, J. V., Neuck, Larbert, N.B., Assayer.
1900. Barr, Edmund C., 1722, Vallejo Street, San Francisco, Cal., U.S.A., Manufacturer.
1900. Burr, E. Willard, Alvarado, Alameda Co., Cal., U.S.A., Sugar Manufacturer.
O.M. Burrell, B. A., 5, Mount Preston, Leeds, Analytical Chemist.
1897. Burrell, Loamis, Little Falls, Herkimer Co., N.Y., U.S.A., Manufacturer.
1892. Burrough, Horace, jun., c/o Burrough Bros. Manufacturing Co., Baltimore, Md., U.S.A., Technical Chemist.
1901. Burrows, Dr. Eggleston, Northbourne, Eton Avenue, Hampstead, N.W., M.D.
1888. Burrows, Edw., Belle Vue Road, Low Fell, Gateshead-on-Tyne, Alkali Works Manager.
1901. Burton, Alf., c/o Merchants' Dyeing and Finishing Co., Ltd., 42, Front Street West, Toronto, Canada, Dyer and Finisher.
1889. Burton, Wm., The Hollies, Clifton Junction, near Manchester, Potter's Chemist.
1897. Burwell, A. W., 208, Superior Street, Cleveland, Ohio, U.S.A., Consulting Chemist.
1885. Bury, J. H., Church Chemical Works, near Accrington, Chemical Manufacturer.
1898. Busch, Dr. Albert, 2, Blücherstrasse, Brunswick, Germany, Chemist.
1897. Bush, J. M., 7, Hyde Park Street, London, W., Manufacturing Chemist.
O.M. Bush, Baron W. de, c/o W. J. Bush and Co., Ltd., Ash Grove, Hackney, E., Chemical Manufacturer.
1897. Butler, David B., 41, Old Queen Street, Westminster, S.W., Cement Expert.
1890. Butler, Paul, Lowell, Mass., U.S.A., Ammunition Manufacturer.
1885. Butler, Samuel, The Cedars, Compton, Wolverhampton, Brewer.
1886. Butler, W. W., Southfield, Norfolk Road, Edgbaston, Birmingham, Brewer.
O.M. Butterfield, J. C., 79, Endlesham Road, Balham, S.W., Analytical Chemist.
1892. Butterfield, W. J. A., Overdale, Bletchingley, Surrey, Analytical Chemist.
1883. Butt, E. N., 77, Hamilton Terrace, Maida Vale, W., Pharmaceutical Chemist.
1897. Butters, Charles, 28-31, Bishopsgate Street Within, London, E.C., Metallurgist.
1900. Butterworth, Elwell R., c/o Reversible Collar Co., 111, Putnam Avenue, Cambridge, Mass., U.S.A., Chemist.
1892. Buttfield, Horace V., 13, Wellington Road, Bush Hill Park, Enfield, N., Chemical Demonstrator.
O.M. Byard, A. G., c/o Burt, Boulton, and Heywood, Apartado 8, Bilbao, Spain, Technical Chemist.
1899. Byrnes, Eugene A., 918, F. Street, N.W., Washington, D.C., U.S.A., Examiner in Electro-Chemistry.
1893. Byrom, T. H., Laboratory, Wigan Coal and Iron Co., Wigan, Analytical Chemist.
1887. Bythway, M., 44, Lloyd Street, Albert Street, Manchester, Drysalter.

C

1884. Cabot, Godfrey L., 82, Water Street, Boston, Mass., U.S.A., Chemist.
1889. Cadett, Jas., Ashtead, Surrey, Photographic Dry Plate Maker.
1901. Cady, Wm. H., 13, North Water Street, Philadelphia, Pa., U.S.A., Colour Chemist.
1891. Caines, G. S. A., 7, Rochester Terrace, Camden Road, London, N.W., Analytical Chemist.
1900. Cairns, Adam, Thistle Rubber Mills, Commerce Street, Glasgow, Manager.
1896. Cairns, F. Irvan, Anaconda, Mont., U.S.A., Metallurgist.
1897. Cairns, Wm., 5, Carlton Place, Glasgow, Plumber.
1891. Caldecott, W. Arthur, Rand Club, Johannesburg, Transvaal, South Africa, Metallurgist.
1897. Calder, W. A. S., The Hollies, South Road, Smethwick, Chemical Manufacturer.
1888. Caldwell, Wm., Murray Street, Paisley, N.B., Drysalter.
1891. Calkin, Wm. S., Spring Forge, Pa., U.S.A., Paper Pulp Works Chemist.
1901. Calvert, Jos. E., Etna, Allegheny Co., Pa., U.S.A., Analytical Chemist.

899. Calvert, Sidney, State University, Columbia, Mo., U.S.A., Professor of Chemistry.

895. Cumbier, Jacob, 910, Spruce Street, Pueblo, Colo., U.S.A., Chemist.

894. Cameron, Alex., Kronthal im Taunus, Germany, Chemical Engineer.

891. Cameron, Jas., 36, Mersey Lane South, Rock Ferry, near Birkenhead, Chemist.

888. Cameron, Peter, Bath Bridge Colour Works, Bristol, Colour Works Manager.

O.M. Cammack, J., 51, Denton's Green Lane, St. Helens, Technical Chemist.

1901. Camp, J. M., c/o Carnegie Steel Co., Duquesne, Pa., U.S.A., Chemist.

1886. Campbell, Andrew, c/o Thos. Cook and Son, Ludgate Circus, E.C., Analytical Chemist.

O.M. Campbell, Archibald, 1, Anson Street, Rugeley, Staffordshire, Technical Chemist.

1899. Campbell, Jas. Ennyce, 3, View Street, Worcester, Mass., U.S.A., Chemical Engineer.

1886. Campbell, John, 75, Hudson Street, New York City, U.S.A., Dye Manufacturer.

1901. Campbell, Kenneth F., M.Inst.C.E., 1, Peel Street, Huddersfield, Civil Engineer.

1897. Canfield, F. D., jun., 402, Warburton Avenue, Yonkers, N.Y., U.S.A., Sugar Refiner.

1893. Cannon, J. C., 12, Western Road, Shoreham, Sussex, Analyst.

O.M. Cannon, M., 25, Stormont Road, Clapham Common, S.W., Vinegar Works Manager.

1891. Canziani, Enrico, 3, Palace Green, Kensington, W., Civil Engineer.

1891. Carden, Albert J., Lea Valley Distillery, Warton Road, Stratford, E., Distiller.

1893. Carey, Arthur, Grange Cottage, Gateacre, near Liverpool, Chemist.

O.M. Carey, Eustace, 20, Alexandra Drive, Sefton Park, Liverpool, Chemical Manufacturer.

O.M. Carlile, T., 23, West Nile Street, Glasgow, Chemical Manufacturer.

1895. Carlsson, Hugo, c/o Dominion Iron and Steel Co., Sydney, B.C., Canada, Analytical Chemist.

1893. Carmichael, Dr. H., 12, Pearl Street, Boston, Mass., U.S.A., Analytical Chemist.

1896. Carmichael, Herbert, Bureau of Mines, Victoria, British Columbia, Public Analyst and Assayer.

1884. Carmody, Prof. Patrick, Government Laboratory, Port of Spain, Trinidad, Analytical Chemist.

1897. Carnell, Wm. C., c/o Tacony Chemical Works, Bridesbury, Philadelphia, Pa., U.S.A., Chemist.

1899. Carney, Jas. A., West Burlington, Iowa, U.S.A., Division Master Mechanic, C. B. & Q. Railroad.

O.M. Caro, Dr. H., Mannheim, Germany, Technical Chemist.

1900. Carp, B. M. A., Seragi Sugar Estate, Pekalongan, Java, N.E.I., Manager.

1893. Carpenter, C. C., South Metropolitan Gas Co., 709A, Old Kent Road, London, S.E., Civil Engineer.

1900. Carpenter, Frank B., Crenshaw Building, Richmond, Va., U.S.A., Chemist.

1900. Carpenter, Harry B., c/o Lister's Agricultural Chemical Works, Newark, N.J., U.S.A.

O.M. Carpenter, R. F., Prestwich, Greencroft Gardens, West Hampstead, N.W., Alkali Works Inspector.

1885. Carruthers, J. G., Burnbrae House, Milngavie, N.B., Dyeworks Manager.

1901. Carson, Geo. C., c/o Fred. Hurst, Redding, Shasta Co., Cal., U.S.A., Mining Engineer.

O.M. Carteighe, M., 180, New Bond Street, London, W., Pharmaceutical Chemist.

1902. Carter, Jno. P., 626, South 24th Street, Philadelphia, Pa., U.S.A., Analytical Chemist.

1895. Carter, Stewart F., Windsor Printworks, North, Adams, Mass., U.S.A., Technical Chemist.

1886. Carter, W. Chas., Applied Science Faculty, McGill College, Montreal, Canada, Analytical Chemist.

1889. Carulla, F. J. R., 84, Rose Hill Street, Derby, Chemical Manufacturer.

1900. Cates, Wm. A., Chemist.

1900. Cathcart, Dr. Wm. R., c/o Schaefer Alkaloid Works, Maywood, N.J., U.S.A., Chemist.

1895. Catlin, Chas. A., 133, Hope Street, Providence, R.I. U.S.A., Chemist (Rumford Chemical Works).

1896. Caven, Robt. M., University College, Nottingham, Lecturer in Chemistry.

O.M. Cawley, G., 29, Great George Street, Westminster, S.W., Chemical Engineer.

O.M. Cawley, J., 278, Passaic Street, Newark, N.J., U.S.A., Analytical Chemist.

1897. Cawley, Thos. A., British Gelatin Works, New Bedford Road, Luton, Beds., Gelatin Manufacturer.

1900. Cayvan, Llewellyn L., 322, West Monroe Street, Chicago, Ill., U.S.A., Chemist.

1891. Chadwick, Walter M., 24, West 3rd Street, Bayonne, N.J., U.S.A., Chemical Works Manager.

1897. Challen, Matthew B., School of Mines, Daylesford, Victoria, Australia, Assayer.

O.M. Chaloner, G., 30, Weston Park, Crouch End, N., Chemical Lecturer.

1894. Chaloner, G. W., 26, Eagle Wharf Road, Hoxton, N., Chemical Manager.

1901. Chamberlain, G. E., c/o Glucose Sugar Refining Co., Rockford, Ill., U.S.A., Chemist.

O.M. Chance, A. M., Chemical Works, Oldbury, near Birmingham, Chemical Manufacturer.

1883. Chance, J. F., New University Club, St. James' Street, London, S.W., Chemical Manufacturer.

O.M. Chandler, Dr. C. F., Columbia University, West 116th Street, New York City, U.S.A., Professor of Chemistry.

1900. Chandler, Prof. W. H., Lehigh University, South Bethlehem, Pa., U.S.A., Professor of Chemistry.

1893. Chaplin, Dr. Edw. M., 60, Westgate, Wakefield, Yorks, Analytical Chemist.

1890. Chapman, Alf. C., 8, Duke Street, Aldgate, E.C., Analytical Chemist.

O.M. Chapman, S., 36, Mark Lane, E.C., Chemical Manufacturer.

1894. Charlier, A. C. J., Sussex House, Hill Street, Glasgow, General Manager and Chemist.

1900. Chase, March F., c/o Mineral Point Zinc Co., Mineral Point, Wis., U.S.A., Chemist.

1889. Chase, R. L., Arnold Printworks, North Adams, Mass., U.S.A., Printworks Chemist.

1894. Chatard, Dr. T. M., 1714, Rhode Island Avenue, Washington, D.C., U.S.A., Chemical Engineer.

1900. Chattaway, Wm., Apothecaries' Hall, London, E.C., Consulting Chemist.

1898. Chattock, Herbert E., 23, Apsley Road, Clifton, Bristol, Oilcake Manufacturer.

1901. Cheetham, Howard, 18, St. Ann Street, Manchester, Chartered Patent Agent.

1894. Cheney, J. P., c/o Cheney Bros., South Manchester, Conn., U.S.A., Silk Manufacturer's Chemist.

1900. Chevassus, Philip, Chemist.

1885. Cheyne, A. M., c/o Messrs. Burgoyne, 16, Coleman St., E.C., Analytical Chemist.

1899. Child, Josiah F., The London Essence Co., George Street, Camberwell Green, S.E., Technical Chemist.

1893. Cholerton, A. F., Beech Leigh, Narboro' Road, Leicester, Manufacturing Chemist.

1890. Chorley, Jno. C., Lodge Lane, Bewsey, Warrington, Analytical Chemist.

O.M. Christie, J., Levenfield, Alexandria, N.B., Dyer and Printer.

1898. Christison, Geo., Cremona, Cambridge Drive, Glasgow, Engineer.

1883. Christy, Thos., The Manor House, Wallington, Surrey; and 4, 10, and 12, Old Swan Lane, London, E.C., Chemical Botanist.

O.M. Chrystal, W. J., Shawfield Works Rutherglen, near Glasgow, Chemical Manufacturer.

O.M. Church, Professor A. H., F.R.S., Shelsley, Kew, Surrey, Professor of Chemistry in the Royal Academy.

1890. Church, Elihu D., jun., 65, Wall Street, New York City, U.S.A., Soda Manufacturer.

1896. Claflin, Alan, Littleton, Mass., U.S.A., Manufacturing Chemist.
1900 Clamer, Guilliam H., 46, Richmond Street, Philadelphia, Pa., U.S.A., Chemist.
1885. Clanahan, H. C., 79, Mosley Street, Manchester, Chemical Merchant.
1901. Clapham, Henry E., Laurel Bank, Wilsden, near Bradford, Yorks., Technical Chemist.
1891. Clapp, Ralph R., c/o Standard Ammonia Co., Ltd., Iceland Wharf, Old Ford, E., Ammonia Works Manager.
1889. Clapperton, J., jun., c/o British Aluminium Co., Ltd., Larne Harbour, Co. Antrim, Ireland, Analytical Chemist.
1896. Clark, Donald, Bairnsdale, Victoria, Australia, Director of School of Mines.
O.M. Clark, Dr. J., 138, Bath Street, Glasgow, Analytical Chemist.
1901. Clark, Herbert Noel, West Ham Gasworks, Stratford, E., Gas Engineer.
1900. Clark, Jno., 34, Fitzjohn's Avenue, Hampstead, N.W., Manufacturing Chemist.
1902. Clark, Robt. M., Rockbank, Partickhill, Glasgow, Chemist.
1891. Clarke, Goddard, J.P., L.C.C., Fairlawn, 157, Peckham Rye, S.E., Drysalter.
1898. Clarke, J. F. Wylie, Messrs. J. and R. Tennent, Wellpark Brewery, Glasgow, Brewery Proprietor.
1897. Clarke, Wm. B., Edison-Swan Electric Works, Ponders End, N., Electro-Chemist.
O.M. Claudet, A. C., 6, Coleman Street, E.C.; and (Journals) 9, Dalebam Gardens, Hampstead, N.W., Metallurgist.
O.M. Claudet, F. G., 6, Coleman Street, E.C.; and (Journals) 181, Willesden Lane, N.W.; Assayer and Metallurgist.
1889. Claus, Wm. H., c/o Claus and Ree, Clayton, Manchester, Manufacturing Chemist.
O.M. Clayton, E. G., Chemical Laboratory, 32, Holborn Viaduct, London, E.C., Consulting Chemist.
1895. Clayton, Dr. G. C., Maldon Lodge, Wavertree, Liverpool.
1899. Clayton, Harold, 51, Smallbrook Lane, Westleigh, Lancashire, Colourist and Chemist.
1891. Clayton, J. W., Bentfield, Hunt's Cross, Liverpool, Pharmaceutical Chemist.
1894. Clayton, Robt. H., 12, Park Avenue, Southport, and (Journals), 37, George Street, Cheetham Hill, Manchester, Chemist.
1893. Clemes, J. H., The Bracken, Newquay, Cornwall.
1886. Cleminshaw, E., Alkali Works, Oldbury, near Birmingham, Technical Chemist.
1883. Clemons, G. H., Cudbear Street, Hunslet Road, Leeds, Dyeware Manufacturer.
1896. Clennell, J. E., c/o V. Mareenaro and Co., La Union, Salvador, Central America, Analytical Chemist.
1899. Clergue, Francis H., Sault Ste. Marie, Ontario, Canada, Chemical Manufacturer.
1884. Clerk, Dugald, 18, Southampton Buildings, Chancery Lane, W.C., Engineer.
1899. Cleveland, D. B., 116, Olive Street, Cleveland, Ohio, U.S.A., Chemist.
1881. Cliff, Stephen, Wortley, near Leeds, Firebrick Maker.
1900. Clifford, Wm., Glenhurst, Sewage Outfall Works, Wolverhampton, Sewage Works Manager.
1896. Clinch, Jno. W., Eartfield House, Douglas, Isle of Man, Brewer.
O.M. Cloud, T. C., Wallaroo Smelting Works, Wallaroo, South Australia, Metallurgist and Manager.
O.M. Clowes, Prof. F., 10, Craven Street, Charing Cross, W.C.; and The Grange, College Road, Dulwich, S.E., Chief Chemist (L.C.C.).
1886. Clowes, G. A., Woolleigh, Arundel Road, Eastbourne, Brewer and Maltster.
1891. Clotton, J. H., Goring Villas, Burry Port, R.S.O., Carmarthenshire, Assayer.
1900. Clymer, Wm. R., 1, The Northampton, Cleveland, Ohio, U.S.A., Chemist.
1899. Coates, Chas. E., jun., Louisiana State University, Baton Rouge, La., U.S.A., Professor of Chemistry.
1888. Coats, Jno. T., 105, Broughton Street, Edinburgh, Manufacturing Chemist.
1893. Cobb, Jno. W., Farnley Ironworks, near Leeds, Technical Assistant to Managing Director.
1894. Coblentz, Dr. Virgil, College of Pharmacy, 115, West 68th Street, New York City, U.S.A., Chemical Lecturer.
1899. Cochran, Alfred, c/o Parsons Pulp and Paper Co., Parsons, W. Va., U.S.A., Chemist.
1898. Cochrane, A. Lynde, Hamilton, Mass., U.S.A., Clerk (Cochrane Chemical Co.).
1895. Cochrane, Jno., Watford Bridge, New Mills, via Stockport, Calico Printer.
1901. Cockburn, John A., Ardeer, Stevenston, Ayrshire, Analytical Chemist.
1887. Coghill, P. de G., Borax Works, Old Swan, Liverpool, Technical Chemist.
1884. Cogswell, W. B., Syracuse, N.Y., U.S.A., Chemical Engineer.
1899. Cohen, Dr. Hermann, c/o S. Mandle, 3,943, West Pine Boulevard, St. Louis, Mo., U.S.A., Organic Chemist.
O.M. Cohen, Dr. J., Yorkshire College, Leeds, Analytical Chemist.
1900. Cohen, R. Waley, 11, Hyde Park Terrace, London, W., Chemist.
1897. Cohn, Alfred J., c/o Merck and Co., 13–19, University Place, New York City, U.S.A., Chemist.
1901. Cohn, Sigmund, 35, Frankfort Street, New York City, U.S.A., Metallurgical Chemist.
1891. Colby, Albert L., c/o Bethlehem Steel Co., South Bethlehem, Pa., U.S.A., Metallurgical Engineer.
1899. Colby, E. A., Baker Platinum Works, Newark, N.J., U.S.A., Metallurgical Chemist.
O.M. Colby, W. H., Carreg-wen, Aberystwith, Wales.
1893. Colefax, Dr. Arthur, 85, Onslow, London, S.W., Barrister-at-Law.
1899. Coleman, Gurney F., 4244, Cook Avenue, St. Louis, Mo., U.S.A., Chemist and Paint Merchant.
1885. Coleman, Jas. B., 40, Whitehead Grove, Chelsea, S.W., Analytical Chemist.
1893. Coleman, W. H., 4, Sunnyside Terrace, North Road, Clayton, Manchester, Tar Works Chemist.
O.M. Collens, E., Vinegar Works, Stourport, Worcestershire, Vinegar Works Manager.
1887. Collett, J. M., Guy's Cliff, Wotton, Gloucester, Chemical Manufacturer.
1901. Colley, Bernard T., c/o American Smelting and Refining Co., Argentine, Kansas, U.S.A., Assayer and Chemist.
1893. Collin, Dr. C. A., Ferguslie Threadworks, Paisley, N.B., Textile Chemist.
1898. Collingridge, Frank, Warwick Lodge, Hadley, Barnet, Chemist.
1883. Collins, J. H., 702, Salisbury House, Finsbury Circus, London, E.C., Technical Chemist.
1899. Collins, S. Hoare, Durham College of Science, Newcastle-on-Tyne, Agricultural Chemist.
1888. Collins, W. Hepworth, c/o Edw. Wihl & Co., 17, Nicholas Street, Manchester, Analytical Chemist.
1899. Collis, Walter T., Swinford House, Stourbridge, Worcestershire, Chemist.
1891. Colman, Dr. H. G., 27, Stirling Road, Edgbaston, Birmingham, Analytical Chemist.
1892. Colquhoun, Lewis, c/o South African Explosives Co., Modderfontein, Transvaal Colony, Analytical Chemist.
1894. Colquhoun, W., 6, Grove Road, Wrexham, North Wales, Engineer.
1901. Colwell, J. Kear, Finsbury Town Hall, Rosebery Avenue, E.C., Analytical and Consulting Chemist
1900. Comey, Arthur M., 32, Hawley Street, Boston, Mass., U.S.A., Technical Chemist.
1899. Conant, Francis M., c/o Sanderson and Porter, Mishawaka, Ind., U.S.A., Chemical Engineer.

901. Connah, Jas., Normanhurst, Park Road, Sidcup, Kent, Government Analyst.
883. Connor, C. C., 4, Queen's Elms, Belfast, Ireland, Chemist.
891. Conradson, Pontus H., Galena Oilworks, Franklin, Pa., U.S.A., Analytical Chemist.
889. Conroy, Dr. Jas. T., 13, Howard Drive, Cressington, Liverpool, Chemist.
887. Constable, W. H., Australian Alum Works, Runcorn, Analytical Chemist.
902. Converse, W. A., Rooms 27–34, Rialto Building, Chicago, Ill., U.S.A., Chemist.
891. Coode, J. Charles, 19, Freeland Road, Ealing, W., Civil Engineer.
.M. Cook, H. J., The Firs, Woodford Green, Essex, Soap Manufacturer.
888. Cook, Jno. J., Atlas Foundry, St. Helens, Lancashire, Ironfounder.
899. Cook, R. Anderson, New Brunswick, N.J., U.S.A., Chemist.
898. Cook, Thos. Alex., East London Soap Works, Bow, E., Soapmaker.
899. Cook, Walter G., 9, Hendon Lane, Finchley, N., Analytical Chemist.
894. Cook, Wm. Martyn, 142, Highbury New Park, London, N., Analytical Chemist.
891. Cooke, Arthur W., c/o Brotherton and Co., Holmes Street, Dewsbury Road, Leeds, Analytical Chemist.
.M. Cookson, N. T., Newcastle-on-Tyne, White Lead Manufacturer.
901. Cooper, T. S., Beckfoot, Manchester, S.E., Calico Printing Chemist.
891. Cooper, Walter J., c/o South Wales Cement Co., Penarth, Cardiff, Cement Works Manager.
897. Cooper, Wm. R., Carisbrooke, Upper Tulse Hill, S.W., Electrical Engineer.
890. Corcoran, Bryan, 31, Mark Lane, London, E.C., Chemical Engineer.
887. Cordner-James, J. H., Finsbury House, Blomfield Street, London, E.C., Mining Engineer.
899. Cornelison, Dr. Robt. W., Bloomfield, N.J., U.S.A., Consulting Chemist.
887. Cornett, Jas. P., Ford Paper Works, Hylton, near Sunderland, Paper Maker.
889. Corrie, David, c/o Nobel's Explosives Co., Ltd., Polmont Station, N.B., Technical Chemist.
898. Cosby, C. D., Radford House, Home Park Road, Saltash, Cornwall, Mining Engineer.
894. Coste, J. H., 40, Craven Street, W.C.; and (Journals) 206, Amhurst Road, Hackney, E., Analytical Chemist.
883. Cotterill, Thos., The Poplars, West Bromwich, Chemical Agent.
891. Cotton, W. F., Hollywood Roebuck, Co. Dublin, Gas Works Manager.
898. Coupe-Annable, H. W., Keadby, Doncaster, Chemical Assistant.
894. Court, Heywood, 67, Surrey Street, Sheffield, Analytical Chemist.
898. Courtney, Samuel, 37, The Mount, Belfast, Ireland, Manager.
894. Cousins, W. J., 17, Temple Chambers, Temple Avenue, E.C., Consulting Chemist and Director.
902. Cowan, Fredk. W., 8, Nassau Street, Toronto, Canada, Chocolate Maker.
893. Cowan, W. J., 12, Park Avenue, Wood Green, N., Fine Colour Manufacturer.
894. Coward, Percy, Sewage Disposal Works, Deighton, Huddersfield, Chemist.
897. Cowburn, Arthur W., Fernroyd, St. Margaret's Road, Bowdon, Cheshire, Chemical Merchant and Analytical Chemist.
894. Cowburn, W. H., Fernroyd, St. Margaret's Road, Bowdon, Cheshire, Chemical Merchant.
891. Cownley, A. J., 13, Fenchurch Avenue, London, E.C., Analytical Chemist.
891. Cowper-Coles, Sherard Osborn, Grosvenor Mansions, Victoria Street, Westminster, S.W., Metallurgical Engineer.
1884. Craig, Geo., Chemical Laboratory, 95, Bath Street, Glasgow, Technical Chemist.
1895. Craig, Thos. J., c/o Messrs. Peter Spence and Sons, Manchester Alum Works, Manchester, Chemist.
1886. Crake, Wm., 394, Staniforth Road, Sheffield, Analytical Chemist.
1901. Crane, Fred. D., 28, Hillside Avenue, Montclair, N.J., U.S.A., Consulting Chemist.
1898. Cranfield, Wm., 5, Second Avenue, Halifax, Yorks., Teacher of Chemistry.
1902. Craven, Alfd. B., 91, Fielding Terrace, Armley, Leeds, Analytical Chemist.
1889. Craven, Chas. E., Oak Villa, Bramley, near Leeds, Dyer.
1899. Craven, Jas., The Netherlands, Broughton Park, Manchester, Chemist.
1891. Craven, Jno., jun., 6, Halliwell Lane, Cheetham Hill, Manchester, Chemist.
1885. Craw, John, 15, Cadogan Street, Glasgow, Drysalter.
1896. Crawford, Alex., 113, Fenchurch Street, London, E.C., Chemical Merchant.
O.M. Crawford, D., Langdale's Chemical Manure Co., Lim., St. Laurence, Newcastle-on-Tyne, Manager.
1884. Crawford, D., 12, Abbey Grove, Eccles, Manchester, Dyer and Printer.
1890. Crawshaw, E., 25, Tollington Park, London, N., Dye Merchant.
1900. Crayen, Dr. Gustav, 446, West 23rd Street, New York City, U.S.A.
1895. Cremer, John H., 24, Superior Street, Cleveland, Ohio, U.S.A., Chemist and Metallurgist.
O.M. Cresswell, C. G., Ermyngarth, Ashtead, Surrey; and 9, Bridge Street, Westminster, S.W., Chemist.
1901. Cribb, Cecil, 136, Shaftesbury Avenue, London, W., Analytical and Consulting Chemist.
1886. Crichton, Donald G. (Journals), Bundle, viâ Tamworth, New South Wales; (subs.) Logan Bank, Cupar, Fife, N.B., Analytical Chemist.
1898. Crichton, Jas., Raeburn, Stonebridge Park, Willesden, N.W., Merchant.
1890. Criper, Wm R., Cossipore Chemical Works, Cossipore, Calcutta, India, Manufacturing Chemist.
1899. Crombie, Jos. A., 1105, Metropolitan Avenue, Brooklyn, N.Y., U.S.A., Essential Oils Manufacturer.
1898. Crompton, Benj. F., Haigh Dyeworks, near Wigan, Lancs., Dyer.
1885. Crompton, Percy R., Elton Paper Mills, near Bury, Lancashire, Paper Maker.
1901. Cronquist, G. W., Billesholm and Bjuf Coal and Firebrick Co., Bjuf, Sweden, Technical Chemist.
1889. Cronquist, Prof. A., Werner, 5, Malmtorgsgatan, Stockholm, Sweden, Consulting Chemist.
O.M. Crookes, Sir Wm., F.R.S., 7, Kensington Park Gardens, Notting Hill, W., Analytical Chemist.
1899. Crosbie, Adolphe, Walsall Street Chemical Works, Wolverhampton, Chemical and Colour Manufacturer.
1896. Crosby, Thos., Briton Ferry Steelworks, Briton Ferry, Glamorganshire, Metallurgist.
O.M. Crosfield, A. L., 46, Bidston Road, Oxton, Birkenhead, Analytical Chemist and Assayer.
1896. Crosfield, George R., Walton Lea, Warrington, Soap Manufacturer.
1884. Cross, C. F., 4, New Court, Lincoln's Inn, London, W.C., Analytical Chemist.
1900. Crosskey, Alex., N., c/o Alloys Syndicate Ltd., New Dock, Llanelly, South Wales, Chemist.
1894. Crossley, Dr. Arthur W., Chemical Laboratory, St. Thomas' Hospital, London, S.E., Organic Chemist.
1900. Crossley, Frank, Duchy Bank, Seedley Road, Pendleton, Manchester, Analytical Chemist.
1892. Crossman, Tom, Albion Brewery, Coldhurst Street, Oldham, Brewing Chemist.
1884. Crow, Dr. J. K., 2, Ulundi Road, Blackheath, S.E., Technical Chemist.
1894. Crow, Henry W., 94, Romford Road, Stratford, E., Tar Distiller.

1893. Crowther, Edw., Woodland Dyeworks, Headingley, Leeds, Dyer.
1883. Crowther, Horace W., The Beeches, West Bromwich, Technical Chemist.
1899. Crowther, J., South Australian School of Mines, Adelaide, Metallurgist.
1884. Crowther, W. M., Field House, Gomersal, near Leeds, Manufacturing Chemist.
1884. Crumbie, W. D., 146, Washington Street, East Orange, N.J., U.S.A., Analytical Chemist.
1902. Crush, E. H., 17, Foyle Road, Westcombe Park, Blackheath, S.E., Technical Chemist.
1892. Cullen, Wm., c/o South African Explosives Co., Modderfontein, Transvaal; and (Journals) Craig Knowe, Irvine, N.B., Chemist.
1897. Culmann, Dr. Julius, 843, Front Avenue, Buffalo, N.Y., U.S.A., Chemist and Colourist.
1883. Cuming, James, jun., Chemical Works, Yarraville, Melbourne, Australia, Manure Manufacturer.
1897. Cunliffe, Albert J., Kern Mill Printworks, Whittle-le-Woods, Lancashire, Calico Printer.
1884. Cunliffe, E. T., The Parsonage, Handforth, near Manchester.
1893. Cunningham, Edw., 70, Kilby Street, Boston, Mass., U.S.A., Chemical Engineer.
O.M. Curphey, W. S., Borva, Lenzie, N.B., Alkali Works Inspector.
O.M. Curry, W. A., Giltbrook Chemical Works, Awsworth, Notts, Manager.
1898. Curtis, Marvin, 123, California Street, San Francisco, Cal., U.S.A., Wine Chemist.
1884. Cuthbertson, Sir J. N., 29, Bath Street, Glasgow, Chemical Broker.
1899. Cutler, Fred. F., 183, Essex Street, Boston, Mass., U.S.A., Publisher.

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O.M. Dacie, J. C., Soap Works, Putney, London, S.W., Soap Manufacturer.
1897. Dains, Hebert H., Vizianagram Cantonment, Madras Presidency, India, Analytical Chemist.
1897. Dakin, Henry D., 9, Beech Grove Terrace, Leeds, Assistant Analyst.
1887. Dale, Jas., c/o Jas. H. Dale, 1, Dorothy Villas, Cavendish Road, West Croydon, Coppersmith.
1897. Dancer, Wm., 466, Chester Road, Old Trafford, Manchester, Analytical Chemist.
1884. Daniell, Louis C., (Journals) Royal Standard Brewery, Tamworth, New South Wales; and (subs.) c/o W. T. Allen & Co., 132, Queen Victoria Street, London, E.C., Brewer.
1885. Darby, J. H., Pen-y-Garth, Brymbo, near Wrexham, Ironmaster.
1901. Darke, Jesse M., Steel Foundry, General Electric Co., and (Journals) 551, Essex Street, Lynn, Mass., U.S.A., Chemist.
1894. Darling, G. A., Robinson G. M. Co., Box 1,024, Johannesburg, S.A., Metallurgical Chemist.
O.M. Darling, W. H., 126, Oxford Street, Manchester, Analytical Chemist.
1887. Davenport, Dr. B. F., 161, Tremont Street, Boston, Mass., U.S.A., Consulting, Sanitary, and Toxicological Chemist.
190[illegible]. Davidson, Alex., jun., 1, Almond Bank Terrace, East Merchiston, Edinburgh, Analytical Chemist.
1899. Davidson, Charles, 37, Heriot Street, Pollokshields, Glasgow, Analytical Chemist.
1901. Davidson, G. M., Chicago & N. W. Railroad Shops, P.O. Station E., Chicago, Ill., U.S.A., Chemist.
1883. Davidson, J. E., 40, Percy Gardens, Tynemouth, Chemical Manufacturer.
1891. Davidson, Richard, 14, High Street, Dundee, Oil Merchant's Clerk.
O.M. Davidson, R. Holden, c/o United Alkali Co., Ltd., Ammonia Soda Works, Fleetwood, Works Manager.
1897. Davies, Charles T., 405, Elm Street, Reading, Pa. U.S.A., Chemist.
1889. Davies, G. W., 8, Spring Hill, Stockport, Chemica Lecturer.
1898. Davies, Herbert E., The Laboratory, 28, Chape Street, Liverpool, Analytical Chemist.
1893. Davies, Leyshon, 256, West George Street, Glasgow Gunpowder Mills Manager.
1896. Davies, Llewellyn J., Bute Chambers, Bute Road Cardiff, Analytical and Consulting Chemist.
1886. Davies, M. Lloyd, North American Chemical Co. Bay City, Mich., U.S.A., Alkali Works Manager.
1897. Davies, Saml. H., c/o H. S. Rowntree and Co. Cocoa Works, York, Research Chemist.
O.M. Davis, A. R., Derby Lodge, Wellington Road, Heato Chapel, Stockport, Analytical Chemist.
1900. Davis, Arthur C., Saxon Portland Cement Co., Cam bridge, Cement Maker.
1901. Davis, Bernard F., 142, Widmore Road, Bromley Kent, Metallurgical Engineer.
1902. Davis, Charles B., 218, West 134th Street, New York City, U.S.A., Technical Chemist.
1902. Davis, Emerson, 515, Cass Avenue, Detroit, Mich. U.S.A., Chemist.
1893. Davis, Fred., 51, Imperial Buildings, Ludgate Circus London, E.C., Analytical and Consulting Chemist
O.M. Davis, George E., Sandilands, Knutsford, Cheshire Chemical Engineer.
1893. Davis, G. Keville, Sandilands, Knutsford, Cheshire Chemical Engineer.
1893. Davis, Herbert J., 65, Wall Street, New York City U.S.A., Merchant.
O.M. Davis, H. W., Government Laboratory, Clement' Inn Passage, Strand, W.C., Analytical Chemist.
O.M. Davis, T. Sebastian, 199, South Lambeth Road London, S.E., Vinegar Works Chemist.
1897. Davis, Wm. A., Central Technical College, Sout Kensington, S.W., Chemist.
1893. Davis, W. Walley, Virginia Iron Coal and Coke Co. Bristol, Tenn., U.S.A., Analytical Chemist.
1900. Daw, Fred W., Eureka Place, Ebbw Vale, Mon. Metallurgical Chemist.
O.M. Dawson, C. A., 40, Russell Road, Sefton Park Liverpool, Technical Chemist.
1896. Dawson, Geo., Holm Lea, Gorton Road, Reddish Stockport, Technical Chemist.
1886. Dawson, W. Haywood, British Alizarin Co., Limited Silvertown, Victoria Dock, E.; and (Journals) 187, Eglinton Road, Woolwich, S.E., Technica Chemist.
1901. Day, Dr. David T., U.S. Geological Survey, Wash ington, D.C., U.S.A., Geologist.
1901. Day, Murray G., c/o Barber Asphalt Paving Co., 1209 Stock Exchange Building, Chicago, Ill., U.S.A.
O.M. Deacon, H. W., 8, Ullet Road, Liverpool, Alkal Manufacturer.
1896. Deakin, E. Carr, Egremont House, Belmont, nea Bolton, Dyer.
O.M. Deakin, H. T., Dewhurst House, Egerton, nea Bolton, Dyer.
1899. Deane, Leopold M., Davington House, Faversham Kent, Chemist (Cotton Powder Co., Ltd.),
1892. Deaville, B., Hyson Green Works, Nottingham Manufacturing Chemist.
1899. De Castro, J. Paul, Ford House, Redruth, Cornwal Principal (Redruth School of Mines).
1902. De Cew, J. A., School of Practical Science, Toront Canada, Assistant in Chemistry.
1893. De Clerck, Maurice, Heule-lez-Courtrai, Belgium.
1884. Deering, W. H., Chemical Department, Roy Arsenal, Woolwich, S.E., Analytical Chemist.
1900. Deerr, Noel, Albion, Demerara, B.G., Analytica Chemist.
1901. De Jonge, Cornelius, 36, Doughty Street, Brookly N.Y., U.S.A., Pharmaceutical Chemist.
1893. Delahaye, Philibert, 105, Rue St. Lazare, Paris (IX. Gas Engineer.
1899. Delano, Warren, jun., 1, Broadway, New York City U.S.A., Mine Operator.

1901. Delany, Chas., c/o Elliott Bros., Ltd., O'Connell Street, Sydney, N.S.W., Australia, Chemist.
1896. De Lessing, G. C., 147, East 81st Street, New York City, U.S.A., Manufacturing Chemist.
1898. Deming, Edw. D., 143, Federal Street, Boston, Mass., U.S.A., Editor of "The Leather Manufacturer."
1888. Dempsey, Geo. C., 165, Market Street, Lowell, Mass., U.S.A., Chemist.
1899. Denham, Wm. S., 9, Holyrood Crescent, Glasgow, Chemist.
1891. Denison, Joseph R., 4, Duckworth Grove, Manningham, Bradford, Analytical Chemist.
1897. Dennis, John, Ellonville, Dalkeith, N.B., Contractor.
1898. Dent, Dr. Frankland, Plaza del General Santveildes, Burgos, Spain, Consulting Chemist.
1901. Devas Ernest W., Westward Ho., Wimbledon Common, S.W., Technical Chemist.
1890. De Velling, F. W., Higher Grade Board School, The Boulevard, Hull, Head Master and Science Lecturer.
1898. Dewar, Alex. H., c/o The Linoleum Co., Ltd., Staines, Middlesex, Chemist.
O.M. Dewar, Prof. J., F.R.S., Royal Institution, Albemarle Street, W. (Journals); and 1, Scroope Terrace, Cambridge, Professor of Chemistry and Physics.
1894. Dewar, Jno. A., M.P., Murrayshall, Scone, Perthshire, N.B., Distiller.
1889. Dewey, Fred. P., McGill Building, Washington, D.C., U.S.A., Metallurgist.
1899. Dewez, Eugène, jun., Herve, Belgium, Tanner.
1891. De Wilde, Prof. P., 343, Avenue Louise, Brussels, Belgium, Professor of Chemistry.
1886. Dey, Preo Lall, 4, Beadon Street, Calcutta, Manufacturing Chemist.
O.M. Dibdin, W. J., Edinburgh Mansions, Howick Place, S.W.; and (Journals) Mayfield, Grange Road, Sutton, Surrey; Analytical Chemist.
O.M. Dick, A., 110, Cannon Street, London, E.C., Chemical Engineer.
1896. Dick, F. Burnett, 8, Disraeli Gardens, Putney, S.W., Chemist.
1897. Dick, Jno., c/o Dick, Ridout, and Co., 77, York Street, Toronto, Ont., Canada, Manufacturer.
1898. Dickenson, Frank, 48, Bignor Street, Cheetham Hill, Manchester.
1896. Dickenson, F. M., c/o Broken Hill Proprietary Co., 3, Great Winchester Street, E.C., Secretary.
1893. Dickerson, E. N., 15, Wall Street, New York City, U.S.A., Lawyer.
O.M. Dickinson, A. J., Neptune Tar and Chemical Works, Deptford, S.E.; and (Journals) 4, Shardeloes Road, New Cross, S.E., Tar Distiller.
1887. Dickson, Jno., 54, Brown Street, Broomielaw, Glasgow, Oil Merchant.
1898. Dickson, Samuel, 2, Broadway, Westminster, S.W., Analytical Chemist.
1899. Dieckmann, Dr. Otto, 1182, Harrison Avenue, Cincinnati, Ohio, U.S.A., Chemist.
1901. Diehl, Oscar C., 611, Thompson Street, Saginaw, Mich., U.S.A., Chemist.
1894. Diestel, Wm., 77, William Street, New York City, U.S.A., Dyestuff Importer.
1898. Dillon, Wm., Laurel Bank, Halton, Leeds, Oil, Colour, and Varnish Manufacturer.
O.M. Divers, Dr. E., F.R.S., 9, Rugby Mansions, Addison Bridge, Kensington, W., Professor of Chemistry.
1899. Dixon, Fred. W., Longfellow House, Wellesley Hills, Mass., U.S.A., Dyer.
1888. Dixon, Prof. Harold B., F.R.S., Owens College, Manchester, Professor of Chemistry.
1885. Dixon, Jos., Spring Grove, near Sheffield, Paper Maker.
1884. Dixon, Wm., 102, Spring Street, Bury, Lancashire, Science Master.
1892. Dobb, Thos., 4, Cavendish Road, Sharrow, Sheffield, Pharmaceutical Chemist.
O.M. Dobbie, Dr. J. J., University College of North Wales, Bangor, Professor of Chemistry.
1901. Dobbie, Jas., Laurel Bank, Broomfield Road, Ayr, N.B., Tanner.
O.M. Dobbin, Dr. L., Chemical Laboratory, University, Edinburgh, Professor of Chemistry.
1890. Dodd, A. J., River View, Belvedere, Kent, Oil Refiner.
1902. Dodd, T. H., 28, The Vintage, Old Charlton, Kent, Chemist (Royal Arsenal).
1889. Dodd, W. R., Oak Dene, Bush Hill Park, Enfield, N., Chemical Works Manager.
1901. Dodds, Reger, Edison and Swan U. E. L. Co., South Benwell, Newcastle-on-Tyne, Technical Chemist.
1900. Dodge, Dr. Francis D., c/o Dodge and Olcott, 137, Water Street, Brooklyn, N.Y., U.S.A., Chemist.
1897. Doerflinger, Wm. F., 85, Lafayette Avenue, Brooklyn, N.Y., U.S.A., Research Chemist.
1897. Dohme, Dr. Alf. R. L., Messrs. Sharp and Dohme, Baltimore, Md., U.S.A., Manufacturing Chemist.
1885. Doidge, H., 112, Loop Street, Pietermaritzburg, Natal.
1901. Dolden, Arthur G., Newhaven, Maple Road, Leytonstone, Analytical Chemist.
1897. Dolge, Carl B., Westport, Conn., U.S.A., Manufacturer of Instruments and Antiseptics.
1886. Domeier, A., Thriffwood, Silverdale, Sydenham, S.E., Chemical Merchant.
1884. Donald, Jas., 5, Queen's Terrace, Glasgow, Manufacturing Chemist.
1890. Donald, Samuel, Corporation Gasworks, Dundee, Analytical Chemist.
O.M. Donald, W., Saltcoats, N.B., Analytical Chemist.
1900. Donald, Wm., Ridgefield Park, Bergen Co., N.J., U.S.A., Assayer and Chemist.
1901. Donnelly, Francis, 351, Bridgeman Street, Bolton, Lancs., Manager (Varnish Co.).
1886. Doolittle, Orrin S., 445, Oley Street, Reading, Pa., U.S.A., Chemist, Philadelphia and Reading Railroad.
1890. Dore, Jas., Copper Works, High Street, Bromley-by-Bow, E., Distiller's Engineer.
1896. Doremus, Dr. Chas. A., 59, West 51st Street, New York City, U.S.A., Professor of Chemistry.
O.M. Dott, D. B., c/o J. F. Macfarlan & Co., 93, Abbey Hill, Edinburgh, Analytical Chemist.
O.M. Dougall, A., 271, Beverley Road, Hull, Gas Engineer.
1883. Dougall, Archibald, Gasworks, Kidderminster, Gas Engineer.
1897. Douglas, Geo., Heather Bank, Bingley, Yorks, Dyer.
1894. Douglas, Loudon M., Baltic Wharf, Putney, S.W., Chemical Manufacturer.
1884. Douglas, William, Diamond Plantation, Demerara, British Guiana, Chemical Engineer.
1900. Doulton, H. Lewis, Lambeth Pottery, London, S.E., Potter.
1900. Dow, Allan W., 2016, Hillyer Place, Washington, D.C., U.S.A., Chemist (District Engineer's Dept.)
1898. Dow, Herbert H., Midland, Mich., U.S.A., Manufacturing Chemist.
1885. Dowson, J. Emerson, 39, Victoria Street, Westminster, S.W., Civil Engineer.
1901. Doxrüd, Christian, Christiania, Norway, Professor of Chemical Technology.
1885. Drake, Chas. A., Three Mills Distillery, Bromley-by-Bow, E., Brewer.
1886. Dreaper, W. P., Clifton Villa, Coggeshall Road, Braintree, Essex, Technical Chemist.
1901. Dreghorn, David, Greenwood, Pollokshields, Glasgow, Soap Maker.
O.M. Drew, D., Lower House Printworks, near Burnley, Calico Printer.
1896. Drewsen, Dr. Viggo B., c/o F. Barbuch & Co., 308, Temple Court Building, New York City, U.S.A., Wood Pulp and Paper Expert.
O.M. Dreyfus, Dr. C., Clayton Aniline Co., Ltd., Clayton, Manchester, Dye Manufacturer.
1893. Dreyfus, S., Clayton Aniline Co., Ltd., Clayton, Manchester, Chemist.
1899. Dreyfus, Dr. Wm., 162, East 95th Street, New York City, U.S.A., Chemist.
O.M. Driffield, V. C., Appleton, Widnes, Chemical Engineer.

1899. Drobegg, G., 81, Maiden Lane, New York City, U.S.A., Superintending Chemist.

1887. Drown, Prof T. M., The Lehigh University, South Bethlehem, Pa., U.S.A., Professor of Analytical Chemistry.

1889. Drummond, Hon. G. A., Montreal, Canada.

1888. Drummond, Dr. Isaac W., 136, West 22nd Street, New York City, U.S.A., Chemist.

1899. Ducas, B. P., 151, Front Street, New York City, U.S.A., Chemical and Dyestuff Importer.

1897. Duckham, Alex., Phœnix Wharf, West Ferry Road, Millwall, E., Works Chemist.

1899. Dudderidge, Frank B., 55, Northumberland Street, Newcastle-on-Tyne, Teacher of Chemistry.

1890. Dudley, Dr. C. B., 1219, 12th Avenue, Altoona, Pa., U.S.A., Analytical Chemist.

1887. Dudley, Prof. W. L., Vanderbilt University, Nashville, Tenn., U.S.A., Professor of Chemistry.

1890. Duff, Wm. S., Woodland View, Cleveland Road, South Woodford, Essex, Manufacturing Chemist.

1901. Dufty, Lawrence, 23, Broomhall Place, Sheffield, Analytical Chemist.

O.M. Duggan, T. R., Sunnybank, Vanbrugh Hill, Blackheath, S.E., Analytical Chemist.

1898. Duguid, Jas., 46, Sotheby Road, Highbury, N., Journalist.

1898. Duisberg, Dr. Carl, The Bayer Co., Ltd., (Journals), Elberfeld, Germany, (Subscriptions), 19, St. Dunstan's Hill, E.C., Chemist.

1888. Dukes, T. William, Merchant.

1889. Duncan, Arthur W., 42, Trevelyan Street, Eccles, Manchester, Analytical Chemist.

O.M. Duncan, J., 9, Mincing Lane, London, E.C., Sugar Refiner.

1898. Durham, Edw. K., 338, East 26th Street, New York City, U.S.A., Professor of Bacteriology and Hygiene.

1901. Dunham, Henry V., c/o Casein Co., 74, John Street, New York City, U.S.A., Chemist.

1889. Dunlop, Robt., Orepuki, Southland, New Zealand, Oil Works Manager.

1892. Dunn, Fred., 193, Collins Street, Melbourne, Victoria, Analytical Chemist.

O.M. Dunn, J., 53, Brown Street, Manchester, Chemical Manufacturer.

1890. Dunn, John, Morgan Academy, Dundee, Science Teacher.

O.M. Dunn, Dr. J. T., 75, The Side, Newcastle-on-Tyne, Consulting Chemist.

O.M. Dunn, P., 53, Brown Street, Manchester, Chemical Merchant.

1901. Dunn, Wm R., 157, South 6th Street, Easton, Pa., U.S.A., Cement Works Manager.

1901. Dunsford, Geo., Laboratory, Wigan Coal and Iron Co., Ltd., Wigan, Analytical Chemist.

O.M. Dupré, Dr. A., F.R.S., Edinburgh Mansions, Howick Place, S.W., Consulting Chemist.

1897. Durant, H. T., Chemist.

1897. Durkee, Frank W., Tuft's College, Mass., U.S.A., Assistant Professor of Chemistry.

1899. Duryea, Chester B., 34, Gramercy Park, New York City, U.S.A., Starch Manufacturer.

1891. Duttson, W. H., Southwood, Silverdale, Sydenham, S.E., Merchant.

1899. Du Vivier, Ernest H., 411, West 21st Street, New York City, U.S.A., Chemist.

1891. Dvorkovitch, Dr. P., 6, Willow Bridge Road, Canonbury, N., Technical Chemist

O.M. Dyer, Dr. B., 17, Great Tower Street, London, E.C., Analytical and Consulting Chemist.

O.M. Dyson, C. E., Flint, North Wales.

1902. Dyson, George W., 89, Cowlishaw Road, Sheffield, Analyst

1892 Dyson, Septimus, 8, Belmont Avenue, Harrogate, Manufacturing Chemist.

E

1895. Earle, Vavasour, Franks Hall, near Dartford, Kent, Merchant.

1899. Earnshaw, Edward H., 22nd and Filbert Streets, Philadelphia, Pa., U.S.A., Chemist (Gas Improvement Co.).

O.M. Earp, W. R., Halton Road, Runcorn, Cheshire, Chemical Manufacturer.

1902. Easterbrooks, Frank D., Raritan Copper Works, Perth Amboy, N.J., U.S.A., Chemist.

1884. Eastick, C. E., Preston Lodge, Leytonstone, Sugar Works Manager.

O.M. Eastick, J. J., Millaquin Refinery, Bundaberg, Queensland, Sugar Works Manager.

1898. Eastick, S. Philip, 25, Woodville Road, Ealing, W., Chemical Engineer.

1890. Eastlake, A. W., Caenwood House, Grove Road, Clapham Park, S.W., Petroleum Works Manager.

1891. Eastwick, Jos. H., 2216, North 51st Street, Philadelphia, Pa., U.S.A., Chemist.

1885. Eastwood, Edw., c/o Lever Brothers, Ltd., Port Sunlight, Birkenhead, Soapmaker.

1898. Eavenson, Alban, 2013 Vine Street, Philadelphia, Pa., U.S.A., Soap Works Chemist.

1892. Eddy, Harrison P., Sewage Purification Works, Worcester, Mass., U.S.A., Superintendent.

1901. Eddy, W. Clifton, c/o American Beet Sugar Co., Norfolk, Neb., U.S.A., Chemist.

1894. Ede, Henry E., Cordite Works, Arklow, Ireland, Analytical Chemist.

1885. Edge, Anthony, 79, Milton Street, Readville, Mass., U.S.A., Chemist.

1900. Edgerley, Daniel W., Chilton Manufacturing Co., College Point, Long Island, N.Y., U.S.A., Chemist.

1893. Edwards, Henry W., c/o Southern Smelting Co., Oakdale, Ga., U.S.A., Metallurgist.

1885. Ehrenfeld, Prof. Chas. H., York Collegiate Institute, York, Pa., U.S.A., Professor of Chemistry.

1896. Ehrhardt, Ernest F., Badische Anilin und Soda Fabrik, Ludwigshafen a/Rhein, Germany, Research Chemist.

1895. Ekenberg, Dr. M., Gothenburg, Sweden, Technical Chemist.

O.M. Ekman, C. D., Paper Mills, Northfleet, Kent, Technical Chemist.

1885. Elborough, T., 59, Mark Lane, London, E.C., Manure Manufacturer.

1901. Elkan, Leo A., 594, Dearborne Avenue, Chicago, Ill., U.S.A., Tanner.

1901. Elkins, Arthur W., 520, Park Avenue, East Orange, N.J., U.S.A., Civil Engineer.

1900. Elliot, Harry T., Elliot's Buildings, Falkirk, N.B., Chemical Student.

1892. Elliot, John, Free Library, Wolverhampton, Librarian.

1884. Elliott, Dr. A. H., Consolidated Gas Co., 4, Irving Place, New York City, U.S.A., Analytical Chemist.

1896. Elliott, Dr. J. F., c/o Grimwade and Co., 82, Bishopsgate Street, E.C.; and (Journals), O'Connel Street, Sydney, N.S.W., Manufacturing Chemist.

1885. Ellis, C. J., 13, West Scotland Street, Kinning Park, Glasgow, Technical Chemist.

1893. Ellis, E. Victor, 21, Castle Street, Edinburgh, Analytical Chemist.

1902. Ellis, Frederick R., 15, Shadwell Road, Bishopston, Bristol, Chemist and Druggist.

1894. Ellis, G. Beloe, 70, Chancery Lane, W.C., Patent Agent.

O.M. Ellis, H., 112, Regent Road, Leicester, Chemical Merchant.

1902. Ellis, M. C., Knockaloe, Bedford Park P.O., Toronto, Canada, Jeweller.

1891. Ellis, Prof. W. Hodgson, 74, St. Alban Street, Toronto, Canada, Professor of Applied Chemistry.

1891. Ellison, Henry, Flatt Lane, Cleckheaton, Yorks, Manufacturing Chemist.

1901. Ellms, Jos. W., Laboratory, East Court and Martin Street, Cincinnati, Ohio, U.S.A., Chemist.

M. Elmore, A. S., 239, Willesden Lane, N.W., Electro-Metallurgist.

85. Elworthy, H. S., 3, Battlefield Road, Sandpit Lane, St. Albans, Sugar Works Chemist.

01. Emerson, Dr. W. H., Georgia School of Technology, Atlanta, Ga., U.S.A., Professor of Chemistry.

99. Emery, E. G., c/o The Ohio Farmers Fertilizer Co., Columbus, Ohio, U.S.A., Chemist.

M. Endemann, Dr. H., 23, William Street, New York City, U.S.A., Analytical Chemist.

97. Enequist, Erik W., North 8th and Roebling Streets, Brooklyn, N.Y., U.S.A., Chemist.

94. Enequist, John, 556, Greene Avenue, Brooklyn, N.Y., U.S.A., Chemical Engineer.

99. Engledue, Col. W. J., 6, Grosvenor Hill, Wimbledon, S.W., Colonel (late) Royal Engineers.

95. English, Frank H., 223, Monega Road, Manor Park, E., Analytical Chemist.

99. Enright, Bernard, 330, East 4th Street, South Bethlehem, Pa., U.S.A., Analytical Chemist.

86. Ermen, F., jun., Nassau Mills, Patricroft, Manchester, Dyer and Bleacher.

97. Escher, Paul, c/o The Acker Process Co., Niagara Falls, N.Y., U.S.A., Chemist.

84. Esilman, A., 25, Roe Lane, Southport, Lancashire, Analytical Chemist.

M. Estcourt, C., Seymour House, 5, Seymour Grove, Old Trafford, Manchester, Consulting Chemist.

83. Evans, Enoch, 660, Coventry Road, Birmingham, Accountant.

98. Evans, Ernest D., The Western Tanning Co., Bedminster, Bristol, Tanner.

83. Evans, Sir John, K.C.B., F.R.S., Nash Mills, Hemel Hempstead, Herts, Paper Maker.

89. Evans, R. E., 3, Glencoe, Stratford-on-Avon, Brewing Chemist.

96. Evans, Dr. Thos., University of Cincinnati, Ohio, U.S.A., Instructor in Technical Chemistry.

98. Evans, Wm. Perceval, Christ's College, Christchurch, New Zealand, Science Master.

M. Evershed, F., Kenley, Surrey, Colour Chemist.

94. Ewan, Dr. Thos., 30, Lansdowne Crescent, Kelvinbridge, Glasgow, Chemist (Aluminium Co.).

00. Eyssen, Lorenz, Guatemala, C.A., Coffee and Ramie Planter.

92. Exley, Arthur, Braemore, Vesper Road, Kirkstall, Leeds, Tanner.

01. Eyles, Arthur H., Continental Manufacturing Co., Addingham, Del. Co., Pa., U.S.A., Chemist.

F

98. Fade, Louis, c/o Deutsche Gold and Silber Scheide-Anstalt, Frankfort a/M., Germany, Chemist and Director.

M. Fahlberg, Dr. C., Saccharin Fabrik, Salbke-Westerhüsen a/Elbe, Germany, Manufacturing Chemist.

02. Faill, Jas., 51, Partickhill Road, Glasgow, Technical Chemist.

M. Fairley, T., 17, East Parade, Leeds, Analytical Chemist.

M. Fairlie, H. C., Camelon Chemical Works, Falkirk, N.B., Chemical Manufacturer.

01. Fairlie, Jas., Camelon Chemical Works, Falkirk, N.B., Manufacturing Chemist.

94. Fairweather, Wallace, 62, St. Vincent Street, Glasgow, Patent Agent.

98. Falding, F. J., Aldrich Court, 45, Broadway, New York City, U.S.A., Chemical Engineer.

91. Fallon, J. H. M., 61, Birdhurst Rise, South Croydon, Fertiliser Expert.

97. Farmer, John E., Beddington Farm, Beddington Lane, near Croydon, Assistant Manager (Sewage Works).

O.M. Farrant, N., c/o J. Nicholson and Sons, Chemical Works, Hunslet, Leeds, Analytical and Metallurgical Chemist.

1897. Farrell, Frank J., 89, Albert Bridge Road, S.W., Analytical Chemist.

O.M. Farries, T., 12, Coleman Street, London, E.C., Manufacturing Chemist.

O.M. Farrington, T., 5, Summerhill Terrace, Cork, Ireland, Chemical Engineer.

O.M. Faulkner, F., The Laboratory, 65, Bath Row, Birmingham, Consulting Brewer's Chemist.

1891. Fawcett, Jas. H., Federal Metal Agency, Ltd., 1, Leadenhall Street, London, E.C., Metallurgist.

1884. Fawsitt, C. A., Atlas Chemical Works, East Nelson Street, Glasgow, Chemical Manufacturer.

1892. Feld, Walther, Chemische Fabrik, Linz a/Rhein, Germany, Chemical Works Director.

1897. Felix, Dr. Lorenz, 53, Rue Petit, St. Denis s/Seine, France, Technical Chemist.

1899. Ferguson Geo., Gleniffer Soap Works, Paisley, N.B., Soap Manufacturer.

1900. Ferguson, Geo. A., College of Pharmacy, 115, West 68th Street, New York City, U.S.A., Professor of Analytical Chemistry.

1896. Ferguson, J. Hart, Loch Katrine Distillery, Camlachie, Glasgow, Distillery Manager.

O.M. Ferguson, Prof. J., The University, Glasgow, Professor of Chemistry.

1892. Ferguson, Wm. B., K.C., Barrister-at-Law.

1883. Fergusson, H., Prince Regent's Wharf, Victoria Docks, E., Technical Chemist.

1901. Ferrell, Jos. L., 2220, Race Street, Philadelphia, Pa., U.S.A., Mechanical Engineer.

1901. Ferris, Wm. S., c/o U.S. Glue Co., Milwaukee, Wis., U.S.A., Chemist.

1893. Fiebing, John H., 644, 28th Street, Milwaukee, Wis., U.S.A., Leather Trade Chemist.

1885. Field, E. W., Cloud House, Sandiacre, near Nottingham, Brewer.

1887. Field, S. S., 3, Glenluce Road, Blackheath, S.E., Manufacturing Chemist.

1891. Field, Wm. Eddington, 65, Sutherland Road, Armadale, Melbourne, Victoria, Analytical Chemist.

1881. Filcock, P., Cumberland House, Cumberland Street, Macclesfield, Analytical Chemist.

1900. Fillis, Frank, 43, Romilly Road, Barry, Glam., Cement Works Chemist.

1899. Fingland, Jno. J., Minas de Aznalcollar, Prov. de Sevilla, Spain, Analytical Chemist.

1892. Finlay, Kirkman, c/o Milne & Co., 123, Bishopsgate Street, London, E.C., East India Merchant.

1899. Finley, Norval H., 6638, Deary Street, Sta. A. Pittsburg, Pa., U.S.A., Chemist.

1902. Fisher, Fred., Newaygo, Mich., U.S.A., Chemist.

1900. Fisher, Henry, 57, East 83rd Street, New York City, U.S.A., Teacher of Chemistry.

1902. Fisher, Pearson, c/o Messrs. Manlove, Alliott, and Co., Ltd., Bloomsgrove Works, Nottingham, Mechanical Engineer.

1901. Fisher, Wm. Elbertson, 67, Argyle Street, Toronto, Canada, Master Dyer.

O.M. Fisher, W. W., 5, St. Margaret's Road, Oxford, Chemical Lecturer.

1895. Fison, Jno., Messrs. Jas. Fison and Sons, Thetford, Norfolk, Chemical Manufacturer.

O.M. Fitzbrown, G., Ditton Copper Works, Widnes, Metallurgist.

1897. Fitzgerald, Francis A. J., c/o International Acheson Graphite Co., Niagara Falls, N.Y., U.S.A. Chemical Engineer.

1902. FitzGibbon, Thos., 36, Averill Street, Fulham Palace Road, Hammersmith, W., Analytical Chemist.

1900. Fitz-Randolph, Raymond B., Hoagland Laboratory, Henry and Pacific Streets, Brooklyn, N.Y., U.S.A., Bacteriologist and Chemist.

1896. Flammer, E., Heilbronn a/N., Würtemberg, Manufacturing Chemist.

1892. Flanagan, Chas. A., 51, Gorse Street, Stretford, Manchester, Manufacturing Chemist.

1901. Flavelle, Jos. W., c/o Wm. Davies Co., Toronto, Canada, Merchant.

1896. Fleisher, Saml., 25th and Hamilton Streets, Philadelphia, Pa., U.S.A., Woollen Manufacturer.

1892. Fleming, J. Arnold, 136, Glebe Street, Glasgow, Potter.

1898. Fleming, Wm. P., 17, Prince's Road, Jamalpur, E.I.R., Bengal, India; and (Journals) 247, Linthorpe Road, Middlesbro', Yorks, Analytical Chemist.

O.M. Fletcher, A. E., Coombe Lea, Dorking, Surrey, Ex-Chief Inspector Alkali, &c. Works.

1895. Fletcher, Eli, Park House, Aked's Road, Halifax, Yorks, Master Dyer.

1893. Fletcher, E. Morley, 3, Woodhouse Cliff, Leeds, Alkali Works Inspector.

O.M. Fletcher, F. W., Beauchamp Lodge, Enfield, Manufacturing Chemist.

1891. Fletcher, R. Jaques, North Geelong, Victoria, Manufacturing Chemist.

1902. Flinn, Fredk. B., Box 91, Newark, N.J., U.S.A., Chemist.

1892. Flintoff, R. J., 17, Todmorden Road, Littleboro', Lancs., Chemist.

1885. Flower, Major Lamorock (Lee Conservancy Board), 12, Finsbury Circus, E.C., Sanitary Engineer.

1899. Focht, Louis, State Board of Assessors, Trenton, N.J., U.S.A., Civil Engineer.

1890. Foden, Alfred, 19, Lancaster Avenue, Sefton Park, Liverpool, Metallurgical Chemist.

1900. Foersterling, Dr. H., c/o The Roessler and Hasslacher Chemical Co., Perth Amboy, N.J., U.S.A., Chemist.

1900. Fogetty, Lucien, c/o And. Jergens and Co., Spring Grove Avenue, Cincinnati, Ohio, U.S.A., Chemist.

1895. Fogg, Chas. A., 39, Park Road, Bolton-le-Moors, Lecturer in Chemistry.

1901. Folsom, Herbert A., 5, Brighton Street, Providence, R.I., U.S.A., Textile Chemist.

1900. Forbes, Eli, Lancaster Mills, Clinton, Mass., U.S.A., Chemist.

1895. Forbes, Paul R., c/o Walsh, Hall, and Co., Yokohama, Japan, Chemist and Assayer.

1893. Ford, J. B., jun., Michigan Alkali Co., Wyandotte, Mich., U.S.A., Secretary and Treasurer.

1889. Ford, Jno. S., Abbey Brewery, Edinburgh, Analyst.

1899. Forel, Geo., 32, Rue des Vosges, Strasburg, Alsace, Chemist.

1898. Forgie, Jas. T., Viewfield, Bothwell, N.B., Civil and Mining Engineer.

1885. Formoy, J. Arthur, Chestham, Grange Road, Sutton, Surrey, Oil Expert.

1893. Forrest, J. Kerr, 97, Jeffcott Street, Melbourne, Victoria, Australia, Manufacturing Chemist.

1890. Forrester, Albert, Ranipettai, North Arcot, Madras, India, Chemist and Distiller.

1901. Forrester, Arthur, Highfield House, Steven Street, Stretford, Manchester, Chemist.

1890. Forrester, A. M., Port Dundas Chemical Works, 20, Canal Bank, Glasgow, Analytical Chemist.

1899. Forster, Dr. Martin O., Royal College of Science, South Kensington, S.W., Demonstrator of Chemistry.

1901. Forster, Miss E. L. B., c/o The Morgan Crucible Co., Ltd., Battersea, S.W., Analyst.

1902. Forster, Ferdinand E. P., c/o Messrs. Bass and Co., Laboratory, 19, Guild Street, Burton-on-Trent, Brewer's Chemist.

1884. Forster, Ralph C., c/o Messrs. Bessler, Waechter, & Co., 18 and 19, Fenchurch Street, E.C., Chemical Merchant.

1889. Fort, Jas., 16, Adelphi Bank Chambers, South John Street, Liverpool, Chemical Merchant.

1884. Forth, Henry, Meadowcroft, Marple, near Stockport, Drysalter.

1895. Foster, Jas., 11, St. Andrew's Drive, Pollokshields, Glasgow, Engineer.

O.M. Foster, R. Le Neve, Harrytown Hall, Bredbury, near Stockport, Manufacturing Chemist.

1888. Foster, Wm., Esholt House, Chapeltown, Leed Manufacturing Chemist.

1884. Foulis, Wm., 2, Montgomerie Quadrant, Kelvinsid Glasgow, Gas Engineer.

1891. Fowler, Gilbert J., Broad Oak, Urmston, nea Manchester, Superintendent and Chemist (Ma chester Corporation Sewage Works).

1898 Fowler, Theo. V., P.O. Box 168, Buffalo, N.Y U.S.A., Chemical Works Manager.

1896. Fox, A. Stanley, 23, South Road, Faversham, Ken Chemist (Cotton Powder Co., Ltd.).

1898. Fox, Jno., 76, Butler Street, Oldham Road, Ma chester, Analyst.

1888. Fox, J. Wesley, 7, Bushell Street, London, E.C., Sa Merchant.

O.M. Fox, T., jun., Tonedale, Wellington, Somerset, Wo Manufacturer.

1901. France, G. Herbert, Woodroyd Dyeworks, Low Moo Bradford, Yorks., Dyer.

O.M. France, G. T., Friar's Goose Works, Gateshead-on Tyne, Alkali Works Manager.

1899. Franchot, Stanislaus P., Niagara Falls, N.Y., U.S.A Manufacturing Chemist.

1885. Francis, Edwd., Park Ravine, Nottingham, Chemic Lecturer.

O.M. Francis, E. G., c/o Manbré Saccharine Co., Ham mersmith, W., Glucose Works Manager.

O.M. Francis, G. B., 38, Southwark Street, London, S.E Wholesale Druggist.

O.M. Francis, W. H., 38, Southwark Street, London, S.E Wholsale Druggist.

1894. Franck, Jerome W., 29, Broadway, New York Cit U.S.A., Chemist.

1886. Frankenburg, Isidor, Greengate Rubber Works, Sa ford, Manchester, India-rubber Manufacturer.

1895. Frankforter, Dr. G. B., University of Minnesota, Mi neapolis, Minn , U.S.A., Professor of Chemistry.

O.M. Frankland, Prof. P. F., F.R.S., The University, Bi mingham, Professor of Chemistry.

O.M. Frankland, H., Streonshalh House, The Crescent, Li thorpe, Middlesbro', Analytical Chemist.

1901, Frasch, H. A., Hamilton, Ont., Canada, Manag (Nickel Copper Co. of Ontario).

1900. Frasch, Herman, 681, Euclid Avenue, Clevelan Ohio, U.S.A., Oil Refiner.

1891. Fraser, Leslie McG., 98, Commercial Road Eas London, E., Chemical Engineer.

1886. Fraser, W. J., 98, Commercial Road East, London, F Mechanical Engineer.

O.M. Free, R., The Elms, Mistley, Essex, Maltster.

1885. Freear, H. M., Hardwick Road, Woburn Sand Beds., Analytical Chemist.

1897. Freestone, Jos. T., Fenestrella, Egerton Park, Roc Ferry, Cheshire, Manufacturing Chemist.

1899. French, Alf., St. Bartholomew's Hospital, Rocheste Kent, Dispenser.

1899. French, H. Hutchins, Florenceville, Grove Roa Sutton, Surrey, Produce Broker.

1900. French, Thos., 1, Kelvinside Terrace West, Glasgo Chemist.

1898. French, Wm., Storey Institute, Lancaster, Scien Teacher.

1888. Frew, Dr. Wm., Laboratory, Wellpark Brewer Glasgow, Brewing Chemist.

1886. Fries, Dr. Harold H., 92, Reade Street, New Yo City, U.S.A., Chemical Manufacturer.

O.M. Friswell, R. J., Bound Reed, Higham, Kent, Colo Manufacturer.

1901. Fritchle, Oliver P., c/o H. E. Wood and Co., 173 Arapahoe Street, Denver, Col., U.S.A., Meta lurgical Chemist.

1898. Frith, J. Mason, Sunnyside, Norman Road, Runcor Lime Burner.

1899. Fritzsche, Karl, c/o Schimmel and Co., Miltitz, ne Leipzig, Germany, Manufacturer of Essential Oil

1890. Frost, Dr. Howard V., 3958, Drexel Boulevar Chicago, Ill., U.S.A., Professor of Chemistry.

1884. Frost, Joe, Storths Mill, Moldgreen, Huddersfiel Manufacturing Chemist.

1899. Frusher, Tom, 87, Nassau Street, New York City, U.S.A., Colourist.
1899. Fry, Henry E., Metallurgist.
O.M. Fryer, Dr. A. C., 13, Eaton Crescent, Clifton, Bristol, Alkali Works Inspector.
1891. Fuerst, Dr. Alex. F., c/o Wood Street Smelting Works, 30, Wood Street, London, E.C., Chemist.
1889. Fuerst, Jos. F., 17, Philpot Lane, London, E.C., Chemical and Oil Merchant.
1895. Fuerst, W. F., 2, Stone Street, New York City, U.S.A., Chemical Merchant.
1894. Fuller, Chas. J. P., L. and Y. Railway Works, Horwich, near Bolton, Analytical Chemist.
1899. Fuller, Robt. F., Neston Park, Corsham, Wilts, Rubber Manufacturer.
1899. Fuller, W. M., (Journals) Bryn Tigid, Gold Tops, Newport, Mon.; and (subscription) c/o Morris & Griffin, Lim., Maindee, Newport, Mon., Chemical Manufacturer.
O.M. Fuller, Wm., 8, Orchard Road, Blackheath, S.E., Chemist.
1898. Fulmer, Elton, Pullman, Wash., U.S.A., Professor of Chemistry.
O.M. Fulton, H. B., 353, Mansion House Chambers, London, E.C., Metallurgist.
896. Fulton-Smith, J., Bancroft House, Penketh, Warrington, Brewer.
885. Fyfe, Jno., 7, West George Street, Glasgow, Oil Works Director.
896. Fyson, G. A., Leagrave Road, Luton, Beds, Dyer.

G

898. Gabain, Chas. E., Messrs. Gabain Frères, Havre, France, Manufacturer of Edible Fats.
O.M. Gabbett, E. R., Prince Regent's Wharf, Victoria Docks, London, E., Chemical Engineer.
890. Gajjar, T. K., Techno-chemical Laboratory, Girgaum, Bombay, India, Consulting Chemist.
893. Galewsky, Dr. Paul, c/o L. Cassella and Co., Mainkur, bei Frankfort a/Main, Germany, Colour Chemist.
884. Gall, Henry, 5, Rue Albert Joly, Versailles (S. et O.), France, Technical Chemist.
897. Galletly, J. C., 101, Armadale Street, Dennistoun, Glasgow, Assistant to Professor of Metallurgy.
1901 Gallivan, Frank B., 56, Prospect Place, Brooklyn, N.Y., U.S.A., Chemist.
1901. Gallup, W. Arthur, Arnold Printworks, North Adams, Mass., U.S.A., Printer.
1901. Galpin, Harry T., 55, West 57th Street, New York City, U.S.A., Chemist.
1891. Galt, Hugh Allen, Columbia Chemical Co., Barberton, Ohio, U.S.A., Works Manager.
O.M. Gamble, Sir David, Bart., Windlehurst, St. Helens, Chemical Manufacturer.
1887. Gamble, Jas. N., The Laboratory, Procter and Gamble Co., Ivorydale, Ohio, U.S.A., Soap Manufacturer and Oil Refiner.
O.M. Gamble, J. C., Haresfinch, St. Helens, Chemical Manufacturer.
O.M. Gamble, W., Briars Hey, Rainhill, near Liverpool, Chemical Manufacturer.
1894. Gane, Eustace H., 95, Fulton Street, New York City, U.S.A., Pharmaceutical Chemist.
1888. Gans, Adolf, Farbenfabrik von L. Cassella & Co., Frankfort o/Main, Germany, Dye Works Manager.
1901. Gansser, Dr. A., c/o Messrs. Lepetit, Dollfus and Gansser, Garessio-Ponte (Provincia di Cuneo), Italy, Chemical Engineer.
1896. Gardair, Aimé, 51, Rue St. Ferréol, Marseilles, France, Director of Chemical Co.
1893. Gardiner, H. J., 90, Cannon Street, London, E.C., Chemical Manufacturer.
1891. Gardner, Walter M., Municipal Technical College, Bradford, Director of Chemistry and Dyeing Department.
1897. Garfield, Jos., 7, Apsley Villas, Bradford, Yorks, Civil Engineer.
1883. Garibaldi, Joachim A., 21, Church Place, Gibraltar, Analytical Chemist.
1893. Garner, D. C., 40, Nichols Street, Leicester, Manufacturing Chemist.
1890. Garrett, F. C., Durham College, of Science, Newcastle-on-Tyne, Teacher of Science.
1900. Garrigues, Wm. E., 1123, Broadway, New York, City, U.S.A., Chemical Engineer.
1901. Garroway, Jno., 58, Buchanan Street, Glasgow, Manufacturing Chemist.
1899. Garroway, Wm., 694, Duke Street, Glasgow, Chemical Manufacturer.
1898. Garry, H. Stanley, 9, Clipstone Avenue, Nottingham, Manure Works Manager.
O.M. Garton, R. (Hill, Garton, & Co.), Southampton Wharf, Battersea, S.W., Glucose Manufacturer.
1893. Garton, Rd. S., c/o Dr. P. Naef, Woody Crest Avenue, Highbridge, New York City, U.S.A., Chemist.
1886. Gascoyne, Dr. W. J., 36, South Holliday Street, Baltimore, Md., U.S.A., Analytical Chemist.
O.M. Gaskell, Holbrook, Woolton Wood, Woolton, near Liverpool, Alkali Manufacturer.
O.M. Gaskell, Holbrook, jun., Bridge House, Sefton Park, Liverpool, Alkali Manufacturer.
1901. Gass, Jas. Kelly, 2121, West Second Street, Chester, Pa., U.S.A., Dyer.
1897. Gaster, Leon, 37, Maida Vale, W., Electrical Engineer.
1895. Gate, Tom Erskine, Messrs. Howroyd and Oldroyd, Dewsbury, Yorks, Manufacturing Chemist.
O.M. Gatheral, Geo., 174, Soho Hill, Handsworth, Birmingham.
1891. Geisler, Dr. Jos. F., New York Mercantile Exchange Building, 6, Harrison Street, New York City, U.S.A., Consulting Chemist.
1901. Gemmell, G. H., 4, Lindsay Place, George IV. Bridge, Edinburgh, Analytical Chemist.
1901. Gent, Percy W., 44, Luisen-Ufer, Berlin, S., Analytical Chemist.
1897. Gent, Wm. T., Springfield, Misterton, near Gainsboro', Metallurgical Chemist.
1896. Genth, Fred. A., jun., 103, North Front Street, Philadelphia, Pa., U.S.A., Chemist.
1894. Georgi, Carl, 77, John Street, New York City, U.S.A., Aniline Colour Importer.
O.M. Gerland, Dr. B. W., 8, Queen's Terrace, Accrington, Consulting Chemist.
1891. Gibb, Thos., Hunt's Cross, Liverpool, Metallurgist.
O.M. Gibbins, H. B., 177, Redland Road, Bristol.
1883. Gibbs, D. Cecil, Soap Manufacturer.
O.M. Gibbs, Wm. P., Fabriken, Hjerpen, Jemtland, Sweden, Analytical Chemist.
1893. Gibbs, W. T., Buckingham, Prov. Quebec, Canada, Manufacturing Chemist.
O.M. Gibson, Dr. J., 20, George Square, Edinburgh, Chemical Lecturer.
O.M Gibson, J. M., c/o Buckley Brick and Tile Co., Buckley, *viâ* Chester, Brick and Tile Manufacturer.
1898. Gies, Wm. J., College of Physicians and Surgeons, 437, W. 59th Street, New York City, U.S.A., Instructor in Physiological Chemistry.
1899. Gifford, Wm. E., 69, 6th Street, Long Island City, N.Y., U.S.A., Chemist.
1892. Gilbard, Francis, The Laboratory, 17, Great Tower Street, E.C., Analytical Chemist.
1897. Gilbody, Dr. Alex. W., Research Chemist.
O.M. Gilchrist, P. C., F.R.S., Frognal Bank, Finchley New Road, London, N.W., Metallurgist.
1884. Gilchrist, Peter S., Charlotte, N.C., U.S.A., Chemical Engineer.
1900. Gildersleeve, W. H., Flintstone Tannery, Flintstone, Ga , U.S.A., Chemist.
O.M. Giles, W. B., The Grange, Leyton, Essex, Chemical Manufacturer.
1886. Gill, Dr. Aug. H., Massachusetts Institute of Technology, Boston, Mass., U.S.A., Assistant Professor of Gas Analysis.

1900. Gill, J. Arthur, (Journals) c/o Messrs. A. Boake, Roberts, and Co., Carpenter's Road, Stratford, E.; and (communications) 19, Burma Road, Stoke Newington, N., Analyst.
1901. Gill, Wm. S., North of Scotland Colour Works, Aberdeen, Colour and Varnish Manufacturer.
1901. Gilles, Wm. S., Bradford Street, Bocking, near Braintree, Essex, Technical Chemist.
1888. Gillman, Gustave, A.M.I.C.E., Ferrocarril de Murcia, á Granada, Aguilas, Prov. de Murcia, Spain, Civil Engineer.
1892. Gilmour, J. D., 190, Batterfiggins Road, Glasgow, Chemist.
1891. Gimingham, Edw. A., 1, Cranbourne Mansions, Cranbourne Street, W.C., Electrician.
1900. Ginder, Wm. H., c/o American Sheet Steel Co., Vandergrift, Pa., U.S.A., Analytical Chemist.
1886. Girdwood, Dr G. P., 111, University Street, Montreal, Canada, Professor of Chemistry.
O.M. Gladstone, Dr. J. H., F.R.S., 17, Pembridge Square, London, W., Professor of Chemistry.
1886. Glaeser, F. A., Carpenter's Road, Stratford, E., Varnish Manufacturer.
1889. Glaser, Chas., 21, South Gay Street, Baltimore, Md., U.S.A., Analytical and Consulting Chemist.
1889. Glatz, Jos., Riverside Chemical Works, 485—493, Kent Avenue, Brooklyn, N.Y., U.S.A., Chemical Manufacturer.
1901. Glegg, Robt., 29, Kimberley Street, Liverpool, Analytical Chemist.
1894. Glen, Chas., Glengowan Printworks, Caldercruix, N.B., Calico Printer.
1890. Glen, J., jun., Glengowan Printworks, Caldercruix, N.B., Calico Printer.
1900. Glendenning, Arthur, 31, Bright Street, Middlesbrough, Analytical Chemist.
1884. Glendinning, H., Winnington Park, Northwich, Cheshire, Technical Chemist.
1895. Glenn, Wm., Baltimore Chrome Works, 1348, Block Street, Baltimore, Md., U.S.A., Chrome Manufacturer.
1888. Gloag, Robt. F., Grove Hill, Middlesbrough, Secretary.
O.M. Glover, G. T., 24, Cravenhill Gardens, Lancaster Gate, W., Chemical Works Manager.
1896. Glover, H., East Falls, Schuylkill, Philadelphia, Pa., U.S.A., Chemical Works Superintendent.
O.M. Glover, John, 20, Holly Avenue, Newcastle-on-Tyne, Chemical Engineer.
O.M. Glover, T., Messrs. Mort, Liddell & Co., Widnes, Technical Chemist.
O.M. Glover, W., Rio Tinto Mines, Huelva, Spain, Technical Chemist.
1896. Goetz, Isidore, 2, Kelfield Gardens, North Kensington, W., Mine Manager.
189 . Golding, Jno., Midland Agricultural and Dairy Institute, Kingston, Derby, Agricultural Chemist.
O.M. Goldschmidt, Dr. S. A., 43—51, Sedgwick Street, Brooklyn, N.Y., U.S.A., Chemical Manufacturer.
1897. Goldschmiedt, Dr. Guido, Laboratory, 11 Salmgasse 1, Prag, Austria, Professor in Imperial German University.
1895. Goldsmith, Byron B., 19, East 74th Street, New York City, U.S.A., Vice-President (American Lead Pencil Co.).
1899. Goldsmith, Jno. N., British Xylonite Co., Ltd., Manningtree, Essex, Chemist.
19 1. Goodchild, Wm. H., Rosslyn, Haslemere Road, Crouch End, N., Chemical Student.
1898. Goode, J. Archibald, 16, Crampton Street, London, S.E., Analytical Chemist.
1899. Goodhue, Francis A., 32, India Street, Boston, Mass., U.S.A., Aniline Colour Importer.
1898. Goodrich, Chas. G., Akron, Ohio, U.S.A., Rubber Manufacturer.
1884. Goodwin, C. C., The White House, St. John's Road, Bowdon, Cheshire, Soapmaker.
1891. Goodwin, Dr. W. L., The School of Mining, Kingston, Canada, Professor of Chemistry.
O.M. Goppelsroeder, Dr. F., Leimenstrasse 51, Basel, Switzerland, Professor of Chemistry.
1901. Gordon, A. T., c/o Oliver Iron Mining Co., Moun Iron, Minn., U.S.A., Chemist.
1898. Gordon, Colin, Storer's Wharf, Cubitt Town, E., and (Journals) Lynwood, Vanbrugh Hill, Blackheath, S.E., Chemical Engineer.
1881. Gordon, J. G., Queen Anne's Mansions, Westminster, S.W., Steel Manufacturer.
1883. Gore, Dr. G., F.R.S., 20, Easy Row, Birmingham, Metallurgist.
1900. Gormly, Sam. J., P.O. Box 1041, Butte, Mont., U.S.A., Assayer.
1901. Gornall, Frank H., 256, Park Road, Crouch End, N. Chemist.
1891. Gorvin, Jno. C., English Crown Spelter Co., Ltd., Swansea, Works Manager.
O.M. Gossage, F. H., Widnes, Alkali Manufacturer.
1897. Gossage, W. Winwood, Widnes, Lancashire, Soap Manufacturer.
1890. Goulding, Wm. Joshua, 25, Eden Quay, Dublin, Manure Manufacturer.
O.M. Gow, R. J., Ivy Lea, Hough Green, near Widnes, Metallurgical Chemist.
O.M. Gowland, W., 13, Russell Road, Kensington, W., Assayer and Metallurgist.
1886. Goyder, G. A., Ootalinka, Hawker's Road, Medindie near Adelaide, South Australia, Chemist (Adelaid School of Mines).
1890. Grabfield, Dr. J. P., 238, Franklin Street, Chicago Ill., U.S.A., Chemist.
1900. Grabill, Clarence A., c/o Mountain Copper Co. Keswick, Shasta Co., Cal., U.S.A., Chemist.
1897. Graesser, Franz A., The Wrexham Lager Beer Co. Wapping Station, Liverpool, Manager.
1883. Graesser, R., Cefn, near Ruabon, North Wales; an Argoed Hall, Llangollen, North Wales, Manufacturing Chemist.
O.M. Graham, Prof. C., The Reculvers, Hastings, Consulting Chemist.
O.M. Graham, C. C., Highmoor, Benrhydding Road, Ilkley Yorks, Technical Chemist.
1883. Grandage, H., Royd House, Brighouse, near Leeds Dyer.
1897. Granger, Dr. J. Darnell, 25, All Saints Street, Nottingham, Analytical Chemist.
1900. Granja, Rafael, c/o The Palen Co., Kingston, N.Y U.S.A., Chemist.
1896. Graves, Geo. H., c/o General Chemical Co., Bridg port, Conn., U.S.A., Manufacturing Chemist.
1896. Graves, Walter G., 555, Sibley Street, Clevelan Ohio, U.S.A., Chemist.
1895. Gray, Elisha B., New Brighton, Richmond Co., N.Y U.S.A., Oil Inspector and Chemist.
1884. Gray, G. Watson, 8, Inner Temple, Dale Stree Liverpool, Consulting Chemist and Assayer.
1902. Gray, J. Campbell, Glengoyt, Strines, near Stoc port, Printworks Chemist.
1886. Gray, Jno., 13, Queen's Road, Rock Ferry, ne Birkenhead, Oil Works Chemist.
1896. Gray, Dr. Thos., 204, George Street, c/o Goul and Dies, 180, Hope Street, Glasgow, Lecturer Chemistry.
1901. Greaves, Albert E., c/o P. Spence and Sons, Lt Goole Alum Works, Goole, Yorks, Works Chemi
1891. Greaves, I. A. R., Morton, Gainsborough, Brewer.
1894. Greaves, Wm., Powell Duffryn Steam Coal C Aberaman, Aberdare, South Wales, Chemic Engineer and Chemist.
1894. Greeff, R. W., 20, Eastcheap, London, E.C., Chemic Agent.
1890. Green, Alfred H., Oaklands, Lowton, Newton-l Willows, Lancashire, Manufacturing Chemist.
O.M. Green, Arthur G., 2, Dartmouth Road, Brondesbur N.W., (Laby.); and 28, Victoria Street, Wes minster, S.W., Cons. Organic Chemist.
O.M. Green, H., Hayle Mill, Maidstone, Paper Man facturer.

888. Green, Jno. Edw., Grafton House, Talbot Street, Southport, Soap Works Manager.
896. Green, Jno. Wilberforce, 55, The Avenue, Kew Gardens, S.W., Technical Chemist.
O.M. Green, L., Lower Tovil, Maidstone, Paper Manufacturer.
O.M. Greenaway, A. J., 39, Frognal, Hampstead, N.W., Sub-Editor of Chemical Society's Journal.
884. Greenhalgh, Jns. Herbert, Whitebirk, Green Mount, near Bury, Lancs., Assistant Manager of Printworks.
O.M. Greenway, T. J., Second Avenue, St. Peter's, Adelaide, South Australia, Metallurgist.
902. Greenwood, Conrad Varley, Green Hill, Colne, Lancs., Cotton Mill Manager.
O.M. Greenwood, H., Regent House, Harlmann Street, Accrington, Lancashire, Technical Chemist.
897. Gref, Anthony, 40, Stone Street, New York City, U.S.A., Patent Lawyer.
O.M. Greville, H. L., Diersheim, Churchfields, Woodford, Essex, Gas Examiner.
900. Griffin, Dr. Jno. J., Catholic University of America, Washington, D.C., U.S.A., Professor of Chemistry.
890. Griffin, John R., 20—26, Sardinia Street, Lincoln's Inn Fields, W.C., Chemical Apparatus Maker.
886. Griffin, Martin L., Mechanicville, Saratoga Co., N.Y., U.S.A., Analytical Chemist (and Consulting) (Fibre, Paper, Clays).
O.M. Griffith, R. W. S., Eyeworth Lodge, Lyndhurst, Hants, Gunpowder Manufacturer.
891. Griffiths, Thos., The Cedars, Clapham Common, S.W., Manufacturing Chemist.
886 Grime, J., Calico Printer.
O.M. Grimshaw, H., Sunnyside, Clayton, Manchester, Chemical Manufacturer.
O.M. Grimwood, R., 41, Lady Margaret Road, London, N.W., Analytical Chemist.
900. Grimwood, Robt. G., 17, Dagmar Road, Stroud Green, N., Analytical Chemist.
O.M. Grindley, J., Upper North Street, Poplar, London, E., Tar Distiller.
888. Gripper, Harold, Great Central Railway, Gorton, Manchester, Analytical Chemist.
897. Gronemeyer, Herman H., 731, Giddings Avenue, Cleveland, Ohio, U.S.A., Chemical Superintendent.
900. Gross, Abraham, 341, Oakland Avenue, Pittsburg, Pa., U.S.A., Technical Chemist.
O.M. Grossmann, Dr. J., Harpurhey Chemical Works, Manchester, Chemical Manufacturer.
1896. Grosvenor, Wm. M., jun., c/o General Chemical Co., Hudson River Works, Edgewater, N.J., U.S.A., Electro-Chemist.
O.M. Groves, C. E., F.R.S., 352, Kennington Road, London, S.E., Chemist (Thames Conservancy).
1899. Gudemann, Dr. Edw., 4319, Vincennes Avenue, Chicago, Ill., U.S.A., Chemist.
1902. Guenther, Felix, jun., Sun Portland Cement Co., Ltd., P.O. Box 102, Owen Sound, Ont., Canada, Chemist.
1898. Guess, Harry A., Silver Lake Mines, Silverton, Colo., U.S.A., Chemist.
1899. Guest, Edw. Graham, 5, Churchhill, Edinburgh, Cereals Chemist.
1899. Guild, Frank N., University of Arizona, Tucson, Arizona, U.S.A., Professor of Chemistry.
1900. Guitermann, Edw. W., c/o U.S. Finishing Co., Pawtucket, R.I., U.S.A., Chemist.
1894. Gulliver, Geo. W., c/o Burt, Boulton, and Haywood, Selzaete, Belgium, Chemist.
1883. Gunn, W. L., Broad Plain Soap Works, Bristol, Analytical Chemist.
1900. Günther, Chas. E., Liebig's Extract of Meat Co., Ltd., 9, Fenchurch Avenue, London, E.C., Merchant.
1894. Gurney, J. Clare, Fabrica Roma, La Union, Prov. de Murcia, Spain, Analytical Chemist.
1899. Gutcher, Wm., Singapore Oil Mills, Singapore, S.S., Superintendent Engineer.
1892. Guthrie, John, 34, Prospect Terrace, Hunslet Moor, Leeds; Chemical Works Manager.
1901. Guthrie, John M., 199, Ferry Road, Leith, N.B., Analytical Chemist.
1892. Guttmann, Oscar, 12, Mark Lane, London, E.C., Consulting Chemical Engineer, M. Inst. C. E.

H

O.M. Habirshaw, W. M., Glenwood Works, Yonkers, N.Y., U.S.A., Chemical Engineer.
1883. Hacking, W. H., The Grange, Clayton-le-Moors, near Accrington.
1900. Haddock, Arthur G., c/o Castner Kellner Alkali Co., Ltd., 13, Abchurch Lane, London, E.C., and (Journals) Lynwood House, Norman Road, Runcorn, Technical Chemist.
1898. Haddow, Geo., Nobel's Explosive Co., Perranporth, R.S.O., Cornwall, Chemist.
1887. Hadfield, R. A., Newhall Road, Attercliffe, Sheffield, Steel Founder.
1884. Hadkinson, F., Pamphila Oil and Soap Works, Mitylene, Mediterranean, Oil Refiner and Soap Manufacturer.
O.M. Hadkinson, R., Smyrna, Asia Minor, Oil Refiner.
1887. Haig, Robert, Mechanical Retorts Co., Limited, Murray Street, Paisley, N.B., Chemical Engineer.
1896. Haigh, De Lagnel, Avenue A and 13th Street, Bayonne City, N.J., U.S.A., Chemist.
1898. Haigh, Fred., 141, Autumn Street, Passaic, N.J., U.S.A., Chemist (Flax Spinning Co.).
1898. Haigh, Percy, c/o J. and J. Lonsdale and Co., Longford, Ireland, Analytical Chemist.
1888. Hailes, A. J. de, 15, Red Lion Square, W.C., Analytical Chemist.
1889. Haines, Reuben, Haines Street, near Chew Street, Germantown, Philadelphia, Pa., U.S.A., Analytical Chemist.
O.M. Hake, C. N., Department of Trade and Customs, Melbourne, Victoria, Inspector of Explosives.
1900. Hale, Albert C., 352A, Hancock Street, Brooklyn, N.Y., U.S.A., Teacher of Chemistry.
1888. Hale, Edw. P., c/o Wakefield & Co., Gatebeck Kendal, and (communications) Endmoor, near Kendal, Analytical Chemist.
1887. Hall, Allan T., c/o Sissons Bros. & Co., Ltd., Hull, Oil Refiner and Varnish Manufacturer.
1886. Hall, Archibald D., 34, Bishopsgate Street, London, E.C., Analytical Chemist.
1898. Hall, Clarence A., 3220, Powelton Avenue, Philadelphia, Pa., U.S.A., Chemist.
O.M. Hall, Edgar, Tenterfield, N.S.W., Australia, Technical Chemist.
1898. Hall, Frederick W., 25, Oak Bank, Harpurhey, Manchester, Dyer.
1893. Hall, Jas. W., Bombay, Baroda, and Central India Railway, Sabarmata, near Ahmedabad, India, Linseed Oil Mills Manager.
1885. Hall, Jno. A., Victoria Chemical Works, Victoria, British Columbia, Analytical Chemist.
1900. Hall, Jos. J., 414, Fifth Avenue, Cedar Rapids, Iowa, U.S.A., Chemist.
1900. Hall, Prof. Robt. W., Havemeyer Laboratory, University Heights, New York City, U.S.A., Professor of Analytical Chemistry.
O.M. Hall, S., East London Soap Works, Bow, London, E., Soap Manufacturer.
1896. Hall, S. G., East London Soap Works, Bow E., Soap Maker.
1898. Hall, Wm. F., c/o Barrett G. McCoy, Kaapsche Hoop, Transvaal Colony, South Africa, Cyanide Manager.
1886. Haller, Geo., Sussex House, 52, Leadenhall Street, London, E.C., Chemical Merchant.
1893. Haller, H. Left, 26, Scale Lane, Hull, Analytical Chemist.
1895. Halliwell, Edw., West Riding of Yorkshire Rivers Board, Wakefield, Yorks, Analyst.

1901. Hallock, Dr. Albert P., 41[illegible], First Avenue, New York City, U.S.A., Chemist.
1898. Halstead, Jno. E., 7, Bath Street, Elland, Yorks, Colour Chemist.
1892. Hamaguchi, K., Hiro Mura, Arito Gori, Wakayama Ken, Japan, Soy Manufacturer.
1897. Hambly, Fred. J., Buckingham, Quebec, Canada, Chemist.
1901. Hambuechen, Carl, 616, Lake Street, Madison, Wis., U.S.A., Electro-Chemist.
1895. Hamburger, Aron, 18 and 19, Great Windmill Street, London, W., Technical Chemist.
1887. Hamilton, Jas. C., Arncliffe, Arnside, viâ Carnforth, Chemical Works Manager.
1885. Hamilton, Oswald, Lancaster Cottage, Old Stratford, near Stony Stratford, Chemical Engineer.
1884. Hamilton, Robert, Glengarnock Chemical Co., Ltd., Glengarnock, N.B., Works Manager.
1892. Hamilton, Robt., 62, Tempest Road, Beeston Hill, Leeds, Analytical Chemist.
O.M. Hammill, M. J., The Gables, St. Helens, Alkali Manufacturer.
1898. Hammersley, W. Stanley, Longjumeau, S. et O., France, Tanner.
1892. Hammond, Geo. W., Yarmouthville, Maine, U.S.A., Paper Co.'s Agent.
O.M. Hammond, J., Gas Works, Eastbourne, Sussex, Gas Manager.
1900. Hampton, F. T., Hill City, Tenn., U.S.A., Civil Engineer.
1900. Hancock, Walter C., 10, Upper Chadwell Street, Myddelton Square, London, E.C., Analytical Chemist.
1896. Hand, Daniel, 30, Mount Pleasant Avenue, Newark, N.J., U.S.A., Chemist.
1889. Handy, Jas. O., 325, Water Street, Pittsburg, Pa., U.S.A., Chemist.
1888. Hanks, Abbot A., 531, California Street, San Francisco, Cal., U.S.A., Assayer.
1901. Hanna, Charles E., P.O. Box 2303, Montreal, Canada, Secretary.
1899. Hanna, Dillinger C., 4262, Parkside Avenue, Philadelphia, Pa., U.S.A., Chemist and Superintendent.
O.M. Hanson, A. M., Abbey Printworks, Whalley, Blackburn, Print Works Chemist.
1899. Hantke, Ernst, 646, Broadway, Milwaukee, Wis., U.S.A., Director of Brewers' School.
1901. Hardcastle, G. Fred., 9, Newtown Street, Leicester, Teacher of Science and Technology.
1894. Harden, Arthur, c/o British Institute of Preventive Medicine, Grosvenor Road, London, S.W., and (communications) 2, Marlborough Road, Richmond, S.W., Lecturer in Chemistry.
1900. Hardwick, W. Roscoe, 13, Batavia Buildings, Hackins Hey, Liverpool, Chemist.
1897. Harger, Dr. Jno., 11, Ivy Mount, Sutton-on-Hull, Chemist.
1896. Hargreaves, Jas., Farnworth, Widnes, Lancashire, Chemical Engineer.
O.M. Hargreaves, Jno., Widnes, Alkali Manufacturer.
1898. Hargreaves, Luke, c/o Electrolytic Alkali Co., Ltd., Middlewich, Cheshire, Chemical Engineer.
O.M. Harland, R. H., Plough Court, 37, Lombard Street, London, E.C., Consulting Chemist.
1893. Harlock, E. B., Newton Farm, Middlewich, Chemical Manufacturer.
18[illegible]8. Harman, Edw. A., Elsinore, Gledholt, Huddersfield, Gas Engineer, M. Inst. C. E.
1[illegible]. Harmon, L. E., 46–54, Fulton Street (Drawer 255), Buffalo, N.Y., U.S.A., Analytical Chemist.
O.M. Harrington, W. B., Leeview, Montenotte, Cork, Chemical Manufacturer.
1893. Harris, Arthur, 22, Marsh Gate Lane, Stratford, E., Soap Maker.
1885. Harris, Booth, jun., Hillside, Loughton, Essex, Soap Maker.
O.M. Harris, D., Caroline Park, Edinburgh, Chemical Manufacturer.
1897. Harris, Fred. W., Sanitary Chambers, Chemica Department, Glasgow, Public Analyst.
1900. Harris, Dr. Harry B., 212, Jones Street W., Savannah Ga., U.S.A., Chemist.
1900. Harris, L. A., Wyoming, Wood Vale, Lordshi Lane, London, S.E., Chemist.
1896. Harris, Wm. T. A., Ideal Soapery, East Street Brompton, Adelaide, South Australia, Soap Make
O.M. Harrison, A., Thames Sugar Refinery, Silvertown London, E., Sugar Works Chemist.
O.M. Harrison, C., Hayle, Cornwall, Technical Chemist.
O.M. Harrison, G. D., Netham Chemical Works, Bristo Chemical Manufacturer.
1883. Harrison, G. H., Hagley, near Stourbridge, Firebric Maker.
1884. Harrison, G. King, Hagley, near Stourbridge, Fire clay Mine Owner.
O.M. Harrison, J., Madore, Ballintemple, Cork, Chemica Engineer.
1892. Harrison, Prof. John B., C.M.G., Government Laboratory, Georgetown, Demerara, B.G., Governmen Analyst.
1898. Harrison, Wm. H., Knostrop Sewage Works, Leed and (communications) 4, Roundhay Grove, Harehills Lane, Leeds, Analytical Chemist.
1896. Hart, Bertram, c/o Tennants and Co., Clayton, Manchester, Analyst.
1886. Hart, Bertram H., The Elms, Old Charlton, S.E Analytical Chemist.
O.M. Hart, Dr. E., Lafayette College, Easton, Pa., U.S.A Professor of Chemistry.
1890. Hart, H. W., 13, Lynwood Villas, Darwen, Lancashire, Analytical Chemist.
1897. Hart, Wm. Beamont, Manchester Laboratory, 8 Exchange Street, Manchester, Consulting Chemis
1888. Hartford, Jas., 3, Cedar Street, New York City U.S.A., Aniline Merchant.
1886. Hartley, Arthur, The Brewery, Emsworth, Hant Brewer.
1883. Hartley, Joseph, 7, Scarsdale Road, Victoria Park Longsight, Manchester, Technical Chemist.
1889. Hartley, R. Kent, Springwood House, Middleto Junction, near Manchester, Chemical Work Manager.
O.M. Hartley, Prof. W. N., D.Sc., F.R.S., Royal College o Science, Dublin, Professor of Chemistry.
1897. Hartmann, Ernest E., Waialua, Oahu, Hawai Chemist.
1891. Hartog, Philip J., 6, Mauldeth Road West, Withington, Manchester, Analytical Chemist.
1892. Hartridge, Jas. Hills, Holmwood, Hendon, Manufacturing Chemist.
1901. Hartwell, S. Warren, 215, North 2nd Street, Easto Pa., U.S.A., Chemist.
1901. Hartzell, Harry S., 126, North 4th Street, Allentow Pa., U.S.A., Chemist.
1899. Harvey, Chas., 163, Kensington Avenue, East Ha E., Manufacturing Chemist.
1892. Harvey, E. Feild, Omrac, St. John's, Newfoundlan Chemist.
1885. Harvey, Ernest W., 20, Malwood Road, Balha S.W., A.R.S.M. Engineer.
1888. Harvey, H. C., Raglan House, Brooklands, ne Manchester, Chemist.
1891. Harvey, Sidney, South-Eastern Laboratory, Canterbury, Analytical Chemist.
1899. Harvey, Thos. F., 84, Henry Road, West Bridgfo Nottingham, Analyst (Drug Co.).
1883. Harvey, T. H., Cattedown, Plymouth, Chemical Manufacturer.
1893. Harzer, C. A., 79½, Gracechurch Street, Londo E.C., Merchant.
O.M. Hasenclever, R., Chemische Fabrik - Rhenani Aachen, Prussia, Chemical Manufacturer.
1900. Haskell, J. Amory, Laflin and Rand Powder Co., 9 Cedar Street, New York City, U.S.A., President.
1900. Haslwanter, Chas., 901, Flushing Avenue, Brookly N.Y., U.S.A., Analytical Chemist.

1897. Hasslacher, Jacob, P. O. Box 1999, New York, U.S.A., President of Roessler-Hasslacher Chemical Co.
1891. Hatfield, Jno. A., 89, Bridge Street, Wednesbury, Staffordshire, Analytical Chemist.
1897. Hatton, Wm. P., c/o W. R. Hatton & Sons, Wormwood Scrubs, W., Starch Works Manager.
1890. Haus, Simon V., c/o Nepera Chemical Company, Nepera Park, N.Y., U.S.A., Photographic Chemist.
1900. Havens, Dr. Franke S., 1143, Garden Street, Hoboken, N.J., and (Journals) 602, Farmington Avenue, Hartford, Conn., U.S.A., Silk Conditioner.
1890. Hawdon, H. S., Hedworth Barium Works, East Jarrow-on-Tyne, and (Journals) Westoe Village, South Shields, Manager.
1895 Hawker, E. W., Adelaide Club, Adelaide, South Australia, Metallurgist.
1897. Hawkins, Ernest M., South Eastern Laboratory, Canterbury, Chemist.
O.M. Hawkins, H., c/o American E.C. and Schultze Gunpowder Co., Ltd., Oakland, Bergen Co., N.J., U.S.A., Explosive Works Manager.
1893. Hawkins, J. Dawson, c/o Colo. Phila. Reduction Co., Colorado City, Col., U.S.A., Smelting Works Manager.
1887. Hawliczek, Josef, 2, Princes Avenue, Liverpool, S., Technical Chemist.
1899. Haworth, Dr. Edw., 6, Stanley Villas, Runcorn, Cheshire, Chemist.
1895. Hay, Alex. B., Kelvindock Chemical Works, Maryhill, Glasgow, Manufacturing Chemist.
1898. Haycraft, Jos. H., St. Peter's, Adelaide, South Australia, Metallurgical Chemist.
1894. Haynes, David O., 396, Broadway, New York City, U.S.A., Proprietor of "Pharmaceutical Era."
1894. Heal, Carlton, c/o Northampton Tanning Co., St. James' End, Northampton, Chemical Student.
1890. Healey, Alfred E., Willesden Paper and Canvas Works, Willesden Junction, N.W., Managing Director.
1894 Heap, Isaac H., Turnhurst Hall, Chell, near Stoke-on-Trent, Pharmaceutical Chemist.
1890. Heape, Chas., 19, George Street, Manchester, Calico Printer.
1893. Heasman, Walter, Castle Brewery, Bridgnorth, Salop, Brewer.
O.M. Heath, R. C., Myton Grange, near Warwick, Chemical Manufacturer.
1897. Heaton, John, 3, Belle Vue Park, Sunderland, Brewer and Chemist.
1895. Hebden, Jno. C., 64, Exchange Place, Providence, R.I., U.S.A., Works Manager and Chemist.
1889. Hecht, Jos., c/o McCormick Harvesting Machine Co., Chicago, Ill., U.S.A., Analytical Chemist.
1895. Hecker, Paul, 102, Fenchurch Street, London, E.C., Chemical Merchant.
1900. Heckman, J. Conrad, (Journals) c/o Larkin Soap Manufacturing Co., Seneca Street, Buffalo, N.Y., U.S.A., Chemist.
1889. Heckmann, C., 9, Görlitzerufer, Berlin, S.O., Germany, Chemical Apparatus Maker.
1885. Hedley, Armorer, Mayfield, Gosforth, Newcastle-on-Tyne, Soap Manufacturer.
1895. Hedley, Geo. H., Hedge Mill, Loudwater, Bucks, Chemical Manufacturer.
1902. Heebner, Prof. Chas. F., Ontario College of Pharmacy, Toronto, Canada, Professor of Pharmaceutical Chemistry.
1883. Heerlein, Robt., (Journals) E. E. Armstrong, Pennsylvania Salt Manufacturing Co., Natrona, Pa., U.S A., Salt Works Chemist.
1893. Hefford, Geo. W., County Technical Schools, Stafford, Chemical Instructor.
O.M. Hehner, O., 11, Billiter Square, London, E.C., Analytical and Consulting Chemist.
1898. Heileman, W. H., (communications) U.S. Department of Agriculture, Bureau of Soils, Washington, D.C.; and (Journals) Elwell, Iowa, U.S.A., Expert Field Assistant.
1887. Hellier, E. A., 90, Marlborough Avenue, Hull, Varnish Manufacturer.
1885. Hellon, Dr. R., 40, New Lowther Street, Whitehaven, Analytical and Consulting Chemist.
O.M. Helm, H. J., Simonstone, Hammelton Road, Bromley, Kent, Government Analyst.
1898. Hemingway, Frank C. R., Albyns, Forest Road, Walthamstow, Essex.
1883. Hemingway, H., Marsh Gate Lane, Stratford, E., Chemical Manufacturer.
1884. Hempleman, F. S., Wennington House, Wennington, Romford, Essex, Manure Manufacturer.
1900. Henderson, J. Brownlie, Government Analyst's Office, Brisbane, Queensland, Government Analyst.
1894. Henderson, Jos., 3, Derwent Street, Norton Road, Stockton-on-Tees, Metallurgical Chemist.
1894. Henderson, Norman M., Broxburn Lodge, Broxburn, N.B., Oil Works Manager.
1883. Henderson, Prof. G. G., The Technical College, George Street, Glasgow, Professor of Chemistry.
1902. Henderson, Jas. A. Russell, 33, Blythswood Drive, Glasgow, Technical Chemist.
O.M. Henderson, W. F., Moorfield, Claremont Gardens, Newcastle-on-Tyne.
1893. Hendrick, Jas., Marischal College, Aberdeen, Lecturer on Agricultural Chemistry.
1889. Hennin, Alphonse, Portoferraio, Elba, Italy, Metallurgical Chemist.
1885. Henshaw, Jno., Green Lane, Brook Street, Manchester, Soap Manufacturer.
1894. Henshaw, Sam., Chatterley, Tunstall, Stoke-on-Trent, Chemical Works Manager.
1891. Hepburn, J. G., Priory Works, Dartford, Kent, Leather Manufacturer.
1887. Herf, O., Herf & Frerichs Chemical Co., St. Louis, Mo., U.S.A., Chemical Manufacturer.
1897. Heriot, James, 18, Dumbiedykes Road, Edinburgh, Mineral Water Manufacturer.
1894. Heriot, T. H. P., Usine Ste. Madeleine, San Fernando, Trinidad, B.W.I., Analytical Chemist.
O.M. Herman, W. D., Holm Lea, Rainhill, Lancashire, Glass Works Chemist.
O.M. Heron, J., 110, Fenchurch Street, London, E.C., Brewing Chemist.
1899. Herrick, Rufus F., 16, Herrick Street, Winchester, Mass., U.S.A., Chemist.
1887. Herriot, Wm. Scott, 19, Kier Street, Pollokshields, Glasgow, Chief Engineer.
O.M. Herrmann, R. W., 59, Mark Lane, London, E.C., Chemical Merchant.
1891. Hersam, Ernest A., University of California, Berkeley, Cal., U.S.A., Assistant Professor of Metallurgy.
O.M. Herschel, Prof. A. S., F.R.S., Observatory House, Slough, Bucks, Hon. Professor of Experimental Physics.
1898. Hersey, Milton L., 146, St. James' Street, Montreal, Canada, Consulting Chemist.
1901. Hershey, Aldus N., c/o Sharp and Dohme, Baltimore, Md., U.S.A., Chemist.
1898. Heslop, Oliver, 55, Sandown Lane, Wavertree, Liverpool, Analytical Chemist.
1885. Hess, Dr. Adolph, Oil Works, Leeds, Chemical Manufacturer.
1891. Hetherington, Dr. Albert E., Ammonia Soda Works, Fleetwood, Lancashire, Analytical Chemist.
1891. Hewitt, A. H., The Green Island Cement Co., Lim., Hong Kong, China, Engineer.
O.M. Hewitt, Dr. D. B., Oakleigh, Northwich, Cheshire, Alkali Manufacturer.
1899. Hewitt, Edw. R., 13, Burling Slip, New York City, U.S.A., Glue Manufacturer.
1896. Hewitt, Dr. J. Theo., 65, Silverdale, Sydenham, S.E., Lecturer.
1897. Hewitt, T. Lacey, 8, Frodingham Road, Scunthorpe, viâ Doncaster, Analytical Chemist.
1890. Hewlett, John C., 40—42, Charlotte Street, Great Eastern Street, London, E.C., Manufacturing Chemist.
1893. Hey, Harry, 2, Ash Terrace, Savile Town, Dewsbury, Dyer.
1881. Heyden, Dr. F. von, Chemische Fabrik, Radebeul, bei Dresden, Germany, Salicylic Acid Manufacturer.

1894. Heys-Dia, G. Edw., 236, Great Clowes Street, Higher Broughton, Manchester, Chemical and Electrical Engineer.

1901. Heys, Thos., 110, Adelaide Street West, Toronto, Canada, Consulting Chemist.

1884. Heys, W. E., 70, Market Street, Manchester, Engineer and Patent Agent.

1884. Heys, Z. J., Stonehouse, Barrhead, N.B., Calico Printer.

1883. Heywood, J. H., 231, Drake Street, Rochdale, Technical Chemist.

O.M. Heywood, J. S., 7, Caledonian Road, King's Cross, London, N., Chemical Manufacturer.

1897. Hibbard, Paul L., 163, Park Avenue, Waukigan, Ill., U.S.A., Starch Chemist.

O.M. Hibbert, W., 101, Goldhurst Terrace, South Hampstead, N.W., Analytical Chemist.

1901. Hiby, Dr. Walter, c/o Otto Hilgenstock Coke Oven Co., Ltd., 109, Victoria Street, London, S.W., Chemical Engineer.

1897. Hicks, Edwin F., 233, West 44th Street, New York City, U.S.A., Analytical Chemist.

1893. Hicks, Jas. A., c/o Dr. B. Redwood, 4, Bishopsgate Street Within, London, E.C., Analytical Chemist.

O.M. Higgin, W. H., Hollywood, Lostock, near Bolton-le-Moors, Chemical Manufacturer.

1901. Higginbottom, Alf., Quarry Bank, New Mills, near Stockport, Colourist.

1886. Higgins, C. L., Muspratt's Works, Widnes; and (Journals) 79, Bedford Street South, Liverpool, Manufacturing Chemist.

1901. Highley, Arnold, 20, Spotland Road, Rochdale, Chemist.

1897. Hill, George, Barton-on-Humber, Chemical Works Manager.

1897. Hill, Herbert M., University of Buffalo, N.Y., U.S.A., Professor of Chemistry and Toxicology.

O.M. Hill, J. K., 13, Osborne Place, Copland Road, Govan, near Glasgow, Manufacturing Chemist.

1892. Hill, Sydney, c/o Blundell, Spence, and Co., Ltd., Hull, Analytical Chemist.

1898. Hill-Jones, Thos., 30, Bisham Gardens, Highgate, N., Manufacturing Chemist.

O.M. Hills, C. H., Anglesea Copper Works, Low Walker, Newcastle-on-Tyne, Copper Smelter.

1894. Hills, Harold F., 29, Cavendish Mansions, Clapton Square, London, N.E., Analytical Chemist.

1898. Hills, Thos. Herbert, Chemical Works, Deptford, S.E., Chemical Manufacturer.

O.M. Hills, W., 225, Oxford Street, London, W., Pharmaceutical Chemist.

1893. Hilton, Edgar G., 37, Kourlandsky Street, St. Petersburg, Russia, Varnish and Paint Manufacturer.

1899. Hinchley, J. W., 85, Gracechurch Street, London, E.C., Chemical Engineer.

O.M. Hindle, J. H., 8, Cobham Street, Accrington, Dyeworks Manager.

1883. Hinds, James, 127, Gosford Street, Coventry, Pharmaceutical Chemist.

1899. Hinks, Percy J., Tavern Street, Stowmarket, Chemist.

1891. Hinman, Bertrand C., 9, Worship Street, London, E.C., Metallurgical Chemist.

1892. Hinshelwood, Thos., Glasgow Oil and Paint Works, Glenpark Street, Glasgow, Oil Refiner.

1900. Hirsh, Jos. E., 1245, 85th Street, Brooklyn, N.Y., U.S.A., Chemist.

1895. Hirst, H. Reginald, Croft House, Batley, Yorks, Works Chemist.

1896. Hislop, Geo. R., Gas Work House, Craigielea, Paisley, N.B., Gas Engineer and Manager.

1900. Hobbs, Alex. F., Merrimack Manufacturing Co., Lowell, Mass., U.S.A., Printworks Superintendent.

1900. Hobbs, Dr. Perry L., Western Reserve Medical College, Cleveland, Ohio, U.S.A., Professor of Chemistry.

1894. Hodge, Andrew, 20, Hawthorn Grove, Heaton Moor, near Stockport, Printworks Chemist.

[illegible] Hodges, Harry B., Long Island Railroad Co., Long Island City, N.Y., U.S.A., Chemical Engineer.

1902. Hodgkins, David H., 19, East Park Street, Newark N.J., U.S.A., Manufacturing Chemist.

O.M. Hodgkinson, Dr. W. R., 18, Glenluce Road, Blackheath, S.E. (Journals); and Royal Artillery Co lege, Woolwich, S.E., Prof. of Chemistry.

O.M. Hodgson, Chris., 33, Oakdale Road, Nether Edg Sheffield, Metallurgical Chemist.

1897. Hodgson, Matthew, Leitrim Cottage, Wicklow, Ir land, Technical Chemist.

1890. Hodgson, Wm., 66, Deansgate, Manchester, Oil an Colour Broker.

1886. Hogben, W., c/o Fiberloid Co., Newburyport, Mass U.S.A., Chemist and Superintendent.

1888. Hogg, Quintin, 61, Threadneedle Street, Londo E.C.; and (Journals) Polytechnic, 309, Rege Street, W., Merchant.

O.M. Hogg, T. W., (Journals) c/o John Spencer & Son Newburn Steelworks, Newcastle-on-Tyne; an (communications) Castlenook, Rylon-on-Tyn Metallurgical Chemist.

1899. Holden, Archie Neill, 73, Albert Road, Southpor Manufacturing Chemist.

1887. Holden, G. H., Gildabrook, Edge Lane, Chorlto cum-Hardy, Manchester, Manufacturing Chemist

1885. Holgate, S. V., 29, Long Row, Nottingham, Pharm ceutical Chemist.

1885. Holgate, T. E., 173, Hollins Greve, Darwen, La cashire, Metallurgist.

1884. Holgate, Thos., Rockleigh, Savile Park, Halifax, G Engineer.

O.M. Holland, Philip, 22, Taviton Street, Gordon Squar London, W.C., Analytical Chemist.

1892. Holland, Philip H., 958, Sherbrooke Street, Montrea Canada, Merchant.

1901. Hollick, Herbert, c/o General Chemical Co., Camde N.J., U.S.A., Works Manager.

1898. Hollinger, M. J., Alma Portland Cement Co., Wellsto Ohio, U.S.A., Chemist.

1896. Hollings, J. Spencer, Brymbo, North Wales, Wor Manager.

1900. Hollinshead, W. H., Vanderbilt University, Nashvil Tenn., U.S.A., Teacher of Chemistry.

1890. Holloman, Fred R., 43, Southern Road, Plaist E., Sugar Works Chemist.

1890. Holloway, G. T., 57 and 58, Chancery Lane, W. Analytical and Consulting Chemist.

1884. Holloway, Wm., Newlands, Middlesbro', Manufa turing Chemist.

1900. Hollway, Jno., 6, Highbury Grange, London, Mine Owner.

1883. Holmes, Ellwood, Wyncote, Jesmond Park Ea Newcastle-on-Tyne, Colour Manufacturer.

O.M. Holmes, F. G., 31, St. George's Road, Waterl Liverpool, Technical Chemist.

1900. Holthouse, Harold B., 12, Melton Grove, West Brid ford, Nottingham, Chemist.

1892. Holton, E. C., Sherwin-Williams Co., 100, Ca Street, Cleveland, Ohio, U.S.A., Chemist.

1893. Holzapfel, Max., Maritime Buildings, Quaysid Newcastle-on-Tyne, Manufacturer.

1893. Homfray, D., 6, Dartmouth Row, Greenwich, S. Analytical Chemist.

1890. Hooker, Benj., Pear Tree Court, Farringdon R London, E.C., Mechanical Engineer.

1899. Hooker, H. D., 341, Adelphi Street, Brooklyn, N. U.S.A., Sanitary Engineer.

O.M. Hooper, E. Grant, Government Laboratory, Clemen Inn Passage, Strand, W.C.; and (Journals) Royal Avenue, Sloane Square, S.W., Analyti Chemist.

1889. Hooper, Ernest F., Wear Fuel Works, Hendon Do Sunderland, Technical Chemist.

1888. Hope, Jas., The Nickel Co., Kirkintilloch, N. Nickel Works Manager.

1892. Hopkins, Erastus, 60, William Street, Worcest Mass., U.S.A., Consulting Chemist.

1893. Hopkins, Gerald V., Nicholaston House, Penma near Swansea; and (Journals) Silico, Rossla Canada, Metallurgist.

1894. Hopkins, Herbert W., (Journals) c/o Waihi G. M. Co., Waihi, Paeroa, N.Z.; and 13, Harrington Gardens, South Kensington, S.W., Metallurgist.

1891. Hopkinson, John, Marion Street, Lister Hills, Bradford, Yorks, Lubricant Manufacturer.

1898. Hopwood, Wm. H., Strines, near Stockport, Printworks Chemist.

1889. Horn, Wm., Lautaro Nitrate Co., Taltal, Chili, Technical Chemist.

1895. Horne, W. D., Yonkers, N.Y., U.S.A., Consulting Chemist.

1900. Horsfall, Jno., 4, Grange Avenue, Rawtenstall, Manchester, Analytical and Consulting Chemist.

1901. Horton, Edw., jun., 8, Orford Street, Chelsea, S.W., Student.

1889. Horton, William, 44, Cable Road, Hoylake, Cheshire, Analytical Chemist.

1902. Hosford, Roger F., 125, Milk Street, Boston, Mass., U.S.A., Chemical Engineer.

1892. Hosie, G. H., 136, Cambridge Drive, Kelvinside, N., Glasgow, Technical Chemist.

1890. Hoskins, A. Percy, 25, Cromwell Road, Belfast, Analytical Chemist.

1899. Hoskins, Wm., Room 55, 81, South Clark Street, Chicago, Ills., U.S.A., Chemist.

1899. Houlder, Bertram E., 11, Portland Road, Southall, Middlesex, Chemist.

1892. Houston, John, 26, Princess Street, Manchester, Drysalter.

1888. Houston, Robt. S., Hawkhead Road, Paisley, N.B., Analytical Chemist.

1891. Hovenden, Fred., Glenlea, Thurlow Park Road, West Dulwich, S.E.

O.M. Howard, A. G., Burnt House, Chigwell, Essex, Chemical Manufacturer.

1901. Howard, Bernard F., Devon House, Buckhurst Hill, Essex, Chemical Student.

1900. Howard, Chas. D., Agricultural Experiment Station, Morgantown, W. Va., U.S.A., Chemist.

O.M. Howard, D., Devon House, Buckhurst Hill, Essex, Chemical Manufacturer.

1887. Howard, D. Lloyd, (Journals), City Mills, Stratford, London, E. and (Communications) Little Friday Hill, Chingford, Essex, Chemical Manufacturer.

1898. Howard, Henry, 175, Mountfort Street, Brookline, Mass., U.S.A., Chemical Engineer.

O.M. Howard, W. D., City Mills, Stratford, London, E., Chemical Manufacturer.

1899. Howles, Fred., c/o McDougall Bros., Millwall Docks, London, E., Chemist.

1889. Howorth, F. Wise, c/o Lloyd Wise. 46, Lincoln's Inn Fields, W.C., Manufacturing Chemist.

1896. Hoyte, Percy S., Gas Works, Coxside, Plymouth, Gas Engineer.

1900. Hübner, Julius, 24, Delaunay's Road, Crumpsall, Manchester, Chemist and Colourist.

1898. Hudson, Albert W., 208, Opera House, Denver, Col., U.S.A., Assayer.

1899. Hudson, Dr. Edw. J., Cleveland Cliffs Iron Co., Gladstone, Mich., U.S.A., Chemist.

1896. Hudson, Jos., Rawden Lodge, Headingley, Leeds, Drysalter.

1901. Huffman, Louis, 1588, King Street West, Toronto, Canada, Manufacturer.

O.M. Hughes, J., 79, Mark Lane, London, E.C., Agricultural Chemist.

1898. Hughes, Raymond M., Oxford, Butler Co., Ohio, U.S.A., Professor of Chemistry and Physics.

O.M. Hughes, T., 31, Loudoun Square, Cardiff, Analytical Chemist.

1901. Hulley, Elkanah, c/o General Chemical Co., Moro-Phillips Works, Camden, N.J., U.S.A., Chemist.

1900. Hulley, Geo. D., c/o J. Eavenson and Sons, 20th and Wood Streets, Philadelphia, Pa., U.S.A., Soapworks Chemist.

1893. Humfrey, Chas., Hilderstone, Hartford, Cheshire, Alkali Works Manager.

O.M. Hummel, Prof. J. J., 152, Woodsley Road, Leeds, Prof. of Dyeing.

1895. Humphrey, H. A., 38, Victoria Street, Westminster, S.W., Consulting Engineer.

1901. Humphrey, Henry C., c/o New York Glucose Co., Edgewater, N.J., U.S.A., Chemist.

1901. Humphreys, Otho F., Patton Paint Co., Milwaukee, Wis., U.S.A., Paint Manufacturer.

O.M. Humphrys, N. H., Gasworks, Salisbury, Wilts, Gas Engineer.

1895. Hunicke, Dr. H. Aug., 3532, Victor Street, St. Louis, Mo., U.S.A., Prof. of Applied Chemistry.

1900. Hunt, Arthur V., 76, Cromwell Street, Stretford, Lancashire, Analytical Chemist.

O.M. Hunt, Bertram, c/o C. D. Laing, 717, Taylor Street, San Francisco, Cal., U.S.A., Technical Chemist.

O.M. Hunt, C., Gasworks, Windsor Street, Birmingham, Gas Engineer.

O.M. Hunt, E., Wood Green, Wednesbury, Staffordshire, Chemical Manufacturer.

1897. Hunt, Edmund, 121, West George Street, Glasgow, Patent Agent.

1883. Hunt, J. S., Appleton, Widnes.

O.M. Hunt, W., Hampton House, Wood Green, Wednesbury, Staffordshire, Chemical Manufacturer.

1897. Hunter, Prof. A. G. Kidston, (subs.) c/o John Hunter, 18, Great Clyde Street, Glasgow; and (Journals) P.O. Box 164, Dunedin, N.Z., Prof. of Chemistry.

1902. Hunter, Hy. Blount, c/o Liquid CO_2 Manufacturing Co., S.E. Corner of 36th Street and First Avenue, New York City, U.S.A., Industrial Chemist.

1893. Hunter, Prof. Matthew, Rangoon College, Rangoon, Burmah, Prof. of Chemistry.

1892. Hunter, Sidney H., 202, Bow Road, E., Mechanical Engineer.

O.M. Huntington, Prof. A. K., King's College, Strand, London, W.C., Prof. of Metallurgy.

1897. Huntington, Dr. Harwood, University Club, 1, West 54th Street, New York City, U.S.A., Consulting Chemist.

1902. Huntly, Geo. N., 96, Gower Street, London, W.C., Analytical and Consulting Chemist.

1900. Hurd, Geo. E., 72, Michigan Avenue, Chicago, Ill., U.S.A., Food Products Manufacturer.

1894. Hurry, E. H., Bethlehem, Pa., U.S.A., Mechanical Engineer.

1884. Hurst, G. H., 22, Blackfriars Street, Salford, Manchester, Analytical Chemist.

1901. Hurty, Jno. N., Cor. Penn and Ohio Steets, Indianapolis, Ind., U.S.A., Analytical Chemist.

O.M. Huskisson, P. L., 77, Swinton Street, London, W.C., Chemical Manufacturer.

O.M. Huson, C. W., 18, Batavia Buildings, Hackins Hey, Liverpool, Analytical Chemist.

1894. Hutcheson, Jno. F., 22, St. Enoch Square, Glasgow, Chemical Manufacturer.

O.M. Hutchinson, C. C., 3, Harcourt Buildings, Temple, E.C., Barrister-at-Law and Chemical Engineer.

1900. Hutchinson, Edw. G., Gasworks, Pontefract Road, Barnsley, Yorks, Assistant at Gasworks.

O.M. Hutchinson, T. J., Aden House, Manchester Road, Bury, Analytical and Consulting Chemist.

1901. Hutton, Robt. S., Owens College, Manchester, Lecturer on Electro-Chemistry.

O.M. Huxley, J. H., 15, Kenwood Park Road, Sharrow, Sheffield, Metallurgical Chemist.

1897. Hyams, Geoffrey M., P.O. Box 5104, and 312, Sears Building, Boston, Mass., U.S.A., Mines Manager.

1897. Hyde, B. T. Babbitt, c/o B. T. Babbitt, 82, Washington Street, New York City, U.S.A., Soap Manufacturer.

1899. Hyde, Fred. S., 215, Schermerhorn Street, Brooklyn, N.Y., U.S.A., Research Chemist.

1897. Hyde, Henry St. John, 210, East 18th Street, New York City, U.S.A.

1899. Hyde, Wm. Grantley, 26, Winsham Street, Clapham Common, S.W., Assayer.

1901. Hyman, Leonard W., New York Central and Hudson River R.R., West Albany, N.Y., U.S.A., Analytical Chemist.
1896. Hyndman, H. H. Francis, Physical Laboratory, Leyden, Holland, Analytical and Consulting Chemist.

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1898. Ibbotson, E. C., jun., c/o Dearne and Dove Steelworks, Worsbrough Dale, Barnsley, Metallurgist.
1900. Ichioka, Tajiro, Kure Arsenal, Hiroshima, Japan, Doctor of Chemistry, Chemist (Imperial Japanese Navy).
1885. Idris, T. H. W., 120, Pratt Street, Camden Town, N.W., Mineral Water Manufacturer.
1899. Imhoff, Dr. Paul, 18, Greenbank Road, Liverpool, Chemist.
1900. Imrie, John, 415, Shields Road, Pollokshields, Glasgow, Analytical Chemist.
1900. Ingalls, Walter R., 153, Milk Street, Boston, Mass., U.S.A., Mining Engineer and Metallurgist.
1889. Ingle, Dr. Harry, 15, John Street, Kirkcaldy, Fifeshire, Organic Chemist.
1891. Ingle, Herbert, Yorkshire College, Leeds, Assistant Lecturer on Chemistry.
1884. Inglis, R. A., Culrain, Bothwell, N.B., Analytical Chemist.
1891. Innes, Murray, P.O. Box 156, Clifton, Arizona, U.S.A., Technical Chemist.
1888. Irivè, Koremasa, China and Japan Trading Co., Kobé, Japan, Analytical Chemist.
O.M. Irvine, R., Royston, Granton, Edinburgh, Chemical Manufacturer.
1884. Irving, J. M., 17A, Dickinson Street, Cooper Street, Manchester, Chemical Merchant.
O.M. Irwin, W., 3, Wilton Polygon, Cheetham Hill, Manchester, Analytical Chemist.
1893. Isaac, J. F. V., Research Chemist.
1888. Isaac, T. W. Player, Barton Court, Abingdon, Chairman of Waterworks Co.
1901. Isakovics, Alois von, 419, East 121st Street, New York City, U.S.A., Manufacturing Chemist.
1896. Isaacs, Louis A., 110, Greencroft Gardens, West Hampstead, N.W., Manufacturer.
O.M. Isler, Otto, 35–37, Dickinson Street, Manchester, Chemical Merchant.
1900. Ittner, Dr. Martin H., c/o Colgate and Co., Jersey City, N.J., U.S.A., Soap and Essential Oil Chemist.

J

1890. Jackman, E. J., 60, Belgrave Road, Ilford, Essex, Technical Chemist.
1898. Jackson, Alf Greville, 355, George Street, Brisbane, Queensland, Electrical Engineer.
1901. Jackson, Daniel D., Mount Prospect Laboratory, Flatbush Avenue and Eastern Parkway, Brooklyn, N.Y., U.S.A., Chemist.
O.M. Jackson, Edward, Clovelly, Grove Avenue, Moseley, Birmingham, Alkali Works Inspector.
1891. Jackson, F., Smedley Bridge Works, Cheetham, near Manchester, Chemical Apparatus Maker.
1883. Jackson, Frederick, 14, Cross Street, Manchester, Laboratory Furnisher.
1884. Jackson, G. B., 7, Brazenose Street, Albert Square, Manchester, Chemical Manufacturer.
1901. Jackson, H. A., 1101, Washington Street, Wilmington, D. L., U.S.A., Chemist.
1886. Jackson, John, 98, Dobbie's Loan, Glasgow, Lubricant Manufacturer.
1901. Jackson, Percy G., Chemical Laboratory, Locomotive Department, Midland Railway, Derby, Chemist.
O.M. Jackson, R. V., c/o Scotch and Irish Oxygen Co., Polmadie, Glasgow, Technical Chemist.
1891. Jackson, Robt., 18, Harrington Street, Dublin, Analytical Chemist.
1890. Jackson, Saml., c/o Messrs. Binny & Co., Madras, India, Analytical Chemist.
1898. Jackson, Thos., Clayton Chemical Works, Clayton, Manchester, Chemical Manufacturer.
1900. Jackson, Victor G., 167, Grove Lane, Denmark Hill, S.E., Chemist.
1901. Jackson, W. B., Glengowan Printworks, Caldercruix, N.B., Chemist.
1899. Jackson, W. E. Russell, Sunderland Brewery, Sunderland, Brewer.
1900. Jackson, Dr. W. Hatchett, Radcliffe Library, University Museum, Oxford, Librarian and Science Tutor (Keble College).
1893. Jackson, Rt. Hon. W. L., M.P., F.R.S., 27, Cadogan Square, S.W.; and (Journals) Allerton Hall, Chapel Allerton, near Leeds, Leather Manufacturer.
1899. Jackson, W. Morton, c/o Manchester Oxygen Co., Ltd., Great Marlborough Street, Manchester, Manager.
O.M. Jackson, W. P., Saxilby, near Lincoln, Chemical Works, Manager.
1901. Jacobs, Charles B., 44, Broad Steeet, New York City, U.S.A., Chemist.
1901. Jacobsen, Rudolph C., 154, Lake Street, Chicago, Ill., U.S.A., Editor "Hide and Leather."
1900. Jacoby, Areli H., c/o F. E. Atteaux and Co., 176, Purchase Street, Boston, Mass., U.S.A., Chemist.
1897. Jacqué, Maurice, Fabrica de Dinamita, Galdacano, cerca Bilbao, Spain, Chemical Engineer.
1891. Jadhava, Khasberao B., Baroda, Bombay Presidency, India, Collector and District Magistrate.
1900. Jäger, B. M., c/o Geo. Jäger and Sons, 77, Burlington Street, Liverpool, Chemist, Sugar Refinery.
1886. Jago, Wm., Godrevy House, Wilbury Avenue, Hove, Sussex, Chemical Engineer.
1889. James, Alf., 56, New Broad Street, London, E.C., Mining Engineer.
1900. James, Edgar C., 202, Portway, West Ham, E., Chemist.
1853. James, E. T., British Alizarin Co., Ltd., Silvertown, Victoria Docks, E., Secretary.
1885. James, Dr. J. Wm., Aylmer House, Weston-super-Mare; and (Journals) 29, Redcliff Street, Bristol, Chemical Lecturer.
1893. James, Lawrence S., 32, Hawley Street, Boston, Mass., U.S.A., Gas Inspector.
1894. Jameson, A. H., 23, Mathewson Street, Providence, R.I., U.S.A., Chemist.
1897. Jansen, Dr. Robt., 43, Plymouth Avenue, Longsight, Manchester, Technical Chemist.
1890. Jantzen, Paul, 132, Fenchurch Street, London, E.C., Chemical Merchant.
O.M. Japp, Dr. F. R., F.R.S., The University, Aberdeen, Professor of Chemistry.
1890. Jarmain, Geo. S., Dalton Lodge, Huddersfield, Wool Extractor.
O.M. Jarmay, G., Hartford Lodge, Hartford, Cheshire, Alkali Manufacturer.
1891. Jarrett, H. T., 90, William Street, New York City, U.S.A., Chemist.
1884. Jarves, Deming, Michigan Carbon Works, Detroit, Mich., U.S.A., Manufacturing Chemist.
1900. Jarvie, Hugh, Earnest Soap and Glycerin Works, Coatbridge, N.B., Chemist.
1900. Jarvie, Jas., Monkland House, Kirkintilloch, N.B., Chemist.
1894. Jarvis, Talbot McL., Latrobe Cottage, Bedford, Brewer.
O.M. Jayne, Dr. H. W., 931, North Broad Street, Philadelphia, Pa., U.S.A., Manufacturing Chemist.
1900. Jefferson, Jos., Empreza Industrial Portugueza, Sto. Amaro, Lisbon, Metallurgist.
O.M. Jekyll, J., Castle Moat House, Lincoln, Chemical Manufacturer.
1892. Jenkin, W. A., 5, Bella Vista, Minas de Rio Tinto, Provincia de Huelva, Spain, Metallurgical Chemist.

1894. Jenkins, John H. B., Laboratory, G.E.R. Works, Stratford, E., Analytical Chemist.

1894. Jenks, Robt. L., 89, Bartholomew Close, London, E.C., Chemist.

O.M. Jenner, E., 209, Markhouse Road, Walthamstow, Essex, Chemical Manufacturer.

1898. Jennings, Arthur S., 62, Barry Road, East Dulwich, S.E., Editor of "Oils, Colours, and Drysalteries."

1899. Jennings, Thos., Brookfield, Cork, Ireland, Chemical Manufacturer.

1899. Jerdan, Dr. David S., c/o J. and G. Cox, Ltd., Gorgie Mills, Edinburgh, Chemist (Gelatin Works).

1899. Jessop, Louis V., 8, Rockmead Road, Victoria Park, N.E., Chemist.

1896. Job, Robt., 638, North 6th Street, Reading, Pa., U.S.A., Analytical Chemist.

1886. Johnson, A. E., Claremont, Lyndhurst Road, Wolverhampton, Analytical Chemist.

1900. Johnson, Albert C., 320, East 25th Street, Baltimore, Md., U.S.A., Chemical Engineer.

1891. Johnson, Edmond E., Engineering Works, Carpenter's Road, Stratford, E., Chemical Engineer.

1900. Johnson, Edw., c/o Pereira, Carneiro, & Co., Rua do Commercio, No. 6, Pernambuco, Brazil, Sugar Works Manager.

1900. Johnson, F. Carter, National Acid Co., 714, Union Street, New Orleans, La., U.S.A., Chemical Engineer.

O.M. Johnson, J. E., 40, Idmiston Road, Stratford, London, E., Manufacturing Chemist.

1884. Johnson, J. Grove, 23, Cross Street, Finsbury, London, E.C., Assayer.

1895. Johnson, Jesse F., c/o Hamilton Powder Co., Montreal, Canada, Chemical Engineer.

1900. Johnson, Jno. E., c/o John Johnson and Co., 95—97, Liberty Street, New York City, U.S.A., Chemical Engineer.

1900. Johnson, Jno. W. H., York House, Thornhill, Dewsbury, Yorks, Analytical Chemist.

O.M. Johnson, S. H., Warren Hill House, Loughton, Essex, Chemical Engineer.

1899. Johnson, S. H., jun., Engineering Works, Stratford, E., Chemical Engineer.

O.M. Johnson, T. A., Field House, Winnington Park, Northwich, Cheshire.

1900. Johnson, Thos. H., American Forcite Powder Manufacturing Co., Landing, N.J., U.S.A., Superintendent.

1895. Johnston, Alex. R., 18, Percy Street, Ibrox, Glasgow, Analytical Chemist.

1894. Johnston, G. Lawson, Kingswood Road, Sydenham Hill, S.E., Vice-Chairman, (Bovril, Ltd.).

1889. Johnston, Thos., Nobel's Explosives Co., Ltd., 149, West George Street, Glasgow, Explosives Co.'s Manager.

1890. Johnston, Wm. A., The S. S. White Dental Manufacturing Co., Prince's Bay, Staten Island, N.Y., U.S.A., Dental Enamel Manufacturer.

1894. Johnston, Wm. E. Lawson, 49, Mount Street, London, W., Assistant Chemist (Bovril, Limited).

O.M. Johnston, Wm. G., Chemical Works, Coatbridge Street, Port Dundas, Glasgow, Technical Chemist.

O.M. Johnstone, Jas., Shawfield Works, Rutherglen, Glasgow, Technical Chemist.

O.M. Johnstone, W. G., The Brewery, Newark-on-Trent, Chemist.

1897. Jones, Chas. H., Minas de Rio Tinto, South Spain, Technical Chemist.

1902. Jones, David R., Standard Chemical Co., Deseronto, Ont., Canada, Chemical Engineer.

1899. Jones, Ernest W., 18, Upper Tooting Road, S.W., Chemist.

O.M. Jones, E. W. T., 10, Victoria Street, Wolverhampton, Analytical Chemist.

1897. Jones, Fred. W., Barwick, near Ware, Herts, Explosives Works Manager and Chemist.

1896. Jones, G. Cecil, Basingstoke Ironworks, Basingstoke, Hants, Works Chemist.

1900. Jones, Gordon, Pystill, Holywell, Flints., North Wales, Paper Manufacturer.

1898. Jones, Henry, Broughton Bridge Mills, Salford, Dyer and Finisher.

O.M. Jones, H. Chapman, Royal College of Science, South Kensington, S.W., Senior Demonstrator in Chemistry.

1893. Jones, Herbert. *See* Sefton-Jones, H.

1901. Jones, Herbert J., 52, Sneinton Dale, Nottingham, Chemist.

1899. Jones, Llewellyn J. W., Omaha Smelting Works, Omaha, Neb., U.S.A., Metallurgist.

1898. Jones, Martin L., c/o Ooregum G. M. Co., Oorgaum, Mysore Prov., India, Metallurgical Chemist.

1894. Jones, M. W., 8, Cavendish Place, Jesmond, Newcastle-upon-Tyne, Analytical Chemist.

1899. Jones, Thos. J., Anglo-Continental Guano Works, North Woolwich Road, E., Foreman.

1887. Jones, T. Tolley, 356, Little Collins Street, Melbourne, Victoria, Explosives Manufacturer.

O.M. Jones, W. Norris, Lancashire Metal Works, Widnes, Technical Chemist.

1899. Joplin, Geo. C., 8, O'Connell Street, Sydney, N.S.W., Australia, Analyst.

1897. Jorissen, Dr. Wm. P., Koninklijk Inst. v. d. Marine, Willemsoord, Holland, Editor.

1892. Joseland, Walter H., Laboratory, Newport Lane, Burslem, Staffordshire, Analytical Chemist.

1900. Josephson, Edgar, 131, Amity Street, Brooklyn, N.Y., U.S.A.

1891. Joslin, Omar T., Spring Grove Avenue (opp. Bates), Cincinnati, Ohio, U.S.A., Chemical Engineer.

1887. Joüet, Dr. C. H., Roselle, Union Co., N.J., U.S.A., Technical Chemist.

1889. Journand, Louis, 21, Grand Rue, Bourg-de-Péage, Drôme, France, Technical Chemist.

1888. Joy, Douglas G., The Rookery, Stevenage, Herts, Oil Refiner.

1887. Jürgensen. Dr. Rolof, Karlsgasse 5, Prag-Zizkov, Austria, Chemist.

1900. Just, Jno. A., 116, East Castle Street, Syracuse, N.Y., U.S.A., Chemist.

O.M. Justice, P. M., 55–56, Chancery Lane, London, W.C., Patent Agent.

K

1898. Kaho, Julius, 100, West 80th Street, New York City, U.S.A., Manufacturer of Rubber Goods.

1896. Kalbfleisch, Franklin H., 33–35, Burling Slip, New York City, U.S.A., Chemical Manufacturer.

1884. Kalle, Dr. Wm., Biebrich-am-Rhein, Germany, Colour Manufacturer.

1899. Karas, J., c/o Tim and Co., Troy, N.Y., U.S.A., Laundryman.

1901. Kasson, Henry R., 1209, Stock Exchange Building, Chicago, Ill., U.S.A., Asphalt Chemist.

1901. Kauder, Dr. E., c/o Merck and Co., University Place, New York City, U.S.A., Chemist.

1892. Kaufmann, Dr. Herbert M., c/o Mutual Chemical Co., Jersey City, N.J., U.S.A., Chemist.

1885. Kawakita, Michitada, Imperial Engineering College, Tokio, Japan, Analytical Chemist.

O.M. Kay, H. A., 71, Maida Vale, London, W.

1891. Kay, Dr. Percy, South-Western Polytechnic, Manresa Road, Chelsea, S.W., Analytical Chemist.

O.M. Kay, W. E., Ashlands, Sale, Cheshire, Printworks Chemist.

O.M. Kearns, H. W., Baxenden, near Accrington, Dyer.

1897. Kearns, Jno. S., Baxenden House, near Accrington, Chemist and Dyer.

1894. Kebler, Lyman F., 35, Poplar Street, Philadelphia, Pa., U.S.A., Analytical and Manufacturing Chemist.

1900. Keeble, Arthur J., Peterborough, Cement Manufacturer.

1886. Keiser, Prof. E. H., Washington University, St. Louis, Mo., U.S.A., Professor of Chemistry.

1900. Kelf, Henry C., c/o East India Distilleries, Nellikuppam, S. Arcot, Madras, India, Sugar Chemist.

1900. Kellner, Dr. Carl, Kellner Partington Paper Pulp Co., Hallein bei Salzburg, Austria, Paper Chemist.

1885. Kellner, Dr. Wm., 13, Victoria Road, Old Charlton, S.E., Chemist to War Department.

1901. Kelsey, D. McC. Stone, 192, Woodlawn Avenue, Saratoga Springs, N.Y., U.S.A., Manufacturing Chemist.

1901. Kelsey, Jas. W., 2, West View, Blackhill, co. Durham, Chemist and Metallurgist.

1889. Kempson, John F., Pye Bridge Chemical Works, near Alfreton, Derbyshire, Chemical Manufacturer.

1901. Kennedy, Alex., Kenmill House, Bothwell, N.B., Rosin Distiller.

1891. Kenrick, Prof. Edgar B., Winnipeg, Manitoba, Canada, Professor of Chemistry.

1901. Kenrick, Dr. Frank B., 209, John Street, Toronto, Canada, Lecturer on Chemistry.

1888. Kent, Wm. J., Holly Lodge, Hornsea, Yorks, Assayer, and Chemical Engineer.

1889. Kenyon, Thos., The Shrubbery, Hilton Park, Prestwich, near Manchester, Manufacturing Chemist.

1900. Keppelmann, Alf. J., 308, Carpenter Street, Germantown, Pa., U.S.A., Chemical Merchant.

1883. Ker, Alan D., Millburn Chemical Works, Garngad Hill, Glasgow, Chemical Manufacturer.

1899. Kern, Walter P., 275, Paulison Avenue, Passaic, N.J., U.S.A., Chemist.

1894. Kerr, Jas., 42, Craiglea Drive, Morningside, Edinburgh, Works Chemist.

1890. Kerr, Saml. T., 516, North Delaware Avenue, Philadelphia, Pa., U.S.A., Salt Manufacturer.

1897. Kerr, Wm. M., c/o General Chemical Co., 608, Philadelphia Bourse, Philadelphia, Pa., U.S.A., Manufacturing Chemist.

1896. Kershaw, Jno. B. C., Faraday House, 8, Charing Cross Road, London, W.C., Analytical Chemist.

1893. Kestner, Paul, 22, Boulevard Vauban, Lille, France, Chemist.

1898. Keswick, Wm., M.P., 3, Lombard Street, London, E.C., Merchant.

1900. Kewley, Jas., Arbory Road, Castletown, Isle of Man, Technical Chemist.

1890. Keys, W. H., Lyndon House, West Bromwich, Oil and Chemical Manufacturer.

1892. Kibble, W. Oakes, Sonora, Tuolumne Co., Cal., U.S.A., Chemical Engineer.

1896. Kier, Thos., Thornliebank, Glasgow, Chemist.

1900. Kilgore, Benj. W., Raleigh, N. Carolina, U.S.A., Chemist.

1901. Kilmer, Fred. B., New Brunswick, N.J., U.S.A., Chemical Manufacturer.

O.M. Kinch, E., Royal Agricultural College, Cirencester, Professor of Chemistry.

O.M. King, A. J., (Journals) Ingersley Vale, and (Communications) Rock Bank, Bollington, near Macclesfield, Bleacher and Finisher.

1884. King, C. M., Campsie Alum Works, Lennoxtown, N.B., Alum Manufacturer.

1887. King, Sir James, Bart., 115, Wellington Street, Glasgow, Chemical Manufacturer.

O.M. King, J. Falconer, 20, Chambers Street, Edinburgh, Consulting Chemist.

1897. King, Joshua, Clarewood, Camberley, Surrey, Indian Civil Service (retired).

1887. King, Robt., 115, Wellington Street, Glasgow, Chemical Manufacturer.

1895. King, Sidney J., 49, Arundel Square, Barnsbury, N., Colour and Dyestuff Traveller.

O.M. King, Walter R., (Journals) Avalon, Trinity Avenue, Southend-on-Sea; and (Subscriptions) 47, Wilson Street, Finsbury, E.C., Chemical Manufacturer.

1899. King, Wm. R., Box 695, Summit, N.J., U.S.A., Mechanical Engineer.

1896. Kingdon, G. Holman, 9, Grappenhall Road, Stockton Heath, Warrington, Technical Chemist, M.A., Oxon.

1899. Kingsford, Edw. A., 91, Petherton Road, Highbury, N., Manufacturing Chemist.

1883. Kingsford, T. P., Oswego Starch Factory, Oswego, N.Y., U.S.A., Starch Manufacturer.

O.M. Kingzett, C. T., Elmstead Knoll, Chislehurst, Kent, Technical Chemist.

1892. Kinnicutt, Professor L. P., 77, Elm Street, Worcester, Mass., U.S.A., Professor of Chemistry (Worcester Polytechnic Institute).

1897. Kipping, Dr. F. Stanley, F.R.S., University College, Nottingham, Prof. of Chemistry.

1898. Kirkland, Archd., 80, High Street, Irvine, N.B., Baker.

1897. Kirkland, Robt., Viewfield, Newmains, N.B., Chemist.

1900. Kirkpatrick, Stafford F., c/o Mountain Copper Co., Keswick, Shasta Co., Cal., U.S.A., Assayer.

1887. Kitamura, Y. (Journals), c/o R. Fujihanaya, Yokoyamacho Sanchome, Tokyo, Japan, Agricultural Chemist.

1883. Kitchen, Theo., (Journals) c/o J. Kitchen and Sons, Ltd., Port Melbourne, Victoria, Australia; and (subs.) c/o Jno. H. Kitchen, 35, Queen Victoria Street, E.C., Soap and Candle Manufacturer.

1891. Kitson, Sir James, Bart., M.P., Gledhow Hall; and (Journals) Monkbridge Iron and Steel Co., Ltd., Leeds, Iron and Steel Manufacturer.

1883. Kitto, B., 26, Lancaster Road, Finsbury Park, London, N., Analytical Chemist.

1900. Kittredge, H. G., 42, Linden Avenue, Dayton, Ohio, U.S.A., Chemist.

1900. Kleber, Dr. Clemens, Union Avenue, Clifton, N.J., U.S.A., Director (Fritzche Bros.' Laboratory).

1888. Kleemann, Dr. S., Farben Fabrik, Forcheim, Bavaria, Analytical Chemist.

1898. Klein, Otto H., Room 110, Stewart Building, 280, Broadway, New York City, U.S.A., Consulting Engineer.

1889. Klipstein, A., 122, Pearl Street, New York City, U.S.A., Chemical Manufacturer.

1891. Knaggs, Alfred B., Bradley Lane, Huddersfield, Technical Chemist in Dyeworks.

1900. Knapp, Rudolf E., 487, East Congress Street, Detroit, Mich., U.S.A., Chemist.

1892. Knecht, Dr. E., Station Road, Crumpsall, Manchester, Analytical Chemist.

1900. Kniffen, Fred., U.S. Naval Smokeless Powder Factory, Indian Head, Md., U.S.A., Chemist.

1887. Knight, A. H., 2, Gerald Road, Oxton, Cheshire, Assayer.

1884. Knight, Henry, 33, Faraday Street, Breck Road, Liverpool, Colour and Varnish Manufacturer.

O.M. Knight, J. B., Silvertown Soapworks, Silvertown, London, E., Soap Manufacturer.

1894. Knight, Wm. A., Sexey's Trade School, Bruton, Somerset, Head Master.

1887. Knights, J. West, Public Laboratory, Tenison Road, Cambridge, Analytical Chemist.

1885. Knipler, F., c/o R. Harper and Co., Port Melbourne, Victoria, Starch Manufacturer.

1883. Knowles, Joshua, Stormer Hill, Tottington, near Bury, Calico Printer.

1886. Knox, E. W., Colonial Sugar Refining Co., Sydney, N.S.W.; and c/o Parbury Henty & Co., 20, Eastcheap, London, E.C., Sugar Manufacturer and Refiner.

1895. Koechl, Victor, 122, Hudson Street, New York City; (Journals) 47, Montgomery Place, Brooklyn, N.Y., U.S.A., Dye Merchant.

1901. Koehler, Dr. H., c/o Roessler and Hasslacher Chemical Co., Perth Amboy, N.J., U.S.A., Manager.

1901. Kohl, Herbert C., Craigsville, Va., U.S.A., Cement Works Chemist.

1884. Kohn, Dr. Charles A., M.Sc., Sir John Cass' Technical Institute, Jewry Street, Aldgate, E.C., Principal.

1896. Kohnstamm, E. H., 44, West Broadway, New York City, U.S.A., Colour Maker and Importer.

1884. Kolb, J., Soc. Anon. des Manuf. de Produits Chimiques, Lille, France, Chemical Manufacturer.

O.M. Kraftmeier, E., 54, Parliament Street, Westminster, S.W., Explosives Manufacturer.

1894. Krause, Dr. Albert H., 32, Wellington Avenue, Cleveland, Ohio, U.S.A., Chemist (Grasselli Chemical Co.).

O.M. Krause, Dr. G., "Chemiker-Zeitung," Cöthen, Germany, Editor.

O.M. Krause, O. H., c/o American Sugar Refining Co., Jersey City, N.J., U.S.A., Chemical Engineer.

1898. Krebs, H. J., Wilmington, Del., U.S.A., Manufacturing Chemist.

1900. Kremers, Dr. Edw., Madison, Wis., U.S.A., Professor (University of Wisconsin).

1899. Krick, Howard L., Sheridan Furnaces, Sheridan, Leb. Co., Pa., U.S.A., Analytical Chemist.

O.M. Kühl, W. H., 73, Jägerstrasse, Berlin, Germany, Bookseller.

1900. Kuaheim, Erich, 32, Doratheenstrasse, Berlin, N.W., Germany, Chemist.

1885. Kupferberg, Dr. H., 303, Collyhurst Road, Manchester, Technical Chemist.

1896. Kuttroff, Adolf, 128, Duane Street, New York City, U.S.A., Chemical Merchant.

1900. Kuttroff, Fred., 128, Duane Street, New York City, U.S.A., Merchant.

O.M. Kynaston, J. W., 3, Oak Terrace, Beech Street, Liverpool, Chemical Engineer.

1898. Kynaston, Wm. C. R., Analyst.

L

1897. Labonde, Dr. Leon, (Journals) P.O. Box 594, Rochester, N.Y., U.S.A., Consulting Chemical Engineer.

1890. Lacey, E. C., 10, Clarence Road, Croydon, Manufacturing Chemist.

O.M. Lacey, T. S., Gas Light and Coke Company, Lupus Street, Pimlico, S.W., Gas Engineer.

1899. Lachman, Albert, California Wine Association, San Francisco, Cal., U.S.A., Wine Merchant.

1897. Ladd, Edwin F., Agricultural College, Fargo, North Dakota, U.S.A., Prof. of Chemistry.

1888. Lagerwall, Dr. Ivar, Sunthorpe, Wallington, Surrey, Petroleum Manufacturer.

O.M. Laidler, C. P., 20, Noble Terrace, Gateshead-on-Tyne, Analytical Chemist.

1894 Laing, Wm., 10-11, The Exchange, Bradford, Yorks, Oil Merchant.

1902. Laist, Fredk., 1408, N. Main Street, Santa Ana, Cal., U.S.A., Chemist.

O.M. Lake, G., jun., 83, Primrose Lane, Glossop, Derbyshire, Analytical Chemist.

1900. Lamar, Wm. R., c/o Mallinckrodt Chemical Works, St. Louis, Mo., U.S.A., Chemist.

1898. Lamb, Morris Chas., Dyeing Department, Herold's Institute, Drummond Road, Bermondsey, S.E., Chemist.

1892. Lambert, Alan, Union Oil Mills, 21, St. Mary Axe, E.C., Oil Mills Director.

1900. Lambert, Walter S., 56, Leytonstone Road, Stratford, E., Analyst.

1899. Lamborn, Leebert Lloyd, Room 519, 108, Fulton Street, New York City, U.S.A., Technical Chemist.

1895. Lancaster, Jno. C., 260, Alfreton Road, Nottingham, Engineering Works Manager.

1900. Lander, Geo. D., 1, Balmoral Road, Nottingham, Lecturer.

1895. Landin, John, 40, Drottninggatan, Stockholm, Sweden, Public Analyst.

1890. Lang, Jas. G., Balmoral Hotel, Victoria, British Columbia, Analytical Chemist.

1899. Lang, Dr. Wm. R., University of Toronto, Canada, Professor of Chemistry.

O.M. Langdon, Dr. M. J., 16, Harriet Street, Stretford, Manchester, Analytical Chemist.

1890. Lange, Dr. Martin, Nieuwe Witsenkade, 35, Amsterdam, Holland, Analytical Chemist.

1892. Langer, Dr. Carl, Ynyspenllwch, Clydach, R.S.O., Glamorganshire, Analytical Chemist.

1897. Langmuir, Arthur C., c/o Marx and Rawolle, 9, Van Brunt Street, Brooklyn, N.Y., U.S.A., Analytical Chemist.

1898. Langstaff, Wm., 34, Fowler Street, Cleveland, Ohio, U.S.A., Chemist.

1900. Lant, Herbert, "Ivy Bank," Wath-on-Dearne, near Rotherham, Yorks., Chemist and Manager.

1884. Latham, Baldwin, Parliament Mansions, Victoria Street, Westminster, S.W., Civil Engineer.

1889. Latham, J. J., Mill House, Bold, Widnes, Chemical Works Manager.

O.M. Lawrence, Jas., Repauno Chemical Works, Paulsboro', N.J., U.S.A., Assistant Manager.

O.M. Laws J. P., 2, Aigburth Vale, Liverpool, S., Analytical Chemist.

1885. Lawson, Arthur J., Marsh Soapworks, Bristol, Soap Manufacturer.

1388. Lawson, Dr. T. A., 90, Boundary Road, London, N.W., Colour Chemist.

1900. Lawson, Wm., Alameda Sugar Co, Alvarado, Cal., U.S.A., Chemist.

1893. Lawton, Thos., Calthorpe House, Aldridge Road, Perry Barr, Birmingham, Chemical Works Manager.

1890. Laycock, Dr. W. F., 2, Park Street, Dewsbury, Analytical Chemist.

1902. Lazell, Ellis Warren, 1110, Stephen Girard Building, Philadelphia, Pa., U.S.A., Chemist.

1898. Lean, Geo., 15, Park Terrace, Glasgow, Chemist.

1897. Leathart, Thos. H., Bracken Dene, Gateshead-on-Tyne, Lead Manufacturer.

O.M. Leather, Dr. J. W., Dehra Dun, N.W.P., India, Agricultural Chemist, Government of India.

1897. Le Bosquet, Maurice, 328, East Eagle Street, East Boston, Mass., U.S.A., Technical Chemist.

1893. Le Boutillier, Clement, c/o Taylor Iron and Steel Co., High Bridge, N.J., U.S.A., Chemist.

1896. Lecomber, W. G., Moorland Villa, Brooklands, near Manchester, Engineer.

1896. Lederle, Dr. E. J., Health Department, New York City, U.S.A., Chief Chemist.

1892. Ledoff, Prof. A., Technological Institute, Kharkoff, Russia, Professor of Chemistry.

1895. Ledoux, Dr. Albert R., 99, John Street, New York City, U.S.A., Chemist.

1901. Lee, FitzHugh, c/o Grasselli Chemical Co., East Chicago, Ind., U.S.A., Superintendent.

1898. Lee, Jno. L., Woodfield, Lytham, Lancashire, Dyer and Bleacher.

1885. Lee, S. Wright, 6–10, Whitechapel, Liverpool, Wholesale Druggist.

891. Lee, Theo. H., (subsn). Edgcumbe Villa, Clevedon, Somerset; and (Journals) St. John Del Rey Mine, Morro Velho, Villa Nova de Lima, Minas Geraes, Brazil; Analytical Chemist.

1899. Lee, Waldemar, Passaic, N.J., U.S.A., Chemist.

1886. Leeds, F. H., 26, East Bank, Stamford Hill, N., Analytical Chemist.

1889. Leese, Joseph, 3, Lord Street West, Southport.

1901. Lefebvre, Georges, Compagnie du Phospho-Guano, 60, Rue de Bondy, Paris, Director.

1901. Leffler, Rudolf L., c/o Thos. Firth and Sons, Ltd., Norfolk Works, Sheffield, Metallurgical Chemist.

1901. Leibfried, Jno. E., Bethlehem, Pa., U.S.A., Analytical Chemist.

1888. Leigh, Cecil, Birmingham Metal and Munition Co., Adderley Park Rolling Mills, Birmingham, Technical Chemist.

1902. Leighton, A. E, 78, Hillfield Avenue, Hornsey, N., Analytical Chemist.

1894. Leitch, Jno. W., Milnsbridge Chemical Works, near Huddersfield, Aniline Dye Manufacturer.

1898. Leman, Wm. T., c/o Paragon Refinery Co., Toledo, Ohio, U.S.A., Oilworks Manager.

1894. Lenders, A. W. H., c/o Glucose Sugar Refining Co., Davenport, Iowa, U.S.A, Technical Chemist.

1901. Lengfeld, Dr. Felix, 202, Stockton Street, San Francisco, Cal., U.S.A., Manufacturing Chemist.

1883. Lennard, F., 70, Gracechurch Street, E.C.; and (Journals) Merrow Croft, Merrow, Guildford, Chemical Manufacturer.

1884. Leonard, Wm. J., Hope Chemical Works, Hackney Wick, E., Naphtha Distiller.
1888. Lequin, E., Directeur Général des Usines de Produits Chimiques de la Société de St. Gobain, 1, Place des Saussies, Paris (VIIIe.).
1894. Leslie, Hugh M., Marikuppara, Mysore State, South India, Chemical Engineer.
189[illegible]. Lesser, Wm., P.O. Box 162, Albany, N.Y., U.S.A., Manufacturing Chemist.
1900. Lessner, Chas. R., 46, Broadfield Road, Hither Green, London, S.E., Metallurgical Chemist.
1896. Lester, Isaac E., Nirvana, Infield Park, Barrow-in-Furness, Steelworks Manager.
1892. Lester, J. H., Royal Exchange, Manchester, Analytical Chemist.
1899. Le Sueur, Henry R., Chemical Laboratory, St. Thomas' Hospital, London, S.E., Demonstrator.
1891. Lett, Stephen J., 72, Clarendon Road, Notting Hill, W., Chemical Engineer.
1898. Leuthardt, Peter, 163A, Fairfield Road, Droylsden, near Manchester, Chemical Manufacturer.
1891. Lever, Jas. D., Thornton Hough, Cheshire, Soap Manufacturer.
1891. Lever, Wm. H., Thornton House, Thornton Hough, Cheshire, Soap Manufacturer.
1901. Levett, Walter, Fairview, St. Margaret's Avenue; and (Journals) Mines Safety Explosives Co., Stanford-le-Hope, Essex, Factory Manager.
1900. Levine, Edmund J., c/o The Fiberloid Co., 638, Broadway, New York City, U.S.A., Chemist.
1901. Levinstein, Dr. Herbert, Crumpsall Vale Chemical Works, Crumpsall, and (Journals) Hawkesmoor, Fallowfield, Manchester, Chemist.
O.M. Levinstein, Ivan, 21, Minshull Street, Manchester, Colour Manufacturer.
1901. Levy, Dr. Albert, The Mond Nickel Co., Ltd., Clydach, R.S.O., Glamorgan, Works Chemist.
1887. Lewes, Prof. Vivian B., Royal Naval College, Greenwich, S.E. Professor of Chemistry.
1898. Lewio, H. James, Royal Victoria Yard, Deptford, S.E., Assistant Inspector of Stores.
1889. Lewis, A. E., 56, Thomas Lane, Knotty Ash, Liverpool, Analytical Chemist.
1896. Lewis, Daniel C., c/o Millville Manufacturing Co., Millville, N.J., U.S.A., Dye and Bleach Works Chemist.
1900. Lewis, Ernest A., 310, Dudley Road, Birmingham, Chemist and Metallurgist (Muntz Metal Co.).
1902. Lewis, Fredk. H., Craigsville, Va., U.S.A., Manager (Virginia Portland Cement Co.).
1900. Lewis, John, 57, East Dulwich Road, East Dulwich, S.E., Cashier (Paint Works).
1900. Lewis, Saml. J., 122, Newington Causeway, London, S.E., Pharmaceutical Chemist.
1889. Lewkowitsch, Dr. Julius, 71, Priory Road, West Hampstead, N.W., Consulting Chemist.
1901. Lichtenstein, Alf. S., Arnold Printworks, North Adams, Mass., U.S.A., Chemist.
O.M. Lichtenstein, Theodore, Chemical Works, Silvertown, E., Manufacturing Chemist.
1892. Liddle, G. A., 313, Walmersley Road, Bury, Lancs., Chemist, Dyewood Extract Works.
1885. Liddle, W. T., Woodville, Walmersley Road, Bury, Lancs., Manager, Dyewood Extract Works.
O.M. Liebmann, Dr. A., 10, Marsden Street, Manchester, Analytical Chemist.
1899. Liedbeck, P. F. Alarik, 43, Strandwagen, Stockholm, Sweden, Chemical Engineer.
O.M. Lightfoot, T. E., 88, Arden Terrace, Accrington, Calico Printer's Chemist.
1898. Lilly, Josiah K., c/o Eli Lilly and Co., Indianapolis, Ind., U.S.A., Manufacturing Pharmacist.
1885. Lilly, Oliver M., The Croft, Spondon, Derby, Colour Manufacturer.
1897. Lindsay, Robt., Hayfield, Alexandria, N.B., Chemist.
1901. Lindsay, Robt. D., Busby Printworks, near Glasgow, Chemist.
1890. Ling, Arthur R., Laboratory, 2, St. Dunstan's Hill, E.C., and (Journals) 45, Lambton Road, Cottenham Park, Wimbledon, Analytical and Consulting Chemist.
1901. Lippincott, Warren B., c/o American Smelting and Refining Co., Argentine, Kansas, U.S.A., Chemist.
1896. Lishman, Geo. P., Bunker Hill, Fence Houses, Co. Durham, Colliery Chemist.
1896. Littell, R. Ballantine, 50, South Walnut Street, East Orange, N.J., U.S.A., Chemist.
1901. Little, C. A., Elyria, Ohio, U.S.A., Analytical Chemist.
1900. Little, Jno. G., 66, Albany Street, London, N.W.; and (Journals) c/o A. von Gernet, 101, Leadenhall Street, London, E.C., Assayer.
1889. Little, Wm. G., Blendon Grove, Bexley, Kent, Chemical Manufacturer.
O.M. Littlejohn, Jas., c/o South African Banking Corporation, Johannesburg, Transvaal, Analytical Chemist.
1902. Littlewood, Dr. Jas. B., U.S. Patent Office, Washington, D.C., U.S.A., Chemical Examiner.
1886. Liversedge, A. J., Clock House, Arundel Street, Strand, W.C., Mechanical Engineer.
O.M. Liversidge, Prof. A., F.R.S., The University, Sydney, New South Wales, Professor of Chemistry.
1883. Livingston, W. J., London County Council, Spring Gardens, London, S.W., Analytical Chemist.
1899. Lloyd, Charles, 77, Bishopsgate Street Within, London, E.C.; and (Journals) c/o Manager, Lake View Consols, Ltd., Boulder, Western Australia, Secretary.
1900. Lloyd, Fred. J., Muscovy House, Trinity Square, London, E.C., Analyst.
1900. Lloyd, Thos. H., 121, Kingsley Road, Princes Park, Liverpool, Analyst.
1901. Lober, Jno. B., Vulcanite Portland Cement Co., Room 1415, Real Estate Trust Building, Philadelphia, Pa., U.S.A., Cement Manufacturer.
1899. Lockwood, Alfred A., 48, East Street, Faversham, Kent, Metallurgist.
1899. Loder, Francis H., 9, St. John's Park, Blackheath, S.E., Director.
1884. Lodge, A. S., Newchurch, near Manchester, Technical Chemist.
1888. Lodge, Edw., 25, Cowcliffe Hill, Huddersfield, Teacher of Wool Dyeing.
1900. Loeb, Dr. Morris, New York University, University Heights, New York City, U.S.A., Professor of Chemistry.
1901. Loebell, Eugene, jun., 130, Dickenson Road, Rusholme, Manchester, Brewers' Chemist.
1891. Loewenthal, Dr. R., Uhlandstrasse, 39, Frankfurt a/M., Germany, Textile Chemist and Lecturer on Dyeing.
1899. Logan, John, Moatfield House, Timperley, Cheshire, Indigo-Blue Dyer.
O.M. Lomas, T., 3, Selborne Villas, Minehead, Taunton, R.S.O., Chemical Manufacturer.
1888. Lombard, Emile, 12, Rue Breteuil, Marseilles, France, Director of Pyrites Co.
1901. Long, Eugene J., c/o E. O'Callaghan and Son, City Tannery, Limerick, Ireland, Tanner.
1902. Longden, Alf. Hy., Stanton-by-Dale, Nottingham, Analytical Chemist.
1898. Longstaff, Jas. P., Chemical Department, Heriot Watt College, Edinburgh, Assistant.
1890. Lord, F. J., 4, Winmarleigh Street, Warrington, Analytical Chemist.
1896. Lord, Jno. Lloyd, 23, Park View, Elton, Bury, Lancs., Chemist and Manager.
1897. Lord, N. W., 338, West 8th Avenue, Columbus, Ohio, U.S.A., Professor of Metallurgy.
O.M. Lorenz, H., 7 and 8, Idol Lane, London, E.C., Chemical Merchant.
O.M. Lorimer, J., Britannia Row, Islington, N., Manufacturing Chemist.
O.M. Lorrain, J. G., Norfolk House, Norfolk Street, Strand, London, W.C., Civil Engineer.

O.M. Lott, F. E., The Labaratory, Bridge Chambers, Burton-on-Trent, Consulting Brewing Chemist.

O.M. Louis, D. A., 77, Shirland Gardens, London, W., Metallurgist and Mining Engineer.

1894. Louis, Prof. Henry, Durham College of Science, Newcastle-on-Tyne, Professor of Mining.

O.M. Love, Dr. E. G., 80, East 55th Street, New York City, U.S.A., Analytical Chemist.

1899. Love, Wm., 28, Royal Exchange Square, Glasgow, Managing Director (Broxburn Oil Co., Ltd.).

1895. Lovejoy, Frank W., Kodak Park, Rochester, N.Y., U.S.A., Chemical Engineer.

O.M. Lovibond, J. W., Lake House, Salisbury, Tintometer Manufacturer.

O.M. Lovibond, T. W., West Jesmond House, Newcastle-on-Tyne, Brewer.

1897. Low, Albert H., P.O. Drawer 1537, Denver, Colo., U.S.A., Metallurgical Chemist.

1900. Low, Prof. Wilson H., Cudahy Packing Co., South Omaha, Neb., U.S.A., Chemist.

1887. Lowe, C. W., Summerfield House, Reddish, near Stockport, Manufacturing Chemist.

1900. Lowe, Herbert G., c/o Falulah Paper Co., Fitchburg, Mass., U.S.A., Paper Manufacturer.

O.M. Lowe, W. F., 9, Hough Green, Chester, Analytical Chemst.

1885. Lowson, J. G. F., Hollycot, Lasswade, N.B., Paper Maker.

1895. Lucas, Alf., Survey Department, Public Works Ministry, Cairo, Egypt, Analyst.

1892 Lucas, Bernard R., 3, Dyar Terrace, Winnington, Northwich, Alkali Works Manager.

O.M. Lucas, R., Alwinenstrasse 11, Wiesbaden, Germany, Technical Chemist.

O.M. Luck, Alf., Luck's Explosives, Ltd., Stowmarket, Suffolk, Explosives Chemist.

1900. Lummus, Walter E., 62, Newhall Street, Lynn, Mass., U.S.A., Manager (Commonwealth Manufacturing Co.).

1888. Lund, Jas., 142, Hawthorne Street, Malden, Mass., U.S.A., Ammonia Works Manager.

1888. Lundholm, Carl O., Journals to Nobel's Explosives Co., Ltd., Ardeer Factory, Stevenston, Ayrshire, Explosives Works Manager.

1898. Lundteigen, Andreas, Union City, Mich., U.S.A., Chemist.

O.M. Lunge, Prof. Dr. G., Zürich, V., Switzerland, Professor of Chemistry.

1894. Lungwitz, Theo., c/o Chas. Pfizer and Co., 81, Maiden Lane, New York City, U.S.A., Superintending Chemist.

1885. Lupton, Sydney A., 102, Park Street, Grosvenor Square, London, W.

1890. Luthy, Edmund O., P.O. Box 232, Cincinnati, Ohio, U.S.A., Distiller.

1884. Lüthy, Otto, 2336, Fairmount Avenue, Philadelphia, Pa., U.S.A., Analytical Chemist.

1895. Luxmoore, Dr. Chas. M., Reading College, Reading, Lecturer on Chemistry.

1899. Luxton, Thos., 19, Spring Street, Hull, Teacher of Chemistry.

1885. Lye, W. T., Leagrave Hall, near Luton, Beds, Straw Dyer.

1884. Lyle, James, Plaistow Wharf, North Woolwich Road, London, E., Sugar Refiner.

1885. Lyle, Jno., 21, Mincing Lane, London, E.C., Sugar Refiner.

1889. Lymn, Arthur H., 1, Manor Crescent, East Molesey, Chemical Works Manager.

1899. Lynn, R. Rankine, 7, Highburgh Terrace, Dowanhill, Glasgow, Chemical Engineer.

1899. Lynn, Vaughan G., c/o Messrs. Best and Co., Madras, India, Merchant.

1898. Lynne, Miss Daisie, 4621, Forbes Street, Pittsburg, Pa., U.S.A., Chemist.

1902. Lyon, Edwd. H., 141, Charles Street, New York City, U.S.A., Manufacturing Chemist.

O.M. Lyon, J. G., The Aire Tar Works, Knottingley, Yorks, Tar Distiller.

O.M. Lyte, F. Maxwell, 60, Finborough Road, Radcliffe Square, London, S.W., Chemical Manufacturer.

O.M. Lytle, A. M., North of Ireland Chemical Co., Ltd., 31, Victoria Street, Belfast, Ireland, Chemical Manufacturer.

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1898. Maass, Frank, P.O. Box 507, Paterson, N.J., U.S.A. Silk Dyer.

1887. Mabery, Prof. Chas. F., Case School of Applied Science, Cleveland, Ohio, U.S.A., Professor of Chemistry.

1894. Mabey, Fred O., 196, Amhurst Road, Hackney, N.E., Wine Merchant.

1891. Macadam, Herbert E., Milton House, Selsdon Road, Wanstead, E., Manure Works Manager.

O.M. Macadam, Prof. W. Ivison, Surgeons' Hall, Edinburgh, Professor of Chemistry and Consulting Chemist.

1894. Macadam, Stevenson, Surgeons' Hall, Edinburgh, Analytical Chemist.

O.M. McAlister, R., Lawes' Chemical Manure Co., Limited, Barking Creek, Essex, Manure Works Manager.

1894. McAlley, Robt., Bankside, Falkirk, N.B., Paint Works Manager.

1891. Macallan, J., 3, Charlemont Terrace, Clontarf, Dublin, Analytical Chemist.

1892. Macara, Thos., jun., 6, West Bank Terrace, Hillhead, Glasgow, Chemical Student.

1889. McArthur, Jno., 196, Trinity Road, Wandsworth Common, S.W., Chemist.

1887. McArthur, J. B., Price's Patent Candle Co., Limited, Bromborough Pool, near Birkenhead, Oil Works Chemist.

1886. Macarthur, J. G., 98, Dobbie's Loan, Glasgow, Lubricant Manufacturer.

O.M. McArthur, J. S., 45, Renfield Street, Glasgow, Consulting Chemist and Metallurgist.

1901. MacArthur, Jno. S., 15, St. John's Road, Pollokshields, Glasgow, Paint and Varnish Manufacturer.

1892. McArthur, Thos., 7, Temple, Dale Street, Liverpool, Drysalter and Dyewood Extractor.

1892. McBretney, E. G., 23, Ferrybridge Road, Castleford, Yorks, Glass Works Chemist.

1901. McCaffery, Richard S., San Pedro, New Mexico, U.S.A., Mining Engineer and Metallurgist.

1898. MacCallum, D. A., 10, Midlothian Drive, Shawland, Glasgow, Chemist.

O.M. McCallum, J. M., Southdene, Paisley, N.B., Soap Manufacturer.

O.M. McCalman, D., 18, Harbour Street, Irvine, N.B., Technical Chemist.

1894. McCann, Owen, 80, Studley Road, Forest Gate, Essex. Printing Ink Manufacturer.

1893. McCombie, C., 19, St. Dunstan's Hill, London, E.C., Drug and Chemical Merchant.

O.M. McCowan, W., Brewer.

1897. McCrae, Dr. John, jun., 7, Kirklee Gardens, Kelvinside, Glasgow, Chemical Demonstrator.

1898. McCreath, W. D., West Cornwall Creamery, Lelant, R.S.O., Cornwall, Analytical Chemist.

1884. McCulloch, J., Oakleigh, Rose Street, Garnet Hill, Glasgow, Chemical Works Manager.

1900. McCulloch, John, Glencoe, Lostock Gralam, Cheshire, Chemical Engineer.

O.M. McDaniel, J. J., Woodlands, Bandon, Ireland, Distiller.

O.M. Macdonald, A., 72, Great Clyde Street, Glasgow.

1897. MacDonald, G. W., c/o Curtis and Harvey, Ltd., Dartford, Kent, Explosives Chemist.

1894. McDonald, John, Distillery Offices, Fort William, N.B., Distiller.

O.M. Macdonald, J. W., c/o Messrs. H. Tate & Sons, Love Lane, Liverpool, Analytical Chemist.

1899. MacDonald, S. Fremont, c/o Ashtabula Hide and Leather Co., Ashtabula, Ohio, U.S.A., Tanner.

O.M. McDonald, T. M., Wallilabo Estate, St. Vincent, West Indies, Sugar Chemist.

1888. McDougall, Arthur, Fallowfield House, Fallowfield, Manchester, Chemical Manufacturer.

1890. McDougall, Hugh, Phœnix Works, Westonpoint, Runcorn, Chemical Engineer.

1895. McDougall, Isaac, jun., High Bank, Didsbury, Manchester, Student.

1895. McDougall, Isaac S., High Bank, Didsbury, Manchester, Manutacturing Chemist.

1890. McDougall, J. T., Dunolly, Morden Road, Blackheath, S.E., Manufacturing Chemist.

1889. MacEwan, Peter, 37, Hornsey Lane Gardens, Highgate, N., Editor of "Chemist and Druggist."

1891. McEwen, Atholl F., 43, Gilmore Road, Lewisham, S.E., Analytical Chemist and Assayer.

1901. McEwen, Duncan C., 3, Armadale Place, Greenock, N.B., Metallurgical Chemist.

1902. McFarland, Alan R., c/o Solvay Process Co., Syracuse, N.Y., U.S.A., Alkali Works Manager.

1897. McFarland, B. W., 278, Canner Street, New Haven, Conn., U.S.A., Chemist.

O.M. Macfarlane, J. A., Metallurgical Chemist.

O.M. Macfarlane, R. F., Tharsis Copper Works, East Moors, Cardiff, Technical Chemist.

1884. Macfarlane, Thos., Inland Revenue Dept., 317, Queen Street, Ottawa, Canada, Analyst to Dominion of Canada.

1901. McFarlane, Walter, Sunnyside, Mansewood, Pollockshaws, Glasgow, Printworks Manager.

1894. McFarlane, Dr. Walter D., c/o Canada Paper Co., Windsor Mill, P.Q., Canada, Paper Manufacturer.

1890. McFarlane, W. W., 522, West 9th Street, Chester, Pa., U.S.A., Dyeworks Manager.

1900. McFie, Robt. A., The Nickel Co., Kirkintilloch, N.B., Chemist.

1893. McGhie, T. Burns, c/o Quirk, Barton, and Co., Normandy Wharf, Rotherhithe, S.E., Analytical Chemist and Assayer.

1891. McGill, Dr. J. T., Vanderbilt University, Nashville, Tenn., U.S.A., Adjunct Professor of Chemistry.

1890. MacGillivray, Wm. A., c/o Swansea Safety Fuse Co., Pipe House Wharf, Swansea, Analytical Chemist.

1887. McGlashan, John, Cawnpore Sugar Works, Cawnpore, India, Technical Chemist.

1884. McGowan, John, Ash House, Talke, near Stoke-upon-Trent, Colliery Manager.

1896. McIlhiney, Dr. Parker C., 145, East 23rd Street, New York City, U.S.A., Chemist.

1894. McIlwaine, Alf. W., Stoneferry, Hull, Oil Manufacturer.

O.M. MacIndoe, G. D., Belfast, Christchurch, New Zealand, Chemical Works Manager.

1901. Macintosh, John, c/o Curtis' and Harvey, Explosives Factory, Cliffe-at-Hoo, Kent, Analytical Chemist.

1888. MacKean, Wm., 76, York Street, Westminster, S.W., Technical Chemist.

O.M. McKechnie, D., Eccleston Grange, Prescot, Lancashire, Copper Extractor.

O.M. McKechnie, D. M., 196, Lodge Lane, Liverpool, Copper Extractor.

1887. McKellar, W. G., c/o United Alkali Co., Ld., Eglinton Works, Irvine, N.B., Technical Chemist.

1895. McKenna, Dr. Chas. F., 221, Pearl Street, New York City, U.S.A., Chemist.

18[illegible]. Mackensie, Alex. H., 12, Hale Street, North Adams, Mass., U.S.A., Colour Mixer.

1891. Mackenzie, Dr. G. S., Sydney Smelting Works, Woolwich, N.S.W., Metallurgical Chemist.

1900. Mackenzie, John K., 1104, Rookery Building, Chicago, Ill., U.S.A., Mining Engineer.

1885. Mackenzie, T. E., 6, Cardonald Park Terrace, Cardonald, Renfrewshire, N.B., Technical Chemist.

1884. Mackenzie, Dr. W. Cossar, Tewfikieh College of Agriculture, Ghizeh, Egypt, Analytical Chemist.

1893. McKerrow, C. A., 8, Exchange Street, Manchester, Analytical and Consulting Chemist.

1893. McKesson, John, 91, Fulton Street, New York City, U.S.A., Manufacturing Chemist.

1891. Mackey, W. McD., Victoria Chambers, Leeds, Analytical Chemist.

1900. McKillop, George F., Broxburn Oilworks, Broxburn, N.B., Works Chemist.

1890. McKillop, Jno., 10, Adelphi Terrace, London, W.C., Metallurgist.

1902. McKim, Wm., 69, Linden Street, Yonkers, N.Y., U.S.A., Colour Maker.

1884. McKinlay, R. W., Ameliaville, Aytoun Road, Pollokshields, N.B., Metal Merchant.

1901. McLaren, Daniel, Brookdale, Grey Street, Stalybridge, Teacher of Chemistry.

1898. McLaurin, Robt., 414, Sauchiehall Street, Glasgow, Chemist.

1888. MacLean, Alex. S., 31, Bank Street, Greenock, N.B., Soap Refiner.

O.M. McLellan, J. Y., 112, Claude Road, Cardiff, Chemical Manufacturer.

1892. McLeod, Jas., Westhill, Cardross Road, Dumbarton, N.B., Analytical Chemist and Gas Examiner.

1896. McMaster, Daniel, McMurray's Royal Paper Works, Wandsworth, S.W., Paper Mill Manager.

1894. Macmillan, Arch., 12, Hastings Street, Sunderland.

O.M. McMillan, W. G., 8, Leigham Court Road, Streatham, S.W., Metallurgical Chemist.

1889. McMurtrie, J. M., 21, Princes Street, Pollokshields, Glasgow, Brass Founder.

1900. McMurtrie, Wm. T., 101, West 81st Street, New York City, U.S.A., President of American Chemical Society.

1895. McMurtry, G. C., Copper Smelting Works, Lithgow, N.S.W., Australia, Metallurgist.

1881. Macnab, C., Lillyburn, Milton of Campsie, N.B., Calico Printer.

O.M. Macnab, W., Edinburgh Lodge, Howick Place, Victoria Street, S.W., Analytical Chemist.

O.M. Mactear, Jas., 28, Victoria Street, Westminster, S.W., Chemical Engineer.

1892. McVie, Jas. P., Ravenscraig, Canning Street, Hebburn-on-Tyne, Analytical Chemist.

1894. McVitie, Robt., 12, Greenhill Gardens, Edinburgh, Biscuit Manufacturer.

1901. Maertens, Emile, P.O. Box 1002, Providence, R.I., U.S.A., Engineer.

1895. Magnus, Isidor, 52, Leadenhall Street, London, E.C., Chemical Merchant.

1901. Magruder, Egbert W., Department of Agriculture, Richmond, Va., U.S.A., Chemist.

1885. Mahon, R. W., N.Y. Central and Hudson River Railroad, West Albany, N.Y., U.S.A., Analytical Chemist.

1898. Main, Wm., 299, Jefferson Avenue, Brooklyn, N.Y., U.S.A., Chemical Expert.

O.M. Major, J. Lewis, Sculcoates, Hull, Tar Distiller and Chemical Manufacturer.

1886. Mallinckrodt, Edw., Mallinckrodt Chemical Works, St. Louis, Mo., U.S.A., Manufacturing Chemist.

1897. Mallory, J. Halsey, 409, Fitten Building, Atlanta, Ga., U.S.A., Assistant Chemist (The American Cotton Oil Co.).

1896. Mann, E. A., Government Chemical Laboratory Fremantle, Western Australia, Government Inspector of Explosives.

1893. Mann, Harold H., Indian Tea Association, Royal Exchange Buildings, Calcutta, India, Research Chemist.

1899. Mann, Jas. S., 521, Barking Road, Plaistow, Essex, Analyst.

1891. Mann, John C., c/o Major and Co., Ltd., Sculcoates, Hull, Chemist.

1900. Manna, Haridas, 4, Gulu Ostagur's Lane, Calcutta, India, Chemist and Doctor.

O.M. Mannington, H. T., Marshlea, Beaconsfield Road, Farnworth, Widnes.

1896. Manoukian, Dr. Wahan, 71, Elsasserstrasse II., Trep. Links, Berlin, N., Germany, Analytical Chemist.

1892. Mansbridge, Wm., 133, Park Grove, Hull, Chemist.

1893. Marchlewski, Dr. L., Strzelecka, 9, Krakau, Austria.

1883. Markel, Dr. K., Lodge Lane, Bewsey, Warrington, Technical Chemist.
1886. Markham, A. D., 71, Queen Street, Hull, Pharmaceutical Chemist.
1901. Marks, Arthur H., c/o Diamond Rubber Co., Akron, Ohio, U.S.A., Vice-President.
1901. Marsden, Dr. Fred, Chemische Fabrik, Sulzbach in Oberpfalz, Germany, Chemist.
O.M. Marsh, J. T., Ammonia Soda Works, Fleetwood, Lancashire, Chemist.
1883. Marsh, W., Union Alkali Co., Soho Works, Manchester, Chemical Manufacturer.
1895. Marshall, Arthur, Hope Cottage, Church Hill, Loughton, Essex, Explosives Chemist.
1891. Marshall, Dr. Hugh, 12, Lonsdale Terrace, Edinburgh, Professor of Chemistry.
1895. Marshall, Frank G., 4, Woodhouse Terrace, Bewick Road, Gateshead, Technical Chemist.
1894. Marshall, Jas., 20, Glenview Terrace, Paisley, N.B., Chemical Student.
1901. Marshall, Jos. W., Boulevard Higher Grade School, Hull, Science Lecturer.
1896. Marshall, Percy S., Union Laboratory, Half Moon Street, Huddersfield, Assistant Chemist.
1883. Marshall, Wm., 149, Drake Street, Rochdale, Dyer.
1884. Marshall, Wm., 35, Streathbourne Road, Balham, S.W., Analytical Chemist.
1894. Martin, Alex. M., Douglas Villa, Coatbridge, N.B., and (Journals), Twechar Office, Kilsyth, N.B., Analytical Chemist.
1895. Martin, Chas. H., 14, Aldred Street, Crescent, Salford, Oil and Soap Works Assistant Manager.
1901. Martin, David, jun., South Inch Brewery, Perth, Brewer.
1885. Martin, H., 67, High Street, Wellington, Somerset, Manure Works Manager.
O.M. Martin, N. H., Ravenswood, Low Fell, Gateshead-on-Tyne, Manufacturing Chemist.
1894. Martin, T. Tremills, 45, Stapleton Hall Road, Stroud Green, N., Analytical Chemist.
1899. Martin, Wm E., c/o Kynoch Ltd., Arklow, Co. Wicklow, Ireland, Chemist.
O.M. Martin, W. H., 183B, King's Road, Chelsea, London, S.W., Analytical Chemist.
1887. Martineau, Sydney, Northwood, Rydal Road, Streatham, S.W., Sugar Chemist.
1891. Martyn, T. Graham, 11, Stratton Terrace, Truro, Cornwall, Metallurgist.
O.M. Mason, J., Eynsham Hall, Witney, Oxon, Director of Pyrites Co.
1887. Mason, J. Francis, Eynsham Hall, Witney, Oxon.
1892. Mason, Thos., Hyson Green Works, Nottingham, Manufacturing Chemist.
1884. Mason, W. B., 117, Derby Street, Bolton-le-Moors, Pharmaceutical Chemist.
O.M. Masson, Prof. D. Orme, University of Melbourne, Victoria, Australia, Professor of Chemistry.
1889. Master, Ardesheer B., 679, Tardeo, Bombay, India, Chemical Manufacturer.
1901. Master, Chaturbhai G., Khodi-Amboli, Ahmedabad, India, Size and Chemical Manufacturer.
1893. Mather, Colin, Salford Iron Works, Manchester, Engineer.
O.M. Mather, J., Blaydon Chemical Works, Blaydon-on-Tyne, Manager.
1900. Mather, Wm., c/o British Aluminium Co., Ltd., Larne Harbour, co. Antrim, Ireland, Chemist.
1890. Matheson, W. J., 182–184, Front Street, New York City, U.S.A., Chemical Merchant.
1901. Mathew, W. E. B. de Vere, 13, Orlando Road, Clapham Common, S.W., Analytical Chemist.
1900. Mathews, Dr. J. A., 4, First Place, Brooklyn, N.Y., U.S.A., Chemist.
1898. Mathewson, E. P., c/o J. A. Mathewson and Co., Montreal, Canada, Metallurgist.
1888. Mátos, Louis J., 99, North 19th Street, East Orange, N.J., U.S.A., Chemist.
1896. Matsui, G., c/o Japan Sugar Refinery Co., Onagigawa, Tokio, Japan, Chemical Engineer.
O.M. Matthews, C. G., 31, Stapenhill Road, Burton-on-Trent, Brewing Chemist.
1896. Matthews, Donald J., 165, Ebury Street, London, S.W., Chemist.
1899. Matthews, Dr. J. Merritt, 225, South 45th Street, Philadelphia, Pa., U.S.A., Professor of Chemistry and Dyeing (Philadelphia Textile School).
1889. Mawdsley, W. H., c/o Gold Mining Co., Ltd., Mount Morgan, Queensland, Chemist.
1894. Maxwell, Jno., Solway Chemical Works, Silloth, and (communications) English Street, Carlisle, Cumberland, Chemical Manure Manufacturer.
1897. May, George H., Hohokus P.O., Bergen Co., N.J., U.S.A., Assistant Chemist (American Pegamoid Co.).
1901. May, Dr. Sidney, 115, West 68th Street, New York City, U.S.A., Lecture Assistant.
1884. Mayenfeld, Dr. E. von Salis. See under "Salis."
1896. Mayfield, A. S., 14, Beresford Avenue, Hull, Analyst.
1892. Mayfield, H. B., Normanhurst, Mundy Street, Heanor, near Nottingham, Dyer.
1901. Mayfield, Thos., Fair View House, Heanor, near Nottingham, Hosiery Manufacturer.
1885. Mayhew, E. W. A., High Street, Freemantle, Western Australia, Manufacturing Chemist.
1900. Maywald, F. J., 1028, 72nd Street, Brooklyn, N.Y., U.S.A., Technical Chemist.
1892. Meacham, Chas. S., c/o Ohlsson's Cape Breweries, Ltd., Cape Town, South Africa, Brewer.
1901. Meier, Dr. Franz, Basle Chemical Works, Basle, Switzerland, Chemist.
1898. Meeds, Alonzo D., 103, Boston Block, Minneapolis, Minn., U.S.A., City Gas Inspector and Chemist.
1896. Meggitt, Loxley, Laboratory, Sutton-in-Ashfield, Notts, Analytical Chemist.
1888. Meikle, Jno., 8, Melrose Street, Great Western Road, Glasgow, Journalist.
1902. Melcher, Arthur C., 58, Bowen Street, Newton Centre, Mass., U.S.A., Chemist.
O.M. Meldola, Prof. R., F.R.S., 6, Brunswick Square, London, W.C., Professor of Chemistry.
1901. Meldrum, And. N., 29, Kimberley Street, Liverpool, Lecturer on Chemistry.
1891. Meldrum, Jas. Jones, Atlantic Works, City Road, Manchester, Manufacturing Engineer.
1891. Mellen, E. D., 1590, Massachusetts Avenue, Cambridge, Mass., U.S.A., Treasurer (Curtis, Davis, and Co.)
O.M. Mellon, W. W., 16, Sandymount Road, Dublin, Ireland, Manufacturing Chemist.
O.M. Mellor, S., Magnesium Metal Co., Patricroft, Manchester, Metal Refiner.
1899. Mellors, Paul, Locksley House, Pelham Road, Sherwood Rise, Nottingham, Mine Manager.
1884. Melville, D., P.O. Box No. 1, Woodmere, Wayne Co., Mich., U.S.A., Chemical Works Manager.
1900. Mende, Alex. P., 536, West 14th Street, New York City, U.S.A., Manufacturing Chemist.
1893. Mensching, Dr. C., (Journals) Crumpsall Vale Works, Blackley, near Manchester; and 62, Delaunays Road, Crumpsall, Manchester, Chemist.
O.M. Menzies, R. C., Inveresk Mills, Musselburgh, N.B., Paper Maker.
1892. Mercer, C. A., 22, Streathbourne Road, Upper Tooting, S.W., Chemical Apparatus Maker.
1886. Mercer, J. B., 330, Lower Broughton Road, Manchester.
O.M. Mercer, F. M., 34, Camomile Street, London, E.C., Manufacturing Chemist.
1890. Merck, E., Darmstadt, Germany, Manufacturing Chemist.
1887. Merrell, Geo., Lock Box 786, Cincinnati, Ohio, U.S.A., Manufacturing Chemist.
1899. Merrill, Frank H., Los Angeles Soap Co., Los Angeles, Cal., U.S.A., Factory Superintendent.
1902. Merritt, Wm. G., c/o Berry Bros., Ltd., Varnish Works, Detroit, Mich., U.S.A., Chemist.
1901. Merson, Geo. F., 24, Newgate Street, Newcastle-on-Tyne, Manufacturing Phamaceutical Chemist.

1897. Meslans, Prof. M., 59, Quai de la Baronnie, Ablon (Seine et Oise) France, Professor of Chemistry.
O.M. Messel, Dr. R., 147, Victoria Street, London, S.W., Chemical Manufacturer.
1899. Metcalf, Howard F., Farr Alpaca Co., Holyoke, Mass., U.S.A.
1886. Metcalf, Jno., Moorfield, Altham, near Accrington, Tar Distiller.
1885. Metcalf, Wm., c/o Wm. Metcalf, Ltd., Tar Works, Church, Lancs., Tar Distiller.
1898. Metz, Herman A., P.O. Box 2178, New York City, U.S.A. (Victor Koechl and Co., Dyestuffs and Chemicals).
1900. Mewborne, Robt. G., c/o Kentucky Tobacco Product Co., Louisville, Ky., U.S.A., Chemist.
1898. Meyer, Dr. Franz, c/o Actien Gesellschaft für Zinkindustrie vorm. W. Grillo, Hamborn a Rhein, Germany, Chemist and Manager.
1902. Meyer, Dr. Fredk. L., 2028, Park Avenue, Philadelphia, Pa., U.S.A., Chemist.
1902. Meyer, Jas. O., Laboratory, C. B. and Q. R. R. Co., Aurora, Ill., U.S.A., Chemist.
1900. Meyer, Karl, Osterbrogade, 60, Kopenhagen, O., Denmark, Chemist.
1902. Meyrick, L. J., 137, City Road, Birmingham, Assistant Analyst.
1896. Miles, G. Wellington, 29, Central Street, Boston, Mass., U.S.A., Analytical Chemist.
1889. Milestone, W. C., 7, Heathfield Road, Wandsworth Common, S.W., Chemical Works Manager.
1899. Millar, Jas. H., c/o P. J. Petersen and Co., P.O. Box 38, Cape Town, South Africa, Laboratory Manager.
1897. Millard, Edgar J., 40-42, Charlotte Street, London, E.C., Chemist and Manager.
1883. Miller, Dr. A. K., Kilvert's Buildings, Withy Grove, Manchester, Analytical Chemist.
1884. Miller, A. Russell, Castlebank, Bothwell, N.B., Printworks, Chemist.
O.M. Miller, E. V., c/o New Zealand Sugar Co., Auckland, New Zealand, Sugar Works Chemist.
1889. Miller, Geo., Wood Lane, Halewood, near Liverpool, Technical Chemist.
1897. Miller, Dr. Edmund H., School of Mines, Columbia University, New York, U.S.A., Chemist.
1900. Miller, Hampton K., Lake City, Fla., U.S.A., Chemist (Florida A. & M. College).
1893. Miller, Dr. Harry E., 1015, Chestnut Street, Oakland, Cal., U.S.A., Chemist.
1902. Miller, H. Harold, Consumers' Gas Co., 269, Front Street, E., Toronto, Canada, Chemist.
1883. Miller, Dr. H. von, Beatrixgasse 32, Wien III., Austria, Chemical Manufacturer.
1894. Miller, Dr. John A., 40-45, Lewis Block, Buffalo, N.Y., U.S.A., Consulting Chemist, State Analyst.
1897. Miller, Jas., Minas de São Bento, Santa Barbara de Matto Dentro, Minas Geraes, Brazil, Metallurgical Chemist.
1894. Miller, J. Carlile, 89, Rumford Street, Bridgeton, Glasgow, Manufacturing Chemist.
1888. Miller, J. Hopkins, 5, Catherine Street, Parliamentary Road, Glasgow, Dyeworks Chemist.
1889. Miller, Jno. Poynter, Sandilands Chemical Works, Aberdeen, Technical Chemist.
1884. Miller, Dr. N. H. J., Harpenden, near St. Albans, Agricultural Chemist.
1892. Miller, P. Schuyler, Mount Prospect Laboratory, Flatbush Avenue, Brooklyn, N.Y., U.S.A., Chemist.
1898. Miller, Rudolf E. W., 8, Stanley Villas, Greenway Road, Runcorn, Chemist.
1901. Miller, Stuart B., 148, Hancock Street, Cambridge, Mass., U.S.A., Chemical Engineer.
1884. Miller, T. Paterson, The Cairns, Cambuslang, near Glasgow, Dyer and Printer.
1901. Miller, W. Lash, 50, St. Alban Street, Toronto, Canada, Associate Professor of Physical Chemistry.
1884. Miller, W. M., Caledonia Estate, Prov. Wellesley, Penang, S.S., Sugar Chemist.
O.M. Mills, Prof. E. J., F.R.S., 11, Greenhill Road, Harrow, Professor of Chemistry.
O.M. Milner, E., Hartford Manor, Northwich, Alkali Manufacturer.
1887. Milnes, Edmund, Seedfield, Bury, Lancashire, Dyeing Extract Maker.
1902. Milnes, Ernest E., c/o Joseph Smithson, Ltd., India Buildings, Halifax, Yorks, Chemist.
1901. Milroy, Andrew, The Scottish Co-operative Wholesale Society, Ltd., Chemical Works, Shieldhall, Govan, N.B., Manager.
1895. Miner, Harlan S., c/o Welsbach Light Co., Gloucester City, N.J., U.S.A., Technical Chemist.
1889. Miniati, T., Penketh, near Warrington, Chemist.
1895. Mitchell, Chas. A., c/o Beaufoy and Co., South Lambeth Road, S.W., Analyst.
1901. Mitchell, Frank H., Orono, Penobscot Co., Maine, U.S.A., Tutor in Chemistry.
1898. Mitchell, G. D. H., c/o S. S. White Dental Manufacturing Co., Prince's Bay, Staten Island, N.Y., U.S.A., Chemist.
1883. Mitchell, J. W., Plantation House, Clough Fold, near Manchester, Waste Bleacher.
O.M. Mitting, E. K., 43, Highfield South, Rock Ferry, Cheshire, Technical Chemist.
1900. Mixner, Albert F., c/o Homeward Bound G. M. Co., Yalwal, viâ Nowra, N.S.W., Australia, Metallurgist.
1895. Moale, Dr. Philip R., 100, Merrimon Avenue, Asheville, N.C., U.S.A., Analytical Chemist.
O.M. Mohr, Dr. B., 69A, Parliament Hill, Hampstead, N.W., Consulting Chemist and Metallurgist.
1894. Mole, Herbert B., Ivy Cottage, Shepton Mallet, Somerset, Brewer.
1902. Molesworth, F. H., 39, Hunter Street, Sydney, N.S.W., Australia, Analytical Chemist.
1899. Mommers, Rich., Glucose Sugar Refining Co., Rockford, Ill., U.S.A., Chemist.
O.M. Mond, Dr., L., F.R.S., 20, Avenue Road, Regent's Park, N.W.; and 64, Via Sistina, Rome, Alkali Manufacturer.
1891. Mond, Robt. L., Winnington Hall, Northwich, Chemist.
1890. Moodie, Wm. E., Alexandria Works, Alexandria, N.B., Analytical Chemist.
1901. Moody, Chas. J., Lake View Consols Mine, Boulder, West Australia, Analyst and Assayer.
1898. Moody, Dr. Herbert R., Hobart College, Geneva, N.Y., U.S.A., Science Instructor.
1884. Mook, Chas., 2, Kapellenstrasse, Eisenach, Germany, Alkali Works Director.
1883. Mooney, M., 118, Pembroke Road, Dublin, Chemical Manufacturer.
1898. Moore, Byron L., c/o N. W. Fertilising Co., 45th and Center Avenue, Chicago, Ill., U.S.A., Chemist.
1887. Moore, Chas. C., Harley Buildings, 11, Old Hall Street, Liverpool, Chemist.
1901. Moore, Chas. W., 33, Demesne Road, Whalley Range, Manchester, Chemical Student.
1892. Moore, Dr. Geo. D., 201, Salisbury Street, Worcester, Mass., U.S.A., Professor of Chemistry.
1902. Moore, Jas. H., c/o Central Silica Co., Fortville, Ind., U.S.A., Chemist.
1899. Moore, Landon C., 85, Perkins Hall, Harvard University, Cambridge, Mass., U.S.A., Secretary.
1899. Moore, Quintin, jun., Dalmarnock Chemical Works, 89, Rumford Street, Glasgow, Works Manager.
1899. Moore, Russell, W., 47, Linden Place, Orange, N.J., U.S.A., Chemist (U.S. Appraiser's Office).
1885. Moore, R. T., 156, St. Vincent Street, Glasgow, Mining Engineer.
1890. Moore, Thos., Laboratoire du Service Local, Noumea, New Caledonia, Analytical Chemist.
1890. Mordle, F. Dare, 38, The Ropewalk, Nottingham, Starch Manufacturer.
1892. Morgan, Albert J., 439, West Street, New York City, U.S.A., Soap Manufacturer.
1901. Morgan, Dr. Gilbert T., Royal College of Science, South Kensington, S.W., Demonstrator of Chemistry.
1890. Morgan, J. Jas., 28, London Road, Neath, Assayer.

1898. Morgan, Thos. M., Longue Pointe, near Montreal, Canada, Manufacturer.
1885. Morgans, Thos., 60, Queen Square, Bristol, Civil Engineer.
1901. Moriarty, John J., 1426, Queen Street West, Toronto, Canada, Assistant Chemist.
1897. Morison, Samuel L., 15, Broad Street, New York City, U.S.A., Water Engineer.
O.M. Moritz, Dr. E. R., 45, Great Tower Street, London, E.C., Brewing Chemist.
1885. Morley, Dr. H. Forster, 5, Lyndhurst Road, Hampstead, N.W., Professor of Chemistry.
1902. Morrell, Dr. R. S., Gonville and Caius College, Cambridge. Lecturer.
1884. Morrice, Jas. A., 1, Prince's Terrace, Dowanhill, Glasgow, Starch and Gum Manufacturer.
1898. Morris, Edgar F., Grey House, Barrington Road, Altrincham, Cheshire. Research Chemist.
1897. Morris, Harry, Avenue House, Doncaster, Chemical Merchant.
1890. Morris, Herbert N., Gorton Brook Chemical Works, Manchester, Technical Chemist.
O.M. Morris, J. Haydn, 9, Rathbone Road, Wavertree, Liverpool, Technical Chemist.
1901. Morse, Willard S., Apartado A., Aguascalientes, Mexico, Assistant Manager.
O.M. Morson, T., 42, Gordon Square, London, W.C., Manufacturing Chemist.
1899. Morton, Dr. Hy., Stevens Institute of Technology, Hoboken, N.J., U.S.A., President.
1889. Morton, Jas., Dalquhurn Works, Renton, N.B., Dyeworks Manager.
1897. Morton, Jno., North Road, St. Helens, Lancashire, Analytical Chemist.
1899. Morton, Thos. W., 8, Luxemburg Gardens, Hammersmith, W., Headmaster.
1888. Mosenthal, Henry de, 220, Winchester House, Old Broad Street, E.C., Explosives Company Manager.
O.M. Moss, J., Wilson Street, New Cross Road, London, S.E., Manufacturing Chemist.
1894. Moszezenski, J. von, Tartar Chemical Co., Ninth Street and Gowanus Avenue, Brooklyn, N.Y., U.S.A., Consulting Chemist.
1897. Motion, Jno., c/o Valvoline Oil Co., Edgewater, N.J., U.S.A., Oil Refinery Chemist.
1887. Moul, Frank, Aldersgate Chemical Works, Southall, Technical Chemist.
1901. Moule, Jno. W., Sulphide Corporation, Ltd., Cockle Creek, N.S.W., Metallurgical Chemist.
1884. Moult, J., Underhill, Low Fell, Gateshead-on-Tyne, Secretary.
1890. Moulton, G. J., Rulow, Macclesfield, Chemical Manufacturer.
1898. Moulton, Prof. Chas. W., Vassar College, Poughkeepsie, N.Y., U.S.A., Professor of Chemistry.
1892. Mount, Edw., Oaklands, Aughton, near Ormskirk. Assistant Secretary (United Alkali Company).
O.M. Muir, J. P., 233, Camden Road, London, N., Chemist.
1899. Muir, Jas. Stanley, 8, Westminster Gardens, Glasgow, W., Chemist.
1896. Muir, Wm., 97, Church Street, Edmonton, Middlesex, Merchant.
1894. Muir-Smith, W., c/o A. B. Fleming & Co., Ltd., Caroline Park, Edinburgh, Oil Works Manager.
O.M. Müller, Dr. H., F.R.S., 13, Park Square East, Regent's Park, London, N.W., Research Chemist.
1896. Mundy, Lionel, 27, Merton Road, Kensington, W., Importer of Unfermented Wines.
1887. Munroe, Prof. Chas. E., Columbian University, Washington, D.C., U.S.A., Professor of Chemistry and Dean.
1900. Munsell, Dr. Chas. E., c/o Devor and Raynolds Co., 110, Horatio Street, New York City, U.S.A., Colour Chemist.
1900. Munton, Fred. T., The Oak House, Winsford, Cheshire, A.R.S.M., Analytical Chemist.
1897. Murch, D. Wilshin, Church Road, Lostock Gralam, Cheshire, Chemist.
1886. Murdoch, R. H. M., 4, Nobel's Villas, Stevenston, Ayrshire, Explosives Chemist.
1899. Murphy, Albert J., The Laboratory, 11, Lyddon Terrace, Leeds, Brewer's Chemist.
1901. Murray, Benjamin L., c/o Merck and Co., University Place, New York City, U.S.A., Chemist.
1899. Murray, Jas. J., c/o Mountain Copper Co., Ltd., Iron Mountain, Shasta Co., Cal., U.S.A., Mining Engineer.
1901. Murray, Jas. P., Toronto Carpet Manufacturing Co., Ltd., King Street and Fraser Avenue, Toronto, Canada. Carpet Manufacturer.
1896. Murray, Dr. Thos. S., 1, Nelson Street, Dundee, Professor of Chemistry.
1898. Murray, Rd., Laurel Bank, Potternewton Lane, Chapel Allerton, Leeds, Analyst.
O.M. Muspratt, E. K., Seaforth Hall, near Liverpool, Alkali Manufacturer.
1894. Muspratt, Max, 2, Mannering Road, Sefton Park, Liverpool, Technical Chemist.
O.M. Muspratt, S. K., 9, Church Street, Flint, North Wales, Alkali Manufacturer.
O.M. Muter, Dr. Jno., The Châtelet, Horley, Surrey, Chemical Lecturer.
1895. Muurling, T. J. R., P.O. Box 2660, New York City, U.S.A., Dyestuff Importer.
1897. Myers, Dr. Henry C., University of California, Berkeley, Cal., U.S.A., Professor of Chemistry.
1891. Myers, Wm. S., Nitrate of Soda Propaganda, 12, John Street, New York City, U.S.A., Director.

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1884. Naef, Dr. P., 132 (1034), Woody Crest Avenue, near 165th Street, New York City, U.S.A., Technical Chemist.
1897. Nairn, Michael, Ben Dhu, Kirkcaldy, N.B., Linoleum Manufacturer.
1901. Nakagawa, Sōsuke, Hokkaidō Cement Co., Kamüso, near Hakodate, Japan, Chief Engineer.
1901. Nanabhai, Krishnalal, 8–10, Nepean Sea Road, Malabar Hill, Bombay, India, Technological Chemist.
1893. Napier, Jno. W., Gas Works, Carnoustie, N.B., Manager and Chemist.
1897. Nash, Leonard M., 281, Seven Sisters Road, Finsbury Park, N., Works Chemist.
1900. Nathan, Major Fred. L., R.A., Royal Gunpowder Factory, Waltham Abbey, Essex, Superintendent.
1898. Natioo, Edmund C., 237, Smith Street, Peekskill, N.Y., U.S.A., Manager (Highlands Chemical Co.).
1892. Naylor, Wm., 16, Walton's Parade, Preston, Lancashire, Chief Inspector (Ribble Joint Committee).
O.M. Naylor, W. A. H., 38, Southwark Street, London, S.E., Manufacturing Chemist.
1899. Neale, Harry A., Brentwood, Clothorn Road, Didsbury, Manchester, Chemist.
1901. Neale, Percy R., c/o Messrs. Morris and Co., Doncaster, Yorks, Chemical Manufacturer.
1899. Neate, Percy J., "Belsize," Watts Avenue, Rochester, Kent, Director of Cement Co.
1902. Neave, Geo. B., Technical College, 204, George Street, Glasgow, Assistant to Professor of Chemistry.
1898. Neil, Jas. Millar, 129, Beverley Street, Toronto, Ont., Canada, Technical Chemist.
1890. Neill, Geo. D., Drumslea, Greenock, N.B., Sugar Refiner.
1898. Neilson, Alex. M., c/o T. Stanes and Co., Coimbatore, Madras, India; and (Journals) 38, Brisbane Street, Greenock, N.B., Analytical Chemist.
1889. Neilson, Thos., Metallurgical Chemist.
1893. Nelson, Arthur J., 381, Edge Lane, Droylsden, Manchester, Chemist.
1898. Nelson, Elnathan K., 4311, Ellis Avenue, Chicago, Ill., U.S.A., Chemist.

1897. Nelson, Walter, Messrs. Geo. Nelson, Dale, & Co., Ltd., Emscote Mills, Warwick, Gelatin Manufacturer.
1902. Nesbitt, Dr. Beattie, 44, Adelaide Street, W., Toronto, Canada, Physician.
1901. Neufville, Dr. Rudolf de, c/o Metallurgische Gesellschaft, Frankfort a M., Germany.
1902. Neumann, Dr. Edgar, 10, Randolph Crescent, Maida Hill, W.
1899. Neurath, Dr. F., 37, George Street, Cheetham Hill, near Manchester, Chemist.
O.M. Newall, F. S., Washington, co. Durham, Chemical Manufacturer.
1889. Newberry, Spencer B., Sandusky Portland Cement Co., Sandusky, Ohio, U.S.A., Cement Works Manager.
1896. Newcomen, Thos., Chemical Works, Lydbrook, near Ross; Wood Distiller.
O.M. Newlands, B. E. R., 2, St. Dunstan's Hill, London, E.C., Analytical and Consulting Chemist.
O.M. Newlands, W. P. R., 232, Amesbury Avenue, Streatham Hill, S.W., Sugar Chemist.
O.M. Newton, H. C., 4, Ornan Mansions, Haverstock Hill, N.W., Artists' Colour Manufacturer.
1884. Newton, Jno., Park Green, Macclesfield, Silk Dyer.
O.M. Newton, Jno., Manor Works, Rotherhithe New Road, London, S.E., Manure Manufacturer.
1900. Newton, Dr. Wm., 39, Mincing Lane, London, E.C., Chemist.
1901. Nibelius, Axel W. T., American Forcite Powder Manufacturing Co., Landing, N.J., Chemist.
1884. Nichols, J. A., Stanley Mount, New Mills, near Stockport, Teacher of Science.
1888. Nichols, W. H., The Nichols Chemical Co., 25, Broad Street, New York City, U.S.A., Manufacturing Chemist.
1897. Nicholsen, Harry, Smethurst Furnace, Penmaenpool, near Dolgelly, North Wales, Assayer.
1901. Nicholson, Jos., McClary Manufacturing Co., London, Ont., Canada, Enamel Ware Manufacturer.
O.M. Nicholson, J. C., Hunslet Chemical Works, Leeds, Chemical Manufactorer.
1897. Nicholson, Wm. J., Ardeer, Stevenston, Ayrshire, N.B., Chemist.
1897. Nickel, Herman, c/o The N. K. Fairbank Co., 3rd and Convent Streets, St. Louis, Mo., U.S.A., Chemist.
1888. Nickolls, John B., The Laboratory, Grange, Guernsey, Analytical Chemist.
O.M. Nicol, Dr. W. W. J., 15, Blacket Place, Edinburgh, Chemical Lecturer.
1900. Nield, J. H., c/o General Chemical Co., Bayonne Works, Bayonne, N.J., U.S.A., Superintendent.
1898. Nightscales, Geo., 13, Spring Street, Hull, Oil Merchant.
1899. Nihoul, Dr. Edw., Waremme, Belgium, Professor of Leather Industries.
O.M. Nimmo, Jas., Penshurst, 8, Lawrence Road, South Norwood, S.E., Analytical Chemist.
1885. Nishigawa, T., Ryuso Kaisha, Osaka, Japan, Director of Sulphuric Acid and Soda Works.
1898. Nishikawa, T., c/o Nippon, Seimikaisha, Onoda, Nagato, Japan, Chemist.
O.M. Nolting, Dr. E., Ecole de Chimie, Mulhouse, Alsace, Germany, Professor of Chemistry.
O.M. Norman, F. J., Lyndhurst, Higher Runcorn Cheshire, Chemical Manufacturer.
1900. Norman, Geo. M., Moro-Phillips Chemical Works Camden, N.J., U.S.A., Chemist.
1892. Norman, J. T., 23, Leadenhall Street, E.C., Consulting Chemist.
1898. Norris, Albert P., 760, Massachusetts Avenue, Cambridgeport, Mass., U.S.A., Assistant Chemist.
1899. Norris, Geo. L., Standard Steel Works, Burnham, Mifflin Co., Pa., U.S.A., Chemist.
1893. Norris, Wm. M., Princeton, N.J., U.S.A., Leather Chemist.
1890. North, E. Gordon N., Bella Vista, 14, Minas de Rio Tinto, Huelva, Spain, Technical Chemist.
O.M. Northing, J., The Murrough, Wicklow, Ireland, Technical Chemist.
O.M. Norton, Dr. S. A., 363, East Town Street, Columbus, Ohio, U.S.A., Professor of Chemistry (Ohio State University).
1887. Norton, Dr. T. H., U.S. Consulate, Mezereh, Mamouret-ul-Aziz, Turkey-in-Asia, open Mail, *viâ* Constantinople, Ph.D., Sc.D., U.S. Consul.
1901. Novarine, John L., 79, Main Street, Brooklyn, N.Y., U.S.A., Chemist.
1899. Noyes, Henry, 17, Queen Street, Melbourne, Vic., Australia, Engineer.
1901. Noyes, Wm. A., 2115, North 9th Street, Terre Haut, Ind., U.S.A., Professor of Chemistry.
1900. Nuttall, Thos. R., 175, Fernsholme, Walmersley Road, Bury, Lancashire, Technical Chemist.

O

1894. Oakes, Geo. A., Bloomfield, N.J., U.S.A., Woollen Mill Owner.
1884. O'Beirne, W. G., British Chemical Works, Clydebank, Glasgow, Manufacturing Chemist.
1900. O'Brien, Frederick, The Grove, Nicholas Road, St. Mark's, Bristol, Analytical Chemist.
1900. O'Byrne, Leo C., 996, Washington Boulevard, Chicago, Ill., U.S.A., Chemist.
1901. O'Connor, Chas. P., 38, Clinton Street, Brooklyn, N.Y., U.S.A., Analytical Chemist.
1887. Oddie, Jas., School of Mines, Ballarat, Australia, Chemical Lecturer.
1888. Oddy, Robert W., 60, Waterhouse, Toad Lane, Rochdale, Chemist.
1901. Odling, Francis J., Box 314, G.P.O., Melbourne, Vic., Australia, Mining Engineer.
1898. Odling, Walter, 56, High Street, Burton-on-Trent, Brewer and Chemist.
O.M. Odling, Dr. Wm., F.R.S., 15, Norham Gardens, Oxford, Professor of Chemistry.
1884. Oehler, K., Offenbach-am-Main, Germany, Colour Manufacturer.
1888. Ogata, Saburo, Zohei Shikyoku, Okurasho, Tokyo, Japan, Assayer.
1901. Ogden, Richard L., c/o Pittsburg Gas and Coke Co., Otto, Allegheny Co., Pa., U.S.A., Chemist.
1896. Ogilvy, D. J., Gest Street; and C. H. and O. R. R., Cincinnati, Ohio, U.S.A., Manufacturing Chemist.
1898. Ogle, F. B., Royston Park, Pinner, Middlesex, Cyanide Manager.
1901. Ogston, Alex. G., Ardoe, near Aberdeen, N.B., Soap Manufacturer.
1898. Olden, Chas., Hunstanton, Norfolk, Metallurgical Engineer.
1884. Oliver, F., 31, Horsley Hill Road, Westoe, South Shields, Analytical Chemist.
1888. Oliver, Wm. Letts, 101, Vernon Street, Oakland, Cal., U.S.A., Mining Engineer.
1901. Olivier, Dr. Louis, 22, Rue du Général-Foy, Paris, 8^e, Directeur (Revue Générale des Sciences).
O.M. Ollerenshaw, S., 96, Davyhulme Lane, Urmston, Manchester, Technical Chemist.
1899. Olsson, Gustav, c/o Hecla Compressed Gas Co., West 3rd Street, Chelsea, Mass., U.S.A., Manufacturing Chemist.
1902, O'Neill, Chas., British Dyewood and Chemical Co., Ltd., Dyewood Mills, Parkhead, Glasgow, Chemist and Colourist.
O.M. O'Neill, E. H., Johnson's Saccharum Co., Limited, Stratford, London, E., Managing Director.
1893. Ormerod, Ernest, The Oaklands, Rochdale, Lancashire, Chemical Student.
1894. Ormerod, John, Globe Leather Works, Castleton, Manchester, Tanner and Currier.
O.M. Orr, A., 35A, Bligh Street, Sydney, New South Wales, Analytical Chemist.
O.M. Orr, J. B., Chestnut Lodge, Widnes, Lancashire, Chemical Manufacturer.

1884. Orr, Robert; c/o Jas. Miller, Son, and Co., 79, West Nile Street, Glasgow; and (Journals), Kinnaird, Larbert, N.B., Manufacturing Chemist.

1899. Orr, Thos. W., Esperanza Nitrate Co., Taltal, Chile, Chemist.

1890. Orsman, Wm. Jas., Chemical Laboratory, Gathurst, near Wigan, Explosives Chemist.

1897. Osborne, Thos. B., P.O. Box 485, New Haven, Conn., U.S.A., Chemist.

1900. Osbourne, Jno. P., 572, Alexandra Parade, Dennistoun, Glasgow, Analytical Chemist.

1896. Osmond, Jno. H., c/o Smith, Bell, & Co., Manila, Sugar Works and Technical Chemist.

1889. Ostlere, Edward, Messrs. Barry, Ostlere, & Co., Kirkcaldy, N.B., Linoleum Manufacturer.

1900. O'Shaughnessy, Francis R., Home Farm, Tyburn, Birmingham, Chemist.

1885. O'Shea, L. T., Firth College, Sheffield; and (Journals), to The Cottage, East Cosham, Hants, Chemical Lecturer.

O.M. O'Sullivan, C., F.R.S., 140, High Street, Burton-on-Trent, Brewer and Chemist.

1883. O'Sullivan, J., High Bank, Burton on-Trent, Brewing Chemist.

1893. Oswell, Benj. L., 5, Balmoral Road, Burton-on-Trent, Brewer's Chemist.

1898. Oushkoff, John P., c/o P. K. Oushkoff & Co., Moscow, Russia, Chemical Manufacturer.

1887. Overtoun, Lord, 7, West George Street, Glasgow, Chemical Manufacturer.

1891. Owens, Caradoc, 88, Great Clowes Street, Lower Broughton, Manchester, Dyer's Manager.

P

O.M. Packard, E., jun., Bramford, near Ipswich, Manure Manufacturer.

1899. Paessler, Dr. Joh., Vorstand der Deutschen Versuchsanstalt für Lederindustrie, Freiberg in Sachsen, Germany, Chemist.

O.M. Page, F. J. M., 54, Sutherland Street, Pimlico, S.W., Chemical Lecturer.

1901. Page, Ralph H., 169, McDougall Avenue, Detroit, Mich., U.S.A., Chemist (Solvay Co.).

1886. Pagès, Albert, 34, Boulevard Henri IV., Paris, Technical Chemist.

1892. Paine, Augustus G., 60, Times Building, New York City, U.S.A., President of Paper Making Co.

O.M. Paine, S., Devisdale, Bowdon, and (Journals) Otter Works, Manchester, Pharmaceutical Chemist.

1902. Pakes, Walter C. C., Government Laboratory, Pretoria, South Africa, Analyst and Bacteriologist.

1902. Palmer, Fredk. G., Laboratory, The Associated Portland Cement Manufacturers (1900), Ltd, White's Branch, Swanscombe, Kent, Analyst.

1887. Palmer, T. Chalkley, Box 19, Chester, Pa., U.S.A., Manufacturing Chemist.

1887. Palmer, Thos. C., 98, Commercial Road East, London, E., Engineer.

O.M. Park, J., Millburn Chemical Works, Garngad Hill, Glasgow, Chemical Manager.

1888. Parker, Chas. E., Vine House, Penketh, Warrington, Tanner.

1891. Parker, Chas. E., 150, Alden Street, Orange, N.J., U.S.A., Chemist.

1898. Parker, Charles H., Craigside, Clark Street, Wolverhampton, Chemist.

1894. Parker, Dr. J. Gordon, Herold's Institute, Drummond Road, Bermondsey, S.E., Head of Tanning School.

1891. Parker, Edw., Laburnum House, Rushford Park, Levenshulme, Manchester, Analytical Chemist.

1897. Parker, Matthew A., 13, Hamilton Crescent, Partick, Glasgow, Assistant to Professor of Chemistry.

1901. Parker, Col. Richard H., N.Y. Testing Laboratory, Long Island City, N.Y., U.S.A., Analytical Chemist.

O.M. Parker, Thos., Manor House, Tettenhall, Wolverhampton, Electrical Engineer.

1894. Parker, Thos. J., Bayonne, N.J., U.S.A., Chemical Works Manager.

1901. Parker, Dr. Wm. Huntington, 177, State Street, Boston, Mass., U.S.A., Chemist in Charge (U.S. Appraiser).

1898. Parker, W. W., Whitehouse Street Tannery, Bristol, Tanner.

1901. Parkes, Albert E., 43, Whitehorse Street, Stepney, E., Analytical Chemist.

1898. Parmelee, C. W., Seminary Place, New Brunswick, N.J., U.S.A., Chemist.

1898. Parrish, Saml., 10, Sholebroke Mount, Leeds, Teacher of Chemistry.

1896. Parry, John, Ebbw Vale Wharf, Newport, Mon., Analytical Chemist.

O.M. Pass, A. C., Hawthornden, Clifton Down, Bristol, Lead Smelter.

1901. Pass, James, Onondaga Pottery Co., Syracuse, N.Y., U.S.A., Pottery Manufacturer.

1902. Patch, Jas. A., Syrian Protestant College, Beirût, Syria, Instructor in Chemistry.

1897. Patchett, Jas., Oakworth, Hadley, Wellington, Salop, Ironmaster.

1901. Paterson, David, Leabank, Rosslyn, Midlothian, Colour Chemist.

1884. Paterson, John, Belle Isle Place, Workington, Cumberland, Mechanical Engineer.

1887. Paton, J. M. C., Messrs. Manlove, Alliott & Co., Ltd., Nottingham, Mechanical Engineer.

1886. Paton, W. Grant, 18, Bertram Road, Liverpool, Alkali Works Manager.

1901. Patterson, Chas. A., c/o Repauno Chemical Co., Chester, Pa., U.S.A., Analytical Chemist.

O.M. Patterson, Geo., c/o The Manbré Saccharine Co., Ltd., Fulham Palace Road, Hammersmith, W., Technical Chemist.

1893. Patterson, Harry J., College Park, Prince George's Co., Md., U.S.A., Agricultural Chemist.

O.M. Patterson, T. L., Maybank, Finnart Street, Greenock, N.B., Sugar Works Manager.

1884. Pattinson, Dr. H. Salvin, 75 Side, Newcastle-on-Tyne, Analytical Chemist.

O.M. Pattinson, J., 75, The Side, Newcastle-on-Tyne, Consulting Chemist.

O.M. Pattison, Jas., Dunaamona, Kilmalcolm, N.B., Chemical Merchant.

1889. Pattison, Percy J., 5, Kingsley Road, Forest Gate, E., Technical Chemist.

1894. Paul, Dr. Benjamin H., 13, Fenchurch Avenue, E.C.; and (Journals) Parkside, Kingston Vale, Putney, S.W., Consulting and Analytical Chemist.

1900. Paal, Dr. L. Gordon, 3, Market Street, Huddersfield, Consulting Chemist.

1891. Paul, Jas. H., Albion Chemical Co., Riverside, Charlton, S.E., Analytical Chemist.

1902. Pauli, Dr. Hermann, Kensington Infirmary, Marloes Road, W., Scientific Chemist.

O.M. Pauli, Dr. Ph., Höchst a/Main, Germany, Chemical Manufacturer.

O.M. Payne, J. B., 15, Mosley Street, Newcastle-on-Tyne, Manufacturing Chemist.

1888. Peak, C. P., Bridgewater Chemical Works, Wigan, Manufacturing Chemist.

1898. Pearce, Edw. D., Messrs. T. P. Shepard and Co., P.O. Box 1336, Providence, R.I., U.S.A., Manufacturing Chemist.

1894. Pearce, Jas. Stanley, Clements, Snaresbrook, Essex, Chemical Manufacturer.

1897. Pearce, Richard, Argo, Col., U.S.A., Smelting Works Manager.

1883. Pearce, W., The Elms, Salway Hill, Woodford, Essex, Chemical Manufacturer.

1892. Pears, Andrew, jun., Spring Grove, Isleworth, Analytical Chemist.

1893. Pearson, Frank P., Arnold Printworks, North Adams, Mass., U.S.A., Printworks Manager.
1894. Pearson, Wm. H., 6, Fenchurch Buildings, London, E.C., Analytical Chemist.
O.M. Pechiney, A. R., Salindres, Gard, France, Chemical Engineer.
1898. Peck, Dr. Ernest L., Claremont, Merrilocks Road, Blundellsands, near Liverpool, Analytical Chemist.
1898. Peckham, Stephen F., Room 104, 280, Broadway, New York City, U.S.A., Chemist.
1894. Peden, Jno., 30, Ardgowan Street West, Greenock, N.B., Analytical Chemist.
O.M. Pedler, Prof. A., C.I.E., F.R.S., 31—32, Judges' Court Road, Alipore, Calcutta, India, Professor of Chemistry.
1886. Pedler, J. R., 47, Tregunter Road, South Kensington, S.W., Clerk.
1899. Pell, A., 7, Elphinstone Circle, Bombay, India, Chemist.
1897. Pellew, Chas. E., Columbia University, New York City, U.S.A., Adjunct Professor of Chemistry.
1888. Pemberton, Henry, jun., 1008, Clinton Street, Philadelphia, Pa., U.S., Manufacturing Chemist.
1896. Péniakoff, D. A., Selzaete, Belgium, Chemist and Physicist.
1896. Penney, Mulgrave D., 11, High Street, Hull, Analytical Chemist.
1890. Pennock, J. D., c/o Solvay Process Co., Syracuse, N.Y., U.S.A., Technical Chemist.
1885. Pentecost, S. J., Nottingham Road, New Basford, and (Journals), Sherwood Hill Works, Basford, Nottingham, Lace Dresser.
1887. Pentermann, H. T., 37, Clifton Crescent, Peckham, S.E., Brewing Chemist.
1892. Peploe, D. H. T., Seale Lodge, Farnham, Surrey.
1899. Peppel, S. Vernon, 169, King Avenue, Columbus, Ohio, U.S.A., Chemist.
1885. Perkin, A. G., 8, Montpelier Terrace, Hyde Park, Leeds, Technical Chemist.
1898. Perkin, Dr. F. Mollwo, Borough Polytechnic Institute, Borough Road, S.E., Head of Chemical Department.
O.M. Perkin, Dr. W. H., F.R.S., The Chestnuts, Sudbury, Harrow, Research Chemist.
1887. Perkin, Dr. W. H., jun., F.R.S., Fairview, Wilbraham Road, Fallowfield, Manchester, Professor of Chemistry.
1896. Perkins, Chas. W., P.O. Box 573, Waterbury, Conn., U.S.A., Chemist and Druggist.
1893. Perkins, T. S., c/o Californian Tartar Co. 123, California Street, San Francisco, Cal., U.S.A., Chemist.
1899 Perks, Walter G. (Journals), Glanafon, and (communications) c/o National Explosives Co., Ltd., Hayle, Cornwall, Manufacturer.
1901. Perry, Chas. M., 238, Cottage Street, Pawtucket, R.I., U.S.A., Bleach and Dyeworks Chemist.
1887. Perry, D., Forth and Clyde Chemical Works, Nitshill, N.B., Manufacturing Chemist.
1895. Perry, Jos. H., 176, Highland Street, Worcester, Mass., U.S.A., Teacher of Chemistry.
1901. Persons, Ashton C., 133, Prospect Street, Willimantic, Conn., U.S.A., Chemist.
1897. Peter, Dr. A. H., 205, Third Avenue, New York City, U.S.A., Chemist.
1893. Pethybridge, Walter, 3, Rhodesia Road, Clapham Rise, S.W., Chemist and Assayer.
1902. Petsche, B. W., 25, Fairview Street, Yonkers, N.Y., U.S.A., Chemist.
1883. Pettigrew, J., 6, St. Helen's Place, Bishopsgate, E.C., Technical Chemist.
1892. Pettigrew, Robt., c/o Mersey and Irwell Joint Committee, 44, Mosley Street, Manchester, Electrochemist.
O.M. Peyton, E. P., Chemical Works, Lister Street, Birmingham, Chemical Manufacturer.
1900. Peyton, Wm. C., c/o Peyton Chemical Co., Room 30, 4th Floor, Mills Building, San Francisco, Cal., U.S.A., Chemist.
1888. Philip, Arnold, 67, Waverley Road, Redland, Bristol, Electro-Metallurgist and Electrical Engineer.
1886. Phillips, A. G., 11, Essex Villas, Phillimore Gardens, Kensington, W., Barrister-at-Law.
1891. Phillips, George Brinton, 622, Race Street, Philadelphia, Pa., U.S.A., Manufacturing Chemist.
O.M. Phillips, Harcourt, 9, Crawford Avenue, Bolton, Analytical Chemist.
1895. Phillips, S. Chas., 47, Cannon Street, London, E.C., Chemical Engineer.
1898. Phillips, Wm. H., 100, Milton Avenue, East Ham, E., Soapmakers' Assistant.
1883. Phipson, Dr. T. L., Cara Mia, Putney, S.W., Analytical and Consulting Chemist.
1894. Picard, Hugh F. K., 44, London Wall, London, E.C., Metallurgist.
O.M. Pick, Dr. S., Direction der Soda Fabrik, Szczakowa, Galizien, Austria, Chemical Engineer and Manager.
1897. Pickert, Leo. W., American Sugar Refining Co., Granite Street, South Boston, Mass., U.S.A., Chemist.
1899. Pidduck, E. W., University College of Wales, Aberystwith, Wales, Assistant Chemist.
1901. Pierce, Ira L., Woodbury, Gloucester Co., N.J., U.S.A., Chemist (Repauno Chemical Co.).
1899. Pilgrim, Julius A., 67, Poulton Road, Seacombe, Cheshire, Dyer's Chemist.
1897. Pilhashy, B. M., c/o Rheinstrom, Bettman, Johnson, and Co., 906–910, Sycamore Street, Cincinnati, Ohio, U.S.A., Distiller's Chemist.
1888. Pilkington, G., Laboratory, Victoria Buildings, Silver Street, Bury, Lancashire, Analytical Chemist.
1893. Pilley, Thos. W., 33, Grove Hill Road, Denmark Hill, S.E., Analytical Chemist.
1894. Pilling, John E., Agnew Villas, 78, Whitegate Drive, Blackpool, Chemist.
1900. Pinto-Leite, A., c/o W. R. Hardwick, 13, Batavia Buildings, Hackins Hey, Liverpool, Manufacturing Chemist.
1883. Pipe, Jas., Messrs. Wm. Henderson & Co., Irvine, N.B., Chemical Manufacturer.
1896. Piper, Walter E., Boston Rubber Shoe Co., Malden, Mass., U.S.A., Chemist.
1899. Pirie, Alex. G., Messrs. Alex. Pirie and Sons, Ltd., Stoneywood Works, Bucksburn, Aberdeenshire, Paper Manufacturer.
1900. Pitman, Jno. R., c/o Lafflin and Rand Powder Co., Pompton Lakes, N.J., U.S.A., Chemist.
O.M. Pitt, T., 16, Coleman Street, London, E.C., Manufacturing Chemist.
1902. Pittard, Jno., 30, Mansfield Road, Ilford, Essex, Chemical Manufacturer.
1884. Pittuck, F. W., 15, Stratford Grove, Heaton, Newcastle-on-Tyne, Technical Chemist.
1899. Pizey, Jas. H., 11, St. Albans Villas, Highgate Road, London, N., Chemist.
1894. Platten, Frank, c/o Elliot's Metal Co., Limited, Selly Oak Works, near Birmingham, Metallurgical Chemist.
1890. Platts, Jno. C., Heaton Moor Lodge, Heaton Chapel, near Stockport, Metallurgical Chemist.
1896. Plaut, Albert, 128, William Street, New York City, U.S.A., Wholesale Druggist.
1888. Playfair, David J., 7, Victoria Crescent, Dowanhill, Glasgow, Manufacturing Chemist.
1891. Pocklington, Hy., 41, Virginia Road, Leeds, Assurance Co.'s Local Manager.
1901. Pollard, Wm., Museum, Jermyn Street, London, S.W., Chemist (H.M. Geological Survey).
1893. Pollitt, R. B., De Beers Explosives Works, Somerset West, C.C., South Africa, Civil Engineer.
1883. Pollock, A., Kirkland, Bonhill, Dumbartonshire, Dyeworks Manager.
1890. Pomeroy, Dr. Chas. T., 55, Broad Street, Newark, N.J., U.S.A., Ink Manufacturer.
1896. Pond, Prof. G. G., State College, Centre Co., Pa., U.S.A., Professor of Chemistry.
O.M. Pond, J. A., 99, Queen Street, Auckland, New Zealand, Analytical Chemist.
1900. Pont, Francis G. du, Wilmington, Del., U.S.A., Manufacturer.

1895. Pont, Pierre S. du, Lorain, Ohio, U.S.A., Explosives Manufacturer.

1896. Poole, Herman, 157, West 106th Street, New York City, U.S.A., Manufacturing Chemist.

O.M. Pooley, T. A., Beverley, Hersham Road, Walton-on-Thames, Analytical Chemist.

1892. Pope, Frank, c/o The Dunwoody Bros. Soap Co., Denver, Col., U.S.A., Chemist.

O.M. Pope, S., 35, Victoria Road, Runcorn, Chemical Works Manager.

1899. Pope, Thos. H., 59, Gillott Road, Edgbaston, Birmingham, Chemist.

1900. Pope, W. J., Municipal School of Technology, Manchester: and (Journals), 48, Cawdor Road, Fallowfield, Manchester, Professor of Chemistry.

1900. Popplewell, Jos. M., c/o Brotherton and Co., Holmes Street, Dewsbury Road, Leeds, Chemist.

1899. Porter, A. Felix, Pompton Lakes, N.J., U.S.A., Explosives Chemist.

1896. Porter, Herbert, 6, Cavendish Road, Chorlton-cum-Hardy, Manchester, Alkali Inspector.

1901. Porter, Jno. L., New Orleans Sewerage Board, 602, Carondelet Street, New Orleans, La., U.S.A., Chemist.

1899. Potter, Chas. A., 198, Waterman Street, Providence, R.I., U.S.A., Chemist.

1884. Potter, Chas. E., Love Lane Sugar Refinery, Liverpool, Sugar Works Chemist.

1888. Potter, Chas. J., Heaton Hall, Newcastle-on-Tyne, Cement Manufacturer.

O.M. Potter, E. P., Ferneclough, Bolton-le-Moors, Alkali Manufacturer.

1899. Potter, Rowland S., 2, Museum Hill, Haslemere, Chemist.

1900. Potts, Geo., E., Dover, N.J., U.S.A., Explosives Manufacturer.

1892. Potts, Joseph T., Price's Patent Candle Co., Bromboro' Pool, near Birkenhead, Chemist.

1900. Pough, Frank H., 146, Hicks Street, Brooklyn, N.Y., U.S.A., Manager (Bergen Point Sulphur Works).

1889. Powell, A. Ernest, Craigowan, Clarendon Road, Whalley Range, Manchester, Oil Merchant.

1900. Powell, Harry J., Whitefriars Glass Works, London, E.C., Glass Manufacturer.

1884. Powell, L. S., 5, Campden Hill Square, London, W., Electrician.

1897. Power, Dr. Fred. B., Wellcome Research Laboratories, 6, King Street, Snow Hill, London, E.C., Director.

1902. Powney, Wm. E. F., 67, Barrett's Grove, Stoke Newington, N., Analytical Chemist.

1900. Pratt, N. P., Laboratory, Atlanta, Ga., U.S.A., Manufacturing Chemist.

1889. Pratt, Walter E., 35, Regent Street, Lancaster, Analytical Chemist.

1897. Prentice, Dr. Bertram, Royal Technical Institute, Salford, Lecturer on Chemistry.

1888. Prescott, Dr. Albert B., Ann Arbor, Mich., U.S.A.

1900. Prescott, Saml. C., Mass. Inst. of Technology, Boston, Mass., U.S.A., Instructor in Bacteriology.

1891. Preston, Alf., 29, Southfields, Manchester Road, Bury, Lancs., Chemist.

1883. Preston, R., Grasmere, Whitefield, near Manchester, Manufacturing Chemist.

O.M. Price, A. F., 524, Sacramento Street, San Francisco, Cal., U.S.A., Analytical Chemist.

1899. Prinsen-Geerligs, H. C., Fegal, Java, Netherlands Indies, Director of Sugar Cane Experimental Station.

1893. Pritchard, Edgar J., North Hill, Swansea, Works Manager.

1896. Prochazka, Dr. Geo. A., 138, West 13th Street, New York City, U.S.A., Colour Manufacturer.

1897. Prochazka, John, 15, East 12th Street, New York City, U.S.A., Coal-Tar Colour Chemist.

O.M. Procter, Prof. H. R., Yorkshire College, Leeds; and (Journals) Rowangarth, Ben Rhydding, near Leeds, Yorks, Lecturer on Tanning.

1884. Procter, J. W., Skeldergate Bridge, York, Manure Manufacturer.

1890. Proctor, Miss Anne J., Free Library, Widnes, Librarian.

O.M. Proctor, C., 99, Underhill Road, East Dulwich, S.E., Analytical Chemist.

O.M. Proctor, W. W., 33, The Side, Newcastle-on-Tyne, Assayer and Analytical Chemist.

1901. Propach, C., 189, East Kinzie Street, Chicago, Ill., U.S.A., Colour Merchant.

1894. Proude, Jas., 30, Cromwell Terrace, Halifax, Yorks, Soap Works Chemist and Manager.

1899. Pullar, Edmund, Keirfield, Bridge of Allan, N.B., Manufacturer.

1894. Pullar, Herbert S. (Journals), Rosebank, Perth; and Pullar's Dyeworks, Perth, N.B., Dyer.

O.M. Pullar, Sir Robert; Journals to J. Minto, Sandeman Public Library, Perth, N.B., Dyer.

O.M. Pullar, R. D., Pullar's Dyeworks, Perth, N.B., Dyer.

1899. Pullman, Edw. E., 13, Claremont Gardens, Surbiton, Leather Manufacturer.

1891. Purdie, Dr. Thos., F.R.S., 14, South Street, St. Andrews, N.B., Professor of Chemistry.

Q

1887. Quibell, Oliver, Manure Manufacturer.

1897. Quinan, Wm. R., De Beers Explosives Works, Cape Town, South Africa, Superintendent (Powder Works).

1891. Quincke, Dr. F., Farbenfabriken Leverkusen, Mulheim (Rhein), Germany, Chemical Works Director.

1891. Quinn, J. Cardwell, Hillesdon, Barnstaple, N. Devon, Consultant on India Rubber.

1897. Quirk, Jno. S., Lead Smelting Works, St. Helens, Lancs., Manager.

R

1898. Radcliffe, Lionel G., 6, Alma Terrace, Old Trafford, Manchester, Chemist.

1884. Rademacher, H. A., (Journals), P.O. Box 243, Lawrence, Mass., U.S.A.; and c/o Law Office of Pierson and Pease, Chamber of Commerce, Chicago, Ill., U.S.A., Consulting Technical Chemist.

1900. Radley, Ernest, 49, Ernest Street, West Norwood, S.E.

O.M. Rae, Geo., Holly Bank, Townhead, Kirkintilloch, N.B., Assayer.

1897. Rae, Roderic H., Claremont, Turner's Hill, Cheshunt, Herts., Engineer (Edison-Swan Electric Works.).

1895. Raegener, Louis C., 141, Broadway, New York City, U.S.A., Lawyer.

1901. Ralston, Wm., Lagos, West Africa, Government Chemist.

O.M. Ramsay, Dr. W., F.R.S., University College, Gower Street, London, W.C.; Journals to 12, Arundel Gardens, W., Professor of Chemistry.

1888. Ramsay, W., c/o Laird Bros., Ironworks, Birkenhead, Chemist and Assayer.

1898. Ramsden, Andrew, Deccan Sugar Co., Ltd., Samalkot, Godaveri District, India, Manager.

1883. Ramsden, J., Lion Brewery, Belvedere Road, Lambeth, London, S.E., Brewer.

1901. Ransom, Francis, The Chilterns, Hitchin, Herts, Manufacturing Pharmaceutical Chemist.

1895. Raper, Arthur E., Alston House, Thornton Road, Bradford, Yorks, Works Chemist.

1898. Raschen, Dr. Julius, The Highlands, Runcorn, Cheshire, Consulting Chemist (United Alkali Co.).

1893. Ratcliff, F. D., 108, Varna Road, Birmingham, Vinegar Brewer.

1898. Ratcliffe, Walter, 21, Mawdsley Street, Bolton, Analytical Chemist.

1895. Rau, Dr. H. M., 130–132, Pearl Street, New York City, U.S.A., Chemist.

1901. Rauter, Dr. G., Bismarckstrasse, 108, Charlottenburg, 4, bei Berlin, Germany, Engineering Chemist.
1901. Rawlins, Herbert J. L., Hope Cottage, Rainhill, Lancashire, Managing Director.
O.M. Rawson, Chris., 11, St. Augustine Road, Bedford; and (Journals) Peeprah, Jolhara, Chumparun, Bengal, Analytical and Consulting Chemist.
1883. Rawson, Dr. S. G., Technical Schools, Huddersfield, Analytical Chemist.
1895. Read, E. J., 69, Sheen Lane, Mortlake, Surrey, Analyst.
1890. Reade, Thos., Sebright House, Tettenhall Wood, Wolverhampton, Manufacturing Chemist.
O.M. Readman, Dr. J. B., Chemical Laboratory, 4, Lindsay Place, George IV. Bridge, Edinburgh, Analytical and Consulting Chemist.
O.M. Reddrop, J., Sound Cottage, Sound, near Nantwich, Analytical Chemist.
1890. Redgate, J. G., Traffic Street, Nottingham, Aërated Water Manufacturer.
1901. Redpath, Leon Wallace, U.S. Naval Torpedo Station, Newport, R.I., U.S.A., Chemist.
O.M. Redwood, Dr. Boverton, 4, Bishopsgate Street Within, London, E.C., Petroleum Expert.
1884. Redwood, I. I., Bantry House, Picardy Hill, Belvedere, Kent, Technical Chemist.
1887. Redwood, Robt., 4, Bishopsgate Street Within, London, E.C., Secretary.
1891. Redwood, T. Horne, Olveston, Sedlescombe Road, St. Leonard's-on-Sea, Analytical Chemist.
1886. Rée, Dr. A., 15, Mauldeth Road, Withington, Manchester, Aniline Dye Manufacturer.
1884. Reed, Albert E., The Grange, Leigham Court Road, Streatham, S.W., Paper Works Chemist.
1902. Reed, Herbert C., c/o Stamford Manufacturing Co., Stamford, Conn., U.S.A., Chemist.
1895. Reed, Dr. J. Hastings, Hambledon Mill, *viâ* Cairns, North Queensland, Sugar Manufacturer.
1893. Reckie, J. A., Shaw Lane, Dinting, near Manchester, Calico Printer's Colour Mixer.
1883. Reeks, T. H., 106, Queen Victoria Street, London, E.C., Analytical and Consulting Chemist.
1901. Rees, Harald B., Asheville Tannery, Asheville, N.C., U.S.A., Tanner and Currier.
1897. Rees, W. H., Big Pine, Inyo Co., Cal., U.S.A., Chemist.
1900. Reese, Dr. Chas. L., c/o New Jersey Zinc Co. (of Penna.), Palmerton, Carbon Co., Pa., U.S.A., Chemist.
1897. Reid, Andrew, 133, Minard Road, Crossmyloof, Glasgow, Chemist.
1896. Reid, Robt., Oil Mills, Horbury Bridge, near Wakefield, Chemical Student.
1897. Reid, T. Anderson, 8, Ashton Drive, Hunt's Cross, Liverpool, Works Manager.
1894. Reid, Walter C., Broomlee, Haydon Bridge-on-Tyne, Manufacturer.
O.M. Reid, Walter F., Fieldside, Addlestone, Surrey, Technical Chemist.
1893. Reid, Wm., jun., Bombay Dyeworks, Dadur, Bombay, India, Dyer.
1898. Reitmeyer, Robt. E. D., 1 & 2, Rangoon Street, London, E.C., Chemical Merchant.
1901. Remington, J. Percy, c/o E. R. Squibb and Sons, 36, Doughty Street, Brooklyn, N.Y., U.S.A., Chemist.
1[illegible]. Remington, J. Stewart, Laboratory, Corporation Street, Lancaster; and Journals), Aynsome, Grange-over-Sands, R.S.O., Lancs., Consulting Chemist.
1884. Renaut, F. W., The Brambles, Elmbourne Road, Tooting Common, S.W., Secretary.
O.M. Rennie, Dr. E. H., University of Adelaide, South Australia, Professor of Chemistry.
O.M. Rennoldson, W. L., c/o United Alkali Co., Ltd., Hebburn-on-Tyne, Manager.
1901. Renwick, Frank F., Glengall, Woodford Green, Essex, Chemist (Photographic Works).
1885. Reoch, R., River Point, R. I., U.S.A., Print Works Manager.
1894. Rettie, Theodore, 16, Great King Street, Edinburgh, Metallurgical Chemist.
1895. Reubens, Chas. M., c/o Brady Brass Co., 202, Tenth Street, Jersey City, N.J., U.S.A., Chemist.
1896. Reuter, Dr. L. H., 434, East 87th Street, New York City, U.S.A., Chemist.
1899. Reynolds, F. Emory, Columbian G.M. and Milling Co., York, Mont., U.S.A., Chemist.
O.M. Reynolds, Dr. J. Emerson, F.R.S., Trinity College, Dublin, Professor of Chemistry.
O.M. Rhodes, E., c/o Thos. Vickers & Sons, Widnes, Technical Chemist.
1892. Rhodes, Jos., 352, Blackburn Road, Accrington, Print Works Chemist.
1895. Ricarde-Seaver, Major F. J., 16, Grafton Street, Bond Street, W., Metallurgist.
1901. Richard, Geo. A., Mount Morgan Mine, Queensland, Australia, Metallurgical Engineer.
1889. Richards, Edgar, 341, West 88th Street, New York City, U.S.A., Analytical Chemist.
O.M. Richards, W. A., Sandbach, Cheshire, Alkali Works Manager.
1888. Richardson, Clifford, New York Testing Laboratory, Long Island City, N.Y., U.S.A., Chemical Engineer.
1898. Richardson, C. Gordon, c/o N.Y. Chemical Refining Co., 38, Park Row, New York City, U.S.A., Chemist.
1888. Richardson, D. B., Aucheneck, Killearn Station, N.B., Chemical Merchant.
1884. Richardson, F. W., Broad Oak, Oak Avenue, Bradford, Yorkshire, Analytical Chemist.
1892. Richardson, G. E., Branch House, Batley, Yorks, Manufacturing Chemist.
1894. Richardson, Jas. C., 19, Claremont Square, London, N., Electro-chemical Engineer.
1900. Richardson, Jno. H., c/o H. D. Pochin and Co., Ltd., Salford, Manchester, Manager.
1889. Richardson, S. M., 415, Main Street, Bonhill, N.B., Analytical Chemist.
1891. Richardson, Walter W., 1, Montpellier Terrace, Cliff Road, Leeds, Manufacturing Chemist.
1894. Richardson, Wm. H., Newsky Thread Mills, Malaja Bolotnaja, St. Petersburg, Russia, Textile Chemist.
1899. Richmond, Edmund W. T., 132, Queen Victoria Street, London, E.C., Gas Engineer.
1886. Richmond, H. D., Fair Holm, Grimwood Road, Twickenham, Chief Chemist (Aylesbury Dairy Co.).
1898. Richmond, Jno. R., Woodend Park, Grassendale, Liverpool, Alkali Works Manager.
1901. Richmond, Sylvester O., c/o A. H. Allen, 67, Surrey Street, Sheffield, Analytical Chemist.
1884. Richmond, W. H., Liver Alkali Co., Limited, Ditton Road, Widnes, Alkali Manufacturer.
1886. Riddell, R., 87, Horninglow Street, Burton-on-Trent, Brewer.
1894. Ridding, Howard C., A.R.S.M., 7, Wilfred Street, Hartshill, Stoke-on-Trent, Analytical Chemist.
1884. Rideal, Dr. Samuel, Chemical Laboratory, 28, Victoria Street, Westminster, S.W., Analytical and Consulting Chemist.
O.M. Ridsdale, C. H., Milton Lodge, Southfield Road, Middlesbrough, Yorks, Analytical Chemist.
1899. Riederer, Emil J., Hercules Powder Works, Ashburn, Mo., U.S.A., Chemist.
1902. Riederer, Herman S., 251, West 95th Street, New York City, U.S.A., Chemist.
1888. Rigby, John S., West Thurrock, Essex, Chemical Manufacturer.
1892. Riker, Jno. J., 45, Cedar Street, New York City, U.S.A., Merchant.
O.M. Riley, E., 2, City Road, Finsbury Square, London, E.C., Metallurgical Chemist.
O.M. Riley, J. E., Arden Hall, near Accrington, Chemical Manufacturer.
1884. Riley, Jno., Mayfield, Thornliebank, near Glasgow, Print Works Manager.
1899. Riley, Walter A., jun., Brunswick Lodge, Newmarket Road, Norwich, Brewer.

1893. Riley Wm., Castleton, Manchester, Chemical Manufacturer.
1899. Rink, Arnold, 9, Butler Street, Milton Street, London, E.C., Tannin Extract Manufacturer.
1889. Rintoul, Wm., Royal Gunpowder Factory, Waltham Abbey, Essex, Explosives Chemist.
1901. Ripley, Philip F., c/o American Woollen Co., Maynard, Mass., U.S.A., Chemist.
1900. Rising, Willard B., Berkeley, Cal., U.S.A., Professor of Chemistry.
1888. Ritchie, Robt., Hayfield, Rutherglen, near Glasgow, Technical Chemist.
1885. Ritson, T. N., Gas Works, Kendal, Gas Engineer.
1899. Rivington, W. John, 24, Mark Lane, London, E.C., Newspaper Proprietor.
O.M. Rix, W. P., Ashfield Cottage, Liverpool Road, Newcastle, Staffordshire, Potter.
O.M. Robbins, J., 57, Warrington Crescent, Maida Vale, London, W., Pharmaceutical Chemist.
1898. Roberts, Caryl C., 14, Wesley Street, Waterloo, Liverpool, Teacher of Chemistry.
1890. Roberts, C. F., Linfitts, Delph, viâ Oldham, Chemical Merchant.
1887. Roberts, F. A., Cornbrook Chemical Works, Hulme, Manchester, Chemical Manufacturer.
O.M. Roberts, F. G. Adair, Oak Hill Lodge, Frognal, N.W., Chemical Manufacturer.
1901. Roberts, H. E. U. (Journals), 11, Albion Terrace, Faversham, Kent; and 9, St. James' Street, Bath, (Cotton Powder Co., Ltd.), Chemist.
1885. Roberts, R. Wightwick, 22, Calle Arturo Prat, Valparaiso, Chili, Analytical and Consulting Chemist.
1900. Roberts, Wm. Brittain, Wilderspool House, Warrington, Brewer and Analyst.
1902. Roberts, Wm. H., 52, Devonshire Road, Princes Park, Liverpool, S., Analytical Chemist.
1894. Robertson, Alex., Argyle Chemical Works, Oban, N.B., Manufacturing Chemist.
1891. Robertson, Alex. A., 12, Bennison Drive, Grassendale, Liverpool, Technical Chemist.
1897. Robertson, Andrew J., Williamsburg Avenue, Richmond, Va., U.S.A., Analytical Chemist.
1892. Robertson, Geo. H., 30, Hemstall Road, West Hampstead, N.W., Electro-Chemist.
1900. Robertson, Jas., 103, Whifflet Street, Coatbridge, N.B., Analytical Chemist.
1891. Robertson, Dr. Robt., Royal Gunpowder Factory, Waltham Abbey, E., Analytical Chemist.
1901. Robertson, Robert, California Powder Works, Santa Cruz, Cal., U.S.A., Superintendent.
1895. Robins, Walter, 9, Northbrook Road, Lee, S.E., Chemist.
1897. Robinson, Clarence J., Westerleigh, West New Brighton, N.Y., U.S.A., Chemist.
1900. Robinson, Edw. B., 70, Great Clyde Street, Glasgow, Oil Distiller.
1902. Robinson, Hy. Fishwick, Culcheth Chemical Works, Newton Heath, Manchester, Manufacturing Chemist.
O.M. Robinson, Prof. H. H., 98, Finborough Road, West Brompton, S.W., Analytical Chemist.
O.M. Robinson, Jos., Farnworth, Widnes, Chemical Manufacturer.
O.M. Robinson, Jno., Beaconsfield Road, Widnes, Chemical Engineer.
1887. Robinson, Thomas, (Journals) 401, West Street, Glasgow; and (communications), The Villa, Nitshill, N.B., Chemical Works Manager.
1894. Robson, Jas., 204, George Street, Glasgow, Chemist.
1894. Rodda, Edw. D., 6, Gold Street, Roath, Cardiff, Engineer.
1884. Rodger, Edw., 1, Clairmont Gardens, Glasgow, W.
1900. Rogers, Geo. J., Wallaroo Smelting Works, South Australia, Chemist.
1890. Rogers, Harry, 5, Stoke Newington Common, London, N.
1899. Rogers, John, 2, Barrie Terrace, South Beach, Ardrossan, N.B., Chemist.
1901. Rogerson, John W., 101, Leadenhall Street, London, E.C., Maltster.
1890. Rogerson, W. J., 38, Southwark Street, London, S.E., Wholesale Druggist.
1898. Roller, H. C., c/o Electro-chemical Co., 44, Broad Street, New York City, U.S.A., Chemist.
1899. Rollin, Chas., 1, St. Nicholas Buildings, Newcastle-on-Tyne, Chemical Manufacturer.
O.M. Rollin, J. C., 1, St. Nicholas Buildings, Newcastle-on-Tyne, Chemical Manufacturer.
1898. Roode, Rudolf de, International Paper Co., Glens Falls, N.Y., U.S.A., Chemist and Superintendent.
O.M. Roscoe, Sir Henry, F.R.S., 10, Bramham Gardens, South Kensington, S.W., Consulting Chemist.
1901. Roscow, Jas., 471, Park Avenue, Paterson, N.J., U.S.A., Colourist and Chemist.
1893. Roscow, Jno. F., c/o United States Finishing Co., Norwich, Conn., U.S.A., Print Works Chemist.
1899. Roscow, Wm., 102, Central Avenue, Pawtucket, R.I., U.S.A., Analytical Chemist.
1901 Rose, Jno. Leonard, 454, Cheetham Hill Road, Manchester, Chemist.
1902. Rosebrugh, Prof. T. R, 666, Spadina Avenue, Toronto, Canada, Professor of Electrical Engineering.
1890. Rosell, Dr. Claude A. O., "The Pierrepoint," 45, West 32nd Street, New York City, U.S.A., Chemist.
1897. Rosengarten, Dr. Geo. D., 1700, Fitzwater Street, Station D, Philadelphia, Pa., U.S.A., Manufacturing Chemist.
1896. Rosenheim, Dr. Otto, 68, Belsize Park Gardens, Hampstead, N.W., Analytical and Research Chemist.
1887. Ross, Alex. J. J., Tayavalla, Falkirk, N.B., Chemical Manufacturer.
1893. Ross, Arthur, 1, Glengall Road, Old Kent Road, London, S.E., Analytical Chemist.
1901. Ross, Herbert W., 1070, 16th Street, Oakland, Cal., U.S.A., Chemist.
1887. Ross, J. G., Sunbury, Belford Road, Edinburgh, Analytical Chemist.
1900. Ross, Raymond, Public Analyst's Office, Burnley, Lancashire, Analytical Chemist.
1901. Rothberg, Dr. M. E., Lebanon, Pa., U.S.A., Chemist.
1888. Rothwell, C. F. Seymour, 15, Skerton Road, Old Trafford, Manchester, Print Works Chemist.
O.M. Rottenburg, Paul, Messrs, Leisler, Bock & Co., 105, West George Street, Glasgow, Chemical Merchant.
1896. Round, Wm., 100, Bagot Street, Birmingham, Analytical Chemist.
1900. Rountree, Walter B., c/o Mountain Copper Co., Keswick, Shasta Co., Cal., U.S.A., Chemist.
1899. Rouse, H. W., 62, Russell Road, Custom House, E. Foreman (Sulphuric Acid Works).
O.M. Rowland, W. L., 4800, Chester Avenue, Philadelphia, Pa., U.S.A., Chemist.
1901. Rowley, Walter Eugene, c/o Schoellkopf, Hartford, and Hanna Co., 100, William Street, New York City, U.S.A.
1884. Roxburgh, J. W., Levenbank Cottage, Jamestown, Dumbartonshire, N.B., Print Works Manager.
1899. Roy, Benjamin, Ailsa Lodge, 17, Whitelow Road, Chorlton-cum-Hardy, Manchester, Chemist.
1896. Royal-Dawson, H., Prospect Cottage, Oulton, near Leeds, Brewer's Chemist.
1898. Royle, Chas. L., c/o East India Distilleries and Sugar Factories, Ltd., Nellikuppam, S. Arcót, Madras, India, Sugar Chemist.
1898. Royle, Thos. H., c/o Messrs. Carew and Co., Rosa, N.W.P., India, Chemist.
O.M. Royle, T., 329, Upton Lane, Forest Gate, Essex, Chemical Engineer.
O.M. Royse, S. W., St. Andrew's Chambers, 20, Albert Square, Manchester, Chemical Engineer.
1890. Royston, Ernest R., 15, Water Street, Liverpool, Patent Agent.

1902. Rücker, Dr. Hermann von, 163, East 56th Street, New York City, U.S.A., Chemist.
1896. Ruddock, Fred. G., Lower Walton, Warrington, Analytical Chemist.
1895. Rudge, Alfred, Sutton Alkali Works, St. Helens, Analytical Chemist.
1884. Ruffle, Jno., Musley, Ware, Herts., Consulting Chemist and Electrician.
1898. Ruhl, Louis, c/o Roessler and Hasslacher Chemical Co., P.O. Box 1999, 100, William Street, New York City, U.S.A., Chemical Merchant.
1902. Ruhoff, O. E., c/o Mineral Point Zinc Co., Mineral Point, Wis., U.S.A., Chemist.
O.M. Rumble, C., Belmont Works, Battersea, London, S.W., Candle Works Chemist.
1889. Rumbold, Wm. R., Mill House, Holmwood, Surrey, Electro-Metallurgist.
1895. Rump, Ernst, The Leeds Phosphate Works, Hunslet, Leeds, Manager.
1889. Rushby, Wm., 22, Surrey Street, Batley, Yorks, Analyst.
1901. Rushton, Benjamin, Waterloo, Whalley Road, Accrington, Analytical Chemist.
1887. Russell, D., Cadham, Markinch, Fife, N.B., Paper Maker.
1896. Russell, G. Harrison, 7, Heath Bank Road, Devonshire Park, Birkenhead, Chemist (Glue and Gelatin Works).
1884. Russell, Jno., Anchor Brewery, Britten Street, Chelsea, London, S.W., Brewer.
O.M. Russell, Dr. W. J., F.R.S., 34, Upper Hamilton Terrace, London, N.W., Professor of Chemistry.
1892. Russell, Wm., c/o Gold and Silver Extraction Co. of America, Box 1606, Denver, Col., U.S.A., Analytical Chemist.
1901. Rust, Robt. R., c/o Somerset Chemical Co., Bound Brook, N.J., U.S.A., Chemist.
1884. Ryland, Howard P., Agricultural Chemist.

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1895. Saalfeld, Adolphe, 2, South King Street, Manchester, Chemical Merchant.
1895. Saarbach, Dr. L., 114, Pearl Street, New York City, U.S.A., Consulting Chemist.
1883. Sadler, A. E., Sand Hall, Ulverston, Lancashire, Manufacturing Chemist.
O.M. Sadler, Dr. S. A., M.P., Middlesbrough-on-Tees, Colour Manufacturer.
1884. Sadtler, Dr. S. P., 145, North 10th Street, Philadelphia, Pa., U.S.A., Consulting Chemist.
1896. Sadtler, Dr. S. S., N.E. corner of 10th and Chestnut Streets, Germantown, Pa., U.S.A., Chemist (U.S. Customs).
1897. Sage, C. Edward, 2, Charterhouse Street, London, E.C., Consulting Chemist.
1897. St. John, Harry, Queen Street Brewery, Sunderland, Brewer and Analyst.
1884. Salamon, A. G., 1, Fenchurch Avenue, London, E.C., Consulting Chemist.
1885. Salamon, Jno., Rainham, S.O., Essex, Manufacturing Chemist.
1884. Salis-Mayenfeld, Dr. E. von., P.O. Box 165, Albany, N.Y., U.S.A., Technical Chemist.
O.M. Samuel, W. Cobden, 66, Croxted Road, West Dulwich, S.E., Analytical Chemist.
O.M. Samuelson, Rt. Hon. Sir Bernhard, Bart., F.R.S., 56, Prince's Gate, London, S.W., Ironmaster.
1896. Samuelson, Francis A. E., Sir B. Samuelson and Co., Ltd., Middlesbrough, Ironmaster.
1895. Samuelson, Godfrey B., c/o Messrs. W. T. Glover and Co., Salford, Electrical Manufacturer.
1901. Sanders, C. Newell, Roanoke, Va., U.S.A., Railway Chemist.
1895. Sanderson, John, 4, Lancaster Road, Belsize Park, N.W., Chemist.
1898. Sanderson, T. Crisp, c/o Matheson and Co., 25–27, Cedar Street, New York City, U.S.A., Chemical Engineer.
1899. Sandford, J. Wallace, c/o A. W. Sandford and Co., Grenfell Street, Adelaide, S. Australia, Analytical Chemist.
1884. Sandon, R., 42, Lewisham Road, Dartmouth Park, N.W., Examiner at Patent Office.
O.M. Sanford, P. Gerald, Analytical Laboratory, 20, Cullum Street, E.C., Public Analyst and Consulting Chemist.
1890. Saniter, E. H., 51, Grange Road West, Middlesbrough, Analytical Chemist.
1901. Sargent, Dr. Geo. W., Carpenter Steel Co., Reading, Pa., U.S.A., Chemist and Metallurgist.
1896. Saunders, Walter M., 20, Dewey Street, Olneyville, R.I., U.S.A., Analytical Chemist.
1895. Savage, Arthur E., Sulphide Corporation Works, Cockle Creek, Newcastle, N.S.W., Metallurgist.
1895. Sawers, Wm. D., 1, Athole Gardens Place, Glasgow, Chemist.
1901. Sawyer, Harris E., 176, Federal Street, Boston, Mass., U.S.A., Chemist and Bacteriologist.
1898. Saxe, Sigmond, 108, Fulton Street, New York City, U.S.A., Manufacturing Chemist.
1895. Sayer, Harry, Heathlands, Rustham Road, Wandsworth Common, S.W., and (Journals) c/o Sherard Cowper-Coles and Co., Ltd., Grosvenor Mansions, Victoria Street, S.W., Metallurgical Chemist.
1894. Sayers, Jos. J., Mayville, Stevenston, Ayrshire, Explosives Chemist.
1895. Scales, F. Shillington, Wearmouth Paper Mill, Sunderland, Paper Maker.
1899. Schaak, Dr. Milton F., 108, Penn Street, Brooklyn, N.Y., U.S.A., Chemist.
O.M. Schack-Sommer, Dr. G., 48, Marlborough Mansions, Victoria Street, S.W., Sugar Refiner.
1884. Schad, Julius, York Buildings, 33, Mosley Street, Manchester, Aniline Co.'s Agent.
1899. Schaefer, Dr. L., Maywood, N.J., U.S.A., Manufacturing Chemist.
1898. Schaffer, Herbert A., 347, Brodhead Street, Easton, Pa., U.S.A., Chemist (Vulcanite Portland Cement Co.).
O.M. Schäppi, Dr. H., Mitlödi, Canton Glarus, Switzerland, Analytical Chemist.
1886. Schellhaas, Henry Alf., Thornhill, Beach Road, Hartford, Northwich, Mechanical Engineer.
1894. Schidrowitz, Dr. P., 57, Chancery Lane, W.C., Research Chemist.
1895. Schieffelin, Dr. W. Jay, 841, Southern Boulevard, New York City, U.S.A., Manufacturing Chemist.
1902. Schlegel, Jno. Wm., 602, East 5th Street, New York City, U.S.A., Chemist.
1893. Schleicher, Francis J., 38, West Tenth Street, Long Island City, N.Y., U.S.A., Technical Chemist.
1901. Schlichting, Emil, 646, Broadway, Milwaukee, Wis., U.S.A., Chemist.
1902. Schloss, Joseph A., Apartado, 65, Monterey, Mexico, Analytical Chemist.
1901. Schneider, Edw. J., c/o Union Carbide Co., Niagara Falls, N.Y., U.S.A., Chemist.
1899. Schniewind, Dr. F., 277, Broadway, New York City, U.S.A., Chemist.
1897. Schoder, Dr. Robt., 6, Brandreth Road, Balham, S.W., Chemist.
O.M. Scholefield, H. E., Edge Hill Chemical Works, Liverpool, Chemical Manufacturer.
1898. Scholes, Geo. R., 27, Station Road, Urmston, Manchester, Analytical Chemist.
1895. Schroeder, E. August, c/o Church and Co., 36, Ash Street, Brooklyn, N.Y., U.S.A., Chemist.
1900. Schroller, Wm., 20, Mount Street, Manchester, Engineer.
1894. Schryver, Dr. S. B., Effingham House, Arundel Street, Strand, W.C., Chemist.
1901. Schultze, Wm., 102, Academy Street, Jersey City Heights, N.J., U.S.A., Chemist.

1902. Schulze, Emil A., The Guaranty Mantle Co., Balham Hill, S.W., Incandescent Mantle Manufacturer.
1888. Schulze, Dr. Karl E., Ladenburg, bei Mannheim, Germany, Technical Chemist.
O.M. Schunck, Dr. E., F.R.S., Kersal, near Manchester, Colour Chemist.
1893. Schüpphaus, Dr. R. C., 174, Broadway, New York City, U.S.A., Consulting Chemist.
1893. Schwab, Dr. L. C., Sedanstrasse 53, Bernburg, Anhalt, Technical Chemist.
1901. Schwartz, David, c/o Southern Cotton Oil Co., Gretna, La., U.S.A., Chemist.
1900. Schwarz, Dr. Henry P., c/o Haas Bros., 27, William Street, New York City, U.S.A., Chemist.
1889. Schweich, Emil, 20, Hyde Park Square, London, W., Technical Chemist.
1894. Schweitzer, Dr. H., 40, Stone Street, New York City, U.S.A., Analytical Chemist.
1891. Scott, Andrew, Royal Gunpowder Factory, Waltham Abbey, Essex, Analytical Chemist.
1893. Scott, A. Ross, Verreville, Lenzie, N.B., Manufacturing Chemist.
1889. Scott, Ernest G., 2, Talbot Court, Gracechurch Street, London, E.C., Soap Works Chemist.
1898. Scott, Jas., Cawnpore Woollen Mills, Cawnpore, India, Chemist.
1894. Scott, Jno. Gillespie, Annislea, Northfield, Liberton, near Edinburgh, Analytical Chemist.
1901. Scott, Leonard C., c/o Grasselli Chemical Co., East Chicago, Ind., U.S.A., Chemist.
1894. Scott-Smith, G. E., 67, Surrey Street, Sheffield, Analytical Chemist.
1889. Scovell, M. A., Lexington, Kentucky, U.S.A., Agricultural Chemist.
1887. Scrutton, Willis J. C., Elkhart Mine, Chloride, Mohair Co., Arizona, U.S.A., Analytical Chemist.
1896. Scrymgeour, Wm., Whistlebrae, Lamington Heights, Kalgoorlie, West Australia, Chemist.
O.M. Scudder, F., Mersey and Irwell Joint Committee, 14, Mosley Street, Manchester, Analytical Chemist.
1895. Seabrooke, H. Cecil, Black Ash, Grays, Essex, Research Chemist.
1900. Searby, Fred. M., West Berkeley, Cal., U.S.A., Oilworks Superintendent.
1889. Searl, Albert, Montreux, Victoria Road, Sidcup, Kent, Technical Chemist.
1898. Searle, Alf. B., 280, Western Bank, Sheffield, Analytical Chemist.
1896. Sedding, G. H. P., c/o Florida Syndicate, Jacksonville, Florida, U.S.A., Chemist.
1901. Sederholm, Erik, 28, Jakopsgatan, Stockholm, Sweden, Chemist (Royal Navy Board).
1901. Seeler, Dr. F., c/o Geo. Lueders and Co., Chemical Works, Elizabeth, N.J., U.S.A., Manufacturing Chemist.
1893. Sefton-Jones, Herbert, c/o W. P. Thompson and Co., 322, High Holborn, W.C., Analytical Chemist.
1899. Seher, A., c/o Maas and Waldstein, Riverside Avenue, Newark, N.J., U.S.A., Chemist.
1896. Seldner, Rudolph, 217, Jefferson Avenue, Brooklyn, N.Y., U.S.A., Instructor in Chemistry.
1884. Semet, Louis, 217, Chaussée de Vleurgat, Brussels, Alkali Manufacturer.
1900. Semonite, Radcliffe G. C., 910*a*, Greene Avenue, Brooklyn, N.Y., U.S.A., Chemist.
1898. Sen (Gupta), Nagendra Nath, 18, Lower Chitpur Road, Calcutta, India, Physician and Chemist.
1895. Senger, Robt., 37, Warren Street, New York City, U.S.A., Manufacturing Chemist.
1899. Senior, Francis L., Lock 28, Sanford, Maine, U.S.A., Mill Chemist.
O.M. Sevin, C., 68, Central Hill, Upper Norwood, S.E., and (Journals) c/o Dollman & Pritchard, 9 and 10, King Street, Cheapside, E.C., Chemical Engineer and Oil Refiner.
1900. Seward, Geo. O., Holcomb Rock, Va., U.S.A., Chemist.
1896. Seyler, Clarence A., Technical Institute, Nelson Terrace, Swansea, Chemist and Assayer.
1889. Seymour-Jones, A., Cambrian Leather Works, Wrexham, Leather Manufacturer.
1894. Shallcross, 926, Ashton Old Road, Manchester, Chemical Manufacturer.
1892. Shanks, Arch., Bridgend Mills, Dalry, Ayrshire, N.B., Chemist.
1883. Sharp, James, Shirley Manor, Wyke, near Bradford, Yorks, Dyer.
1891. Sharpe, Granville H., 11 & 12, Great Tower Street, London, E.C., Analytical Chemist.
1884. Sharples, Stephen P., 13, Broad Street, Boston, Mass., U.S.A., Analytical Chemist.
1896. Sharpley, Wm. P., Haywood, Poplar Avenue, Edgbaston, Birmingham, Analytical Chemist.
1900. Sharwood, Wm. J., c/o Montana Mining Co., Marysville, Lewis and Clarke Co., Mont., U.S.A., Metallurgical Chemist.
1900. Shattuck, A. F., The Solvay Process Co., Detroit, Mich., U.S.A., Chemist.
1885. Shaw, F. W., Temple House, Heapey, near Chorley, Lancashire, Analytical Chemist.
1883. Shaw, Geo., 35, Temple Row, Birmingham, Patent Agent.
1890. Shaw, H. Dixon, Bond Street, Dewsbury, Yorks, Analytical and Consulting Chemist.
O.M. Shearer, A., 36, Demesne Road, Alexandra Park, Manchester, Technical Chemist.
O.M. Shenstone, W. A., F.R.S., Clifton College, Bristol, Chemical Lecturer.
1892. Shenton, Jas. P., 29, Claude Road, Chorlton-cum Hardy, near Manchester, Analytical Chemist.
1889. Shepard, Dr. Chas. U., 56–58, Broad Street, Charleston, S.C., U.S.A.
1900. Shepherd, E. Sanger, 5-7, Gray's Inn Passage, Holborn, W.C., Scientific Instrument Maker.
1893. Shepherd, H. H. B., Northcote, Mount Pleasant Lane, Upper Clapton, N.E., Chemist.
1898. Shepherd, Reginald des F., c/o Calico Printers' Association, 56, Mosley Street, Manchester, Printworks Chemist.
1895. Sherman, G. W., c/o North Western Rubber Co., Litherland, near Liverpool, General Manager.
1899. Shero, John E., c/o Pittsburg Reduction Co., Niagara Falls, N.Y., U.S.A., Chemist.
1893. Shields, Dr. John, 22, Upper George Street, Bryanston Square, London, W., Chemist.
1899. Shillitoe, Frank, 35, Pontefract Road, Castleford, Yorks, Chemist.
1896. Shimomura, K., c/o Osaka Seimi Works Co., Kawagishicho, Nishiku, Osaka, Japan, Chemist.
1886. Shimosé, Masachika, Shimosé Powder Works, Takinogawa, near Oji, Tokyo, Japan, Chemical Engineer.
1888. Shishkoff, Sergius A., Elabouga, Govt. of Viatka, Russia, Manager (Glass Works).
1893. Shishkoff, Waldemar A., Chemical Engineer.
1899. Sholes, Chas. E., c/o General Chemical Co., Syracuse, N.Y., U.S.A., Chemical Salesman.
1900. Shonk, Albert, 168, Malmesbury Road, Canning Town, E., Analytical Chemist.
1899. Shores, Dr. Jeff. H., Mill Brow, Widnes, Chemist..
1897. Shorey, Dr. Edmund C., Office of Board of Health, Honolulu, H.I., Chemist.
1902. Shubridge, Sydney Y., M.I.C.E., Gasworks, Lower Sydenham, S.E., Gas Engineer.
1901. Shukoff, Dr. Alexis A., Borowaja, No. 86, St. Petersburg, Russia, Technical Chemist.
1899. Shuler, Darius P., Sudbury, Ont., Canada, Chemist.
1890. Shutt, Frank T., Central Experimental Farm, Ottawa, Canada, Agricultural Chemist.
1901. Siau, Raymond L., 32, Sussex Villas, Kensington, W. Carbohydrate Research Chemist.
1901. Silberrad, Dr. Oswald, Research Laboratory, Royal Arsenal, Woolwich, S.E., Research Chemist.
O.M. Sill, T. T., c/o United Alkali Co., Ld., Flint, North Wales, Alkali Works Manager.
1884. Sillar, W. Cameron, The Native Guano Co., Limited, 29, New Bridge Street, Blackfriars, E.C., Director (Native Guano Co.).

1892. Silvester, Harry, 78, Holyhead Road, Handsworth, Birmingham, Analytical and Consulting Chemist.
1901. Sim, Wilfrid A., c/o Wm. Sim and Son, 40, Jane Street, Leith, N.B., Colour Manufacturer.
1899. Simeons, Carl, 70, Finsbury Pavement, London, E.C., Gelatine Manufacturer.
1898. Simon, Dr. A., 55–56, Bishopsgate Street, E.C., Chemical Engineer.
1890. Simonds, Dr. F. M., 159, Front Street, New York City, U.S.A., Mining Engineer and Assayer.
1892. Simonson, Wm., 126, West 9th Street, Cincinnati, Ohio, U.S.A., Chemist.
1897. Simpson, Edw. S., Geological Survey Office, 395, St. George's Terrace, Perth, West Australia, Government Assayer.
O.M. Simpson, W. S., Halcyon House, Private Road, Enfield, N., Analytical Chemist.
1900. Sims, W. Edgar, 11, Brampton Grove, Cheetham, Manchester, Technical Chemist.
1894. Sinclair, Dr. W., 60, Stirling Road, Trinity, Edinburgh, Chemist.
1890. Sindall, R. W., c/o Lloyd, Ltd., Sturgeon Falls, Ont., Canada, Paper Mills Chemist.
1889. Singer, Ignatius, Petone, near Wellington, New Zealand, Manufacturing Chemist.
1899. Singmaster, J. Arthur, c/o New Jersey Zinc Co. of Penna., Palmerton, Pa., U.S.A., Chemist.
1901. Sinnatt, Frank S., Glenside, Church Lane, Moston, Manchester, Demonstrator of Chemistry.
O.M. Sisson, G., jun., c/o Washington Chemical Co., Ltd., Washington Station, R.S.O., Co. Durham, Works Manager.
1885. Skaife, Wilfred T., 630, Sherbrooke Street, Montreal, Canada, Sugar Chemist.
1894. Skelton, John R., c/o Norwich Crape Co., Ltd., St. Augustine's, Norwich, Technical Chemist.
1901. Skertchley, Sydney A. R., 2, Woodside, Wimbledon Park, S.W., Mining Engineer.
1897. Skertchley, W. P., Laboratory, 11. Billiter Square, E.C., Analytical Chemist.
1891. Skilton, C. F. E., Brewery House, Staines, Brewer.
1901. Skinner, Hervey J., c/o General Chemical Co., Camden, N.J., U.S.A., Chemist.
1893. Skurray, Thos., United Breweries, Abingdon, Berks, Brewer.
1897. Skvortzoff, Basil N., Works of Oushkoff & Co., Kazan, Russia, Chemical Technologist.
O.M. Slade, H. E., India Rubber Works, Streatham Common, London, S.W., Rubber Works Manager.
1887. Slatter, Geo. W., Carlton Terrace, Nab Wood, Shipley, Yorkshire, Analytical Chemist.
1895. Slocum, Frank L., 401, South Linden Avenue, E.E., Pittsburg, Pa., U.S.A., Chemist.
1899. Slosson, Edwin E., University of Wyoming, Laramie, Wyoming, U.S.A., Professor of Chemistry.
1883. Smail, J. I., Warren Wood, Hayes Common, Beckenham, Kent, Chemical Manufacturer.
1901. Smale, Dr. F. J., c/o Wm. Davies Co., Toronto, Canada, Chemist.
1898. Small, Fritz H., c/o Graton and Knight Manufacturing Co., Worcester, Mass., U.S.A., Chemist.
O.M. Smetham, A., 16, Brunswick Street, Liverpool, Analytical Chemist.
1884. Smiles, Jas., 173, Bruntsfield Place, Edinburgh, Manufacturing Chemist.
188 . Smith, Alfred, Excelsior Chemical Works, Clayton, Manchester, Manufacturing Chemist.
189 . Smith, Alf. B., Whiteley House, Glossop, Derbyshire, Bleacher and Dyer's Manager.
1897. Smith, Allan, c/o Kellner-Partington Paper Pulp Co., Hallein, bei Salzburg, Austria, Paper Mills Chemist.
1898. Smith, Andrew B., P.O. Box 90, Queenstown, C.C., S. Africa, Chemist.
1896. Smith, Andrew T., 43, Castle Street, Liverpool, Chemical Broker.
1893. Smith, Edgar B., Prince Regent's Wharf, Silvertown, E., Chemist.
1895. Smith, Dr. E. Ellsworth, 26, East 29th Street, New York City, U.S.A., Consulting Physiological Chemist.
O.M. Smith, Edgar F., c/o E. M. Robson, Trelawny, Fairfax Road, Bedford Park, W., Analytical Chemist.
1892. Smith, Ernest A., The Assay Office, Leopold Street, Sheffield, Assayer.
1900. Smith, E. Sell, 219, East Market Street, Warren, Ohio, U.S.A., Manufacturing Chemist.
1898. Smith, E. Shrapnell, 35, Botanic Road, Wavertree, Liverpool, Chemical Engineer.
1891. Smith, Francis P., 121, Sansome Street, San Francisco, Cal., U.S.A., Chemist.
885. Smith, Fred., Analytical Chemist.
O.M. Smith, G., Rosehall Terrace, Falkirk, N.B., Explosive Works Manager.
1897. Smith, Sir Geo. J., Messrs. Bickford, Smith, & Co., Ltd., Tuckingmill, Cornwall, Fuse Manufacturer.
1890. Smith, Harry, 74, Holly Avenue, Jesmond, Newcastle-on-Tyne, Technical Chemist.
1890. Smith, Harry E., 29, 31st Street, Milwaukee, Wis., U.S.A., Analytical Chemist.
1900. Smith, H. Ewing, 22, City Road, London, E.C., Manufacturing Chemist.
1898. Smith, H. Gilbertson, Hollies, Park Hill, Clapham, S.W.
1901. Smith, H. Procter, 17, Orbiston Street, Motherwell, near Glasgow, Metallurgical Chemist.
O.M. Smith, H. R., 1, Aubert Park, Highbury, London, N., Analytical Chemist.
1901. Smith, H. Sutcliffe, Edward Ripley and Son, Ltd., Bowling Dyeworks, Bradford, Managing Director.
1890. Smith, H. Wood, c/o British Cyanides Co., Ltd., Oldbury, near Birmingham, Analytical Chemist.
1897. Smith, James, 30, Milner Road, Aigburth, Liverpool, Analytical Chemist.
1893. Smith, Jas. F., 30, Chester Road, Akroydon, Halifax, Analytical Chemist.
O.M. Smith, J., Ash Grove House, Radcliffe, Manchester.
1901. Smith, J. Cruickshank, 20, Felday Road, Lewisham, S.E., Technical Chemist.
O.M. Smith, Dr. J. H., Wollishofen, Zürich, Switzerland, Chemical Manufacturer.
1884. Smith, J. Johnstone, Lockwood Brewery, Huddersfield, Brewing Chemist.
1898. Smith, John, Hartley Street Dyeworks, Dewsbury, Yorks, Dyer.
1896. Smith, Joseph Kent, Glascoed, Shavington Avenue, Hoole, Chester, Metallurgical Chemist.
1888. Smith, J. Tertius, Richmond House, Plaistow, Essex, Technical Chemist.
O.M. Smith, Jno. W., Massachusetts Institute of Technology, Boston, Mass., U.S.A., Analytical Chemist.
1890. Smith, J. Wm., Solvay Process Co., Syracuse, N.Y., U.S.A., Alkali Works Manager.
1898. Smith, R. F. Wood, Laboratory, 89, Bartholomew Close, E.C., Consulting Chemist.
1890. Smith, R. Greig, Linnean Society's House, Elizabeth Bay, Sydney, N.S.W., Analytical Chemist.
1890. Smith, R. Watson, c/o J. and J. Cunningham, Ltd., Salamander Street, Leith, N.B., Chemical Works Manager.
1900. Smith, T. Connell, Blandfield Chemical Works, Edinburgh, Manufacturing Chemist.
1897. Smith, Theophilus R., c/o Brotherton & Co., Haigh Park Chemical Works, Stourton, near Leeds, Chemist.
1896. Smith, Walter E., 158, Doyle Avenue, Providence, R.I., U.S.A., Instructor in Chemistry.
O.M. Smith, Watson, 34, Upper Park Road, Haverstock Hill, N.W., Editor of Society's Journal.
O.M. Smith, Wilfred, 182, West Street, Glasgow, Chemical Manufacturer.
1896. Smith, Dr. W. Stanley, Bryntirion, Bersham, near Wrexham, North Wales, Brewer.
O.M. Smithells, Prof. A., F.R.S., Yorkshire College, Leeds, Professor of Chemistry.
1902. Smither, F. W., 30, Cole Building, Nashville, Tenn., U.S.A., Analytical Chemist.

O.M. Smithers, F. O., Dashwood House, 9, New Broad Street, London, E.C., Chemical Agent.

1902. Smyth, Dr. Morland, c/o Mander Bros., John Street, Wolverhampton, Chemist.

1902. Smythe, Jno. A., Durham College of Science, Newcastle-on-Tyne, Demonstrator in Chemistry.

1888. Snape, Dr. H. Lloyd, Balholm, Lathom Road, Southport, Director of Education for Lancashire.

1896. Snowdon, Jno., jun., Messrs. Snowdon, Sons, & Co., Millwall, E., Chemical and Oil Manufacturer.

1900. Snyder, Geo. D., 31, Bradford Street, Brooklyn, N.Y., U.S.A., Chemist.

1900. Sodeau, Wm. H., 25, Shore Road, London, N.E., Chemist to Explosives Committee.

1894. Sohn, Chas. E., 2, Harpur Street, Bedford Row, London, W.C., Analyst.

1895. Solvay, Armand, 25, Rue Prince Albert, Brussels, Gérant de la Société Solvay et Cie.

1884. Solvay, Ernest, 43, Rue des Champs Elysées, Brussels, Alkali Manufacturer.

1897. Somerset, H. St. John, jun., Mount Morgan Gold Mining Co., Mount Morgan, Queensland, Australia, Assayer.

1884. Sommer, Adolf, corner 1st and Binney Streets, East Cambridge, Boston, Mass., U.S.A., Pharmaceutical Chemist.

1894. Sonstadt, Edw., Church Fields, Cheshunt, Herts, Chemical Technologist.

1896. Sorel, Ernest, 119, Rue Notre Dame-des-Champs, Paris, VI., Engineer.

1896. Souther, H., 140, Capitol Avenue, Hartford, Conn., U.S.A., Chemical and Metallurgical Engineer.

1892. Southern, Thos., Jr., Wheathill Chemical Works, St. Simon Street, Salford, Manufacturing Chemist.

1883. Soward, A. W., 28, Therapia Road, Honor Oak, S.E., Principal Clerk (Legacy Duty Office).

1890. Sowerby, Thos. H., Canal Soap Works, Verney Road, Rotherhithe New Road, S.E., Soap Manufacturer.

O.M. Sowerby, W. M., c/o United Alkali Co., Ltd., Allhusen Works, Gateshead-on-Tyne, Lancashire, Alkali Works Manager.

1887. Spackman, Chas., Rosehaugh, Clitheroe, Lancashire, Portland Cement Manufacturer.

1900. Sparks, John C., c/o The De la Vergne Refrigerating Machine Co., foot of East 138th Street, New York City, U.S.A., Chemist.

1901. Sparrow, J. Marcellus, c/o Imperial Varnish and Colour Co., Ltd., 6–22, Morse Street, Toronto, Canada, Varnish and Colour Manufacturer.

1883. Spence, D., Alum Works, Manchester, Alum Manufacturer.

O.M. Spence, F., Alum Works, Manchester, Alum Manufacturer.

1900. Spence, Howard, (Journals) Audley, Broad Road, Sale, Cheshire, and c/o Peter Spence and Sons, Ltd., Alum Works, Manchester, Chemical Manufacturer.

1901. Spence, Jno. Davidson, 2, Hawkhill Place, Perth Road, Dundee, Chemist.

1894. Spence, J. Napier, Heathfield, Harrow-on the-Hill, Teacher of Chemistry.

1883. Spence, Jno. W., Tiviot Colour Works, Manchester Road, Stockport, Drysalter.

1900. Spencer, Harold R.S., Spring Side, Sharples, Bolton, Lancs., Paper Maker.

1884. Spencer, Jno., Globe Tube Works, Wednesbury, Tube Manufacturer.

O.M. Spencer, J. W., Newbiggin House, Kenton, Newcastle-on-Tyne, Steel Manufacturer.

1901. Spencer, Robt., jun., The Sycamores, Blackburn, Lancs.

1897. Sperry, Erwin S., 208, Colorado Avenue, Bridgeport, Conn., U.S.A., Metallurgist.

1884. Spiegel, Dr. Adolf, Messel, bei Darmstadt, Germany, Analytical Chemist.

1899. Spieler, Aug. J., c/o The Will and Baumer Co., Syracuse, N.Y., U.S.A., Stearic Acid Works Superintendent.

1889. Spies, Adolph, 102, Fenchurch Street, London, E.C., Chemical Merchant.

1889. Spies, Hermann, 102, Fenchurch Street, London, E.C., Chemical Merchant.

1885. Spiller, A., Edison-Swan Electric Co., South Benwell Works, Newcastle-on-Tyne, Electrician.

O.M. Spiller, J., 2, St. Mary's Road, Canonbury, London, N., Consulting Chemist.

1896. Spoor, J. L., Madras Cement Works, Madras, India; and (Journals), Culver House, Gravesend, Kent, Portland Cement Manufacturer.

O.M. Sprengel, Hermann Johann Philipp, Ph.D. (Heidelb.), F.R.S., Royal Prussian Professor (titular); Journals to Prof. Sprengel, F.R.S., Savile Club, 107, Piccadilly, London, W., Chemist.

1900. Spurge, Edw. C., Witham, Essex, Chemist.

1901. Spurlin, Oscar L., Drawer 13, Columbia, S.C., U.S.A., Chemist.

O.M. Squire, P. W., 413, Oxford Street, London, W., Pharmaceutical Chemist.

O.M. Squire, Dr. W. S., Clarendon House, St. John's Wood Park, N.W., Chemical Engineer.

1901. Staempfli, Major W., Worblaufen, Bern, Switzerland Director (Swiss Smokeless Powder Factory).

1896. Stafford, Chas. H., (Journals) c/o The Birkacre Printing Co., and Hollyfield, Weldbank, Chorley, Colourist.

O.M. Stahl, Dr. K. F., 57th Street and A. V. Ry., Pittsburg, Pa., U.S.A., Chemical Works Manager.

1891. Stanger, W. Harry, Chemical Laboratory and Testing Works, 2, Broadway, Westminster, S.W., Engineer.

1884. Stanning, John, Broadfield, Leyland, near Preston, Bleacher.

1902. Stansfield, Edgar, Technical College, Sunderland, Lecturer in Chemistry.

1888. Stantial, Frank G., c/o Cochrane Chemical Co., Everett, Mass., U.S.A., Technical Chemist.

1885. Staples, H. J., The Old Hall, Spondon, Derby, Colour Manufacturer.

O.M. Stark, J. F., 9, Allfarthing Lane, Wandsworth, S.W., Works Superintendent.

1896. Statham, Noel, Credito Industrial Gijones, Gijón, Spain, Engineer.

1895. Stead, J. Christopher, Mitre Works, Cordova Road, Bow, E., Chemist and Manager.

O.M. Stead, J. E., 11, Queen's Terrace, Middlesbrough-on-Tees, Analytical Chemist.

1898. Stearns, Theron C., 41, Montgomery Street, Jersey City, N.J., U.S.A., Consulting Chemist.

O.M. Stebbins, J. H., 80, Madison Avenue, New York City, U.S.A., Analytical Chemist.

O.M. Steedman, R. H., Golftyn, Carrick Road, Ayr, N.B., Chemical Manufacturer.

1896. Steel, Fred. W., c/o Cuming, Smith, and Co., Yarraville, Melbourne, Vic., Analytical Chemist.

1900. Steel, Jno. S., Adelaide Chemical Works, New Thebarton, Adelaide, South Australia, Chemist.

1884. Steel, R. Elliott, Northampton and County School, Northampton, Headmaster.

O.M. Steel, Thos., Colonial Sugar Refinery, Sydney, N.S.W., and (Journals) 70, Holmscroft Road, Greenock, N.B., Sugar Chemist.

1897. Stein, Sigmund, 214, Upper Parliament Street, Liverpool, Sugar Refinery Manager.

1897. Steinhart, Dr. Oscar J., 4, Palace Street Mansions, Buckingham Gate, S.W., Manufacturing Chemist.

1901. Steinmetz, Chas. P., Research Laboratory, General Electric Co., Schenectady, N.Y., U.S.A., Electrician.

1887. Stenhouse, T., Townhead, Rochdale, Analytical Chemist.

1892. Stephens, M. E., 4, Carlton Gardens, London, S.W.; and (Journals) 57–60, Aldersgate Street, London, E.C., Ink Manufacturer.

1884. Stephens, H. Chas., M.P., 4, Carlton Gardens, London, S.W., Ink Manufacturer.

1889. Stern, Arthur L., Southbank, Stapenhill Road, Burton-on-Trent, Brewing Chemist.

O.M. Steuart, D. R., Osborne Cottage, Broxburn, West Lothian, N.B., Oilworks Chemist.

1899. Stevenot, G. A., c/o Schoellkopf, Hartford, and Hanna Co., 100, William Street, New York City, U.S.A., Chemist.
1898. Stevens, Arthur F., 61, Balfour Road, Highbury New Park, N., Paper Examiner.
1902. Stevens, Hy. P., The Firs, Ash, Surrey, Demonstrator in Chemistry.
1894. Stevens, Jno. H., 295, Ferry Street, Newark, N.J., U.S.A., Manufacturing Chemist.
1884. Stevens, Wm., The Native Guano Co., Ltd., 29, New Bridge Street, Blackfriars, E.C., Secretary.
1892. Stevenson, Arnold, 4, Porchester Gardens, London, W., Chemist.
1884. Stevenson, Jas., 23, West Nile Street, Glasgow; and Hailie, Largs, N.B., Manufacturing Chemist.
1901. Stevenson, M. R., Morrison and Cass Paper Co., and (Journals) Ward House, Tyrone, Blair Co., Pa., U.S.A., Chemist.
O.M. Stevenson, Dr. T., Guy's Hospital, London, S.E., Chemical Lecturer.
O.M. Stevenson, W., Standard Works, 95A, Southwark Street, London, S.E., Chemical Manufacturer.
1901. Stewart, David B. D., Aberdeen Comb Works, Hutcheon Street, Aberdeen, Managing Director.
1891. Stewart, Jeffrey, Albert Mills, The Mall, Hammersmith, Sugar Works Manager.
1890. Stewart, Robt., c/o Boake, Roberts, and Co., Warton Road, Stratford, E., Chemical Works Manager.
1886. Stewart, R. Patrick, 59, Wellwood Terrace, Kerr Street, Kirkintilloch, N.B., Analytical Chemist.
O.M. Stewart, S., c/o Michael Nairn and Co., Ltd., Linoleum Works, Kirkcaldy, N.B., Technical Chemist.
1899. Stewart, Saml., 16, Great George Street, Westminster, S.W., Managing Director (Explosives Co.).
1901. Stifel, Walter H., 1319, Locust Street, Allegheny, Pa., U.S.A., Tanner.
1890. Stillman, Dr. T. B., Stevens Institute of Technology, Hoboken, N.J., U.S.A., Professor of Analytical Chemistry.
1884. Stillwell, Chas. M., 55, Fulton Street, New York City, U.S.A., Analytical and Consulting Chemist.
1886. Stirk, Jos., Ferncliffe, Elm Bank, Nottingham, Brewer's Engineer.
1893. Stock, F. W. Keating, Dinsdale Rectory, Darlington, Analytical and Consulting Chemist.
1900. Stockdale, Edgar, Printworks, Birstall, Yorks, Colour Mixer.
1888. Stockdale, Wm., Irwell Printworks, Stacksteads, near Manchester, Calico Printer.
1887. Stocks, H. B., Lynwood, Neston, Cheshire, Analytical Chemist.
1901. Stoddart, C. W., 526, South Broadway, Yonkers, N.Y., U.S.A., Student.
1885. Stoddart, F. Wallis, Western Counties Laboratory, Bristol, Analytical Chemist.
1899. Stoddart, Reginald T., Belgrave Terrace, Queen's Road, Cheetham, Manchester, Chemist.
O.M. Stoer, J., 6, Hanover Quay, Dublin.
O.M. Stoker, G. N., 9, Lessar Avenue, Clapham Common, S.W., Analytical Chemist.
1899. Stokes, Alf. W., Laboratory, Vestry Hall, Paddington Green, W., Public Analyst.
1898. Stokes, Dr. Henry N., U.S. Geological Survey, Washington, D.C., U.S.A., Chemist.
1892. Stone, Frank, Laboratory, 193, Collins Street, Melbourne, Victoria, Analytical Chemist and Assayer.
O.M. Stone, F. B., Eardley Villa, Picardy Hill, Belvedere, Kent, Technical Chemist.
1900. Stone, Geo. C., c/o New Jersey Zinc Co., 115, Broadway, New York City, U.S.A., Engineer.
1899. Stone, I. F., 100, William Street, New York City, U.S.A., Chemical Merchant.
1888. Stone, Thos. W., Chemical Works, St. George, Bristol, Chemical Manufacturer.
O.M. Storey, I. H., Haverbreaks, Lancaster, Chemical Manufacturer.
1888. Stowe, W. T., Inland Revenue, Wellington, Salop, Analytical Chemist.
1901. Strange, W. W., jun., 97, West Lorain Street, Oberlin, Ohio, U.S.A., Analytical Chemist.
1883. Strangman, J. Pim, 38, Rue Desbordes-Valmore, Passy, Paris, Bleacher.
1887. Strong, Colin R., 13, St. Ann Street, Manchester, Oil Merchant.
O.M. Stuart, C. E., 29, Mosley Street, Newcastle-on-Tyne, Chemical Apparatus Dealer.
1896. Stuart, Harry T. R., Know Mill House, Entwistle, near Bolton, Printworks Sub-Manager.
O.M. Stuart, T. W., 7, Livingston Drive, Sefton Park, Liverpool, Alkali Works Manager.
1901. Stuart, Dr. W. Theophilus, 197, Spadina Avenue, Toronto, Canada, Physician and Professor of Chemistry.
1896. Stubbs, Augustus J., 20, Calle de Carranza, Madrid, Spain.
O.M. Studer, Dr. A., Postgebäude, Olten, Switzerland. Consulting Chemist.
1890. Studer, Simon J., Helvetia, Stockton Heath, near Warrington, Technical Chemist.
1898. Styles, R. Curling, Knockhall, Greenhithe, Kent, Analytical Chemist.
1900. Suart, Arthur B., St. Paul's Works, Paul Street, Finsbury, E.C., Manager of Melting Department.
1896. Suckert, Dr. J. J., 253, Broadway, New York City, U.S.A., Manufacturing Chemist.
1895. Sudborough, Dr. J. J., University College of Wales, Aberystwith, Lecturer in Chemistry.
1889. Sulman, H. L., 44, London Wall, London, E.C., Chemist and Metallurgist.
1895. Summers, Bertrand S., c/o McCormick Harvesting Machine Co., 7, Monroe Street, Chicago, Ill., U.S.A., Electro-Chemist.
1899. Sumner, Harold, Worthington, near Wigan, Dyer and Bleacher.
1896. Sunderland, A., 84, Hainworth Wood Road, Ingrow, Keighley, Teacher of Chemistry.
1899. Sundström, Carl, c/o Solvay Process Co., Detroit, Mich., U.S.A., Chemist.
1895. Sundström, Karl J., Trenton, Wayne Co., Mich., U.S.A., Manufacturing Chemist.
1884. Sutherland, D. A., 28, Victoria Street, Westminster, S.W., Consulting Technical Chemist and Assayer.
1894. Sutherland, Geo., Croft Cottage, Bonhill, N.B., Chemist.
1887. Sutherland, Jas., c/o British Aluminium Co., Ltd., Larne Harbour, Co. Antrim, Ireland, Chemist.
O.M. Sutherland, R. M., Lime Wharf Chemical Works, Falkirk; and Solsgirth, Dollar, N.B., Chemical Manufacturer.
1899. Satherst, Dr. Walter F., Agricultural College, Holmes Chapel, Crewe, and 8, Devonshire Place, Brighton, Science Master.
1901. Sutro, H. H., 60, West 49th Street, New York City, U.S.A., Chemist.
O.M. Sutton, Francis, Norfolk County Laboratory, Redwell Street, Norwich, Analytical Chemist.
1886. Sutton, F. Napier, 6, Grosvenor Gardens, Willesden Green, N.W., Alkali Works Inspector.
1900. Sutton, W. Lineclne, Hilicroft, Eaton, Norwich, Public Analyst.
O.M. Swan, J. Cameron, 4, Nicholas Buildings, Newcastle-on-Tyne, Manufacturing Chemist.
O.M. Swan, Dr. Jos. W., F.R.S., 58, Holland Park, London, W., Chemist and Electrician.
1898. Swanson, Jas. F. (Journals) c/o Mr. R. Glover, 13, Belville Street, Greenock, N.B., Technical Chemist.
1881. Swinburne, Geo., (Journals), 99, Queen Street, Melbourne, Australia; (subs.) c/o C. R. Lee and Co., 5, Laurence Pountney Hill, E.C., Gas Engineer.
1901. Swinton, Ralph S., c/o W. J. Bush, Incorporated, Linden, N.J., U.S.A., Analytical Chemist.
1892. Sykes, James, Heckmondwike Oil and Chemical Works, Heckmondwike, Yorks, Oil Refiner.
O.M. Syme, W. B., Elm Cottage, Addiewell, West Calder, N.B., Oil Works Chemist.
1900. Symes, Dr. W. H., Government Health Officer.

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1895. Taber, G. H., jun., 4134, Girard Avenue, Philadelphia, Pa., U.S.A., Dept. Superintendent (Atlantic Refining Co.)

1896. Takugi, T., c/o Sumitomo, Kobé, Japan, Chemical Engineer.

O.M. Takamatsu, T., Tokyo University, Japan, Analytical Chemist.

O.M. Takamine, Dr. J., 61, West 108th Street, New York City, U.S.A., Engineer.

1890. Takayama, Jintaro, Imperial Geological Survey Office, Dept. of Agriculture, Tokio, Japan, Agricultural Chemist.

1901. Talati, K. E., Bombay, India, Leather Dresser.

1898. Tanaka, Keishin, c/o Tokio Gas Co., 92, Sarneechō, Fukugawa, Tokio, Japan, Chemist.

1900. Tankard, Arnold R., 67, Surrey Street, Sheffield, Analytical Chemist.

O.M. Tate, F. H., 9, Hackins Hey, Liverpool, Analytical and Technical Chemist.

O.M. Tatlock, J., 45, Renfrew Street, Glasgow, Laboratory Furnisher.

O.M. Tatlock, R. R., Novara, Stirling, N.B., Consulting Chemist.

1892. Tatton, Reginald A., Mersey and Irwell Joint Commission, 41, Mosley Street, Manchester, Civil Engineer.

O.M. Taubman, R., 12, Eton Road, Haverstock Hill, N.W., Analytical Chemist.

1901. Taussig, Emil, 26, East 59th Street, New York City, U.S.A., President (West Disinfecting Co.).

1898. Taverner, W., Burnden, Hamilton Road, Burton-on-Trent, Brewers' Chemist.

1901. Tayler, Jno. Bernard, 2, Alma Terrace, Wavertree, Liverpool, Works Chemist.

1898. Taylor, B. Franklin, Gainesville Cotton Oil Co., Gainesville, Ga., U.S.A., Manufacturing Chemist.

1895. Taylor, Edwin, 146, Hooper Street, Brooklyn, N.Y., U.S.A., Explosives Chemist.

1886. Taylor, G. Crosland, Ravenscar, Helsby, near Warrington, Electrical Engineer.

1891. Taylor, G. Midgley, 27, Great George Street, Westminster, S.W., Analytical Chemist.

1893. Taylor, G. W., Dinting Vale Printworks, Dinting, near Manchester, Printworks Chemist.

O.M. Taylor, H. E., 702, Alexandra Parade, Dennistoun, Glasgow, Lead Works Manager.

1883. Taylor, Jas., Department of Mines, Sydney, N.S.W., Australia, Government Metallurgist.

1888. Taylor, Jas. Davis, 9, Mincing Lane, London, E.C., Chemical Merchant.

1898. Taylor, Jas. M., 59, Kenmare Road, Sefton Park, Liverpool, Analytical Chemist.

1901. Taylor, John, Grosvenor Museum, Chester, Science Master.

1901. Taylor, Jno., 3, Rossett Road, Great Crosby, near Liverpool, Works Chemist.

1898. Taylor, J. Scott, c/o Winsor and Newton, Ltd., 38, Rathbone Place, London, W., Technical Chemist.

1896. Taylor, Martin, "The Clough," Buckhurst Hill, Essex, Chemical Works Manager.

1901. Taylor, M. J., 77, Front Street, E., Toronto, Canada, Soap Manufacturer.

1898. Taylor, Newman, Linden House, Stamford Place, Sale, near Manchester, "Water Specialist."

1901. Taylor, Sidney, Parkholme, Albion Terrace, Bath, Works Chemist.

1898. Taylor, Walter, 20, Canning Street, Bury, Lancs., Technical Chemist.

1892. Taylor, W. G. H., 56, Meanley Road, Manor Park, Essex, Analytical Chemist.

1885. Taylor, W. J., 55, Forsyth Street, Greenock, N.B., Technical Chemist.

1887. Teanby, G. W. A., Elvin Lodge, East Dereham, Norfolk, Analytical Chemist.

1899. Teas, Wm. Holmes, Ridegway, Pa., U.S.A., Chemist.

O.M. Teed, Dr. F. L., Chem. Laby., 9, Mincing Lane, London, E.C., Analytical Chemist.

O.M. Tennant, Sir Chas., Bart., 35, Grosvenor Square, S.W.; and Glen, Peeblesshire, N.B. (Journals to St. Rollox, Glasgow), Alkali Manufacturer.

1884. Tennant, Jas., Alex. Fergusson and Co., Ltd., 38, McAlpine Street, Glasgow, Lead and Colour Manufacturer.

1896. Tennille, Geo. F., c/o Southern Cotton Oil Co., Savannah, Ga., U.S.A., Chemist.

1888. Terry, Albert, Verulam, Mount Albert Road, Balwyn, near Melbourne, Victoria, Brewer.

1884. Terry, Hubert L., 3, Herbert Street, Moss Side, Manchester, Technical Chemist.

O.M. Tervet, R., 54, Penshurst Road, South Hackney, E., Oil Works Manager.

1893. Tetley, C. F., Messrs. Jos. Tetley and Son, The Brewery, Leeds, Brewer.

1897. Tetlow, Wm. E., Ash Cottage, Ashfield, Dunblane, N.B., Chemist.

1886. Thew, Walter H., Talbot House, Arundel Street, Strand, W.C., Director.

1897. Thiel, Dr. C. Walther, (Journals) c/o F. Reddaway and Co., Ltd.; and 125, Eccles Old Road, Pendleton, Manchester, Chemist.

1901. Thiry, Jos., Inchcape, Southill Road, Chislehurst, Kent, Manager (Coke Oven Co.).

O.M. Thomas, Chas., J.P., D.L., Pitch and Pay, Stoke Bishop, near Bristol, Soap Manufacturer; Deputy Chairman, Midland Railway.

1894. Thomas, H. Russell, Broad Plain Soap Works, Bristol, Soap Manufacturer.

O.M. Thomas, J. W., 2, Hampstead Hill Mansions, London, N.W., Analytical Chemist.

1901. Thomas, Octavius, Gas and Water Offices, Pentre, Glamorganshire, Gas and Water Engineer.

1888. Thomas, S. Percy, 2, Landrock Road, Hornsey, N., Technical Chemist.

1898. Thomas, Wm. Harrison, jun., Passaic Print Works, Passaic, N.J., U.S.A., Printworks Chemist.

1885. Thompson, Prof. Claude M., 38, Park Place, Cardiff, Professor of Chemistry.

1898. Thompson, Edw. C., 40, Glenluce Road, Westcombe Park, S.E., Manufacturing Chemist.

1899. Thompson, Erwin W., Charlotte, N.C., U.S.A., Mill Engineer.

1893. Thompson, G. Rudd, 69, Dock Street, Newport, Mon., Analytical and Consulting Chemist.

1895. Thompson, Gustave W., c/o National Lead Co., 40, Adams Street, Brooklyn, N.Y., U.S.A., Chemist.

1885. Thompson, W., Sankey Hill, Earlestown, Lancashire, Sugar Refiner.

1884. Thompson, W. G., Tonge Springs Works, Middleton, near Manchester, Colour Manufacturer.

O.M. Thompson, W. P., Patent Office, 6, Lord Street, Liverpool, Patent Agent.

1896. Thomsen, Alonzo L., 612, Continental Trust Building, Baltimore, Md., U.S.A., Manufacturing Chemist.

1889. Thomson, Dr. Andrew, 8, Ardenlea, Pitcullen, Perth, Chemical Lecturer.

1884. Thomson, G. Carruthers, 53, Bedford Road, Rock Ferry, Birkenhead, Engineer.

1891. Thomson, Jas. M., Royal Gunpowder Factory, Waltham Abbey, Essex, Manager (Cordite Branch).

1901. Thomson, J. M., New Hermand Oil Co., Ltd., Breich Works, West Calder, N.B., Manager.

1894. Thomson, John, Overlee, Alexandria, N.B., Printworks Manager.

1884. Thomson, Robt. T., 156, Bath Street, Glasgow, Analytical Chemist.

1899. Thomson, Thos., (Journals) Waterproofing Co., Barrhead; and Westlea, Barrhead, near Glasgow, Manufacturer.

O.M. Thomson, W., Royal Institution Laboratory, Manchester, Analytical and Consulting Chemist.

1890. Thomson, Wm. Thos., Royal Gunpowder Factory, Waltham Abbey, Essex, Explosives Chemist.

1900. Taorman, J. Stanley, West Ham Gasworks, Stratford, E., Chemist.

O.M. Thorne, Dr. L. T., 8, Dynevor Road, Richmond-on-Thames; and (Journals) Southampton Wharf, Battersea, S.W., Technical Chemist.

O.M. Thorneycroft, Wallace, East Plean House, Bannockburn, N.B., Technical Chemist.

1891. Thornton, Chris., 16, Hillside Avenue, Providence, R.I., U.S.A., Printworks Manager.

1891. Thornton, David H., Brookfoot Dyeworks, Brighouse, Yorks., Dyer.

1887. Thornton, H., Redbourn, Ashford, Middlesex, Analytical Chemist.

1899. Thornton, Wm., (Journals) c/o Isaac Brandon & Bros., Panama Central America; and (subsn.) c/o Thos. Thornton, Hermand, West Calder, N.B., Chemist.

1895. Thorp, Frank H., Mass. Inst. of Technology, Boston, Mass., U.S.A., Instructor in Industrial Chemistry.

O.M. Thorpe, Dr. T. E., F.R.S., Government Laboratory, Clement's Inn Passage, Strand, W.C.; and, (Journals) 61, Ladbroke Grove, Notting Hill, W., Chief Chemist (Customs and Inland Revenue).

1898. Thurnauer, Dr. Gustav, c/o Aurora Metal Co., Aurora, Ill., U.S.A., Chemist.

1900. Tiffany, Walton C., 21½, Spruce Street, Manhattan, N.Y., U.S.A., President (Trade Chemists' Co.).

1901. Tilden, Philip S., c/o Franklin H. Kalbfleisch Co., 35, Burling Slip, New York City, U.S.A., Manufacturing Chemist.

O.M. Tilden, Prof. W. A., F.R.S., The Oaks, Murray Road, Northwood, Middlesex, Professor of Chemistry.

1900. Tilley, Jas. W., 2, Stockwell Crescent, London, S.W., Research Chemist.

1901. Timmans, W. G., 108, Peel Street, Derby, Chemical Works Manager.

1886. Timmins, A., Argyll Lodge, Higher Runcorn, Civil Engineer.

O.M. Timmis, T. Sutton, Widnes, Chemical Manufacturer.

1894. Tipler, Fred. C., 48, Brooklyn Street, Crewe, Analytical Chemist.

1890. Tobey, C. H., Collingwood, Ontario, Canada, Tannery Chemist.

1894. Toch, Maximilian, c/o Toch Bros., 468–472, West Broadway, New York City, U.S.A., Chemist.

1893. Tocher, Jas. F., 1, Chapel Street, Peterhead, N.B., Pharmaceutical Chemist.

1886. Todd, A. M., 204, North Rose Street, Kalamazoo, Mich., U.S.A., Manufacturing Chemist.

1899. Tompkins, Vreeland, 533, Communipaw Avenue, Jersey City, N.J., U.S.A., Analytical Chemist.

O.M. Toms, F. Woodland, States Analyst's Office, St. Heliers, Jersey, Analytical Chemist.

1902. Tone, Frank Jerome, c/o The Carborundum Co., Niagara Falls, N.Y., U.S.A., Manager.

1899. Tone, Jay E., 1427, Woodland Avenue, Des Moines, Iowa, U.S.A.

1896. Tonkin, John, 2603, East Broad Street, Richmond, Va., U.S.A., Manufacturing Chemist.

1902. Torrey, Charles A., jun., 17, Park Vale, Brookline, Mass., U.S.A., Chemist.

1889. Tothill, M. A. L., Castle and Buitengracht Streets, Cape Town, S. Africa, Manufacturing Chemist.

O.M. Towers, J. W., Brantwood, Allerton, near Liverpool, Analytical Chemist.

1893. Townsend, Chas. F., West View, Swanley Junction, Kent, Chemist.

1892. Townsend, Chas. W., 19, Crawford Street, Port Dundas, Glasgow, Chemical Manufacturer.

1892. Townsend, Oliver C., Kirkland Works, Leven, Fife, N.B., Chemical Manufacturer.

1897. Towse, Walter, c/o Messrs. E. and J. Richardson, Elswick Leather Works, Newcastle-on-Tyne, Technical Chemist.

1899. Trantom, Dr. Wm., Eagle Oil Mills, Hull, Chemist.

1894. Traphagen, Dr. Frank W., Montana Agricultural Experimental Station, Bozeman, Mont., U.S.A., Chief Chemist.

1900. Traquair, Jno., Glenfield Starch Works, Paisley, N.B., Analytical Chemist.

1893. Travers, Morris W., University College, London, W.C., Chemist.

1889. Trechmann, A. O., Holborough Cottage, Snodland, Kent, Cement Works Chemist.

1885. Trechmann, Dr. C. O., Warren Cement Works, Hartlepool, Cement Manufacturer.

1895. Treharne, F. Gwilym, Wraugbrook, Llanishen, near Cardiff, Analytical Chemist.

1885. Trewby, Herbert, 62, St. John Street, London, E.C., Analytical Chemist.

1883. Tribe, P. C. M., Oswego, N.Y., U.S.A., Secretary.

1901. Trigger, Oliver, Chem. Dept., Royal Arsenal, Woolwich, S.E., Analytical Chemist.

1898. Tripp, Dr. E. Howard (Journals) Municipal Technical College; and 46, Terrace Road, Swansea, Science Master.

O.M. Trobridge, A., c/o Trobridge and Co., Ltd., South Shore Road, Gateshead-on-Tyne, Technical Chemist.

1897. Trotman, Saml. R., King's Walk Chambers, Parliament Street, Nottingham, City Analyst.

1900. True, Percival E., Bowker Chemical Co., Elizabeth, N.J., U.S.A., Chemical Engineer.

1887. Tsukiyama, S., Nippon Seito Kaisha, Osaka, Japan, Paper Mills Chemist.

1894. Tucker, Alex. E., 35, Paradise Street, Birmingham, Metallurgist and Chemist.

1897. Tucker, Samuel A., Columbia University, New York City, U.S.A., Tutor in Industrial Chemistry.

1886. Tuer, Arthur H., Thornhill, near Wigan, Analytical Chemist.

1899. Tullis, John K., The Moorings, Kelvinside, Glasgow, Tanner.

1888. Tulloch, John, Rossie House, Hebburn-on-Tyne, Analytical Chemist.

1901. Tulloch, Wm. F., 7, West George Street, Glasgow, Merchant.

1899. Turnbull, Dr. Andrew, Leather Industries Department, Yorkshire College; and (Journals) 33, St. Michael's Road, Headingley, Leeds, Assistant.

1888. Turnbull, G. W., 35, Lancaster Road, Carnforth, Lancashire, Metallurgical Chemist.

1884. Turnbull, W. S., 37, West George Street, Glasgow, Chemical Manufacturer.

1889. Turner, H. B. H., 68, Upper Berkeley Street, Portman Square, W., Sugar Refiner.

1897. Turney, Fred. N., 76, Rue Wilson, Brussels, Belgium, Leather Dresser.

1887. Turney, Sir J., Springfield, Alexandra Park, Nottingham, Tanner.

1891. Turri, Geo. G., Salisbury Building, cor. of Queen and Bourke Streets, Melbourne, Vic., Australia, Patent Agent.

1896. Tuthill, Jos. B. T., Salem Gas Light Co., Salem, Oregon, U.S.A., Chemist.

1890. Tweedy, Jas., 306A, Burdett Road, Limehouse, E., Metallurgical Chemist.

1901. Twieg, Wm. C., California Powder Works, Pinole, Contra Costa Co., Cal., U.S.A., Chemist.

1891. Twitchell, E., Wyoming, Ohio, U.S.A., Candle Works Manager.

1897. Twynam, H., c/o Mount Morgan Gold Mining Co., Mount Morgan, Queensland, Australia, Mining Engineer.

O.M. Twynam, T., Hawthorne House, Slaid Hill, Moortown, Leeds, Metallurgist.

O.M. Typke, P. G. W., Lawn House, New Malden, Surrey, Chemical Manufacturer.

1893. Tyrer, Chas. T., Stirling Chemical Works, Stratford, E., Manufacturing Chemist.

O.M. Tyrer, T., Stirling Chemical Works, Stratford, E., Chemical Manufacturer.

1899. Tysoe, Jos., South Metropolitan Gas Co., East Greenwich, S.E., M. Inst. C.E., Gas Engineer.

U

1894. Uhlig, E. C., 48, Barclay Street, New York City, U.S.A., Glass Works Chemist.
1900. Uhlig, W. C., c/o Hygeia Distilled Water Co., 349, West 12th Street, New York City, U.S.A., Chemist.
1897. Ullman, Jas. A., c/o Sigmund-Ullman Co., 146th Street and Park Avenue, New York City, U.S.A., Chemist and Superintendent (Printing Ink Works).
1900. Ulmer, Geo. F., c/o Arbuckle Bros., Sugar Refinery, Foot of Pearl Street, Brooklyn, N.Y., U.S.A., Chemist.
O.M. Umney, C., 50, Southwark Street, London, S.E., Manufacturing Chemist.
1889. Underhill, Thos. J., 73, Pepy's Road, New Cross, S.E., Inspector of Stores.
1885. Underwood, G. R., Box 160, Peabody, Mass., U.S.A., Glue Works Chemist.
1898. Unglaub, Oscar, c/o Thom, Domeier. and Co., Ltd., Pendleton, Manchester, Soap Manufacturer.
1883. Usmar, J. H., 22, Billiter Street, London, E.C., Chemical Merchant.

V

1896. Van der Linde, Harold, 61, Front Street West, Toronto, Canada, Chemist (India-rubber and Gutta-percha Manufacturing Co.).
1895. Vanderpoel, Dr. Frank, 153, Center Street, Orange, N.J., U.S.A., Chemist.
1897. Van Gelder, Arthur P., c/o American Forcite Powder Manufacturing Co., Landing, N.J., U.S.A., Chemist.
1891. Van Gundy, Chas. P., Laboratory, B. & O. R. R., Baltimore, Md., U.S.A., Metallurgical Chemist.
1896. Van Ingen, Dudley A., New Jersey Zinc Co., Newark, N.J., U.S.A., Chemist.
1896. Van Laer, Norbert, Truman's Brewery, Burton-on-Trent, Brewer and Chemist.
1897. Van Marken, J. C., 150, Queen Vctoria Street, E.C., Chemical Engineer.
1899. Van Slooten, Wm., 52, Sidney Place, Brooklyn, N.Y., U.S.A., Mining Engineer and Metallurgist.
1902. Vanwinckel, W. H., c/o Lyman Bros. and Co., Ltd., 71, Front Street East, Toronto, Canada, Chemist.
1902. Van Zwaluwenburg, Jas. E.. 32, 2nd Street, Elizabeth, N.J., U.S.A., Analytical Chemist.
1888. Vargas-Vergara, J. M., Apartado No. 237, Bogota, Republic of Colombia, S. America, Metallurgical Chemist.
O.M. Vasey, T. E., 5, South Parade, Leeds ; (Journals) P.O. Box 1149, Montreal, Canada, Chemical Engineer.
1894. Veitch, Geo., Chemical Works, Crieff, N.B., Manufacturing Chemist.
1898. Verity, Ben, Magog, Prov. Quebec, Canada, Printworks Chemist.
1897. Verity, Victor, 83, Lexington Street, East Boston, Mass., U.S.A., Chemical Works Foreman.
O.M. Vickers, Wm., c/o Thos. Vickers and Sons, Miles Platting, Manchester, Chemical Manufacturer.
1895. Vigelius, Carl, 175, Pearl Street, New York City, U.S.A., Shellac Bleacher.
1896. Vincent, Jos. A., Rooms 207–8, 421, Chestnut Street, Philadelphia, Pa., U.S.A., Mechanical Engineer.
1897. Vlies, Leonard E., Fernroyd, Wellington Road, Whalley Range, Manchester.
O.M. Voelcker, E. W., 22, Tudor Street, London, E.C., Agricultural Chemist.
1887. Voelcker, Dr. J. A., 20, Upper Phillimore Gardens, Kensington, W., Agricultural Chemist.
1901. Vogel, G. C., 583, Cass Street, Milwaukee, Wis., U.S.A., Tanner.
1897. Vogel, Julius L., 91, Blackfriars Road, S.E., Engineer.
1899. Vogeler, Gustav, 17, Philpot Lane, London, E.C., Merchant.
1900. Volney, Dr. Carl W., 173, West 81st Street, New York City, U.S.A., Chemist (Smokeless Powder Co.).
1897. Voorhees, Louis A., P.O. Box 357, New Brunswick, N.J., U.S.A., Agricultural Chemist.
1899. Voorhees, Samuel S., c/o Supt. Architect, Treasury, Washington, D.C., U.S.A., Chemist.
1901. Vorce, Loren R., 208, Cuyahoga Building, Cleveland, Ohio, U.S.A., Chemical Engineer.
1888. Vörster, Fritz, Cöln-Marienburg, Germany, Manufacturing Chemist.
1885. Voss, Hermann, 19, Beckenham Road, Beckenham, Kent, Manure Works Manager.
1899. Voss, Walter A., Melrose, Whitworth Road, South Norwood, S.E., Manufacturing Chemist.
1899. Vreeland, Cornelius D., Upper Montclair, N.J., U.S.A., Manufacturing Chemist.

W

1885. Waché, Alf., 9, Place St. François Xavier, Paris, France, Caustic Potash Manufacturer.
1896. Wachtel, Gregory, 6, Manejny Pereulok, St. Petersburg, Russia, Chemical Engineer.
1895. Waddington, Thos. W., 74, Blackburn Road, Padiham, Lancashire, River Inspector.
1890. Wade, Jas. L., 28, West Kensington Gardens, London, W., Chemical Manufacturer.
1889. Wadman, W. E., 102, Lord Avenue, Bayonne, N.J., U.S.A., Manufacturing Chemist.
1897. Wagner, Dr Theodore B., 1444, Wilson Avenue, Chicago, Ill., U.S.A., Chemist.
1893. Wagner, W. G., Glyndhurst, Ealing Common, W. Analytical and Consulting Chemist.
1884. Wainwright, Dr. J. H., 159, Front Street, New York City, U.S.A., Analytical Chemist.
1895. Wainwright, Wm., c/o Spooner and Bailey, Chemical Manure Works, Eling, near Southampton, Chemist.
1901. Waite, C. Nelson, c/o General Artificial Silk Co., 35th Street, and Gray's Ferry Road, Philadelphia, Pa., U.S.A., Chemist.
1899. Wakefield, Wm. C., 3, St. Mary's Place, Savile Town, Dewsbury, Chemist.
1894. Waldman, Louis J., P.O. Box 162, Albany, N.Y., U.S.A., Aniline Dye Manufacturer.
1895. Waldstein, Dr. Martin E., 107, Murray Street, New York City, U.S.A., Manufacturing Chemist.
1887. Walker, Archibald, 8, Crown Terrace, Glasgow, Distiller.
1900. Walker, David C., Gibbonsville, Idaho, U.S.A., Analytical Chemist.
1886. Walker, E. Robinson, 18, St. Ann's Street, Manchester, Patent Agent.
1897. Walker, H. V., 38, Clinton Street, Brooklyn, N.Y., U.S.A., Chemist.
1894. Walker, Dr. Jas., University College, Dundee, Professor of Chemistry.
1902. Walker, Jas., Knowle House, Mirfield, Yorks., Woollen Manufacturer.
1897. Walker, Jas. W., Fernlea. Irvine. N.B., Chemical Manufacturer.
1902. Walker, Jno. H., Gourepore Co., Ltd., Bengal, India, Chemist.
1884. Walker, S. R., 19, Wolsey Street, Radcliffe, Manchester, Foreman Dyer.
1895. Walker, W. Sloane, c/o Walker, Ltd., Litherland, near Liverpool, Tanner.
1900. Walker, Dr. Wm. H., 7, Exchange Place, Boston, Mass., U.S.A., Chemical Expert.
1897. Wallace, Edwin C., Foot of 6th Street, Long Island City, N.Y., U.S.A., Chemist.
1897. Wallace, Robt. A., Dorset Hall, Merton, Surrey, Chemical Manufacturer.
1883. Wallace, Robert, 20, Murrayfield Avenue, Edinburgh, Distiller.

O.M. Waller, Dr E., 410, First Avenue, New York City, U.S.A., Professor of Chemistry.

1899. Wallerstein, Dr. Max, 200, Worth Street, New York City, U.S.A., Chemist.

1900. Walls, Arthur W., North Woburn, Mass., U.S.A., Chemist (Acid Works).

1886. Walsh, F. T., Lowell Dyeworks, Lowell, Mass., U.S.A., Colour Printer.

[illegible] Walsh, Lionel O. P., c/o Burt, Boulton, and Haywood, Ltd., Prince Regent's Wharf, Silvertown, E., Chemist.

1900. Walters, H., 390, Wellington Street, Ottawa, Canada, Professor of Chemistry.

1895. Want, W. Philip, 41, Bishopsgate Street Without, London, E.C., Pharmacist and Editor.

1901. Warburton, Frank, Woodhouse Hill, Hunslet, Leeds, Manager.

1896. Warburton, Thos., Clayton Aniline Co., Ltd., Clayton, Manchester, Chemist.

1899. Ward, Alf. B., 210, Trinity Road, Wandsworth Common, S.W., Bread-Improver Manufacturer.

O.M. Ward, Geo., Messrs. Hirst, Brooke, and Hirst, Millgarth Mills, Leeds, Chemical Works Manager.

1891. Ward, G. J., The Cottage, Hallam Fields, near Nottingham, Civil Engineer.

1884. Ward, Howard Chas., Yeatton, Hordle, Lymington, Hants, Deputy Chairman of Gas Co.

1898. Ward, John, Barnstone Blue Lias Lime Co., Ltd., Barnstone, Notts, Manager.

1888. Ward, Thos., Wadebrook House, Northwich, Salt Manufacturer.

1899. Ward, Wm. J., c/o Olive and Partington, Broughton Bridge Paper Mills, Manchester, Chemist.

O.M. Wardale, J. D., Redheugh Engine Works, Gateshead-on-Tyne, Engineer.

1902. Warden, Jno. B., Bank of B.N.A., Dawson City N.W.T., Canada; and (Journals) to 5, Eton Gardens, Glasgow, Analytical Chemist.

1897. Wardle, Sir Thos., 54, St. Edward Street, Leek, Staffordshire, Silk Dyer.

1885. Warington, Robt., F.R.S., Harpenden, Herts, Agricultural Chemist.

1899. Warnes, Arthur R., c/o Major & Co., Ltd., Sculcoates, Hull, Soapworks Chemist.

1890. Warren, Fiske, 220, Devonshire Street, Boston, Mass., U.S.A., Paper Manufacturer.

1902. Warren, H. D., The Gutta Percha and Rubber Manufacturing Co., Ltd., 45—49, West Front Street, Toronto, Canada, President.

1899. Warren, Jno. Davis, 7, Essex Road, Acton, W., Manufacturing Chemist.

1901. Warren, Jno. E., Eagle Chemical Works, Barchester Street, Poplar, E., Tar Distiller.

1885. Warren, T. T. P. Bruce, Tamworth Villa, Earlham Grove, Forest Gate, Essex, Analytical Chemist.

1885. Waterfall, W. B., c/o Avon Manure Co., Bristol; and (Journals) Thirlmere, Clavering Road, Redland, Bristol, Manure Manufacturer.

1890. Waterhouse, Major-General Jas., Oak Lodge, Court, Road, Eltham, Kent, Assistant Surveyor-General of India (retired).

1891. Waterhouse, Robt., c/o W. A. Bishop and Co., Ltd., Dial Mills, Warrington, Analytical and Agricultural Chemist.

1902. Watkins, E. J., 224, Green Street, Upton Park, E., Works Chemist.

1900. Watkins, Norman, Box 767, Honolulu, Hawaiian Islands, Chemist.

1898. Watkins, Willard H., c/o Schoellkopf, Hartford, and Hanna Co., 163, Oliver Street, Boston, Mass., U.S.A., Colourist.

1894. Watmough, Benj., 1, Ryeburn, Stanley Road, and (Journals) c/o Messrs. Brotherton and Co., Ammonia Works, Calder Vale, Wakefield, Analytical Chemist.

1894. Watson, Alex. Forbes, St. James's Gate Brewery, Laboratory, Watling Street, Dublin, Chemist.

1884. Watson, Chas., c/o English Literary Society, San Martin, 243, Buenos Ayres, Argentina, Manufacturing Chemist.

1894. Watson, Chas. Ernest, c/o Peter Spence and Sons, Manchester Alum Works, Manchester, Chemical Assistant.

1890. Watson, Eric E., (Journals) The Queensland Smelting Co., Aldershot, Maryborough, Queensland, Australia; (subs.) c/o S. Watson, Queen Insce. Buildings, Dale Street, Liverpool, Metallurgical Chemist.

1895. Watson, H. Ard, Ashwood, North Hill Road, Headingly, Leeds, Tar Distiller.

1901. Watson, Herbert J., 33, Main Street, Kilwinning, Ayrshire, Chemist.

1894. Watson, Jas., 60, West Park Terrace, South Shields, Alkali Works Manager.

O.M. Watson, Jno. C., Schluesselberg, near St. Petersburgh, Russia, Technical Chemist.

1891. Watson, Jno., 56, Cantwell Road, Woolwich Common, S.E., Analytical Chemist.

O.M. Watt, A., c/o Macfie & Sons, 34, Moorfields, Liverpool, Sugar Works Chemist.

1901. Watt, Francis L., 111, Lauderdale Mansions, Lauderdale Road, Maida Vale, W., Student.

1900. Watts, Chas. J., 40, City Road, London, E.C., Manufacturer.

1893. Watts, Jno. Isaac, Fairleigh, Hartford, Cheshire, Alkali Works Manager.

1900. Webb, Jno. Fred., 63, Queen Victoria Street, London, E.C., Mining and Electrical Engineer.

1901. Webb, Wm. J., 90, Ash Street, Yonkers, N.Y., U.S.A., Superintendent of Printing Department.

1891. Weber, C. Otto, Heathfield, Middleton Road, Crumpsall, Manchester, Analytical Chemist.

1884. Webster, C. S. Stanford, Malvern House, Redland, Bristol, Professor of Chemistry.

1901. Webster, Geo. J., Standard Chemical Co., Ltd., Gooderham Building, Toronto, Canada, Secretary.

1902. Webster, Jno., Chemical Laboratory, Guy's Hospital, S.E., Analyst.

1897. Wedge, Utley, Carthage, Miss., U.S.A., Oil Refiner (Standard Oil Co.'s Chemical Works).

1901. Wedlake, H. D., c/o National Explosives Co., Ltd. Hayle, Cornwall, Technical Chemist.

1902. Weed, Hy. T., 80, Livingstone Street, Brooklyn, N.Y., U.S.A., Teacher of Chemistry.

1893. Weeks, H. B., 29, Ainslie Street, Barrow-in-Furness, Analytical Chemist.

1895. Weems, Dr. J. B., Iowa Agricultural College, Ames, Iowa, U.S.A., Agricultural Chemist.

1898. Weeple, Lawrence, Pinchin's Wharf, Broad Street, Ratcliff, E., Colour Works Chemist.

1897. Weigall, Arthur R., Kechau Mine, P. O. Kuala Lipis, Pahang, via S.S., Metallurgical Engineer.

1896. Weighman, Alf. T., 6, Chepstow Rise, Croydon, Electro-Chemist.

1898. Weissmüller, Rudolf E. *See* Miller, R. E. W.

1893. Welch, J. Cuthbert, Canadian Smelting Works, Trail, British Columbia, Chemist.

1899. Weldon, Leonard E., Lime Villas, Egypt Road, Nottingham, Dyer.

1891. Wells, Jas. Gray, Trent House, Branston, Burton-on-Trent, Brewing Chemist.

1894. Wells, Pierson L., 86, Joralemon Street, Brooklyn, N.Y., U.S.A., Patent Lawyer and Engineer.

1885. Welsh, Jas., Horrocks Lane Dyeworks, Red Bank, Manchester, Printworks Manager.

1890. Welsh, Thos. L., 3, Prince's Gardens, Dowanhill, Glasgow, Analytical Chemist.

O.M. Welsh, W., Holt Town, Manchester.

1897. Wense, Dr. W., Fabrikvorsteher, Bleicherode, Germany.

1890. Werner, Emil A., 5, Church Avenue, Rathmines, Dublin, Chemical Demonstrator.

1899. Wertheimer, Alf., c/o The British Uralite Co., Higham, near Rochester, Kent.

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Z

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SESSION 1900—1901.

Monday, Feb. 18th, 1901.—Discussion on the Occurrence and Detection of Arsenic in Manufactured Products.

Manchester Section.

Chairman: Dr. J. Grossmann.
Vice-Chairman: Ivan Levinstein.
Committee:

G. H. Bailey.
F. H. Bowman.
W. Brown.
J. Craven.
W. Heys.
J. M. Irving.
M. J. Langdon.
A. K. Miller.
H. Porter.
A. Rée.
F. Scudder.
Sir Thos. Wardle.

Hon. Local Secretary:
J. Carter Bell, The Cliff, Higher Broughton, Manchester.

SESSION 1900—1901.

Friday, Feb. 8th, 1901.—Discussion on the Presence of Arsenic in Acids and other Commercial Products.

Newcastle Section.

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Vice-Chairman: F. S. Newall.
Committee:

A. Allhusen.
P. P. Bedson.
G. T. France.
T. W. Hogg.
H. Louis.
H. S. Pattinson.
John Pattinson.
W. W. Proctor.
W. L. Rennoldson.
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J. Hasslacher.
E. G. Love.
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W. Foulis.
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Vice-Chairman: J. J. Hummel.
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NOTICES.

Changes of Address.

When notifying new addresses, members are requested to rite them distinctly, and state whether they are temporary permanent. Multiplication of addresses is also to be oided as tending to create confusion. When sending bscriptions, the use of the form attached to the application lps in the verification of addresses, on which the safe livery of the Journal depends.

Candidates for Election.

In the Journal for October 1900 will be found a Nomina- on Form and Prospectus for the use of those members ho have a candidate for election to propose. Please keep r use in case of need.

Authors of communications read before the Society, or y of its Local Sections, are requested to take notice that der Rule 43 of the Bye-laws the Society has the right of ority of publication for three months of all such papers. fringement of this Bye-law renders papers liable to be ected by the Publication Committee, or ordered to be stracted for the Journal, in which case no reprints can furnished to the author.

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gall, Philip, P.O. Box 843, Denver, Colo., U.S.A., Manager (Gold Extraction Works).

stin, Herbert, c/o George Scott and Son, Ltd., 67, Lord Street, Liverpool, Engineer.

ker, F. Guy Stirling, Marryatts Lodge, The Forest, Snaresbrook, Essex, Student.

clow, John J., 177, Manchester Road, Accrington, Calico Printers' Chemist.

ntley, Wm. H., 3, Woodbine Terrace, Irlam, near Manchester, Technical Chemist.

ton, E. Richards, c/o Trobridge and Co., South Shore Works, Gateshead, Manufacturing Chemist.

oome, Jos., 38, West 35th Street, Bayonne, N.J., U.S.A., Chemical Engineer.

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ly, Wm. H., 13, North Water Street, Philadelphia, Pa., U.S.A., Colour Chemist.

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wle, Arthur E., c/o Cia. Industrial Jabonera de la Laguna, Gomez Palacio, Durango, Mexico, Chemical Engineer.

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Trigger, Oliver, Chemical Department, Royal Arsenal, Woolwich, S.E., Analytical Chemist.

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Berolzheimer, D. D., l/o New York; 317, South 18th Street, Philadelphia, Pa., U.S.A.

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Duryea, C. B.; Journals to 31 (*not* 24), Gramercy Park, New York City, U.S.A.

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Fawcett, J. H.; Journals to Federal Metal Agency Co., Ltd., 1, Leadenhall Street, E.C.

Fowler, Gilbert J., l/o Flixton Road; Broad Oak, Urmston, near Manchester.

France, H. C. D., l/o Edgbaston; Avondale, Salford Priors, near Evesham.

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Frost, Dr. Howard V., l/o Arlington; 3958, Drexel Boulevard, Chicago, Ill., U.S.A.

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Lye, W. T., l/o Cromwell Road; Leagrave Hall, near Lu Beds.

MacKensie, Alex. H., North Adams, Mass., U.S.A.; spelling of name.

Mann, Harold H., l/o York; Indian Tea Association, R Exchange Buildings, Calcutta, India.

Marshall, F. G., l/o Noble Terrace; 4, Woodhouse Terr Bewick Road, Gateshead.

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lor, Walter; l/o 16, Agincourt Street, Heywood, Lancashire.

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shaw, Jos., Hollinwood, near Oldham.

ndam, Dr. Stevenson, Surgeons' Hall, Edinburgh.

ming, F. A., l/o 18, Billiter Street, London, E.C.

ertson, R. A., 8, Park Circus Place, Glasgow.

h, Wm., 38, Corn Street, Bristol.

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London Section.

Meeting held on Monday, January 7th, 1901.

MR. OTTO HEHNER IN THE CHAIR.

HE EARLY MANUFACTURE OF SULPHURIC AND NITRIC ACID.

BY OSCAR GUTTMANN, M. INST. C.E., F.I.C., F.C.S.

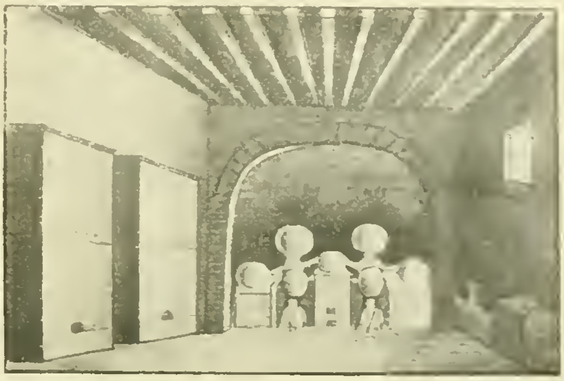
Sulphuric Acid.—Most of you are aware that huric acid was in olden times made "by the bell." earthenware dish with a burning charge of sulphur d on an iron tripod in an earthenware pan, and a bell was suspended over it. It was recommended to during the two equinoxes, because the air contains e moisture at these times of the year, and that of se helped condensation. Later on it was recommended 1683 by Sir Kenelm Digby) to put water into the pan, s to condense the fumes. Glauber, in 1648, already ht to mix some nitre with the sulphur. Nevertheless, method does not seem to have become universal, use in "The Chemical Works of Caspar Neumann, .S., London, 1759," a standard work at this time, we find the bell described as "the most common apparatus this purpose." In a foot-note Neumann says: "This ess has of late been so far improved by some particular ons as to furnish, at a very low price, almost all the now sold under the name of oil of vitriol. The rovement consists in employing very large glass vessels he capacity of a hogshead or more, in which is placed ittle water, whose steam collects and condenses the es; but principally in mixing with the sulphur a small ion of nitre, about 6 lb. to an hundredweight, which bles it to burn much more speedily than sulphur by lf, and without communication with the external air. this means nearly all the fumes are preserved. It does appear that the spirit thus collected contains any of nitrous acid, for the acid of nitre is destroyed by agration."

his improvement, as described by Neumann in 1759, patented in 1749 (No. 644, 23rd June) by Dr. Joshua rd and John White in London, but, according to Lunge, rd made oil of vitriol on a large scale at Richmond in 6 already.

n 1746 Dr. Roebuck, of Birmingham, invented a "lead se," viz., a square lead chamber, wherein the sulphur burnt and the fumes collected in water placed below. dently there was some trouble with the glass bells on arge scale. In 1749 (the same year as Ward and ite's patent) Dr. Roebuck and a Mr. Garbett erected ks at Prestonpans, on the east coast of Scotland; these st be considered as the first sulphuric acid factory, ause Ward's works in Richmond were merely a large oratory.

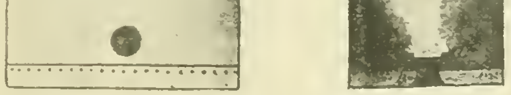
It has been my good fortune to find an old manuscript book, evidently recipes and experiments of a chemist named W. E. Sheffield, who lived in Birmingham from 1771 to 1790 (the dates occurring in the manuscript). The book contains, amongst various descriptions of chemical processes, an account of the manufacture of sulphuric and nitric acid at that time, together with beautifully executed drawings in Indian ink of the apparatus employed, and a general view of such a factory. This is reproduced in Fig. 1, where on the left are the "lead houses" for the sulphuric acid, and lower down, in the centre, the nitric acid plant.

Fig. 1.



I will give briefly, and partly in the quaint language of the manuscript, what he says "is the exact definition of Mr. Garbett; he has 30 in one room, each lies him in 8*l*." The "lead house" (Fig. 2) is 6 ft. wide in front at bottom, 4 ft. broad from front to back, and "raised or cast in the solid, without any soldering, 6 ins. deep." The bottom is made of 9-lb. lead. Two sheets of milled lead, $3\frac{1}{2}$ lb. to the foot, are riveted together and joined one upon the other, each 4 ft. broad and 20 ft. long, and also joined with lead rivets to the bottom. Thus the "house" is $8\frac{1}{2}$ ft. high, 6 ft. long, 4 ft. wide. The top of the "house" is slightly convex, and fastened by "bresting over the sides."

Fig. 2.



The whole is well supported with the back wall and wood framing, to which latter it is riveted with lead rivets both at the top and the sides. In the front, 8 ins. from the bottom, is a round hole of 10 ins. diameter, cut out with the edge turned up, so that a lead stopper may be inserted. The lead house stands solid on sand, and on the common floor of the building. To each belonged also a pedestal of lead 7 ins. high, and a dish of lead 10 ins. wide, turned up 1 in. to receive the sulphur and nitre, of which it held 1¼ lb. As stated above, the lead house cost 8*l*., and, considering that it weighed nearly 10 cwt., lead constructions do not seem to have been expensive at that time.

In the lead house are put 5 cwt. of water for the first time, but only 4 cwt. at each subsequent operation, "because you can't crane it all out by 1 cwt." A mixture is made of 112 lb. of sulphur and 14 lb. of rough nitre (12·5 per cent.*) by first breaking up the sulphur and sifting it, until small enough for the mill, then mixing it with the well dried nitre, and grinding in a hand mill until as fine as meal. A ladle full, holding 1 lb., is put into the dish, and the mixture touched with a red hot iron bar. Then the stopper is put in, and after burning for two hours the hole is left open for an hour. This is twice repeated, after which the dish is taken out to remove the "salts." This operation is continued with 10 houses, served by one man, day and night for a month, or until the water weighs 20 oz.

Some explanation may be here interposed about the terms then used for expressing the density of a liquid. This is given as the weight of a volume of the liquid, which is equivalent to the volume of 1 lb. of water. Thus, if the acid "weighs 20 oz.," or is "4 oz. heavier than water," it means that a measure holding 1 lb. of water would hold 1¼ lb. of the acid.

It can be readily understood that by the way the sulphur and nitre were burnt, a large amount of unconsumed sulphur was left in the "salts." They were therefore carefully saved in a box, ground over again with 7 lb. of fresh nitre per cwt., and on burning they yielded as much acid as before. The "salts" now resulting were called "thirds," and were again ground together with 3½ lb. of nitre per cwt., but those obtained from this operation were thrown away.

There is a note in a later handwriting that the "thirds" must be burnt in cast-iron pans about 8 ins. diameter, ½ in. thick, turned up 1½ in. The pans had to be made red hot before the salts were put in, because no doubt the mixture would not burn readily any more.

After a month's working the acid was craned out with a lead crane or a siphon. The water put in at first stood 4 ins. deep in the bottom. This increased by 400 oz. weekly, and in a month would be 5 ins. deep. We can thus arrive at an estimate of the work done. At six charges per day, in 26 working days, 156 lb. of sulphur would be burnt in a month, yielding 737 lb. of sulphuric acid of 1·250 sp. gr., or 33·43 per cent. H_2SO_4, which is a yield of 158 per cent. monohydrate for 100 sulphur burnt, against the theoretical 306¼ per cent.

The weak acid was boiled down in open lead pans, 6 ft. long, 2 ft. wide, 1 ft. deep, until it weighed 24 oz. (1·500 sp. gr.), and it was then called "weak spirit of salt" or "pickle." The manuscript then says: "In order to make it into oil of vitriol continue to boil away until 32 oz., which is the adopted standard of oil of vitriol."

This would mean that the standard sulphuric acid at that time had a specific gravity of 2·000. Mr. James Mactear, F.I.C., in two very valuable papers read before the British Association in 1876, and before the Glasgow Philosophical Society in 1881, respectively, gave a very detailed history of the manufacture of sulphuric acid from the earliest times, and more especially in the Glasgow district. He gives there a copy of a calculation made in 1799 about the temperature to be aimed at in burning the sulphur, and therein the strength of sulphuric acid is also mentioned at 2·000, "which Kirwan calls his standard acid."† Although in Neumann's Chemistry of 1759 it is already stated to be 1·8775 on the authority of Fahrenheit, which is approximately the maximum gravity as found by Lunge and Naef, yet Kirwan, in 1791,‡ still made the following statement, which is evidently the basis of the standard 2·000: "I neither could make nor procure oil vitriol whose specific gravity is 2·000 in the temperatu of 60°. Yet in cold climates this acid has frequently be produced, and as it is the strongest, or nearly so, than c be exhibited by art, I take it as the standard of the streng of all other acids of this kind." Kirwan was probably t first who made tables showing the gravity of various aci of different percentages and at varying temperatures. informant, Mr. Sheffield, seems to have been equa puzzled, because he makes the following note: "N.B.- have weighed both Mr. Skey's* and Mr. Garbett's, and weighs but 30 oz. (1·875 sp. gr.), which is a very conside able profit."

At the end of the manuscript, perhaps also written ab 1790, are particulars about a factory belonging to Mr. Marg which are also very interesting. This "lead house" w already larger, 20 ft. square and 11 feet high, contain 1,400 cubic feet. It had three doors in front and a wat luted valve of 10½ ins. diameter on the top. There w three rectangular pans, 29 ins. by 19 ins., charged wit mixture of 100 sulphur to 18 nitre, each pan receivi 12 lb. of sulphur and 2 lb. 2½ oz. of nitre. Six char were made in 24 hours, and thus in six working d 1,296 lb. of sulphur and 234 lb. of nitre were used. T time for burning each charge was three hours, but air w admitted for half an hour only, and the process w continued for six weeks, until the acid weighed 27½ 28 oz. (1·719 to 1·750). The bottom of some hou was divided by a partition, so that the acid of o compartment could be used whilst the other gain strength.

From the data given the cost of the acid was follows:—

	£	s.	d.
1,296 lb. of sulphur at 2½*d*. per lb.	13	10	0
234 „ nitre at 70*s*. per cwt.	7	6	3
	20	16	3
Deduct drawback on sulphur used for making O.V., paid every January, at 10*l*. per ton	5	15	9
	15	0	6
Retorting, 1*d*. per lb. yield	10	16	0
	25	16	6
Yield, double the weight of sulphur employed = 2,592 lb., weighing 29½ oz. (1·844 sp. gr.) Cost per ton, without reckoning labour	22	6	4

The acid was sold on four months' credit at 3¾*d*. per = 35*l*. per ton, and at six months' credit for 4*d*. per lb. 37*l*. 6*s*. 8*d*. per ton, which sum was paid at the end of credit by a two months' bill; thus, giving long credit then also known. The price was said to leave 25 per ce profit.

The "retorting" (concentration) was done in gl vessels, but platinum vessels were also used, and Sheffield states that one, holding 30 gallons, cost ab 300*l*.†

At the end occurs the following remark: "I think would be an improvement to agitate the gases by placin fan of lead in the house, and I suspect it is not necessary let the gases escape indiscriminately."

The method of making oil of vitriol given here seems have been in use all over Great Britain at this time. Mactear enumerates 23 factories in England alone in 18 of which seven were in London. The oldest factory in existence is that of Thomas Farmer and Co., Ltd., wh was started at Kennington Common in 1778. Br furnaces attached to the chambers for burning the sulp were erected in 1807, and steam was introduced into chambers in 1813 or 1814.

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* Rough nitre in 1780 contained only about 70 per cent. of KNO_3 (Bottée et Riffault, Traité de l'art de fabriquer la poudre à canon, Paris, 1811).

† From a very interesting paper by Mr. Bennett H. Brough, F.I.C., published in the "Ars Quatuor Coronatorum" of 1900, I find that Richard Kirwan, F.R.S., lived in Dublin, and was a very eccentric scientist, who received the Copley Medal in 1782.

‡ Of the strength of acids and the proportion of ingredients in neutral salts. By Richard Kirwan, F.R.S., Dublin, 1791, p. 7.

* Skey's factory was in Dowles, in Worcestershire.

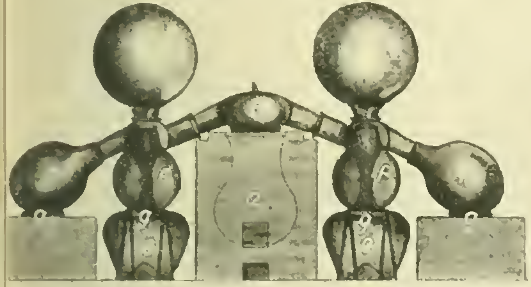
† This statement causes me to doubt whether this last note written in 1790. Although the first platinum crucible was m by Achard in 1781, yet Mr. Sellon, of Messrs. Johnson and Matt has no knowledge of a platinum vessel for sulphuric acid hav been made before 1804; the price of 300*l*. would correspond to price of 14*s*. per ounce, which platinum cost at this time.

he character of sulphuric acid at that time is given by rwan* as follows: "Though pale, yet a little inclined red. It contained some whitish matter, as I perceived its growing milky on the affusion of pure distilled water. ow far this may alter the result of the following experients I have not tried; but believe it to be as pure as at which is commonly used in all experiments, and erefore the fittest for my purpose."

B. *Nitric Acid.*—Nitric acid seems to have been known the earliest times. It is said that the black drawings the clothes of mummies were made with silver nitrate, t the first description of the production of nitric acid qua dissolutiva, aqua fortis) is given by Geber in 778, ho made it by distilling nitre with copper sulphate and um. Raymond Lullius, in the 13th century, made it om nitre and iron sulphate, and Glauber, in 1648, taught to make it from nitre and oil of vitriol. In 1759 was still made, according to Neumann, by charging a bulated retort placed on sand with powdered nitre, ting on a large receiver, and pouring in oil of vitriol in all quantities through the tubulure.

Mr. Sheffield's manuscript of 1771 gives many details out the manufacture on a large scale. The general rangement is shown in Fig. 1; but instead of reproicing each part of the apparatus singly, as drawn by m, I have preferred to put them together, so that the nction of each can be seen at a glance.

Fig. 3.



The retort was an iron pot *a* (Fig. 3), holding 37½ galls. d weighing 20 cwt. It could take a charge of 200 lb. nitre and 104 lb. of oil of vitriol; thus neutral sulphate as aimed at, which was called "sal enixum." The pot as closed by a pothead *b*, with two arms, "made at auxhall" from earthenware. Each of these arms was nnected to a condensing plant. This consisted of a kind crosspiece *c*, called the pipe receiver, which was surounted by a "ballon" or large globe receiver *d*, holding) gallons. The lower part was luted to a "perpendicular ceiver" *e*, and the arms to "large common receivers" *f f*, olding 30 gallons each. The latter rested on "bosses" *g*, ade of twine. The luting was made of equal parts of ean sand and "hufcap," a kind of clay, with one-quarter rt of "sal enixum" and some water.

The distillation lasted four days. Towards the end the re was raised "intensely high." The consumption of coal as 5 cwt., and the production 200 lb. of "gilder's aqua rtis" (1·375 sp. gr.; *see* later on), which works out at bout 96½ per cent. of the theoretical yield.

The cost of production works out as follows:—

	£	s.	d.
200 lb. of nitre at 70*s.* per cwt.	6	5	0
104 „ O.V. at 3¾*d.* per lb.	1	15	1
5 cwt. of coal at 5*d.* per cwt.	0	2	1
For 200 lb. of gilders' acid	8	2	2

Cost without labour, per lb., approximately, 9¾*d.*

It will be noticed that the distillation of a 200 lb. charge sted four days, which is explained by the fact that the ondensing plant had no vent for the uncondensed gases, nd had therefore to be worked very slowly.

There were many kinds of aqua fortis sold, which are enumerated in the following table:—

———	Weight. oz.	Weight. dr.	Sp. Gr.	Price per lb. s.	Price per lb. d.
Pure spirit of nitre	23	12	1·485	3	6
Gilders' aqua fortis	22	0	1·375	1	8
Brass-founders' aqua fortis	24	0	1·500	1	8
Syers' (assayers') aqua fortis Refiners' aqua fortis	20	0	1·250	1	3
Best platina	24	15	1·559	1	1
Single aqua fortis, or weak platina.	23	0	1·437	0	10
Twelve-penny aqua fortis	24	6	1·523	1	0

Some explanation for this table is, of course, necessary, and given. The various receivers had generally some water put in before starting, but if no water was put into the perpendicular receiver, then "pure spirit of nitre" was obtained. If, on the other hand, 10 lb. of water are put into it, then gilders' acid resulted; and if this was not up to standard, pure spirit of nitre was added, whilst, if too strong, weak aqua fortis or water was used for dilution. Gilders' acid is the most useful, because most other sorts are made from it by mere mixing.

For making syers' and refiners' aqua fortis, 30 lb. of water are put into each of the other receivers, and the various acids mixed together.

Brass-founders' aqua fortis is made by mixing 60 parts of gilders' aqua fortis with 10 parts of oil of vitriol. The manuscript naïvely adds: "Sells for 20 pence, the same price of gilders', tho' lowered with 1/6 of oil of vitriol; this justly esteemed a very particular secret in this branch of business."

Platina aqua fortis is made from 16 parts of gilders' acid and 40 lb. of oil of vitriol lowered to 25 oz. "It is used for best dip for platina."

Single aqua fortis, or weak platina, is made from 16 lb. of gilders' acid brought down to 21½ oz., and 40 lb. of oil of vitriol lowered to 24½ oz. "Used for the first dipping of platina work."

Twelve-penny aqua fortis is the same as the weak platina, only the gilders' acid is of the proper strength. It is also used for finishing platina.

The manuscript also contains an account of the manufacture of nitric acid in glass retorts, 9 ins. diameter, 12 ins. high, and called quart retorts, which were made by Stocks, near Blackfriars Bridge, and could be charged with 14 lb. of nitre. The coal consumption was excessively high—about 11 lb. per pound of gilders' acid; yet there was a profit of about 25 per cent.

Improvements in plant for the manufacture of nitric acid were made in recent years only. Plain pots can still be found in some factories, and the condensing plant is also frequently of a very primitive nature.

Discussion.

Mr. **Forbes Carpenter** said that he had with him a few notes of one of the oldest sulphuric acid works in England, which had been in continuous operation since 1791. Messrs. Bealey, of Radcliffe, near Manchester, began as a bleach works in 1683, and in 1791 commenced the manufacture of vitriol for bleaching purposes. He had obtained from them some account of the operations carried on in those early years, and Mr. Mactear, in his paper read before the British Association in Glasgow in 1876, gave a description of working in use at Messrs. Bealey's in 1799, as follows:—"There were six chambers, 12 ft. by 10 ft. by 10 ft., roofed like a cottage. They were placed in houses having openings in the brick walls, leaving the lead to be exposed to the atmosphere. This is perhaps of more use in expediting the filling of the chambers with fresh air than in aiding condensation. Mr. Laird (a Glasgow manufacturer of that period) says that the hotter the chambers are kept the more perfect is the condensation. Each of these chambers has a valve, which is opened between the burnings. In them there is burned each week 1,386 lb. sulphur and 198 lb. nitre, burnt in double pans the larger

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[*] Philosophical Transactions of the Royal Society, 1781, p. 22.

above the lesser, and yielding 1,800 lb. of O.V. of 1·8 sp. gr. (equal to a produce of 130 per cent. on sulphur, with 14·28 per cent. of nitre); 8 to 9 ins. of water on the floor of the chamber. The sulphur and nitre are mixed in the proportion of one of nitre and seven of sulphur. Of this mixture 8 lb. are burned in each chamber every four hours. The mixture is burned on iron plates or trays, of which there are two sets only in each chamber (more not being found so productive), each set consisting of two plates, one placed over the other, about 3½ ins. apart. The iron is of best quality and very thin, so that they heat quickly. They are supported on a frame, which can be drawn out at the door of the chamber. 4 lb. weight of the mixture is put upon the lower plate, and 3 lb. on the upper plate. The plates being charged, the lower plates are first ignited, and, when fairly lit, then the upper plates; the frame is then pushed into the chamber and the door shut. The whole will be finished burning in one hour. Charge again three hours after the burning is over, or once every four hours, opening the doors and valves a quarter of an hour beforehand. The plates to be cleaned each time. By keeping this going on, they in six weeks made their O.V. attain a gravity of 20 oz. (1·250 sp. gr.), when it is run off for concentration to 22 oz. (1·375 sp. gr.), when it is used for bleaching liquors, &c. Having six chambers, therefore, affords one for drawing off each week.

State agreeable to the above.

	£	s.	d.
1,386 lb. sulphur at 22*l.*	13	12	3
198 lb. nitre at 64*l.*	5	13	1½
Labour	1	1	0
Tear and wear	1	1	0
	21	7	4½
Off for drawback on sulphur, at 6*l.* 12*s.* 8*d.* per ton	4	2	0½
Producing 1,800 lb. O.V., costing	17	5	4

Equal to 2⅓*d.* per lb., or 21*l.* 10*s.* per ton.
Interest on sunk capital omitted in this state."

As the works at Prestonpans had been mentioned, he might say that this was the first works of which Mr. Mactear had found any record. Dr. Roebuck, who erected them, was active in many branches of industry in Scotland, and, with some friends, set up, among other ventures, the Carron Ironworks, celebrated for the casting of "carronades." At the Prestonpans works there were 108 chambers, each 14 ft. long by 4 ft. wide and 10 ft. high, and at Burntisland they had 360 chambers, 8 ft. by 4 ft. by 6 ft. high. He himself had seen and talked with men who had seen such small chambers in use (described to him as of the size of tramcars), and whose fathers had worked them. Messrs. Bealey were unable to give the price of acids sold then, 1790—1800, as they made principally for their own use; but from inventories taken at different periods from 1802 to 1813 it was found that the price of brimstone varied from 20*l.* to 27*l.* per ton, and nitre from 49*l.* to 50*l.* per ton. The oil of vitriol bottles cost 4s. each, and the contents 2*l.* In Cornwall he had come across the remains of a work where the manufacture of sulphuric acid was attempted in chambers (and that seemed a solitary instance) whose sides were of dressed native granite, which was put together with as little tar and china-clay cement as possible. He had seen some of these dressed blocks still in existence, but of course used now for other purposes. The top and bottom of the chamber were of lead, he was told.

Mr. W. F. Reid said the members were very much indebted to Mr. Guttmann for rescuing from oblivion the interesting records of early days. In every new process that came out the first fight was with the development of the plant, and in an industry of that kind it was interesting to know how they got over their difficulties in the beginning. He had looked up some old authorities on the matter, and had come across some very early instances of the manufacture of nitric acid and sulphuric acid, and the methods were interesting. The knowledge of the subject seemed to have been widely spread in Germany about the beginning of the 16th century. In a book entitled "The Treasure of Euonymus," translated from the German in 1565, most of the references were to German writers, and the sources of some of the materials specified were in Germany. With regard to the manufacture of "oyle of brimstone," or "oyle of vitriol," the method chiefly used was to distil sulphate of iron, either alone or with some substances which liberated the acid, or to burn sulpher in very large vessels. They knew the use of nitric acid in connection with this manufacture.

"For the making of oyle of brimstone, a mā must chuse out y^{e} which is pure and neuer touched the fire, chiefly aliue and of an ashy colour. This oyl is made many waies at Rome, by sublimatiō and discencion, &c. Take a vessell of glasse, not much unlyke to a little bel, daubed wyth potters claye, hang it the space of a cubit from the grounde, by a wyer of bras or yron, under y^{e} which thou shalt set a basē of glas of a great cōpas, wyth a pot turnde upsyde downe. Moreouver the bottom of the potte sha hold up an yron plate of four fingars broade, made redhoat wherupon the brymstone may be brent. Whyles this is brēt new shalbe added upō it. Therupon it shal com to pas that by the smoke ascending, the hanging vessell in short space shall destill drop down into the basen that standes under, an oyl whych gathered diligently thou shalt serve in a phyal of glasse."

"The oyl of vitriol is maruelous, burning lyke a hoat irō without grief, and is made in this maner: 30 ounces of vitriol of Rome or of Cypres, sal nitrum, roche alum, of ether 4 ounces. When they are all beate let them be calcionated with fire according to art. Afterward put that calcionated in a croked bocia clayed for the fire of an alchymists fornace, and by the fyre thou shalt have the oyl incresed in the receiuer; whych is a meruelous cauterium or burning thing, and hath no pere in any operation and chiefly in taking away of wens and great wartes. But the receiuer muste be greate, if thou wilt make the foresay oyl."

"While y^{e} oyle is preparyng ye must take hede of y smoke: because it doth not onely kil men, but also y^{e} trees that be nye, it drieth thē vp."

There was a curious reference to "oil of salt" also, and they were thus evidently acquainted with hydrochloric acid in those days. With regard to *aqua fortis*, there was a very curious description. They distilled *aqua fortis* from vitriol, *sal nitrum* and alum. These products were chiefly used medicinally. "If a man put a drop of them into a wen or warte fyrst cut they take it away; of the which thyng I made a tryall in myself upon a warte on my fyngars end, and although it went not away by and by, yet within a fewe wekes it was gone."

The following appeared on page 320:—

"Aqua fortis or to separate metalles is thus made. One part of sal nitrum, liquid or molten alum (that they cal roche) three parts: sand half a part, whē they are dried diligently and purgeth with the fyre, let them be destilled in a vessell of glasse. It is gathered by itselfe, that which issueth out fyrst, at length whē yē glasse loketh lyke a saffron colour, increase the fyre and an other followeth: which is receaued in the fyrst for the moste parte, and yet if thou take it in water of the fountain or well, it is yet so sharpe that neuertheles it dissolueth siluer, and separateth it from golde."

He thought it might be interesting to the members to know that in those early times they made use of the same reactions; they practically liberated sulphuric acid from sulphate of iron and caught it in vessels of glass, and obtained the oil of vitriol. It would also be of great interest if they could determine when nitric acid was first discovered; he himself had not seen any article recording it.

NOTES ON THE SO-CALLED "HEAT TEST" FOR EXPLOSIVES.

BY W. CULLEN.

Few empirical tests have such an important influence on manufacturing processes as the so-called "heat test," which is used every day and all day in explosives factories. By it the stability or purification of the products is gauged at each successive stage of the manufacture.

Mr. Guttmann, in a paper read before this Section of the Society in April 1897, proposed to substitute for it diphenylamine; and, later on, Dr. Giovanni Spica, in the "Rivista" of August 1899, finding serious objections to the use of this reagent, substituted for it hydrochloride of metaphenylenediamine, which he asserted was preferable.

On the occasion already referred to, Mr. Guttmann, among others, made the following statement:—

"The iodide test as at present prescribed is absolutely inapplicable for most of the modern smokeless powders and also some blasting explosives."

This is rather a sweeping assertion, but at the same time it must be admitted that the "test" leaves something to be desired. The object of the present paper is to show, however, that it is not quite so bad as it is made out to be, and to make an endeavour to remove some of the admitted defects.

At the present moment most firms engaged in the manufacture of explosives make their own test papers in as nearly as possible the manner prescribed by the Home Office. A point to be very particularly observed, however, is that it is a very rare occurrence for "test papers" obtained from different sources to give the same result, and sometimes the differences are very great.

Two separate series, carried out within the past twelve months with "cordite," may prove of interest. The papers were obtained from six separate sources:—

Paper.	Series I.	Series II.
		Minutes.
A	22	19
B	27	24
C	40	37
D	21	25
E	50	46
F	37	37

Maximum difference in first series, 28 minutes.
" " second " 27 "

Examples like these could be multiplied *ad infinitum*, but with explosives, which do not withstand the "test" for such a long time as cordite, the differences are not so marked.

In investigating the subject I have come to the conclusion that the primary factor to be considered is the filter paper employed. The best English filter paper ought to be used, and it is prescribed that it must be washed in distilled water, then dried. Now, I can say with almost absolute certainty that if anyone will take the trouble to go to three different manufacturers, and from each procure a sample of filter paper, three different "heat-test" papers will be made from them, even although the same chemicals be used throughout. As has already been shown, the difference is not infrequently 50 per cent., and the question naturally arises which test ought to be taken. With empirical tests of this sort the only thing to be done is to standardise as far as possible, and it does not at all follow, as many assume, that because a batch of "test" papers gives low results the papers themselves are faulty. Thick papers invariably give a longer test than thin papers, but even the difference in texture has its influence. Again, papers which contain traces of the chemicals used in purifying the pulp, invariably give low "heat-test" papers.

In a general way, these facts are known to manufacturers, but it has been left to the War Office to recognise them in a practical manner, by having only one source of supply for their factories in this country and inspecting officers abroad. One source of filter paper alone is made use of, and enough is put on one side to last for a number of years. By this means, continuity is as far as possible attained, and each fresh batch, or "mark" as it is called, is standardised against previous issues. By the courtesy of Dr. Kellner and Major Nathan, I am able to reproduce the records for the past few years; but the following results, carried out in August of this year at Waltham Abbey, will illustrate the system of testing. It is observed that Mark O is a little more insensitive than M or N, but in the more elaborate table which follows, it is seen to mellow with age:—

TABLE I.

Date of Test, 29th August.

Gun-cotton.			Mixed Material.			Nitro-glycerin.			Cordite.			Date of Receipt of Papers.
M.	N.	O.	M.	N.	O.	M.	N.	O.	M.	N.	O.	
14			8			21			68			25.11.1899
	15			11			22			68		22.8.1900
		19			18			24			70	22.8.1900
15			10			24			81			25.11.1899
	16			10			24			81		22.8.1900
		19			12			24			83	22.8.1900
16						19			55			25.11.1899
	17						19			55		22.8.1900
		20						20			58	22.8.1900
15	16	19½	9	10½	11½	22⅓	21⅔	22⅔	68	68	70⅓	Mean

The "mixed material" referred to in the foregoing table is the same as the "paste" of the next table, and is in reality the mixture of nitroglycerin and guncotton used in making cordite. The more elaborate table will well repay careful perusal, as it embodies all "standardising" results from 1897.

One point in connection with these records is that sensitiveness appears to diminish with age, while most experimenters find the opposite. On one point, however, all are agreed, *viz.*, that up to the age of six weeks results are erratic, but after this, for some reason at present unexplained, the papers settle down, and can be kept for years without alteration.

It may be of interest here to state that the paper used by the Government, or at least the War Office, is like ordinary thin blotting paper. The average thickness is 0·0082 in. thick, and the air-dry weight per square metre is 75 grms.

My proposal is that all engaged in carrying out this test ought to combine and have one source of supply only, the source, whoever or whatever it is, being under the direct control of an experienced explosives chemist. It would also form part of my scheme to buy or have prepared a special lot of paper, sufficient to last for at least five years, possibly longer. This central supply would naturally be in a favourable position for standardising its papers against those of the various Government departments, and of course, if they could be brought to join in the federation, matters would be still further simplified.

Such, then, in brief, is the proposal to rehabilitate the "heat test" in the eyes of many who even now look on it as more or less of a farce, and I think it will greatly assist in doing so. Even in its new form, abnormal results will sometimes be obtained, but it will certainly apply to 999 cases out of every 1,000. I am at present experimenting with very thin sheets of unglazed earthenware instead of paper, but the results are not yet sufficiently far advanced to be given.

The "heat test" does not claim, as many think, to measure the relative stability of *different* explosives. For instance, it is ridiculous to assert that, by the mere assembling together of the different ingredients which go to form cordite, an explosive is produced which is four times as stable as the guncotton used. The whole matter is one of the physical condition of the new explosive, its state of division, as also the temperature at which the test is carried out. We know that, given raw materials, such as those referred to in the tables, and a certain state of subdivision, a certain test is obtained. If the test is abnormal, then there is something which has to be looked for. The addition of vaseline altogether alters the physical condition of cordite, and, while it does act as a retarding agent for the gases of decomposition to a certain extent, it also increases the toughness and makes subdivision more difficult.

TABLE II.

Comparative Testing of Heat-Test Papers.

	New Papers received from Woolwich.					Previous Supply in current use.				
Date of Test.	Mark and Date of Receipt.	Heat Tests with				Mark and Date of Receipt.	Heat Tests with			
		Gun-cotton.	Nitro-glycerin.	Paste.	Cordite.		Gun-cotton.	Nitro-glycerin.	Paste.	Cordite.
		Mins.	Mins.	Mins.	Mins.		Mins.	Mins.	Mins.	Mins.
15.1.97	H	16	26	..	42	I	16½	30	..	48
20.5.97	H	13½	36, 35	..	..	H	13½	36, 35	..	..
19.7.97	H	15, 15	26	..	..	H	14, 17	25	..	..
26.8.97	K	16, 16	35, 35	16	..	H	15, 15	32, 32	16	..
15.10.97	K	14, 15, 16	27, 30	20	36	K	14, 16, 15	27, 30	20	33
3.12.97	K	15, 14½, 14, 14, 15.	28, 21	15	50, 42, 46	K	13, 13, 12, 12, 13.	24, 17	13	43, 35, 38
3.3.98	K	15, 15	31, 25	15, 15	82, 54	K	13, 13	31, 25	13, 13	82, 54
"	L	"	30, 36	15, 17	58, 86	K	"	25, 31	13, 15	54, 82
7.6.98	K	15, 16, 13½	25, 27, 32, 25, 34.	15, 15	90, 102	K	15, 15, 15	25, 27, 24, 23, 22.	15, 15	90, 102
"	L	15, 16, 14	26, 28, 24, 24	"	"	L	..	37, 27, 26	..	..
28.9.98	L	16, 16	21, 21	17	72	L	15, 15	19, 19	17	66
11.1.99	L, 11.1.99	14, 14	19, 25	15	62, 64	L, 28.9.99	14, 14	19, 25	15	62, 64
3.3.99	M, 3.3.99	18, 14	35, 34	..	70, 71	"	16, 13	30, 29	..	65, 65
6.3.99	"	16, 16	..	24	80	"	14, 14	..	20	74
8.5.99	M, 6.5.99	19, 19	24, 26	20	78, 69	M, 3.3.99	19, 19	24, 26	20	78, 69
28.8.99	M, 26.8.99	18½, 19½	25, 24	20	80, 76	M, 6.5.99	18, 19	25, 24	20	80, 76
29.11.99	M, 25.11.99	18, 18	25, 25	23	84, 81	M, 26.8.99	17, 17	24, 24	22	84, 84
26.1.1900	N, 26.1.00	21, 22, 27, 20, 20.	32, 33, 28, 30	17	102, 68, 122, 126.	M, 25.11.99	17, 17, 22, 15, 15.	31, 32, 26, 27	13	83, 48, 102, 105.
1.6.1900	N, 31.5.00	16½, 15, 14	25, 24, 24½	16	78, 79, 46	"	16, 15, 14	24, 24, 24	15	78, 78, 46
4.7.1900	N, 2.7.00	20, 21, 22	22, 21, 25	12	38, 54, 60	"	21, 20, 21	21, 20, 24	12	38, 54, 60
29.8.1900	N, 22.8.00	15, 16, 17	22, 24, 19	11, 10	68, 81, 55	"	14, 15, 16	21, 24, 19	8, 10	68, 81, 55
"	O, "	18, 19, 20	24, 24, 20	11, 12	70, 83, 58					
25 & 26.9.1900	O, 25.9.00	15, 20, 24	19, 19, 20	16, 16	45, 66, 42	"	15, 20, 21	19, 19, 20	16 16	47, 67, 42

In other cases the converse takes place, and the heat test is lowered. Experience has shown, therefore, that by the assembling of certain materials a certain test is generally obtained, and is to be expected. If it is lower, instability may be looked for; if higher, then "masking," deliberate or accidental.

The presence of vaseline in cordite does not hide evidences of instability when this explosive has been stored in India for a time. But the test does fall to a most alarming extent, although it does not enter into the scope of this paper to discuss the causes.

Undoubtedly the advent of the horny smokeless powders of modern times has made it a little difficult to give the test the same scope as it had when first introduced; but here again it is only a question of adapting it in a commonsense manner to the special circumstances arising. As a rule, a simple explanation can be found for every apparently abnormal result, and, in the accidental retention of a portion of the solvent used in the manufacture, will frequently be found an explanation of the trouble experienced.

I have frequently found the heat test of the interiors of grains and cords to be quite different from the surfaces, and no doubt this is common enough. In cases of doubt it would certainly be advantageous to have some other verification test, and perhaps that of Mr. Guttmann or Dr. Spica would form a very valuable adjunct to the present test. Most manufacturers know to their cost that a batch of explosive made from perfectly stable ingredients will frequently give a test much below the normal, and experience has led them to assume that bodies other than the products of decomposition do sometimes affect the papers adversely. What these bodies are remains yet to be discovered, but the mention of facts like these merely shows that there is still a field for research in this already much investigated sphere.

Some years ago now, when carrying out a very comprehensive series of experiments in connection with this same subject, I found that a very good check was to carry out the following test. The explosive to be examined was subdivided as required and placed in a U tube, which was heated for 30 minutes in a water-bath kept at the requisite temperature. Through the tube purified air was passed, and the escaping gases made to bubble through absorption bulbs containing *m*-phenylamine-diamine. I tried iodide and starch, as well as diphenylamine, by the same method, but the *m*-phenylamine-diamine turned out the most satisfactory. At the expiry of the 30 minutes the depth of colour was ascertained in much the same method as Nessler's test is carried out; and, of course, by doing a blank or standard explosive, or both, a ratio was established between this test and the heat-test results.

When all is said and done, however, I do not think it will be necessary to resort to a confirmatory test of this sort in one case in a thousand.

DISCUSSION.

The CHAIRMAN, in inviting discussion, said that it was a matter on which much discussion had already taken place, and it was of the utmost importance to manufacturers.

Major NATHAN said that he entirely agreed with Mr. Cullen as to the desirability of having standard test papers made in some central establishment, from whence all interested could obtain their supplies, for that would do away with the variabilities incidental to the manufacture of test papers at different establishments, of which Mr. Cullen had given examples. In the old days, before an arrangement had been come to with the Chemical Department at Woolwich there were endless arguments and discussions as to whether the heat tests at Waltham Abbey or those at Woolwich were right, but they eventually adopted one source of supply for test papers, and since then there had been no trouble. It was a fact that freshly made test papers were not reliable, but after a month or six weeks they had settled down, and remained constant for a considerable time. They had ascertained this by employing a standard explosive and testing the test papers with it, and they had found the results pretty constant. When one supply was nearly exhausted they obtained another supply from Woolwich, and tested the new papers against those previously in use, with the results shown in Mr. Cullen's tables. He thought that the heat test left a great deal to be desired. The chief difficulty arose from the fact that they did not know what it was in the explosive that affected the test paper. They did know that samples of apparently safe explosives would give a very low heat test; for instance, samples of cordite from India had gone down to an alarming extent, alarming only because the heat-test figure was low; but that explosive, when tested for composition or ballistics, was found not to have suffered in the slightest degree, and having reached the low point of four or five minutes it did not seem to get any worse. He had had samples of cordite that had failed to stand the heat test, and had then subjected them to considerable temperatures, with the idea that if decomposition had set in it would have been aggravated, and something much more alarming would have resulted. Strange to say, the heat test of those explosives had gone up in the process of heating, perhaps from five to twenty-five minutes. Therefore it did not follow than an explosive that had dropped in the heat test was dangerous. There were factors which affected the heat test which were still unknown, and until they were known one could not regard the test as infallible. At the same time it was most valuable, as it undoubtedly did give an intimation whether the manufacturer had thoroughly purified the raw materials and the finished nitro-explosives. He did not think, however, that a subsequent drop in the test meant that an explosive had gone bad. There were many remarkable things about the heat test. For instance, guncotton mixed with nitroglycerin would sometimes stand only a very low test, though the tests of both were good separately. Separate them again and they both came back to their original heat tests. That, in his opinion, required explanation. With regard to the other tests mentioned by Mr. Cullen, the diphenylamine test was a very good one when applied to explosives of the guncotton type. Some four years ago, when the question cropped up, he made a great number of experiments, and the diphenylamine solution for them was made by Mr. Guttmann himself. As long as he stuck to guncotton explosives he got concordant results, but when he used it for testing nitroglycerin, or explosives containing it, he obtained neither the reaction he ought to have got nor any consistent results. Subjecting a volatile explosive to a heat test in which the reagent was dissolved in sulphuric acid probably had something to do with the unreliability of the results obtained. The metaphenylenediamine test referred to he had also tried, and although the results were claimed to be four times as sensitive as the Abel test, yet his results did not confirm that claim. He found that the heat tests were much the same when testing guncotton and nitroglycerin, whether he used Dr. Spica's reagent or the Abel reagent. But when he came to an explosive like cordite, or explosives containing much nitroglycerin, the results differed widely. Of the three tests, he considered the Abel test the most reliable, but there was much still to be found out about the subject. The most important point to be cleared up, in his opinion, was, what are the volatile bodies that affect the heat test? for it was evident that free acid, as at first supposed, was not by any means the only one.

Mr. O. Guttmann said that Mr. Cullen started by saying that the diphenylamine test he had indicated some years ago was not a better test than the iodide one, and that his statement as to the value of the iodide test was a sweeping one. He (the speaker) begged leave to repeat that statement in the most emphatic manner. The diphenylamine test could not be bad, because four Governments had adopted it, either as the sole test or to control others, and because the British Government had modified the iodide test so that the objections made to it were to some extent removed. If there was a justification needed for his statement, it was to be found in Mr. Cullen's table No. 1. One had only to look at the column "cordite paste" (a mixture of nitroglycerin and guncotton), standing only eight minutes, and the same, *plus* vaselin and acetone, standing 68 minutes, to show that the iodine test was fallacious for smokeless powders. The acetone and vaselin masked the heat test, and made it go up to ten times what it ought to be. Major Nathan had said, and perhaps there was some justification for it, that the diphenylamine test was not so reliable as he had expected. He was quite ready to admit that it had some faults, and he had never claimed to have found the test. He was not the inventor, but had simply adapted it to the purpose. What he claimed as a distinct merit was not the invention of a new test, but to have shown that the old one was bad, and why. He had pointed out several other tests which might be used. Recently a foreign Government had reported to him that they found the guncotton supplied to them going up surprisingly in the heat test, which they could not explain, until, on making an examination, they found that the guncotton before being supplied to them was dried in a room in which smokeless powder with acetic ether as a solvent had been dried. That showed that the diphenylamine test was sufficient to reveal such a slight difference. He would not go very deeply into the objections made by Major Nathan; personally, he owed a great deal to that gentleman for his support in the early investigations. He had given him every opportunity, and had assisted him to the fullest extent. A paper was published in 1879 by General Hess, who had occupied himself very much with the heat tests of various descriptions. In that paper were stated the advantages and defects of the heat tests; and all that General Hess said 20 years ago still held good. Major Nathan had said that he found the diphenylamine test good for testing the prime materials, but failed when he came to cordite, because it gave such extraordinarily low results; this was exactly the reason why the diphenylamine test was good and the iodide test bad. Major Nathan thought the vaporised nitroglycerin was decomposed by the sulphuric acid used for dissolving the diphenylamine, but it was very strange that powders made with ether alcohol gave identical results with both tests, whilst whenever a masking solvent like acetone or acetic ether was used, a decomposition theory was necessary to explain the enormous discrepancies. He wished briefly to mention the present state of the question. The first man who made a test based on the development of nitrous acid on heating was Sir Frederick Abel. Very shortly after, the then Captain Hess made a test by which he aspirated air, very much in the way Mr. Cullen had described, through a bottle containing iodide, then through a tube with the explosive, then allowed it to bubble through a solution of iodide and observed the first appearance of the colour reaction, then the formation of a ring, and then coloration of the whole liquid. Later, he heated the explosives at high temperatures, and observed them from a distance through a telescope, and noted the time in which coloration took place, and also the time of explosion. Still later, but based on the same idea, he proposed that explosives should be heated at 75° under pressure, and for so long that perfect decomposition took place or an explosion. He published tables showing remarkable differences which could not be explained. Guncotton was found to stand the test for an incredibly long time—600 minutes—whereas dynamite would stand only 15. Within the last few years, probably because all the other heat tests failed, the French Government, and also the Dutch Government, had heated the explosives up to 130° C., exposing the vessels to that temperature in a sand bath, or otherwise, and noting the time in which the brown fumes would appear. That time was sometimes days, sometimes hours. The inherent fault of that plan was, that it was very difficult to maintain the same temperature for days and days, and to make sure of observing it. Quite recently a new method had been devised by the Central Institution for Technical Research at Neu Babelsberg, instituted by half a dozen manufacturers of explosives, mostly of the Nobel group, and which laboratory was under the direction of Professor Will. They heated the explosive to 135° C., probably in amyl alcohol, the boiling point of which is 137° C., and collected the gas in the usual way, measuring the time in which it was developed and the quantity developed in a certain time. That was rational, and gave a true indication of the possibility of an explosion through decomposition, but at the same time it is not a test adapted to the actual conditions of storage. On the other hand, when one heated an explosive to 70°, they did not get an indication of actual decomposition, but generally an indication that there were certain impurities in it. With guncotton and similar explosives which had a low heat test, after being kept for a long time the test improved, whilst, again, other explosives decomposed. When one heated to 135°, which was nearing the point of explosion, one had a possibility of a quick and reliable test, in, say, 30 or 40 minutes. He considered the position was not yet exactly defined; more experiments would have to be made; possibly both tests would have to be combined. What was wanted was a quick means of knowing whether an explosive was suitable or not, and a means that would not be bound to show fallacious results, as the present one did in so many cases.

Mr. W. F. Reid said that he considered the last remarks made by Mr. Guttmann of great importance, because, taken in conjunction with what Major Nathan had said, they showed a possibility of obtaining reliable tests. He would not say that the test just described was reliable, because if one heated an explosive to very much above the temperature it would ever be exposed to in practice, it would be subjecting it to conditions which were not natural. The same thing had been done with Portland cement: it was heated to a temperature that it would never require, and fallacious results were obtained. The heat test introduced into the explosives industry required modification, for one really did not know upon what the test was based, and he thought it was rather hard upon manufacturers that they should be bound by a test that, after all, might be erroneous. He believed it was in some cases absolutely fallacious. He had had explosives prepared with the greatest care, and had subjected them to all sorts of conditions, and they would not explode under practical tests, and yet they would be condemned by the heat test. Even the distinguished author of that test was unable to find the connection between the test and the danger of the explosive. With regard to the conditions of testing, Mr. Cullen had given a large number of figures, which represented much work done by himself or at Waltham, and he (the speaker) was very loth to find fault with anything which represented so much labour, but he could not see that the figures were of any earthly use to anybody who read them. The various test papers employed were represented by letters with no reference to their composition. If Mr. Cullen could give any information with reference to the papers themselves, some estimation of, say, the chlorine in them, which no doubt was very often present, and possibly went off after some time, or if he gave the percentage of pure cellulose in the papers, or any other means of identification, they would be useful. With regard to the impurities in the papers, they were very likely due to the bleaching of the pulp, and that was corroborated by the well-known fact that the thick papers gave a worse test than the thin ones. The fact had long been well known that different papers gave different results. He understood that the chief point Mr. Cullen wished to advocate in his paper was that there should be a place where uniform paper could be procured. That was a most difficult thing to bring about; but perhaps it could be arranged, and it would be a great benefit to those who had to use them. There was a firm on the Continent which guaranteed their paper as absolutely pure, but if compared with some English papers it might be found that the English papers came out at the top. What was wanted was not so much absolute purity as uniformity, and if Mr. Cullen could secure that it would be a good thing. He himself was not sure that paper was the best thing that could be used for the purpose. If it were possible to get the reagents on another substance they might eliminate one of the greatest sources of irregularity. He hoped the investigation would not stop until some relation had been found between the explosive and the test.

Mr. H. de Mosenthal said that no doubt a number of members present were not able to follow the discussion, as he himself had found to be the case on previous occasions when no explanatory remarks had preceded a paper on a subject with which he was not acquainted. He would perhaps be allowed to explain that in examining an explosive by the heat test, it was placed in a finely divided condition into a test tube, and suspended over it was starch iodide of potassium test paper prepared in a prescribed manner. The explosive was then heated and kept at a fixed temperature, and the test consisted in no coloration appearing within a prescribed time. If the coloration appears prior to the time fixed, the explosive is regarded as dangerous. The test was first applied to guncotton and dynamite, then to blasting gelatin and so-called gelatin explosives, and lastly to cordite. An explosive which did not stand the test was, as already remarked, considered dangerous, and in some countries it was thrown into the sea. If, as Major Nathan had remarked, the fact that an explosive did not stand the test was not an indication of its dangerous nature, there ought surely to be a change in the test, or considerable hesitation on the part of the authorities to destroy large quantities of valuable merchandise.

Mr. J. M. Thomson said that when one began to speak of the heat test one had to be very careful to avoid dogmatism. There were so many things which affected the question that one could not speak confidently. Fortunately, Mr. Cullen's paper had not raised in itself any questions that might tend to discussion to any great extent. He quite agreed with Mr. Cullen that so long as the heat test was used as a standard for explosives a central supply would be a good thing, and would do away with many of the varying results shown under the present system. The difficulties of the heat test were not new. For 20 years past—for so long as dynamite had been manufactured—those difficulties had cropped up. Even when carbonate of ammonia had been present in the dynamite a very low heat test would often occur, and therefore was not due to any acid present in the substance or in the atmosphere of the tube, so that one was forced to the conclusion that it was volatile nitro bodies which affected the iodide of starch paper. So far as the heat test by diphenylamine was concerned, there were many tests made several years ago on the suggestion of Mr. Guttmann, and it was pointed out that they applied very well to guncotton, but when used for nitroglycerin, which was to some extent volatile, the diphenylamine paper could not be relied on. That was accounted for by the fact that the diphenylamine was in dilute sulphuric acid solution, so that when the volatilised nitroglycerin came in contact with it a reaction took place. If that were the case, it might be taken to apply also to cordite as well as to nitroglycerin, and he believed the heat test of cordite approximated very closely to that of nitroglycerin. The question therefore arose as to whether they could depend upon this heat test, or whether they should look upon it with a certain degree of suspicion as being affected by the volatile nitroglycerin. He considered that so long as the heat test was used—and they had nothing better at the present time—they were greatly indebted to it, and especially for its services in the past. No doubt some other test would be discovered, and the sooner the better; but one had to be very careful in casting aside a test of purity. He understood that with the present test the standard of minutes for each explosive was based on tests of samples of the explosive which had been prepared from carefully purified materials, a fair margin being allowed for manufacturing conditions. He considered that at present they were quite justified in relying on the heat test so far as it went, and he hoped that some better test would soon be forthcoming.

The Chairman said that he would not like it to be thought that the meeting was opposed to the application of either Abel's heat test or modifications of the same. Every manufacturer of explosives must acknowledge that the heat test had been of inestimable service; that until the heat test was introduced and enforced, the manufacture of high explosives had been on a most insecure footing, and that only by its continuous use had the high security of manufacture of explosives become possible. At the same time it appeared to him that the time was approaching for an alteration in the test, and he believed that the discussion that evening would assist to that end. The discussion had somewhat strayed from the main point which Mr. Cullen had brought before them, namely, that while iodide paper was to be used, there should be one uniform supply of the test paper for the whole country. Mr. Reid had lightly touched upon the question whether paper was a desirable substratum for the iodide. He (the Chairman) equally had his doubts on that point. The text-book knowledge, that paper consisted of cellulose, should be disregarded, and it should be recognised that paper contained substances liable to alteration, whereby the sensitiveness of the reagent might be altered. It did not follow that because a large stock of uniform paper might be obtained for the purpose of preparing heat-test papers, that stock would be of the same nature after a lapse of years. A substance less liable to alteration should be sought after.

Mr. W. Cullen, in reply, said that he considered that the Chairman had struck the keynote in his last remark, as the discussion had wandered away from the original purpose of the paper, which was simply to make the best of a test which admittedly had defects. He did not think that the heat test as at present carried out was altogether a bad one. After 20 years' experience it was the best they had, and it might be another 20 years before a better test came into use. He had conducted many thousands of those tests, and had found that one got very much into a circle in carrying out experiments of the sort. Mention had been made of the point of explosion as an indication of the stability of an explosive, but exhaustive experiments had shown this to be quite fallacious, and no ratio had ever been established between it and any other recognised method. Mr. Guttmann had referred to Hess's work. He was not familiar with it, but it seemed very similar to that of Abel on guncotton, which formed the subject-matter of communications to the Royal Society 20 years ago. Abel heated guncotton at various temperatures *in vacuo*, collected the gases, and observed the amount given off in a certain time. The experiments sometimes took weeks and sometimes months, but one could not wait for six weeks in a manufacturing works in order to know whether an explosive was suitable or not. They must be able to obtain a result in half a day. Mr. Reid considered it would be difficult to get manufacturers to combine. He might say that already most of the manufacturers had agreed to the proposal, and were very thankful for it. He was very sorry Dr. Dupré was not present, but the scheme had his hearty approval, as also that of Dr. Kellner. He could not agree with Mr. Reid that the tables shown were not intelligible. They certainly required a little study, which would repay the trouble. After all, the heat test did not pretend to indicate the relative stability of a number of explosives, and a most important point about it was that the physical condition was a function of the utmost moment. In one instance in the tables the two bodies, guncotton and nitroglycerin, had been brought together. The former possessed a heat test of 14 and the latter 20; combined they gave an average of 8; but that was because the surface exposed in the one case was very different from the other. The heat test, as at present carried out, was, therefore, among other things, in a great measure dependent on the physical condition of the explosive. One could not assume that because the cordite stood 68 minutes as against eight minutes, that it was nine times as stable, for the physical conditions were altogether different. The same applied to dynamite. Nitroglycerin would, as a rule, stand the test for 20 minutes; dynamite would seldom stand more than 10 or 12 minutes. In his opinion, that was principally because the physical state was altered. Replying to Mr. Reid, he might say that all the tests shown were made with the one paper. He rather regretted that the discussion had strayed away from the main point which he had intended to bring out.

Manchester Section.

Meeting held on Friday, January 11th, 1901.

DR. J. GROSSMANN IN THE CHAIR.

PATENT LAW.

BY IVAN LEVINSTEIN.

In March 1900 I addressed, as delegate of the Manchester Chamber, the Associated Chambers of Commerce of the United Kingdom, on the defects of our patent laws.

The meeting unanimously resolved that preliminary examination into novelty was desirable. In the same month I read a paper on the same subject before the Manchester Section of our Society, when resolutions were passed in favour of preliminary examination, patents of addition, and amendment of section 18 of the Patent Act of 1883.

This paper, with some additions, was issued in pamphlet form by the Manchester Chamber of Commerce, after the Board of Directors had placed, by special resolution, the *imprimatur* of the Chamber upon it, certifying thereby its approval and adoption.

In deference to these important representative bodies, I cannot ignore a paper by Mr. C. D. Abel, which was read before the Manchester Section in December last year.

A few years ago, Mr. Abel published a paper in which he was anxious to prove what other patent agents have attempted before and after him, *viz.*, that preliminary examination into novelty was not desirable, and that it did not conduce to confer greater security on German patents. He supported his arguments by certain figures showing that the proportion of litigated patents to annulled patents was practically the same in both counties; in England 29:13, and in Germany 102:43. I challenged his figures, as well as his conclusions, and gave some reasons for my objection, which I now briefly repeat:—

(1) Probably half the patents granted in this country are not worth fighting for.

(2) Patent litigation for a man of small capital spells ruin.

(3) Patent litigation in Germany is cheap; if an inventor or manufacturer believes that an injustice has been done to him, redress is open to him, even if possessed of only small means.

(4) That Mr. Abel does not take account of the respective life of British and German patents.

Mr. Abel now says my first reason is only an assertion; my second he accepts as true, but adds "wisely so"; to the third he rejoins that German litigation is "cheap and nasty"; to the fourth he attempts to give some explanation. I contend that he has not disproved any of these assertions

Putting, however, aside, for the moment, my reasons, and assuming for the purpose of argument that Mr. Abel's figures are correct and represent a fair average of years, even then his conclusions as to the security of German patents will be fallacious. Mr. Abel says that I have overlooked the main point of his argument, that the proportion of litigated patents to annulled was practically the same in both countries. It does not matter, however, whether they are the same or not; the greater security or better title of a German patent lies in the fact that out of about 15,000 applications to the German Patent Office, less than 6,000 are granted. It is this weeding out of 9,000 patents by preliminary examination, carried out by a competent court, that enhances the value of a German patent.

I will, however, further show that little reliance can be placed on Mr. Abel's figures and conclusions, and for this purpose I reproduce his own table, and another table compiled from official sources. This latter table goes a little further back than Mr. Abel's. In covers 1896, the year selected by him, and four years preceding. I point out, however, that my table, for obvious reasons, has been somewhat differently arranged from Mr. Abel's. I do not show patents litigated nor patents partially invalidated, as no reliable statistics exist, and can only be at the best guesswork. Our leading authority in this country is the official report of patent cases, but this publication only reports decided cases of public interest, and a good deal of patent litigation is carried on without coming into court.

It is also misleading to classify under one heading patents wholly or partially invalidated.

Mr. Abel's Table —Patents, 1896.

——	Great Britain.	Germany.
Patents granted	14,105	5,410
Patents litigated....................	29	102
Patents wholly or partially invalidated.	13	43

Table compiled from German Official Sources for 1892 *to* 1896.

—	1892.	1893.	1894.	1895.	1896.
Applications	13,126	14,265	14,964	15,063	16,486
Patents granted	5,900	6,430	6,280	5,720	5,410
Patents invalidated, including patents withdrawn.	10	12	22	18	32

It will be seen from the official table that 32 patents were withdrawn and invalidated in 1896, Mr. Abel's year, whilst the average for the four preceding years is less than half of this number, *viz.*, 15·5 per annum.

I leave it to Mr. Abel to explain—

(1) Why he has picked out for his arguments the year 1896.

(2) Whether or not any fair or reliable conclusions can be drawn from a single year's patents statistics.

(3) What value can be attached to his statistics for patents partially invalidated and for patents litigated.

Mr. Abel having, in his opinion, disposed of my criticism of his figures and conclusions, contributes some information about German patent law; and to make this more forcible he refers to his lifelong experience. This does not, however, mean much, as the German patent law has existed only since 1877; whilst the new German patent law, which can only be the one under discussion, has only been in force since October 1891.

In 1886 the German Government appointed a commission consisting, not only of a few Government Officials, patent agents, and patent counsel, similar to that recently appointed here, but including, besides, members of the Patent Office, men eminent in science and largely interested in trades and industries, and also technical, industrial, and scientific experts. This commission was appointed for the purpose of advising the Government to amend the law of 1877. It is interesting and important to state that it was the unanimous opinion of this commission that preliminary examination should be retained. The new patent law of 1891 is a material improvement over that of 1877. It is not a mere addition or enlargement of the latter, but, as expressly stated in the preamble, is an entirely new Act.

Now, Mr. Abel is eminent in his profession. He is a member of a firm occupying a high position among patent agents. He ought to be well aware of the sources from which reliable information on German patent law and procedure can be obtained; yet he says: "In the first place when a patent action is commenced in the Landgericht (county court) where the patentee is domiciled, both parties to the suit are obliged to employ a barrister appointed to that particular court, and no other. Another feature of German litigation is that only written evidence can be produced in court, and the assessors' and lawyers' reports have to be in writing, the payment for such reports being at the rate of 2*s.* per hour occupied."

Most of these statements are absolutely erroneous.

(1) The Landgericht does not correspond to our county court; it is a higher court, consisting of a president and four judges. To the Landgericht, for example, in Berlin, about 500 qualified barristers are admitted. The employment of a barrister attached to this court is therefore no hardship, and the whole procedure is, after all, not dissimilar to our own practice.

(2) It is quite incorrect to state that only written evidence can be produced in court. In an action before the Patent Office, Reichsgericht, or Landgericht, the plaintiff, as well as the defendant, may personally appear to give evidence, together with their witnesses and experts.

(3) It is also quite erroneous to state that assessors and lawyers are paid at the rate of 2*s.* per hour. Barristers in Germany are feed proportionately to their professional standing, and to the importance of the case upon which they are engaged.

I now come to Mr. Abel's illustration of the German method of litigation, of which he says "that this is positive evidence of the absence of security of a German patent."

It is the Schlich case which he cites. I submit that this illustration is unfortunately chosen, as it proves nothing more or less than the security of a German patent, which is the very reverse of Mr. Abel's contention.

The patent was granted to Schlich by the first division of the Patent Office. Schlich brought an action for infringement of his patent against a manufacturing firm. The defendant thereupon applied to the second division of the Patent Office for an annulment of Schlich's patent on the ground of want of novelty. The defendant succeeded. Schlich thereupon appealed against this decision to the Reichsgericht, which quashed the decision of the second division and upheld the patent.

Mr. Abel then cites the well-threshed-out illustration of the Siemens case against the German system of examination, but this illustration is also unfortunately chosen. As the Siemens case has been so often wrongly quoted by patent agents and others as a blot on the German system of preliminary examination, it may be useful information to our members to briefly refer to the various single German States prior to the establishment of German patent law.

Most of the single German States, before the foundation of the German law, had their own patent laws. For example, Prussia established patent laws in the year 1815, Bavaria in 1825, Wurtemberg in 1836, Saxony in 1853. The laws of each of these States differed from each other, and each of them was widely different from German patent law. The patent laws of the various States have been defunct since 1877. The German patent law of 1877, as I have already stated, has been replaced by the law of 1891. The procedure of the defunct Prussian law was most arbitrary. The grant for inventions of great importance was often refused whilst smaller ones were accepted. My personal experience dates back to 1864, when I obtained a patent in Prussia. It is this defunct Prussian law which has been probably confused by Mr. Abel and other opponents to preliminary examination with German patent law.

Only recently Mr. Lloyd Wise, the well-known patent agent, in a paper read before the London Section and published in our Journal, November 1900, on preliminary examination into novelty, said: "It is almost superfluous to recall the facts that in Germany patents were refused for the Bessemer process and for the Siemens regenerative furnaces." Mr. A. G. Bloxam, who, I believe, is also engaged as a patent agent, said in the discussion: "Mr. Wise's interesting reference to the celebrated case of Siemens was most *apropos*."

But from the facts already stated it is quite evident that there never was a German patent refused to either Mr. Siemens or Mr. Bessemer by the German Patent Office and under German law.

Mr. Siemens' application for his regenerative furnaces was made more than 25 years before the existence of the German patent law, and Bessemer about 20 years previous to it. It is therefore waste of energy on the part of our patent agents to cite these cases against preliminary examination as carried out by the German law.

I have been, since its existence, and I am now, constantly in contact with the German Patent Office. I fought my own battles, and I have personally pleaded before it. My experience is that it is now of very rare occurrence that patents are refused which contain any novelty, provided that one perseveres, and also fully replies to the opposition raised by those interested.

In my pamphlet, however, I was not so much concerned to prove the superiority of the German patent system, although I do consider it as the best. On the other hand, I concede that preliminary examination is a controversial subject; but every unbiassed student of patent law will agree with me that the want of conformity existing between our laws and those of our industrial rivals is doing an incalculable harm to our trades and industries.

For example, the grant of a patent to a foreign applicant which has been refused to him by his own country, benefits the foreign country at our expense, the loss to us being proportionate to the value of the invention.

That the patent laws of Germany have been of the greatest possible aid to the growth and development of German industries is freely admitted by those who know the facts.

It is only recently that Privy Councillor Dr. Otto Witt, the eminent Professor of Technology in the Charlottenburg High School, said in his very admirable report on the collective chemical exhibits of Germany: "The beneficial effects which the German patent laws have exercised on the development of German industries, particularly of the chemical industries, are simply incalculable." I wish the same could be said of our patent laws.

I am, however, not in the least sanguine that we shall easily succeed in getting preliminary examination introduced, as it would be costly. Our present Government is already saddled with financial burdens, and any addition to these would no doubt be strenuously objected to, especially if there were the slightest opposition. The consequence, therefore, will be that speculative, bogus, bluff, and block patents will be taken out as hitherto, to the great disadvantage to inventors and manufacturers alike. The title of an English patent will continue to be valueless until established in a court of law; extortion and abuse will continue to flourish to the detriment of our traders.

The question then arises, Can no means be devised to amend, at least to some extent, this deplorable state of things? Is it within the range of practical politics to ameliorate the disadvantages under which we are labouring? I am quite alive to the fact that to carry any proposed amendment it must meet the interests of *bonâ fide* inventors and manufacturers; it must not be diametrically opposed to the interests of patent agents and counsel, and it must not seriously complicate the present machinery of patent legislation.

I submit to you, with some diffidence, some suggestions which, if carried out, will, in my opinion, amend the present chaotic state of our law.

(1) That in all patents which cannot be defined by drawings an applicant shall be permitted to claim in one patent only one single substance or compound, and, if demanded by the Patent Office, he shall deposit samples or specimens of his invention.

(2) That every patentee shall mark each article, or the package in which said article is made up and sold, "patented," together with the number of reference to the patent under which the article has been manufactured.

(3) If the patented article consists of a mixture, of which only a part is patented, it shall be so stated.

Now, in regard to the first proposition, it contains nothing more or less than what is law already in the United States, and partly so in Germany. If carried out, it would remove the fraud which is frequently practised on the public by patentees.

I have already shown in my pamphlet, under section 18, how this section is abused. It is quite a common procedure for a patentee, if he has really invented one thing, to include hundreds, nay, thousands, of others. It is also common practice to make, say, 50 claims, and when the time comes to establish the validity of the patent, to strike out, by help of the said section 18, say 49, and still retain a valid patent. I have also shown that, for example in organic chemistry, one may, by theoretical deduction, fix the potential existence of a large and almost unlimited number of substances which may never have been seen or made by anyone.

I have referred in my last pamphlet to several foreign patents, of which one covered 38 pages of print, whilst its corresponding German patent only covered three pages. I have referred to another German patent, which included in its claims thousands of possible products. This latter patent holds the unique position in as far as it only exists in England.

I had quite recently some unpleasant experience with this identical patent, which shows the widespread mischief which is done by this kind of speculative patents. It is not many weeks ago that we applied to the German Patent Office for a patent for a new colouring matter. We got a reply that our invention was not new, and were referred to the very patent in question, granted to the foreign company in this country, but nowhere else. We at last convinced the German Patent Office that our invention was not anticipated by the speculative patentee. Whether we would have been so successful in our own courts is another question, but certainly not without first spending a small fortune.

Many of you are no doubt aware that, thanks to the efforts of the Manchester Chamber of Commerce, supported by you, and to the first test petition which my company lodged with the Board of Trade, section 22, which deals with compulsory licenses, has been made much more effective.

Now, the adoption of my propositions ought to be a natural sequence. It will be otherwise most difficult to ascertain whether the patent is worked in this country or not.

A foreign patentee, for example, has taken a patent in this country, claiming a thousand and one articles. How will it be possible to find out whether he works his whole patent or not, and, if worked, what part of it? Further, it is illegal in this country to mark an article patented if it is not protected by a patent, but the difficulty often occurs to discover whether the article so marked is patented or not. It further happens that an article is a mixture containing only perhaps 10 per cent. of a patented article, and I hold it is a deception of the public to mark such an article as patented unless the whole mixture has been patented.

To sum up: the advantages which I believe will follow if my suggestions were approved and adopted, are:—

(1) They would assist in the carrying out of section 22.

(2) They would amend section 18.

(3) Litigation and search would be simplified.

(4) The security of an English patent would be substantially increased, as the taking out of bluff, block, and other fraudulent patents would be made much more difficult.

(5) The public would readily know, which is often very difficult, what the patentee has patented and what not.

I cannot conceive that *bonâ fide* inventors could raise any objection to these propositions, whilst their adoption would be conducive to honest trading and of benefit to our industrial and commercial interests. A patent is a public document, and should not be surrounded by any secret: its widest circulation and publication is a boon to all concerned.

The amendment of our patent laws will be again discussed at the annual meeting of the Associated Chambers of Commerce of the United Kingdom, which meeting takes place in March next.

Some important resolutions will be submitted. I venture to appeal to the Council of our Society to reappoint a patent committee and to support the efforts of our chambers of commerce.

Manchester has always done so, but little support has, so far, been given by London.

Discussion.

The Chairman said the subject was not only very interesting, but of great importance. As Mr. Levinstein had stated, there were many different interests—many clashing interests—connected with the patent law, and it was a highly controversial subject. It had been before them at the March meeting. They had discussed the importance of search, and had come to the almost unanimous agreement that an official search for novelty was desirable. The practical difficulties, however, which stood in the way were enormous. Germany, before 1871, consisted of a number of independent states, some of which had patent laws. After 1871 the states became amalgamated, and it became possible to have one patent law for the whole. In 1877 Germany started with a clean sheet, and started in the right way. If the alterations which were advocated with regard to official search were carried out, it would be appalling to think of the litigation to which they would lead during the next 15 years. The difficulties were enormous in the way of alteration, but alteration was desirable.

Mr. J. H. Butterworth, barrister, said he was a lecturer on the subject of the patent laws. The law of the country could create a right. Taking the land laws as the basis for argument, why could they not, in the matter of patents, have a search back, say, for 50 years? Anything further back should be taken no notice of. The Government might undertake the 50 years' search, and give the inventor a guarantee. The law could give a valid title. As to amendments the clause was vague. They might go to the Patent Office for amendments, and the result has been an omnibus clause in its specifications. His suggestion was that they should only do what was done with regard to leasehold and freehold properties. Only such amendments should be allowed as clerical errors and errors of description.

Mr. Heys read from a speech recently delivered by the President of the German Patent Office, in which he said that they hoped to grant more than 50 per cent. of the applications for patents in future. Many of the patents applied for were valueless. The limit of anticipation in Germany was 100 years. Anyone making and working a patent at the time a patent was applied for was entitled to continue working it.

Mr. E. Helm, Secretary of the Manchester Chamber of Commerce, said that if Mr. Abel's paper had been read before any statistical society in the country it would have received a severe and hostile handling. It was the commonest form of the misuse of statistics to take the figures of one year and use them as averages, and it showed the fallacy of Mr. Abel's paper in that respect. He had been disappointed with Mr. Abel's paper. In the course of his duties he had studied the question very closely. The difference between the patent laws of this country and Germany operated to the serious disadvantage of the British people. He did not think they could judge of the importance of the question unless they called to mind the principles which underlay it. Monopolies, *per se*, were an injustice and an abomination. They knew that James I. was made to abolish monopolies. Our forefathers retained, for the benefit of the whole community, a certain class of monopoly. This was retained for the benefit of the people, but primarily for the benefit of the inventor. One reason why they should be careful as to the protection they gave to an inventor was, that many of the greater inventions were evolved from men's intelligence, which could not be protected, and which had benefited the nation highly. The protection they gave should be on the ground that it should be for the benefit of the nation. A good patent affected the interests of the whole nation. When they saw patents given to men for things which had no novelty, and which prevented rather than encouraged further improvements, they had to go deep down to consider the basis of the whole system. He had paid many visits to the Board of Trade, and had seen its work, and he did not know how it was, but from some occult influence what ought to be an assistance to the trade of the country was in some respects a serious hindrance to it. Powers had been conferred on that Board which it would not exercise. He contended that the principle of granting monopolies, and the obstruction they had to meet with at the Board of Trade in one way or another, should make them feel that this was not a question to be played with, but one to be pursued with all the energy possible.

Mr. Grimshaw agreed with Mr. Helm that patents were supposed to be primarily for the benefit of the trade of the country, the next person to be benefited being the inventor and the tradesman who used it. The difficulty was that in this country patents seemed to exist in great part for the benefit of the lawyer, and a Government department did not like to be irritated. Time after time statements were made by responsible men and no notice was taken of them. Mr. Goschen once said in a budget speech that the income of the law was greater than that from the cotton, iron, and coal trades put together. He had since seen no allusion to it, but the statement was so astounding that he thought it could not be true. With regard to the 50 years' limit, did Mr. Butterworth mean that if somebody patented a thing over 50 years ago, somebody could patent it over again? He considered the three points put by Mr. Levinstein as desirable. They would tend to prevent fraud, whether a patent was novel or not. It was a source of infinite harm for a patent to be refused in Germany and granted here. The result was that anybody in Germany could make it in Germany. It was constantly recurring that a German manufacturer, developing his industry, had a free market, whereas the English manufacturer had to buy from a protected market.

Mr. Butterworth said there ought to be a separate court presided over by a special judge dealing with compulsory licenses. In the commercial court the whole proceedings were simplified, and cases were expedited. That was what they wanted in reference to patent cases. The 50 years' limit would cause difficulty. The patent law was an industrial measure for the benefit of the trade of the country.

The Chairman said that whilst they had heard a great deal about the interests of the public, little had been said in favour of the inventor. A patent was certainly a monopoly, but, in order to obtain the monopoly, the inventor had to disclose his methods, and after a certain number of years anybody could use his invention. Besides this, during that period, the publication of his invention might often direct others into lines of thought which might lead to other inventions.

Mr. Levinstein said, in reply, that they were all practically agreed. There were many patentees who were not inventors. A patent was a monopoly, but the country had to get something in return for setting aside the ordinary principles of law to benefit the inventor. Under the statute of monopolies the patentee had to make the article, and a patent was refused if it was mischievous to the State. After commenting upon the threatened ruin of natural indigo, India's most important industry, for which, he said, the nation gave its destroyer a reward by the grant of a patent, Mr. Levinstein said that he was against fraudulent patentees who went in for blocking progress and blocking inventors. He desired to protect honest inventors.

New York Section.

Meeting held on Friday, November 23rd, 1900.

DR. V. COBLENTZ IN THE CHAIR.

THE ANALYSIS OF OILS CONTAINING CARVONE.

BY EDWARD KREMERS, PH.D.

About five years ago the writer was interested in the more detailed examination of the non-ketone constituents of the oils containing carvone. A. v. Baeyer had, during the several years preceding, made a special study of carvone and its isomers and their reduction products. Among other things, he had demonstrated the readiness with which some of the reduction products decomposed, especially when exposed to somewhat higher temperatures. Thus, *e.g.*, tetrahydrocarveol, the isomer of menthol, designated carvomenthol by v. Baeyer, readily splits up into a hydrocarbon and water. That a stereo-isomer of the common menthol also splits up readily in the same manner has been demonstrated more recently.

Those who have worked with oils containing carvone know that upon fractional distillation, which is very imperfect at its very best as a method of separating the individual constituents of a complex mixture, a resinous residue is apt to remain in the flask, thus indicating decomposition. A method, which has been employed to separate the carvone in a pure state from the oils that contain it, consists in converting this ketone into its crystalline hydrogen sulphide addition product from which, after recrystallisation, carvone can readily be regenerated in a fairly pure state. This method, however, is scarcely applicable as a means of obtaining the non-ketone constituents of oils containing carvone, as everyone knows who has prepared carvone hydrosulphide. Not only does part of this compound remain in solution, but some of the ther constituents of the oil are apparently acted upon by o hydrogen sulphide. The product is what German emists so characteristically designate a "Schmiere."

It occurred to the writer, therefore, to remove the rvone from the oils of caraway and spearmint by conerting it into carvoxime. In this reaction hydroxylamine ydrochloride, sodium bicarbonate, alcohol, and the temerature of the water-bath are employed. The resulting roduct is distilled with water vapour. According to the ge of the oil employed a relatively pure carvoxime mains behind and the distillate is an agreeable product every way to work with. The principle non-ketone nstituent of the oils of caraway and spearmint is limoue, the former oil containing the dextro-rotatory variety—rresponding to the dextro-rotatory carvone—the latter the evo-rotatory variety—corresponding to the lævo-rotatory rvone which it contains. From the non-ketone fraction of pearmint oil an alcohol of the formula $C_{10}H_{17}OH$ was olated by the calcium chloride method, first applied by acobsen to the study of the alcohols of geranium oil.

At this early point these investigations were interrupted. r. Chas. Rice, then and now the able Chairman of the .S. Pharmacopœia Revision Committee, had requested e writer to give some of his time and attention to estions of more direct practical import, *viz.*, to the alysis of volatile oils. The apparent quantitative character the carvoxime reaction, mentioned above, suggested the ssibility of its application to the carvone determination in ese oils. The attempt was made, and seemed to prove an qualified success, for in four determinations the following sults were obtained, *viz.*, 50·22 per cent., 50·83 per cent., ·41 per cent., and 50·00 per cent.

For an analysis of a complex organic mixture these sults were remarkable indeed. When the preliminary periments were repeated in Leipsic, the results there tained seemed to throw considerable doubt upon the value the method, which otherwise seemed almost ideal as to chemical simplicity. It, therefore, became necessary to over the ground repeatedly, so that the following papers this subject have been published during the past five ars. As in all analytical methods, great care must be ven to details. This paper is to be a kind of *résumé* of e work done, the results of which are scattered and, erefore, not in a convenient form for anyone who wants apply the method in actual practice or who may want test it still further.

The first paper was published in April 1896 and bears e title "The Quantitative Estimation of Carvone in olatile Oils" (Pharm. Rev. **14**, p. 76). The experiental work was done by Mr. O. Schreiner. The paper ntains a brief review and criticism of the various methods eviously suggested for the analysis of the oils of caraway d spearmint, *viz.*, the following:—

1. By fractional distillation.
2. By means of the crystalline hydrogen sulphide dition product.
3. By Huebl's iodine absorption method.
4. By means of the specific gravity.
5. By means of the rotatory power.

The paper further describes the method of purification the carvone and limonene for an artificial mixture, the eliminary methods of determination as carvoxime and the plication of one of the three modifications tried to mmercial oils.

The second paper was published in November of the me year, and is entitled, "Application of the Carvoxime ethod for the Quantitative Estimation of Carvone to dulterated Spearmint Oil" (Pharm. Rev. **14**, p. 244). he experimental work of this is also by Mr. Schreiner. he method was put to a severe test, oil of spearmint, ientifically adulterated in such a manner as to defy detecon by physical tests or even a combination of physical sts being used. The carvoxime method gave satisfactory sults, revealing the low carvone content of the adulturated s.

The third paper (Pharm. Arch. **2**, p. 81) was published in ay 1899, the experimental work having been done by r. F. W. Alden and Mr. S. Nolte.

The fourth paper (Pharm. Arch. **3**, p. 9) appeared in January of this year, and the experimental work was done by Mr. Alden and Mr. F. G. Ehlert.

The third and fourth papers contain reports on details of the method of determination, such as uniformity of results; volatility of carvoxime; moisture in air-dried carvoxime; volatility of carvoxime with water vapour; effect of alcohol and water vapour upon carvoxime; solubility, real and apparent, of carvoxime in water; time of reaction; influence of solvent; influence of resinous matter; influence of amount of hydroxylamine, of sodium bicarbonate, &c.

For the purpose of testing the method in its simplest form, a mixture of equal parts of carvone, regenerated from its crystalline hydrogen sulphide addition product, and of limonene, purified by repeated fractional distillation under diminished pressure, was made. To a solution of 10 grms. of this 50 per cent. carvone mixture, dissolved in 25 c.c. of alcohol, 5 grms. of hydroxylamine hydrochloride and 5·5 grms. of sodium bicarbonate were added. This mixture was boiled upon a water-bath in a flask connected with a reflux condenser for half an hour, 25 c.c. of water were then added, and the alcohol, which carries over a large quantity of limonene, was distilled off from a water-bath. Steam was then passed through the liquid until traces of carvoxime came over. The last portions of the distillate were collected separately in test-tubes, and, when traces of crystals of carvoxime appeared on the surface, the operation was interrupted. The tube of the condenser was then washed with a little hot water, and this, as well as the last collected distillate containing some carvoxime, was returned to the flask. The contents of the flask were then allowed to cool, and, after the carvoxime had completely solidified, it was removed from the sides of the flask by means of a loop of stiff wire, thrown upon a force filter, washed and dried by suction. The air-dried carvoxime was then transferred to a tared glass dish and heated for one hour on the water-bath, and when cool, weighed. To the weight thus obtained 0·100 grm. was added, as this is about the quantity lost during heating. From the weight of the carvoxime that of the carvone may be readily calculated:—

$$\begin{array}{ccc} C_{10}H_{14}NOH & & C_{10}H_{14}O \\ 164·67 & : & 149·66 = 1 : 0·9088. \end{array}$$

or the weight of carvoxime expressed in grammes, when multiplied by 0·9088, gives the weight of the equivalent amount of carvone.

The 50 per cent. carvone mixture * gave, by this method, the following figures:—

			Per Cent.
I.	5·525 grms.	carvoxime	= 50·22 carvone.
II.	5·592 „	„	= 50·83 „
III.	5·579 „	„	= 50·71 „
IV.	5·503 „	„	= 50·00 „

From these figures it will be seen that the results obtained by this method come within 1 per cent. of the true carvone content.

Two slight modifications of this method had been previously tried. The one gave results several per cent. too low (maximum, 2·40 per cent.), the other results too high (maximum, 4·27 per cent.). It is not necessary here to go into details about these modifications. They will be found in the first paper referred to above.

Applied to commercial caraway and spearmint oils, the method gave satisfactory results. In one instance spearmint oil was adulterated by way of test in such a manner with 50 per cent. of a mixture of 66⅔ per cent. of cedarwood oil, and 33⅓ per cent. of gurjun balsam oil that specific gravity and angle of rotation corresponded closely with the corresponding factors of genuine oil. The method revealed the low carvone content very nicely.

The method was then tested by the chemists of Schimmel and Co., of Leipsic, who reported rather unfavourably on the results obtained by them (Bericht, Schimmel and Co., October, 1896, p. 49). A careful perusal of their report, however, will reveal the fact that they did not apply the precautions specified as to details. If the distillation, *e.g.*, of the carvoxime-oil-alcohol mixture, is not conducted with due regard to small fractions, it will be difficult to learn when to stop. Carvoxime may be lost in the distillate, or oil be retained in the carvoxime residue, thus causing very appreciable differences in the results. In order to put the method to severer and more careful tests, it was studied in almost all of its details. The first question to be answered was whether uniform results could be obtained by a person or persons who had but a moderate experience in analytical work. The question whether the results were either too low or too high did not enter into consideration in this particular series of experiments.

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* When more carvone is present a larger quantity of hydroxylamine must be used.

Uniformity of Results. As stated, the first question to be investigated was to ascertain whether uniform results could be obtained with the exercise of the necessary precaution.

The following table gives the results obtained by two operators, each making five determinations under apparently the same conditions:—

—	Grammes of Oil used.	Carvoxime weighed.*	Carvone Equivalent.	Percentage of Carvone.
1	10·0325	4·8818	4·5275	45·13
2	10·0081	4·8846	4·5300	45·26
3	10·0074	4·8300	4·4804	44·77
4	10·0118	4·7418	4·4002	43·95
5	10·0018	4·8704	4·5171	45·16
6	10·308	4·873	4·519	43·84
7	10·113	4·387	4·078	40·32
8	9·657	4·713	4·374	45·29
9	10·216	4·898	4·542	44·46
10	10·997	5·387	4·957	45·35

With but one exception (No. 7) these results vary slightly, the highest being 45·35 per cent., the low 43·84 per cent., a difference of only 1·51 per cent. for two extremes. For the analysis of so complex a substanc caraway oil such a result leaves little to be desired. each case the oxime was firm and well crystallised. In one instance was there more than a trace of colour.

Influence of Solvent.—In the preparation of the p gone oxime of Beckmann and Pleissner it has been noti repeatedly that with the use of the alcohol-ether mixtu as solvent, as directed by them, a crystalline oxi does not always result even upon standing for days t weeks. This difficulty was overcome by the mere sub tution of petroleum ether for alcohol ether as solvent medium for reaction. Inasmuch as occasionally diffic was encountered in obtaining a good crystallisable c voxime, a few experiments in the change of solvent w made. When petroleum ether was substituted, altho freshly rectified spearmint oil was employed, not a tr of crystalline oxime resulted. In another instance, chl form was tried, to which, after heating for ten minu alcohol was added and the heating continued for f minutes. This also resulted in a failure as far as crystal oxime was concerned. In a third experiment a mixtur 20 parts alcohol and five parts chloroform was tr 47·44 per cent. of oxime resulted, or about 3 per c less than in any of the other assays of the same Besides, the oxime was soft and sticky. Methyl alco has also been tried, and it proved a failure as far quantitative work is concerned. In addition, it has b considered worth while to study the influence of amount of alcohol used, which, so far, proved the l medium in which to carry on the reaction. The follow table (II.) gives the results of a number of experiment this direction, from which it becomes apparent that conclusions can be drawn as to any special effect attribut to the amount of alcohol used as solvent:—

Table II.

No.	Oil taken.		Alcohol.	Weight of Oxime.	Carvone Equivalent.	Melting Point of Oxime.	Percentages.		
	Kind.	Quantity.					Calculated.	Found.	Loss
			C.c.						
1	Carvone and limonene taken in approximately equal quantities.	11·0230	25	4·5542	4·1387	49—56	45·41	37·55	7·86
2		10·0264	25	4·6755	4·2490	?—57	49·95	42·38	7·57
3		10·0457	25	4·6000	4·1805	39—51	50·00	41·61	8·39
4		10·0009	50	4·6401	4·2170	52—59	50·00	42·17	7·83
5		10·0185	50	4·7322	4·3003	?—52	49·98	42·93	7·05
6		9·9964	50	4·6914	4·2636	53—60	49·92	42·65	7·27
7	Oil of spearmint	10·0076	25	5·1628	4·6919	38—48	..	46·88	..
8		10·0193	25	5·2909	4·8084	?—49	..	47·99	..
9		10·0165	50	5·3336	4·8472	34—48	..	48·39	..
10		10·0241	50	5·7578	5·2328	35—46	..	52·20	..

Influence of Amount of Hydroxylamine.—It has been shown by Wallach and Schrader (Ann. **279**, p. 368) that when an excess of hydroxylamine is employed under certain conditions, a compound, $C_{10}H_{14}NOH.NH_2OH$, and not the simple carvoxime, $C_{10}H_{14}N$ is formed. In the method of analysis as previo outlined sufficient oxime is directed to be used to th retically convert all of the oil into carvoxime should

Table III.

No.	Kind of Oil used.	Reagents sufficient for	Weight of Oil taken.	Oxime obtained.	Carvone Equivalent.	Description of Oxime.	Melting Point.	Carvo foun
		Per Cent. Carvone.					°	Per C
1	Spearmint freshly rectified.	50	10·0058	3·5514	3·2275	Good	47—57	32·2
2		50	10·0043	3·5188	3·1979		42—55	31·9
3		60	10·0171	4·8079	4·3694		50—58	43·6
4		60	10·0112	4·5463	4·1317		43—57	41·2
5		70	10·0152	4·6623	4·2371	Poor	?—52	42·3
6		70	10·0969	4·2452	3·8581		40—52	38·5
7		100	10·0064	4·9110	4·4631		30—44	44·6
8		100	10·0032	5·3098	4·8254		25—45	48·2
9	Carvone and limonene in equal quantities.	50	9·9974	4·4315	4·0274	Good	45—57	40·2
10		50	9·9834	4·2179	3·8333		59—65	38·3
11		60	10·0109	4·7457	4·3129		50—58	43·0

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* From several of the tabulated series of results obtained in testing other details, the same conclusion as to uniformity of results can be drawn. It need not be concealed that in certain instances widely deviating results were obtained. But in almost every such case the product weighed showed that something had gone wrong. Thus, *e.g.*, an oily oxime was several times obtained.

carvone. It seemed desirable, therefore, to ascertain in w far an excess of hydroxylamine might prove advan- geous or disadvantageous. The amount of sodium arbonate was varied accordingly, but so that the ratio mained the same. The results of a series of eleven periments are given in Table III. That the theoretical nount of hydroxylamine is not sufficient becomes fully parent from the results, but the variation in the results r like amounts of hydroxylamine is too great to allow of ything more than a rather general conclusion to be awn. The melting point of the oxime, however, clearly ows that the larger excess of hydroxylamine does not mbine with the carvoxime to form the compound, $_{0}H_{14}NOH.NH_2OH$, of Wallach and Schrader, for the ter melts at 174°—175°. The quality of the oxime vertheless suffers from an excess of hydroxylamine in me way or another, as shown by the grades marked good" and "poor."

Influence of Amount of Sodium Bicarbonate.—In order set the hydroxylamine free from the hydrochloride, dium bicarbonate is employed. For 5 grms. of hydroxyl- ine, 6·5 grms. of sodium bicarbonate are directed to be ed, an excess of about 0·5 grms. This renders the neous solution resulting after the distillation with water pour decidedly alkaline. The effect of neutralising this cess of sodium bicarbonate and of avoiding it was, refore, tried.

In experiments 1 and 2 (Table IV.) a mixture of equal rts of carvone and limonene was used. Experiment 1 s left alkaline, experiment 2 was rendered slightly acid h dilute hydrochloric acid. In experiments 3, 4, and 5, earmint oil was used. Although the quality of the oxime m the acid solution is better than that from the alkaline ution, yet the results from experiments 4 and 5 vary nsiderably. Inasmuch as the neutralisation of the sodium arbonate with alcoholic hydrochloric acid—for the utralisation should be effected while the mixture of action is still alcoholic—is somewhat troublesome, and asmuch as an excess of acid may prove harmful, it was ought desirable to avoid the excess of bicarbonate from e beginning. In experiments 6, 7, and 8 the exact ount of sodium bicarbonate calculated to be necessary liberate the hydroxylamine was taken. Freshly rectified earmint oil was employed. In experiments 9 to 13 inclusive insufficient amount of bicarbonate, only 5·5 grms. to grms. of hydroxylamine hydrochloride was used. These portions seem to give the most all round satisfactory ults yet obtained, although there is still a difference of 18 per cent. between the minimum and maximum per- tage. Attention should be called to the fact that earmint oil does not give as good results as does caraway . With these modifications it may be expected that away oil will yield results with but slight variations. rthermore, the oxime in these experiments was much tter than that obtained previously.

TABLE IV.

o.	Amount of Oil taken.	Weight of Oxime.	Carvone Equiva- lent.	Descrip- tion of Oxime.	M. Pt.	Per cent. Carvone found.
					Degrees.	
	9·9932	4·7071	4·2778	Poor	42—52	42·81
	10·0059	4·9171	4·4687	Good	53—56	44·66
	10·0184	5·0799	4·6166	Poor	53—60	46·08
	9·9951	5·1026	4·6372	Fair	48—59	46·40
	10·0046	5·6395	5·1252	Good	50—63	51·23
	10·0067	5·8420	5·3093	"	44—58	53·06
	9·9993	6·0694	5·5150	"	47—57	55·16
	10·0026	5·9877	5·4410	"	45—59	54·40
	10·0089	6·13 6	5·5770	"	44—59	55·72
	10·0006	5·9004	5·3623	"	49—61	53·62
	10·0128	6·3269	5·7499	"	48—59	57·43
	10·0100	6·3661	5·7856	"	43—57	57·80
	10·0008	6·0383	5·4876	"	39—56	54·87

Time of Reaction.—The effect produced by changing the e during which the reaction between the oil (carvone) l the reagents was allowed to take place was studied in o series of experiments. The first series was conducted with spearmint oil, the results being recorded in the following table :—

No.	Grm. Oil taken.	Carvo- xime obtained.	Carvone Equiva- lent.	Per Cent.	Time.	Quality of the Oxime.
					Mins.	
1	10·0073	5·9303	5·3895	53·86	30	Good
2	10·0041	5·5388	5·0337	50·32	30	Fair
3	10·0002	5·7771	5·2502	52·50	30	"
4	10·0007	5·5600	5·0529	50·53	30	"
5	10·0302	6·2472	5·6775	56·60	30	"
6	10·0033	6·3480	5·7691	57·67	20	Very good
7	10·0050	5·9082	5·3694	53·67	20	Good
8	10·0027	6·3799	5·7981	57·96	15	Very good

The second series was made with fraction 228° to 228·5° of Schimmel and Co.'s "extra-starkes Kuemmeluel," which is supposed to be pure carvone. This was mixed with an equal part of fraction 175° to 176° of "carvene." The results are recorded in the following table :—

No.	Grm. taken.	Grm. Carvoxime.	Carvone Equiva- lent.	Per Cent.	Time.	Quality of Oxime.
					Mins.	
1	10·0304	4·9782	4·5242	45·10	30	Excellent
2	10·0068	5·0465	4·5863	45·83	30	"
3	10·0276	5·0602	4·5987	45·86	16	"
4	10·0227	5·0583	4·6061	45·96	16	"
5	10·0198	4·9373	4·4870	44·78	10	"
6	9·9978	4·9509	4·4994	45·00	10	"
7	10·0188	4·5577	4·1120	41·34	5	"
8	9·9952	4·6930	4·2650	42·67	5	"

Whereas in the first series two of the results in the 30 minutes group are rather low, nevertheless the general conclusion that 15 minutes is sufficient for heating the mixture evidently can be drawn from the somewhat irregular figures. In the second table, the results are much better, and they strongly support the conclusion. Even 10 minutes seem to be almost long enough, whereas five minutes indicate a decided drop in the percentage of oxime obtained.

Solubility, Real and Apparent, of Carvoxime in Water.—Attention has been called to the fact that it is difficult to know just when to stop the distillation with water vapour, that not only non-carvone oil passes over, but that carv- oxime is also volatile with water vapour; and, moreover, that the carvoxime does not always crystallise readily, and cannot be readily distinguished from the oil proper. Another objection might have been added, *viz.*, that the carvoxime collected in the test tubes does not always readily solidify completely, but that some at times remains oily and passes through the filter when the oxime is washed with water. A record, therefore, was made in one instance. After distillation with water vapour, the mixture in the flask and the distillate were allowed to stand for 24 hours before being filtered. The aqueous filtrate was then set aside, and from it small crystals of carvoxime separated. These were collected, and their weight found to be 0·0129 grm., or 0·23 per cent. of the carvoxime employed.

The filtrate from assays *d* and *e* (see below) was distilled fractionally. The first fractions were very turbid, but the last ones were perfectly clear. After standing for some time, the turbid fractions separated fine crystals, which, after being dried, were weighed. In assay *d*, 0·0209, and in assay *e*, 0·0132 grm. of oxime were separated, corresponding to 0·379 per cent. and 0·240 per cent. respectively of the oxime employed.

Effect of Alcohol and Water Vapour upon Carvoxime.—In order to get some idea of how the solvents employed and the limonene of the oil might affect the oxime under the ordinary conditions of the assay, the following experiments were made:—

Experiment 1.—To the carvoxime equivalent of approximately 5 grms. of carvone, about 5 grms. of limonene were added, then 25 c.c. each of alcohol and water. This mixture, approximating to that obtained as the product of reaction of the hydroxylamine on the alcoholic solution of the oil, to which 25 c.c. of water had been added, was heated in a flask on a water-bath to drive off the alcohol. Then steam was passed through the mixture, and the distillate collected as usual in the corresponding step of the assay. When crystals of carvoxime began to come over, the distillation was stopped, all of the oxime collected as directed in the process of the assay, air-dried, and heated in a tared capsule on a water-bath. To the weight of the oxime thus obtained, 0·100 grm. was added. The following table shows the results obtained in three experiments :—

	Quantities taken.			Quantities regained.		Percentage of Carvone.		
	Carvoxime.	Carvone Equiv.	Limonene.	Carvoxime.	Carvone Equiv.	Calculated.	Found.	Difference.
a.	5·5000	4·9984	5·1500	5·3806	4·9808	49·25	49·09	0·16
b.	5·5046	5·0071	5·0736	5·4006	4·9989	49·67	49·59	0·08
c.	5·5034	5·0015	4·9962	5·3134	4·8288	50·03	48·30	1·73

The carvoxime was the purified oxime obtained from spearmint oil; the limonene was the "carvene" obtained from Fritzsche Bros. The recovered oxime was nearly white before being heated on the water-bath. After heating, it was hard and crystalline, but of a brownish colour. The loss of carvoxime is therefore but slight, and the oxime seems to have changed but very little in this operation.

Experiment 2.—The limonene, fraction 174·5° to 175·5°, freshly distilled from Fritzsche Bros.' "Carvene," was not weighed accurately, about 5 grms. being taken. Instead of driving off the alcohol at once, as was done in the foregoing experiment, the mixture was heated for 15 minutes in a flask connected with the reflux condenser, as is done in the assay. The oxime used was caraway carvoxime. The results are recorded in the following table :—

d.	5·5090	5·0066	5·0	5·1574	4·6870	50·03	46·84	3·19
e.	5·5022	5·0004	5·0	5·1563	4·6860	50·00	46·86	3·14

Experiment 3.—In order to ascertain whether this difference in the loss (average loss in Experiment 1 = 0·66 per cent., in Experiment 2 = 3·16 per cent.) was due to the additional heating, the same limonene was used, but the mixture was not heated 15 minutes previous to distillation.

f.	5·5054	5·0015	5·0	5·0768	4·6138	50·01	46·13	3·88
g.	5·5032	5·0013	5·0	5·1270	4·6594	50·01	46·59	3·42
h.	5·5025	5·0007	5·0	5·1446	4·6754	50·00	46·75	3·25

The average loss in this case is 3·52 per cent. of carvone, thus showing that the loss in Experiment 2 is not attributable to the additional heating.

Volatility of Carvoxime with Water Vapour.—In order to ascertain the volatility of carvoxime with water vapour, quantities of the oxime usually resulting in the reaction were distilled with water vapour for fifteen, thirty, forty-five, and sixty minutes respectively. The remaining oxime was collected and dried as usual, and weighed. The difference in weight before and after distillation gave the result sought. This result was checked by collecting the oxime that had distilled over, drying and weighing this also.

No.	Weight of Oxime in Distilling Flask.		Oxime Removed by Distillation.	
	Before Dist.	After Dist.	Weight.	Percentage.
1	5·072	4·010	1·062	20·94
2	4·765	2·399	2·366	49·65
3	4·772	0·408	4·364	91·45
4	5·375	0·379	4·996	92·95

No.	Oxime Distilled over and Collected.		Experimental Error du to Solubility in Water and other Loss.	
	Weight.	Percentage.	Weight.	Percenta
1	0·824	16·24	0·238	4·69
2	2·106	44·20	0·260	5·46
3	4·059	85·06	0·305	6·39
4	4·702	87·48	0·294	5·47

Volatility of Carvoxime.—Mr. Schreiner had carefu weighed somewhat over 5 grms. of carvoxime, an a proximation of the quantity generally obtained in t assay, in a glass capsule; heated the capsule on boiling water-bath for an hour at a time, the time th seemed necessary for drying the oxime; and weighed aft each period of heating to note the loss of weight due volatilisation. He found that the average came near 0·1 These experiments were repeated, with the followi results :—

Experiment I.—3·8671 grms. of caraway carvoxi were heated in a glass capsule on a boiling water-bath f an hour at a time, weighed, when cooled, in a desiccat and the following losses recorded. (1) 0·0634; (0·0693; (3) 0·0958; (4) 0·0907; (5) 0·0760; (0·0958.

Experiment II.—5·5002 grms. of spearmint carvoxi when treated in like manner, gave the following resul (1) 0·1127; (2) 0·1019; (3) 0·0582; (4) 0·1117; (0·1067; (6) 0·583.

Experiment III.—4·470 grms. of spearmint carvoxi in a control experiment yielded the following data (1) 0·103; (2) 0·180; (3) 0·160; (4) 0·156; (5) 0·14 (6) 0·141.

Experiment IV.—4·414 grms. of caraway carvoxi in a control experiment yielded the following dat (1) 0·109; (2) 0·177; (3) 0·162; (4) 0·161; (5) 0·15 (6) 0·165.

When compared, these results show rather surpris differences. These differences, however, are readi accounted for if the diameter of the opening of t water-bath is taken into consideration, as shown by t following tabular arrangement :—

Time.	Loss of Caraway Carvoxime.			Loss of Spearmint Carvoxime.		
	35 mm.	43 mm.	65 mm.	35 mm.	43 mm.	65 m
Hours.						
1	0·0634	..	0·109	..	0·1127	0·1
2	0·0693	..	0·177	..	0·1019	0·1
3	..	0·0958	0·162	0·0582	..	0·1
4	..	0·0907	0·161	..	0·1117	0·1
5	0·0760	..	0·152	..	0·1067	0·1
6	..	0·0958	0·165	0·0583	..	0·1

Moisture in Air-dried Carvoxime.—From the foregoi it becomes apparent that the loss of carvoxime due volatility of the oxime itself is a fairly constant quan for the same time and surface of exposure to heat. Th this beating on the water-bath is a necessity is broug out by a series of experiments in which the oxime w weighed when air-dried and after drying on the water-b for an hour. The results are recorded in the followi table, which shows that the air-dried carvoxime eviden

No.	Weight of Air-dried Carvoxime.	After Drying on a Water-bath.	Total Loss.	Loss attributal to Moistu
1	5·1807	4·9768	0·2039	0·1039
2	5·1912	5·0269	0·1643	0·064
3	5·1825	5·0446	0·1379	0·0379
4	5·2103	4·9233	0·2870	0·187
5	5·2925	5·1193	0·1732	0·0732
6	6·0294	5·7674	0·2620	0·162
7	6·1717	5·7869	0·3848	0·2848
8	6·2250	5·7707	0·4543	0·3543

ntains variable quantities of water, and that it would ot do to weigh the air-dried oxime for purposes of say.

Influence of Resinous Matter.—Attention has several nes been called to the various ways in which non-volatile sinified matter in the oil may affect the reaction. If the l has been badly "resinified" by continuous exposure to r and sunlight, the carvoxime resulting in the reaction may so impure as to prevent its crystallisation. Such a sult is not to be deplored, for it shows up at once the purity of the oil and the necessity of its rectification before it is put to use. In order to ascertain the percentage of carvone in such a resinified oil, it is but necessary to distil it with water vapour and to analyse the rectified oil according to the usual process.

As long as the amount of resin is not sufficient to prevent the oxime from crystallising, it is apparent that its presence in the carvoxime will add to the weight of the latter, and thus make the oil show up more favourably than it ought to. This was demonstrated experimentally by a series of three experiments each with pure carvoxime on the one hand and colourless "carvene" and "resinified carvene" respectively on the other. The experiment with the colourless carvene yielded 49·09, 49·59, and 48·30 per cent. of carvone respectively, in place of 50 per cent. as calculated. The resinified carvone yielded 53·32, 53·47, and 53·34 per cent. respectively, in place of 50 per cent. as calculated. Thus the resin in the oil made it appear about 3 per cent. richer in carvone that it was in reality.

No.	Rosin in Limonene.	Quantities taken.			Quantities regained.		Percentage.		Melting Point of Oxime.
		Oxime.	Carvone Equivalent.	Limonene Containing Resin.	Oxime as Weighed† (+ Resin).	Carvone Equivalent.‡	Calculated.	Found.	
	Per Cent.								Degrees.
1	0	5·5057	5·0036	5·0096	5·2846	4·8026	49·97	47·96	67—70
2	0	5·5014	4·9997	5·0000	5·2671	4·7867	50·00	47·87	69—69·5
3	1	5·5042	5·0022	5·0113	5·3032	4·8195	49·95	48·13	63—66
4	1	5·5000	4·9984	5·0069	5·3153	4·8305	49·96	48·28	64·5—68
5	1	5·5065	5·0043	5·0114	5·2786	4·7972	49·96	47·90	64·5—68
6	2	5·5065	5·0043	5·0090	5·3751	4·8849	49·93	48·78	..—67
7	2	5·5027	5·0009	5·0072	5·3899	4·8983	49·97	48·94	..—66
8	2	5·4991	4·9976	5·0034	5·4026	4·9099	49·97	49·09	63—68
9	2	5·5039	5·0019	5·0093	5·4088	4·9155	49·96	49·10	63—68
10	3	5·5024	5·0006	5·0083	5·2724	4·7916	49·96	47·87	62—67
11	3	5·5019	5·0001	5·0089	5·4235	4·9289	49·96	49·24	62—66·5
12	3	5·5032	5·0013	5·0092	5·3939	4·9020	49·96	48·97	62—67
13	3	5·5024	5·0006	5·0023	5·4075	4·9143	49·99	49·13	61—66
14	3	5·5025	5·0007	4·9964	5·4683	4·9696	50·02	49·71	61—67·5
15	4	5·5029	5·0010	5·0010	5·4524	4·9551	50·00	49·54	61—65·5
16	4	5·5054	5·0033	5·0015	5·5159	5·0128	50·01	50·10	61—67
17	4	5·5096	5·0071	5·0001	5·4417	4·9454	50·04	49·42	60—66·5
18	5	5·4999	4·9983	5·0006	5·5097	5·0072	49·99	50·03	62—66·5
19	5	5·5045	5·0025	4·9949	5·4983	4·9969	50·04	49·98	63—67
20	5	5·5044	5·0024	4·9989	5·5491	5·0430	50·02	50·42	62—67
21	1	5·500	4·9984	5·000	5·3010	4·81755	49·99	48·18	..
22	1	5·500	4·9984	5·000	5·2995	4·81619	49·99	48·16	..
23	2	5·500	4·9984	5·000	5·3215	4·8360	49·99	48·36	..
24	2	5·500	4·9984	5·000	5·2830	4·8011	48·99	48·00	..
25	3	5·500	4·9984	5·000	5·3550	4·8666	49·99	48·67	..
26	3	5·500	4·9984	5·000	5·3105	4·8261	49·99	48·26	..
27	4	5·500	4·9984	5·000	5·3640	4·8750	49·99	48·75	..
28	4	5·500	4·9984	5·000	5·3255	4·8398	49·99	48·40	..
29	5	5·500	4·9984	5·000	5·3100	4·8257	49·99	48·26	..
30	5	5·500	4·9984	5·000	5·3005	4·8170	49·99	48·17	..

† Corrected by adding 0·10.

‡ Including the resin.

TABLE XII.

No.	Weight of Resin present.	Weight of Oxime* (– Resin).	Carvone equivalent.	True Percentage of Carvone found.	Loss.
					Per Cent.
1	0·0000	5·2846	4·8026	47·96	2·01
2	0·0000	5·2671	4·7867	47·87	2·13
3	0·0501	5·2531	4·7740	47·68	2·27
4	0·0501	5·2652	4·7850	47·81	2·15
5	0·0501	5·2285	4·7517	47·44	2·52
6	0·1002	5·2749	4·7938	47·86	2·12
7	0·1001	5·2898	4·8074	48·04	1·93
8	0·1001	5·3025	4·8189	48·18	1·79
9	0·1002	5·3086	4·8245	48·19	1·77
10	0·1502	5·1222	4·6551	46·51	3·45
11	0·1503	5·2732	4·7923	47·87	2·09
12	0·1503	5·2436	4·7653	47·60	2·36
13	0·1501	5·2574	4·7779	47·77	2·22
14	0·1499	5·3184	4·8334	48·45	1·57
15	0·2000	5·2524	4·7734	47·72	2·28
16	0·2001	5·3158	4·8310	48·29	1·72
17	0·2000	5·2417	4·7636	47·60	2·44
18	0·2500	5·2597	4·7809	47·81	2·18
19	0·2497	5·2486	4·7699	47·70	2·34
20	0·2499	5·2992	4·8160	48·16	1·86
21	0·05	5·2510	4·7721	47·73	2·26
22	0·05	5·2495	4·7707	47·71	2·28
23	0·10	5·2215	4·7452	47·46	2·53
24	0·10	5·1830	4·7103	47·11	2·88
25	0·15	5·2050	4·7303	47·31	2·68
26	0·15	5·1605	4·6898	46·91	3·08
27	0·20	5·1640	4·6930	46·94	3·05
28	0·20	5·1255	4·6581	46·59	3·40
29	0·25	5·0600	4·5985	45·99	4·00
30	0·25	5·0505	4·5899	45·90	4·09

* Corrected by adding 0·10.

It also became necessary to pay more attention to the melting point of the carvoxime, and to learn how it would be influenced by the presence of this "resin." Two series of experiments were therefore made, the one with colophony or rosin, the other with so-called resin from resinified caraway oil.

I.—In the first series of experiments carvoxime was mixed with limonene to which a known quantity of rosin had been added, and the qualitative and quantitative effect of the rosin on the oxime, recovered according to the directions of the process of analysis, studied. The qualitative effect was judged by the change in melting point. The melting point of the pure recrystallised oxime is given as 71° by Goldschmidt and Zürrer (Ber. **18**, p. 1730). The melting point of the oxime used in these experiments was determined, and found to be 70·5°—72°; 71°—72°; 71·5°—73°; 72°—73° in four different determinations. From the table given above it will be seen that the melting point of the oxime, after having been mixed with pure limonene, subjected to steam distillation, and to the heat of a water-bath for an hour, is lowered several degrees, even if no rosin is present. Whereas in a general way it may be stated that the melting point is lowered by the presence of rosin, and that the lowering is dependent on the amount of rosin present, yet the practical utility of this observation is impaired by two facts. First, it is difficult to state where the impure oxime begins to melt. Different observers may well be of different opinion. Secondly, the point at which the mixture is completely liquid is sharper, but the difference here for different percentages of rosin present is but slight.

With regard to the increase in weight of the oxime produced by the presence of the resin, it will be seen that with the increase in the percentage of resin, the percentage of oxime found gradually increases to about 50 per cent., but in no case goes materially above the theoretical amount, even when 5 per cent. of resin are present.

The influence of the presence of the resin on the weight of the oxime is better demonstrated by the figures in Table XII. With but one exception, *viz.*, experiment 10, it will be seen that the actual loss of oxime in the series of experiments by Mr. Alden (1—20) is quite uniform, varying from 1·57 per cent. as minimum to 2·52 per cent. as maximum. The loss in the series Mr. Ehlert (21—30) who had no previous experience w this method was greater, the greatest loss being 4·09 cent.

II.—The above experiments were supplemented by taki the so-called resin from resinified caraway oil. A bad resinified oil of caraway was distilled with water vap and the residue heated on a water bath until it no lon lost weight. The non-volatile resin was dissolved limonene, a 4·65 per cent. saturated solution resulti Even upon the application of heat a stronger soluti could not be obtained. From this concentrated soluti the more dilute solutions were prepared. The resu obtained in a series of 10 experiments are recorded Table XIII. As will be seen upon comparison, much same results were obtained as in the experiments with colophony.

TABLE XIII.

No.	Per Cent. Resin in Limonene.	Quantities taken. Oxime.			Quantities regained. Oxime weighed* (+ Resin).		Percentages. Calculated.		Melting Po of Oxime
			Carvone equivalent.	Limonene containing Resin.		Carvone equivalent.		Found.	
									Degrees.
1	1	5·5031	5·0012	4·9986	5·3235	4·8380	50·01	48·38	64—67·5
2	1	5·5040	5·0020	5·0004	5·2983	4·8151	50·01	48·14	66—69
3	2	5·5035	5·0016	4·9966	5·3233	4·8378	50·02	48·39	[illegible]—68
4	2	5·5039	5·0019	4·9946	5·2839	4·8020	50·04	48·04	65—67·5
5	3	5·5063	5·0041	5·0414	5·3236	4·8381	49·82	48·16	64—67
6	3	5·5041	5·0021	5·0405	5·3515	4·8634	49·81	48·42	61—66
7	4	5·5056	5·0035	5·0422	5·3729	4·8829	49·81	48·61	58—63
8	4	5·5051	5·0030	5·0376	5·4468	4·9500	49·83	49·30	[illegible]—66
9	4·65	5·5053	5·0032	5·0290	5·4365	4·9407	49·87	49·25	64—67·5
10	4·65	5·5057	5·0036	5·0376	5·4504	4·9533	49·83	49·33	64—66·5

* Corrected by adding 0·10.

Table XIV., like Table XII., shows the actual loss of oxime. Inasmuch as this method of analysis is still in the experimental stage, these figures should be worth recording.

III.—In the series of experiments reported under I. and II. the conditions were chosen as simple as possible by using carvoxime already formed, mixing it with limonene to which rosin or resin had been added, and recovering the contaminated carvoxime by steam distillation in the usual manner. A third series of experiments was undertaken in which the effect of the resin from caraway oil on the reaction between the carvone and hydroxylamine, as well as on the ultimate carvoxime was studied. The carvone employed was a fraction 228—229 of Schimmel and Co.'s "Carvol." The limonene used was a fraction 175° of "Carvene" from the same firm. The oxime of the eleven experiments recorded in Table XV. was soft and somewhat sticky, but could be manipulated without difficulty. It will be seen from this table that the melting point is lower than in the previous experiments. Table XVI. a shows that the loss is much greater.

TABLE XIV.

No.	Weight of Resin present.	Weight of Carvoxime* (– Resin).	Carvone equivalent	True Percentage of Carvone found.	Loss Per C
1	0·0500	5·2735	4·7925	47·93	2·0
2	0·0500	5·2483	4·7697	47·69	2·3
3	0·0999	5·2334	4·7470	47·48	2·5
4	0·0999	5·1840	4·7112	47·13	2·9
5	0·1512	5·1724	4·7007	46·79	3·0
6	0·1512	5·2003	4·7260	47·06	2·7
7	0·2017	5·1712	4·6996	46·78	3·0
8	0·2015	5·2453	4·7669	47·48	2·8
9	0·2388	5·1977	4·7237	47·08	2·7
10	0·2342	5·2162	4·7405	47·20	2·6

* Corrected by adding 0·10.

TABLE XV.

No.	Percentage of Resin in Limonene	Quantities taken. Carvone.		Quantities regained. Oxime.		Percentages. Calculated.		Melting Po of Oxime
			Limonene containing Resin.		Carvone equivalent.		Found.	
								Degrees.
1	0	5·0058	6·0172	6·5542	4·1389	45·40	37·54	49—56
2	0	5·0078	5·0186	4·6755	4·2491	49·95	42·38	[illegible]—57
3	1	5·0090	5·0304	4·5997	4·1802	49·79	41·64	[illegible]—56
4	1	5·0276	5·0234	4·6134	4·1927	50·03	41·72	47—55
5	2	5·0180	5·0190	4·6751	4·2487	50·00	42·33	50—57
6	2	5·0037	5·0107	4·6696	4·3437	49·97	42·38	[illegible]—54
7	3	5·0193	4·9921	4·6570	4·2323	50·14	42·27	[illegible]—53
8	3	5·0715	4·9785	4·8794	4·4344	50·46	44·12	52—59
9	4	4·9920	5·0195	4·7744	4·3390	49·86	43·34	47—55
10	4	4·9894	4·9991	4·7003	4·2716	49·95	42·87	48—59
11	4	5·0192	4·9956	4·8710	4·4268	50·19	44·20	37—4

Table XVI.

No.	Weight of Resin present.	Weight of Carvoxime.	Carvone equivalent.	True Percentage of Carvone found.	Loss Per Cent.
1	0·0000	4·5512	4·1389	37·54	7·86
2	0·0000	4·6755	4·2491	42·38	7·57
3	0·0503	4·5494	4·1345	41·18	8·61
4	0·0592	4·5632	4·1470	41·26	8·77
5	0·1004	4·5747	4·1575	41·42	8·58
6	0·1002	4·5694	4·1527	41·47	8·50
7	0·1498	4·5072	4·0961	40·90	9·24
8	0·1494	4·7300	4·2986	42·77	7·69
9	0·2008	4·5736	4·1565	41·52	8·34
10	0·2000	4·5003	4·0899	40·94	9·01
11	0·1998	4·6712	4·2652	42·59	7·60

To conclude that these low results are due solely to the influence of the resin on the carvoxime while being formed, would not be correct, for other experiments have shown that the alkalinity of the reaction mixture during the steam distillation has much to do both with the yield and the quality of the carvoxime formed.

IV.—The highest percentage of resin in the experiments recorded under I., II., and III., is 2·5 per cent. (colophony) and 2·3 per cent. (resin from caraway oil) respectively. It requires but little experience with volatile oils, however, to know that resinification of oils may proceed much farther. Thus a commercial sample of caraway oil was found to contain as much as 11 per cent. of resin when rectified by steam distillation. The specific gravity of the oil before distillation was 0·957, after distillation 0·910. Before rectification it assayed 40·96 per cent. carvone (melting point of oxime 49°), after rectification 43·54 per cent. (melting point of oxime 55°). A sample of spearmint oil was found to contain 8·8 per cent. of resin when rectified in like manner. The specific gravity of the resinified oil was 0·9015, of the rectified oil 0·8953. Before rectification it assayed 46·88 per cent. (melting point of oxime 38°—48°) and 47·99 per cent. (melting point of oxime ?—49°) respectively. After rectification the oil assayed 44·60 per cent. (melting point of oxime 30°—44°) and 48·33 per cent. (melting point of oxime 25°—45°) respectively. These data are not sufficiently accurate to admit of drawing any very definite conclusions.

Conclusion.—Although the method of determining the carvone content of volatile oils, containing this ketone, as carvoxime is by no means perfect, this method is unquestionably a step in the right direction. The more recent method of shaking out the carvone is subject to the same criticism which is applicable to the shaking out of phenols by alkali solutions. The one great advantage in the method proposed is that the analyst weighs a definite crystalline compound.

Meeting held on Friday, December 21st, 1900.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

COLORIMETRIC DETERMINATION OF TITANIC ACID.

BY JAMES BRAKES.

In the estimation of TiO_2 by the colour method, I have modified the method as used by Dr. Charles Baskerville (this Journal, 1900, 419) as follows:—

Fusing the residue left from the first filtrate with the mixed carbonates. Fusing the chemically pure TiO_2 with the above carbonates instead of $KHSO_4$ in preparing the standard solution. Also in standardising of the same.

The method is as follows:—

Fuse 5 grms. of ore with an equal amount of NaF and ten times the weight of the ore of $KHSO_4$ in a platinum crucible at a low heat until the fusion is quiet, and finally heat 15 or 20 minutes at a low red heat to expel the last traces of fluorine. Cool crucible and lid, place in small beaker, and cover with 50 c.c. of 10 per cent. solution of H_2SO_4, and heat until dissolved. Filter into 500-c.c. flask, washing the filter and residue thoroughly with hot water, and fuse (if necessary) with a small quantity of the mixed carbonates. Cool and dissolve the mass in the crucible with strong H_2SO_4. Heat carefully until the ore is decomposed, cool, place in beaker, cover with water, and heat until dissolved. Filter, allow the filtrate to run into the 500-c.c. flask, cool, dilute to 500-c.c. mark with water, and mix thoroughly.

Take 100 c.c. of the solution with pipette, place in 100-c.c. Nessler tube, add 5 c.c. of hydrogen peroxide, and mix thoroughly with mixing rod.

To a second Nessler tube add 100 c.c. of 10 per cent. solution of H_2SO_4; add the number of c.c. of $FeSO_4$ solution equivalent to the amount of iron present in 0·1 grm. of the ore; add now 5 c.c. of hydrogen peroxide, mix thoroughly, and add standard TiO_2 solution until the desired tint is obtained, comparing the colours by reflected light.

Standard TiO_2 Solution.

Fuse 1 grm. of chemically pure TiO_2 in platinum crucible with 8 grms. of the mixed carbonates (Na_2CO_3 + K_2CO_3), cool, place in beaker, add 100 c.c. of water, and add slowly 30 c.c. of concentrated H_2SO_4, and heat until dissolved. Filter, and should the filtrate be turbid, refilter through the same filter until the filtrate is perfectly clear. Ignite the filter and contents, and fuse with 2 grms. of the above carbonates. Place in beaker as before, and add 100 c.c. of water and 20 c.c. of strong H_2SO_4, and heat until dissolved. Filter, allowing the filtrate, if clear, to run into first filtrate, and, after the solution has become cold, dilute to 500 c.c. and mix.

To standardise the solution take 10 c.c. of the solution with pipette, place in 150-c.c. beaker, add 25 c.c. of water, add an excess of NH_4HO, filter, and wash thoroughly with hot water until free from sodium and potassium salts. Ignite, cool, and weigh.

To the crucible add one or two drops of water and the same amount of strong H_2SO_4 and a few c.c. of HF, and evaporate to dryness. Ignite and weigh, and calculate the TiO_2 contained in 1 c.c. of the solution.

$FeSO_4$ Solution.

Dissolve 50 grms. of $FeSO_4 7H_2O$ in 500 c.c. of water, and add 100 c.c. of H_2SO_4, and dilute to 1 litre, and standardise with $K_2Cr_2O_7$ solution.

The results obtained from a sample of iron ore by the above method were 0·738 per cent. TiO_2 and from the same sample Dr. Charles Baskerville's results were 0·740 per cent. TiO_2 (gravimetric).

Nottingham Section.

Meeting held at the Municipal Technical College, Derby, on Tuesday, November 20th, 1900.

PROF. STANLEY F. KIPPING, F.R.S., IN THE CHAIR.

THE VALUATION OF GAS LIQUOR.

BY F. J. R. CARULLA.

Although ammoniacal liquors are being obtained in increasing quantities from the operations connected with coke ovens and blast furnaces, the large bulk of the make is still produced at the gas works. At one time it used to be worked up almost exclusively by chemical manufacturers, but gradually this process has become part of the gas manager's business.

The reasons for this change, and for the apparent encroachment, must interest this Society, representing, as it does, chemical manufacturers as distinguished from the gas industry.

Clearly, a raw material such as gas liquor, that, on an average, contains no more than 2 per cent. of ammonia, the remaining 98 per cent. being practically waste, is not an article that can be dispatched to long distances. It will not stand heavy carriage charges, and, consequently, large gas works not conveniently situated in regard to chemical works are compelled to work the liquor up themselves. Occasionally, however, a chemical works close to a gas works is suddenly deprived of a commodity that is perhaps necessary to its very existence. Such a state of things can only be due to some serious misunderstanding, and the question is, How can it have occurred?

The chief cause of dissatisfaction is the system of sale and purchase that is generally adopted. The chemical manufacturer generally buys the liquor at a fixed price, but cannot sell his make of sulphate of ammonia ahead in the same way. As the price of sulphate varies enormously, without the manufacturer being able to influence it, the time is sure to come when he is selling at a loss. The gas company then has no cause to complain. On the other hand, sulphate prices may rise when the chemical manufacturer has a low-priced contract for gas liquor. The gas company—not unnaturally—regrets the loss of the considerable profits that it might be making, regardless, however, of the periods of low prices—sure to recur—when the chemical manufacturer has been losing money.

It is surprising that no great effort has ever been made by those manufacturers interested in this industry to bring about a change, making affairs more satisfactory to all concerned. It must be evident that a sliding scale instead of a fixed price would get over the difficulty.

The first consideration that arises, whatever the method of sale may be, is how the strength of the liquor is to be ascertained. The most usual method is to take the specific gravity by means of Twaddell's hydrometer.

Strange as it may appear, this is in many cases, especially with the low strengths, a perfectly fair estimate of the contents of ammonia in the liquor. It is not always so, but with the coals used in this district, and the strengths usually produced, the cases in which the indication is not a fairly true one are very rare indeed.

The Burton Gas Works, for instance, producing a liquor that seldom exceeded 4° Tw., yielded results accurate absolutely to the first decimal point.

The following are some tests made to check a certain lot of liquor:—

Tw. Degrees at 60° F. Actual.	Ounce Strength by Distillation.	Equivalent Tw.
3·3	6·73	3·36
3·9	7·93	3·96
3·9	7·83	3·91

Mr. F. L. Ramsden, the engineer and manager of the Burton Gas Works, informs the author that nearly all the coal and cannel from which this liquor was obtained was from the North Derbyshire district.

These and other analyses referred to in this paper were made by Mr. E. M. Glover, who has had a very long experience in this particular test.

Considering that free ammonia lowers the specific gravity, it is a remarkable fact that as the density of gas liquor rises, the contents of ammonia also increase. The rate of increase is, however, not always even, and there is no doubt that, with strengths of 7 and 8° Tw., the hydrometer test is only an approximation, but as there is usually an increase of real strength over that indicated, it is a matter easy of adjustment when fixing the price, and does not prevent the use of the hydrometer, which is an immense convenience wherever this instrument can be employed. In some cases where the hydrometer is inapplicable or objected to, and where yet expedition has been desired, a method known as the "saturation test" has been applied. This test is only of interest as having given origin to the expression "ounce strength," for in reality it does not always yield reliable results. The test, conducted as it is by the direct saturation of 1 gallon of the gas liquor with sulphuric acid, the number of ounces used being noted, will fail to give the ammonia combined with strong acids.

An actual analysis becomes, therefore, the only alternati where the hydrometer is inapplicable, as, for instance, liquor containing free ammonia, or in those from tarstil &c., or where the liquor supplied is very variable. Such analysis is always carried out by the well-known method distillation.

By the kindness of Mr. John Phillips, secretary of t Bristol Gas Co., the author is able to give particulars of t modification they adopt. The description is of spec interest, as it is issued to would-be contractors for the pu chase of their gas liquor, with the forms of tender to filled in with prices on a sliding scale based on the mark value of sulphate of ammonia.

(The full description, with illustration of the apparat has been published in the Journal of Gas Lighting, Dec. 4 and 11, 1900, pp. 1397 and 1462.)

Having fixed on the method for ascertaining the streng of the liquor, the next point is, what basis should be tak for the price of sulphate of ammonia. As this price published weekly in the Chemical Trade Journal, t Journal of Gas Lighting, and a number of others, it easy to agree upon some publication from which to take Then comes the question, What proportion of the curre value of sulphate of ammonia shall be allocated to t chemical manufacturer, and what to the gas compan Whatever the price of sulphate may be, the cost of i manufacture from any particular strength of liquor, apa from the cost of the liquor itself, varies very little. course, it varies considerably when coal doubles in pric as has recently occurred, but one is speaking of norm times, disregarding accidents and abnormal occurrences, f which, nevertheless, some provision in the nature of insuran should be made.

It is unnecessary here to enter into the details that go make up the cost. A fair sum where the gas liquor is clo to the chemical manufacturer's works, or where it delivered free, might be 5*l*. 5*s*. per ton of sulphate, and this sum is deducted from the current price of sulphate, th remainder would fairly represent what the gas compan should receive for the ammoniacal liquor used in th manufacture.

Having reached this agreement, it is easy to fix the pric per ton for the various strengths of gas liquor that may b supplied.

The Twaddell scale is convenient, in that the number 6 divided by the strength in degrees Tw. gives the numbe of tons of liquor required to make 1 ton of sulphate ammonia. Thus, of 6° liquor, 10 tons are required; of 5 liquor, 12 tons are required; of 4° liquor, 15 tons ar required; of 3° liquor, 20 tons are required. The strengt in Tw. degrees multiplied by the tons required always bein 60.

Suppose that sulphate is at 11*l*. per ton. From thes data it might appear that the price that the manufacture should be able to pay for liquor delivered to his work would be—

$$\text{For } 6^\circ\ \frac{11l. - 5l.\ 5s.}{10} = 11s.\ 6d. \text{ per ton.}$$

$$\text{For } 5^\circ\ \frac{11l. - 5l.\ 5s.}{12} = 9s.\ 7d. \text{ per ton.}$$

$$\text{For } 1^\circ\ \frac{11l. - 5l.\ 5s.}{15} = 7s.\ 8d. \text{ per ton.}$$

$$\text{For } 3^\circ\ \frac{11l. - 5l.\ 5s.}{20} = 5s.\ 9d. \text{ per ton.}$$

But it would really not be so, as, *e.g.*, the cost of manufacture from 3° liquor is much greater than from 6°, in consequence of the much larger quantity that has to be dealt with—*viz.*, double—to produce the 1 ton of sulphate. Obviously it cannot fairly be asked of him to pay one-half the price of 6° for 3°, although the latter yields one-half the quantity of sulphate.

The manufacturer can protect himself by making it a condition that no liquor shall be less than 4° Tw., or, what might be more convenient to both buyer and seller, to adjust the cost of manufacture to the varying strengths.

This may be done in the following manner:—

Let a = price of sulphate of ammonia.

Let b = cost of carriage of gas liquor per ton.

Let c = constant manufacturing charges, including acid, bags, carriage to port of shipment, &c., per ton of sulphate made.

Let d = variable manufacturing charges, including fuel, lime, wages, repairs, &c., also per ton of sulphate made, but their amount depending on the strength of the liquor. We will suppose that d = this value for 5° Tw.

Let T = strength of gas liquor in degrees Tw.

Let x = value per ton of gas liquor of any strength at the gas works.

A fair manufacturing profit should evidently be included in the value d, not in the value c, as otherwise the sulphate maker is not sufficiently protected in the event of deliveries of weak gas liquor, and, on the other hand, the gas company would not derive sufficient benefit when delivering strong liquor.

Remembering that 60 divided by the Twaddell strength of any liquor is equal to the number of tons of that liquor required for 1 ton of sulphate of ammonia, it will be evident that

$$x = \left\{a - \left(\frac{60\,b}{\mathrm{T}} + c + d\right)\right\} \times \frac{\mathrm{T}}{60} \ldots\ldots\ldots\ldots(1).$$

But we are supposing that the value d is for liquor of 5° Tw.; hence, as the equation stands, it would only be rue for liquor of this strength. To make it applicable to iquor of any strength, it is necessary to consider that it will take just as long for, say, 100 tons of liquor to pass hrough the ammonia still if the strength is 4° Tw. as when it is 5°. The process can certainly be hastened or delayed in a certain measure, but this is not of sufficient mportance to be taken into account in this calculation. We may therefore safely say that

$$\frac{5\,d}{\mathrm{T}}$$

will represent the variable manufacturing charges per ton f sulphate made from liquor of any given strength.

Substituting this value for d, in equation (1), we get

$$x = \left\{a - \left(\frac{60\,b}{\mathrm{T}} + c + \frac{5\,d}{\mathrm{T}}\right)\right\} \times \frac{\mathrm{T}}{60} \ldots\ldots\ldots(2),$$

nd, simplifying, we obtain

$$x = \frac{\mathrm{T}(a - c) - (60\,b + 5\,d)}{60} \ldots\ldots\ldots\ldots\ldots(3).$$

Of course, there will be no two manufacturers who could ive the same values to b, c, and d. Nevertheless, we may, or purposes of illustration, assign values to these factors, nd easily construct a table to make the matter more clear.

Suppose b, the carriage per ton of liquor from the gas orks, to be 2*s*.

Let c, the constant manufacturing charges per ton of lphate, be 50*s*., and let d, the variable manufacturing harges, be 55*s*.

Using the formula (3), we get for x the prices given in he following table for liquor of different strengths at the arious values of sulphate of ammonia indicated :—

x = Price per Ton of Liquor at Gas Works.

Tw. Strength f Liquer.	When Sulphate is valued at				
	8*l*.	9*l*.	10*l*.	11*l*.	12*l*.
	s. *d*.	*s*. *d*.	*s*. *d*.	*s*. *d*.	*s*. *d*.
3°	..	..	0 11	1 11	2 11
4°	0 9	2 1	3 5	4 9	6 1
5°	2 7	4 3	5 11	7 7	9 3
6°	4 5	6 5	8 5	10 5	12 5
7°	6 3	8 7	10 11	13 3	15 7
8°	8 1	10 9	13 5	16 1	18 9

It will be evident from this table how unprofitable the orking of low-strength liquor is to the manufacturer. At e low prices of 8*l*. and 9*l*. per ton for sulphate, the manucturer might actually be losing money if liquor of 3° Tw. re *given* to him, and he had a carriage of 2*s*. per ton to pay upon it. As low-strength liquor is frequently worked up, and considerably higher prices than those indicated by our table are paid for it, it is clear that the liquor must be passed as rapidly as possible through the still with probable loss of fixed ammonia in the spent liquor. At the same time, it must be added that low-strength liquor within reasonable limits commends itself to those who have to handle it many times, because any losses by leakage are not so serious as when the liquor is of a high strength.

A comparison may be made of the prices obtained in the earlier calculation for 6°, 5°, 4°, and 3° liquor, deducting the 2*s*. per ton supposed to be paid for carriage, and the prices in the table for the same strengths when the price of sulphate of ammonia is 11*l*. :—

Strengths Tw.	6°	5°	4°	3°
	s. *d*.	*s*. *d*.	*s*. *d*.	*s*. *d*.
Price of liquor per ton, assuming 5*l*. 5*s*. as cost of making sulphate.	9 6	7 7	5 8	3 9
Price of liquor per ton, dividing the same cost into a constant and a variable portion ($c+d$) as per table.	10 5	7 7	4 9	1 11

The fairness of the suggested formula by which the table has been prepared will be seen from the comparison. The sellers would get 11*d*. more per ton for liquor of 6° strength by the table, whilst the buyer would pay 11*d*. less per ton for 4° strength. Of course 5° is not altered, as we have supposed d to represent the variable portion of the cost of manufacture for this strength of liquor.

In conclusion, the author would state that, although figures have been used for the sake of clearness and illustration, he only wishes to draw attention to a principle of valuation, that may be modified according to the circumstances of each case, but which he believes, when properly appreciated and understood, to be capable of introducing harmony amongst the contending interests of the gas and the chemical industries.

DISCUSSION.

The **CHAIRMAN** said he was surprised to hear that anyone used the hydrometer as a test for gas liquor. He understood that the liquor was bought and sold by the "ounce strength."

Mr. **CARULLA** remarked that the ounce strength obtained by saturation of the liquor with sulphuric acid also failed to give a true indication in many instances.

The **CHAIRMAN** said that the ascertainment of the ounce strength by the distillation test is what he referred to.

Mr. **CARULLA** said that he had experience of more than a dozen gas companies by whom the hydrometer was found a convenient and reliable instrument. Of course, when buying liquor from tar distillers, a distillation test was indispensable, as in that case the hydrometer gave no indication of the strength.

Obituary.

LORD ARMSTRONG.

By the death of Lord Armstrong, the Society of Chemical Industry loses one of its most distinguished members, and the world one of its greatest men. In whatever way the character of Lord Armstrong is regarded, whether as a scientific man and inventor, as a man of affairs, or as a public benefactor, he stands out among the great men of his time as a towering personality.

Lord Armstrong's father began life at Wreay, a small place near Carlisle, with no brilliant prospects, and was induced to remove to Newcastle, where he became partner in a firm of corn merchants, and eventually mayor of the town. His son at a very early age began to show a strong inclination to mechanics, but when he left the Bishop Auckland Grammar School he was placed with the family solicitor as an articled clerk, and in due time became a partner in the firm. In 1834, he married Margaret, daughter of William Ramshaw, of Bishop Auckland. For thirteen years he adhered to the legal profession, but in his leisure he sedulously studied engineering problems; in fact, it was to mechanics rather than law that he gave his mind. One of the earliest of his mechanical inventions was the hydraulic crane, a type of hydraulic machine which has now become of world-wide utility. But what first drew the attention of the world to the ingenuity of this north-country solicitor with a mechanical genius was the successful and brilliant experiments he made in elucidation of a mysterious phenomenon reported to him as frequently occurring in connection with a steam engine at Seaton Delaval Colliery.

It was said that when the engineman was adjusting the safety valve while the steam was blowing off, sparks of fire darted out of his fingers. This strange phenomenon interested Mr. Armstrong; he carefully examined into it, found it to be new—the first instance known of the generation of electricity by effluent steam. This led him to the invention and construction of what was, at that time, by far the most powerful means known of generating high-tension electricity—the hydro-electric machine. Chiefly in recognition of the merit of this discovery, Mr. Armstrong, while still a young man, was elected to the fellowship of the Royal Society.

Between 1845 and 1850 Mr. Armstrong invented the "accumulator," by which an artificial "head" of water is substituted for the natural "head" gained by altitude only; and he extended the application of hydraulic power to hoists of every kind, dock-gates and swing-bridges, turntables, capstans, waggon-lifts, &c. For the manufacture of this machinery the Elswick Engine Works were started in 1847–8, the founders being Mr. Armstrong, Mr. Donkin, Mr. Potter, Mr. George Cruddas, and Mr. Richard Lambert. These gigantic works are monumental evidence of the great capacity of Lord Armstrong, not only as an inventor, but as the organiser of a great industrial enterprise—where, for the first time, was attempted the entire construction and armament of great ships of war as the product of one works, and that not a Government establishment. Lord Armstrong used to speak of Elswick as a national arsenal that might in time of war be of great importance in aid of the defence of the country, and recent history has shown the truth of his forecast. The modern cruiser class of fighting ship was evolved at Elswick. During the Crimean war, the difficulties of bringing up heavy artillery engaged Mr. Armstrong's attention. Lighter guns with a longer range, he saw, was the object to be attained. The work he had set himself to do was arduous; it was no less than to completely remodel the ordnance of the Army and Navy. Many details, of course, had to be worked out and trials to be conducted at remote spots on the moors or the shore. In 1856 the Armstrong rifled ordnance was ready for official inspection. A three-pounder was first submitted, then a five-pounder, afterwards heavier pieces. Finally, in 1858, the Rifled Cannon Committee recommended the Armstrong gun for special service in the field, and the Adjutant-General of Artillery pronounced it the best field-gun then known. Mr. Armstrong generously gave his invention to his country without fee or consideration. But such a service could not go unrewarded; he was knighted, made a C.B., and appointed Engineer of Rifled Ordnance with 2,000*l.* a year. Woolwich being unable to turn out the gun with the secrecy or rapidity desired, it was arranged that it should be made at Elswick.

In 1863 Sir William Armstrong was President of the British Association meeting at Newcastle, and drew attention to the increasing consumption and waste of coal, and the nearness of the time when our coalfields will be exhausted. This resulted in a Royal Commission, of which Sir William was made a member. He was president of the Institution of Mechanical Engineers in 1861, 1862, and 1869, and of the Institution of Civil Engineers in 1882.

Sir William Armstrong was raised to the peerage in 1887. LL.D. of Cambridge (1862), D.C.L. of Oxford (1870), and M. Inst. Eng. of Dublin; Grand Officer of the Order of San Maurizio e Lazzaro of Italy, Knight Commander of the Danish Order of the Dannebrog, of the Austrian Order of Francis Joseph, the Spanish Order of Charles III., the Brazilian Order of the Rose, and Second Class of the Rising Sun of Japan. His presidency of the Newcastle Literary and Philosophical Society extended over many years, and continued to the time of his death.

His public spirit and philanthropy were large and widespread. A lecture hall for the Literary and Philosophical Society, an operating theatre for the Infirmary, 10,000*l.* to the Natural History Museum, a Mechanics' Institute, schools for the Elswick men, and a banqueting hall and public parks—these were among his many gifts to Newcastle. He was a man who richly deserved his great popularity.

Lord Armstrong died in his ninety-first year, at Craigside, Rothbury, Northumberland, on Thursday, Dec. 27. The funeral took place on Dec. 31, 1900, and the burial, in the churchyard at Rothbury. All the principal learned and scientific societies were represented, the Society of Chemical Industry by its President, J. W. Swan, F.R.S., who in the name of the Society placed a wreath upon the grave.

Lord Armstrong has been a member of this Society since 1884, when he was elected as Sir W. G. Armstrong.

He leaves no heir, and his peerage dies with him.

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* Any of these specifications may be obtained by post remitting 8*d.*—the price now fixed for all specifications, post included—to C. N. Dalton, Esq., Comptroller of the Patent O Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS, AND MACHINERY.

PATENTS.

Solid Materials; Method of and Apparatus for Treating ——: applicable to the Manufacture of Gas, Coke, and to other Purposes. P. Naef, New York, U.S.A. Eng. Pats. 23,415, also 23,415A, 23,415B, and 23,415C, Nov. 23, 1899. (Under Internat. Convent.)

Heat is applied to (or abstracted from) the material to be treated, by circulating gases or vapours in heaters (or coolers) forming a part of the apparatus. The gases are passed through the material until they are cooled to a temperature at which the operation to be carried out ceases for practical purposes. Then the gases are again heated and brought into contact with the material. A continuous circulation of heated gas through the material is thus obtained, the material itself being preferably also moved through the apparatus. The excess of the gases or vapours produced during the operation is conducted through the material to be treated, and all the heat is abstracted from the same, and the reaction is completed. The invention also comprises improved means for charging the material to and for discharging it from the apparatus.

The claims, 25 in number, partly relate to applications of the method to such purposes as the distillation of bituminous fuel for the production of gas and coke, the manufacture of water-gas, the destruction of sewage matter and the recovery of ammonia therefrom, the calcination of limestone and cement, the production of carbonic oxide and carbonic acid, and to the carrying out of catalytic reactions requiring a constant temperature, such as the manufacture of sulphuric acid from sulphurous acid.

In specifications 23,415A, 23,415B, and 23,415C, which bear the same title and date as the above patent, the inventor describes some modifications in the processes of treatment, together with novel devices for effecting the same.—D. B.

Filtering Medium; Improved ——. H. Nordtmeyer, Germany. Eng. Pat. 2961, Feb. 14, 1900.

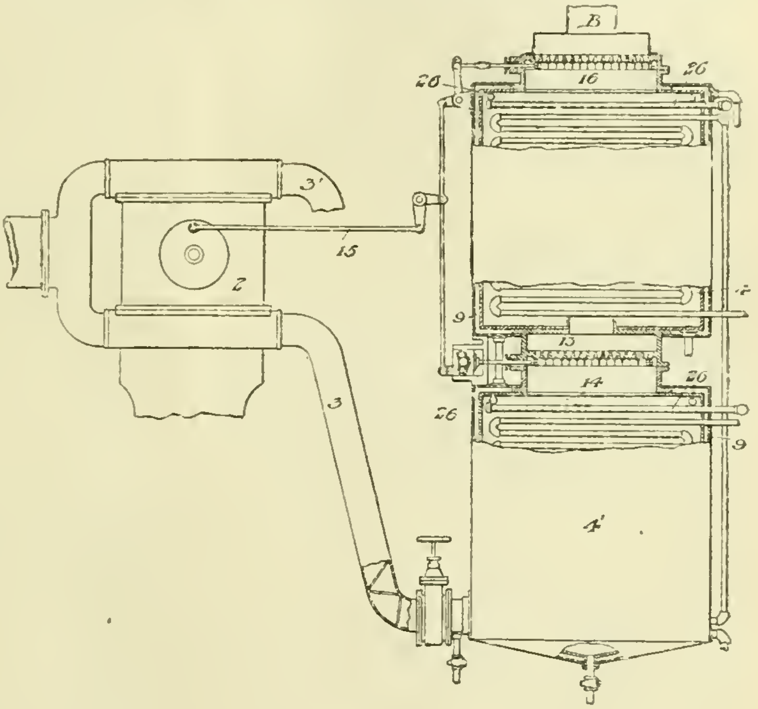
A calcined or baked filtering medium of fossil meal, "free from crazings" or surface cracks, "of a uniform porosity, and of the desired strength and solidity," is produced by mixing the fossil meal with asbestos, or asbestos-like minerals, such as asbestine or amianthus. The mixture, with or without the addition of organic substances, is moulded or shaped to form, and then baked or burnt.—R. A.

Linings for Protecting Vessels, Tubes, and the like from Corrosive Fluids. A. G. Bloxam, London. From R. Panzl and A. Troetscher, Waterville, Maine, U.S.A. Eng. Pat. 3975, March 1, 1900.

A protective lining is made of a mixture of hydraulic cement, pulverised chamotte, siliceous material (preferably pulverised quartz), water, and silicate of soda. Tanks, &c. may be provided with partitions, formed by applying the lining composition to a grate of bars or a strong wire netting, or they may be constructed entirely in this manner. —R. A.

Drying Air, and Apparatus therefor; applicable for Extracting Moisture from Air for Use in Blast Furnaces and Steel Converters, and other Purposes in the Arts for which Dry Air is Useful. J. Gayley, Pittsburg, U.S.A. Eng. Pat. 11,091, June 19, 1900.

The air is dried by passing it through a cooling chamber and intermittently interrupting its flow therethrough, so that the air has alternate periods of rest and motion. The air is cooled by contact with the cooling surfaces of the chamber, and deposits its moisture thereon in the form of water or snow, after which it is delivered to the furnace, &c. By rarefying the air in the cooling chamber, the lowering of the temperature and the consequent deposit of the moisture are facilitated. The figure illustrates an apparatus for carrying out the drying process. The blast engine 2 is connected by pipes, 3, 3′, to two or more cooling chambers, each of which consists of two or more sub-chambers, 4, 4′, provided with a cooling jacket, 9, and cooling tubes or other cooling surfaces, 26. The two sub-chambers can be put in communication through the valve 14 in the neck 13, and the inlet B is controlled by the valve 16. The valves 14, 16 are operated by connections, 15, &c., synchronously with the stroke of the engine, so that one valve is opened when the other is closed, and *vice versâ*. During one half-stroke of the engine, air is drawn from the part 4′ of one cooling chamber, while air enters the part 4 through the valve 16. Simultaneously, in the other cooling chamber, the valve 16 is closed and the valve 14 opened, and, after equalisation of pressure, the air in the parts 4′, 4 remains stationary in contact with the cooling surfaces, the connection with the engine being closed.



On the return stroke of the engine, the conditions with respect to the two cooling chambers are reversed. By employing a third chamber, one or other of the three may be cut out for the removal of the products of condensation without interfering with the working. Each chamber may consist of more than two sub-chambers, arranged in multiple effect, and one or more of the valves between the sub-chambers may be kept open. If all the valves are kept open, the cooling is effected without the aid of rarefaction. In a modification, each chamber consists of only one part, in which rarefaction can be obtained by closing the inlet valve. In another arrangement, rarefaction is obtained without the use of valves, by making the outlet larger than the inlet. Deposited snow may be melted by heating, while the chamber is cut out, or, without interfering with the operation, by washing it off with cold brine.—R. A.

Treating Liquids with Gases, and Heating or Cooling Liquids for Distillatory and other Purposes; Method of and Apparatus for ——. P. Naef, New York, U.S.A. Eng. Pat. 23,404, Nov. 23, 1899. (Under Internat. Convent.)

According to this invention it is proposed to supply heat to or abstract heat from the liquid to be treated, chiefly or partly by passing hot or cold gases through and directly in contact with the said liquid. For this purpose, apparatus is employed comprising one or more chambers having partitions provided with apertures, through which the liquid is passed, and which partitions serve to distribute the liquid or the gas. Means are provided for conducting gas or vapour through the chamber or chambers, and also through heating or heat-absorbing devices. The arrangement is preferably such that the gas is conducted out of the chamber, is reheated or cooled, and is returned to the chamber one or more times before it finally leaves the latter. The liquid is also preferably subjected to a preliminary heating or cooling by being passed through or around pipes, around or through which is conducted the gas from the chamber, or the fluid employed for heating or cooling the gas. In some cases the liquid may itself be passed through heaters or coolers.

The apparatus may be used for the distillation of ammonia liquor, for carrying out operations which require the abstraction of heat from a liquid, such as the precipitation of bicarbonate from brine saturated with ammonia by means of carbonic acid gas, and for the evaporation of liquids. 29 claims are made.—D. B.

Air Pyrometers. B. J. B. Mills, London. From The Bristol Company, Waterbury, Connecticut, U.S.A. Eng. Pat. 17,912, Oct. 9, 1900.

Two tubes of flattened section are coiled in the same direction into spiral form, and are attached together at their free ends, without being in communication. The one end of one of the tubes is fixed, and is in connection with the pyrometer bulb, while the other end of the second tube is connected to the indicating or recording arm. The tubes are moved axially in opposite directions by barometric or thermometric changes, the second tube serving as a compensator for the first, so that corrections for barometer and thermometer are not required.—R. A.

Steam Boilers; Composition for the Prevention or Removal of Incrustation in ——. J. Garside, Ashton-under-Lyne; and G., J., and A. Saxon, all of Manchester. Eng. Pat. 19,734, Nov. 3, 1900.

One pound of palm oil is melted and mixed with 1½ oz. of graphite. This product is to be put into the boiler through the manhole, or "may be dissolved by heat and fed in through the pump or injector." It is stated to float at first, but gradually to attract deposited solid matter until it becomes heavy enough to sink, when it lies quietly at the bottom of the boiler. It is claimed that all formation of scale is prevented, and that any existing scale is broken up and converted into removable flakes.—F. H. L.

II.—FUEL, GAS, AND LIGHT.

Coal Industry in Saghalien Island. F. F. Kleye. Chem. Zeit. Rep. 1900, **24**, [94], 352.

Knowledge of the existence of coal-fields in the island of Saghalien dates from 1787. Coal from Due (air-dried) gave the following numbers on analysis:—Moisture, 1·71; ash, 1·56; sulphur, 0·17; carbon, 83·39; hydrogen, 5·60; oxygen and nitrogen, 7·57 per cent. This coal gave 65 per cent. of coke, whilst the volatile constituents amount to 35 per cent. The coal gives 8,249 cal., and belongs to the anthracite class. For factories and forge work it is the best coal in the East. Huge coal strata are also to be found on the west coast of the island, near the river Mgatsch. The coal is of large size, and is not lustrous. Mgatsch coal is only slightly inferior to Cardiff coal, and a mixture of Due and Mgatsch coals gives excellent results for heating purposes. The output of Due coal amounted in 1899 to 1,500,000 pud (24,745 tons), and of Mgatsch and Sertunai coal to 800,000 pud (12,897 tons). Both classes of coal are certain to find a considerable market in Eastern harbours.—T. A. L.

Electric Furnace [Calcium Carbide]; Development of the. M. Keller.

See under XI. A., *page* 48.

Coal-Gas and Water-Gas; Supply of Mixtures of ——. H. Bunte. J. Gas Lighting, 1900, **76**, [1959], 1332—1335.

In England and America, carburetted water-gas is made from the residual oils obtained in the manufacture of lamp oil from crude petroleum, but in Germany the heavy import duty practically doubles the cost of such oils, and quite prohibits their use for gas-making. Illuminating water-gas can, however, now be produced by the Dellwik process by carburetting with benzol.

The author points out that, in view of the wide extension of the incandescent system of lighting, the illuminating power in flat-flame or Argand burners can no longer be regarded as the sole standard for the valuation of the gas. Von Oechelhaeuser has shown that coal-gas, of which the illuminating power has been reduced from 16 to 1 or 2 candles when consumed in flat-flame burners, will not have an appreciably lower efficiency in the incandescent burner. The author therefore proceeds to discuss the subject from the standpoint of the calorific power of the gas. Coal-gas has a calorific power of 136 to 141½ calories per cubic foot, according to the quality of the coal used and the method of carbonising. Water-gas, with 10 per cent. of impurities—nitrogen and carbon dioxide—has a calorific power of 68 to 73½ calories per cubic foot, or about half that of good coal-gas. If coal-gas be mixed with 20 per cent. of water-gas, the calorific power will be reduced by about 10 per cent., or from 141½ to 127½ calories per cubic foot, but there will be practically no change in the illuminating duty obtainable from the gas in the incandescent burner. The calorific power of the mixed gas may be considerably improved by addition of benzol, but this improvement is expensive compared with the cost of the gas, even when the price of benzol is low. Furthermore, a limit to the employment of benzol for carburetting is very soon reached, as in cold weather, the saturation point is easily passed, and then the benzol condenses in the mains. Enrichment with oil-gas is preferable, but it is pointed out that this method can only be economically adopted if the oil be duty-free. Oil-gas has, on the average, a calorific power of 277½ calories per cubic foot, and a mixture of one-third oil-gas and two-thirds water-gas forms a product which has about the same calorific power as coal-gas, and which may be mixed with the latter without appreciably affecting its calorific power. The author points out that the water-gas process may also be regarded as a means of diminishing the coal requirements of a gasworks. A ton of coal yields, on carbonisation, about 10,250 cb. ft. of gas, which quantity of water-gas would be produced by a consumption of 0·115 to 0·170 ton of coke. Thus, every million cubic feet of water-gas made, means the setting free of about 100 tons of gas-coal.

The author finally discusses the question as to whether the carbonisation process or the water-gas process will predominate in the future. He concludes that the carbonisation system, which industrially and economically is by no means out of date, must be further developed, and the more recent oil-gas and water-gas systems accepted as useful auxiliary processes.—A. S.

Carbide and Acetylene Industries in Germany; Rise, Progress, and Present Condition of ——. F. Rose (Stuttgart). Consular Report. Foreign Office Miscellaneous Series, No. 540, Nov. 1900. (See also this Journal, 1900, 1158.)

At the present time acetylene in Germany is a rather cheaper illuminant than petroleum, as the following figures indicate. Carbide is assumed to cost 32 pf. per kilo. (it now costs less, even in small quantities), and 3⅔ kilos. yield 1 cb. m. net of acetylene. Other charges raise the price of 1 cb. m. of acetylene to 1 mark 50 pf. In lighting power, 1 cb. m. of acetylene is equivalent to 16 cb. m. of coal-gas burnt in open-flame burners, or to 4 cb. m. burnt in an incandescent burner, or to 6 litres of petroleum, or to five 200-watt electric lamps. Coal-gas in Germany costs about 17 pf. per cb. m., and petroleum 25 pf. per litre. Hence, the equivalent in lighting power of 1 cb. m. of acetylene is obtained by petroleum for 1 mark 50 pf.; by coal-gas open burner for 2 marks 72 pf.; incandescent burner for 0 mark 68 pf., to which about 10 per cent. must be added for renewals of mantles, &c.; and by electric light for 3 marks 45 pf.

About 30 small towns in Germany are about to be, or are, lighted by means of acetylene. The works at Treptow-a.-d.-T. are typical of these town installations. They were constructed for a daily make of 200 cb. m., or for the simultaneous use of 2,000 flames of 32 candle-power. The generators are of the "carbide into water" type, and the gasholder has a capacity of 50 cb. m. Purification is effected by means of chromic acid dissolved in sulphuric or acetic acid (Ullmann's system). The gas passes from the generators through condensers and a washer with safety seal, to the gasholder, and thence through the purifiers, dryer, meter, and pressure regulator to the distributing system, of which the main pipes are of wrought-iron, 2 to 3 ins. in diameter. The total length of pipes is about five miles.

The insurance companies in Germany do not now demand increased premiums for premises lighted by acetylene, provided certain conditions are complied with, among which are the following:—(1) The gasholder must be provided with a safety valve. (2) The installation must be provided with a purifying apparatus. (3) Generators and gasholders must be isolated by walls of non-inflammable materials. (4) Inflammable substances must not be stored in the apparatus chambers, which must be always well ventilated. (5) Acetylene must not be prepared, stored, or used under a pressure of more than one atmosphere. (6) The piping must be of specified sizes, and the carbide stored and isolated according to regulations.

—J. A. B.

Acetylene Flame. E. L. Nichols. J. Franklin Inst. 1900, **150**, [5], 356—387.

The author has studied the acetylene flame with a view to utilising it as a standard source of light in photometrical and spectroscopical researches. He concludes that the acetylene must be used soon after generation, as it breaks down with age to such an extent that a sample stored over water for five months was found to contain only 25 per cent. of acetylene, and to give a flame having only 6 per cent. of the brightness of that from newly generated acetylene, though of similar colour. The process by which acetylene is generated from carbide also affects the illuminating power of the gas. Gas generated by the dry process, in which small quantities of water are dropped on large masses of carbide, has on the average only about 80 per cent. of the illuminating power of gas generated by the wet process, in which small masses of carbide are thrown into large quantities of water. The high temperatures which attend the reaction in the dry process appear to produce a mixture of acetylene and other gases instead of merely acetylene. Gas generated by the wet process only was employed in these researches on the acetylene flame.

As acetylene burns with a smoky flame unless mixed with air or a gas less rich in carbon, the flames of mixtures of acetylene and hydrogen were first investigated, but as their candle-power varied greatly with changes in the proportions of the components, and as acetylene was absorbed so rapidly when such a mixture was stored over water that the proportions became uncertain, the flame of a mixture of hydrogen and acetylene was finally deemed unsuitable for photometrical purposes. Certain characteristics of the flame of pure acetylene—*viz.*, its great stability, its great intrinsic brightness, and its white colour—led the author to make further attempts to utilise it in photometry. Photographs of a flat flame viewed edgewise from acetylene under a pressure of more than 2 centimetres of water, showed that it consisted of a layer of heated gas, 0·005 cm. thick, surrounded by a sheath or mantle of highly luminous material. The total thickness from one luminous mantle to the other, was found to be 0·065 cm. The intrinsic brightness was about twelve times that of an ordinary gas flame. This might be attributed either to the number of particles floating in the flame being greater in that proportion, or to the temperature or degree of incandescence being sufficiently higher. If the first were the only or principal cause, the transparency of the flame would be low, and consequently the horizontal distribution of intensity in the case of a flat flame would not be uniform, whereas it was found to be nearly uniform. The great intrinsic brightness of the acetylene flame must consequently be ascribed chiefly to the high incandescence of the carbon, which implies white colour, high temperature, and high radiant efficiency. Spectro-photometric tests showed that the acetylene flame in air is rather whiter than the limelight, and in colour lies between that and the electric arc light. The acetylene flame in oxygen is whiter than the flame in air, and corresponds almost exactly with the light of an ordinary electric arc lamp. The temperature of the flame in air has been estimated by Le Chatelier at 2,000° C., and by Lewes at 1,517°. The author found, by the use of thermo-couples of various thicknesses, and by plotting curves from the results obtained therewith, that the temperature, which a junction of infinitesimal diameter would have when placed in the hottest region of the flame, would be, for the acetylene flame 1,900°, for an ordinary gas flame 1,780°, and for a candle flame 1,675°. The radiant efficiency of the acetylene flame, determined approximately by Melloni's method, was found to be 10·5 per cent. A comparison of the acetylene flame with other sources of light in the projecting lantern, showed that the light flux from four acetylene jets, placed one behind the other, with a reflector, was five times that from a round-wick petroleum flame with a 5-in. parabolic reflector. The light flux from limelight was four (old limes) to eight (fresh limes) times; that from an alternating current arc, ninety times; and that from direct current arcs, 120 to 200 times the light flux from the petroleum flame. The author concludes that the great intrinsic brightness, stability, steadiness, and great preponderance of rays of the shorter wave lengths render the acetylene flame specially valuable as a reference standard in spectro-photometry.

The flame of acetylene, burnt under a slight blast of air or mixed with oxygen, is useful as a source of high temperatures. Quartz and metals of the platinum group can be readily fused thereby. The temperature of the ordinary acetylene flame, from the luminous mantle outwards, exhibits a very sharp decline, the range extending over more than 1,000° in a distance of 4 or 5 mm. A thermo-junction, having a plane surface set parallel to the median plane of the flame, and moved towards it by means of a micrometer screw, gives a convenient means of observing the melting point of any metal which fuses without considerable oxidation. A tiny length of the metal is looped round the thermo-junction. Manometric flames, produced by burning acetylene within a mantle of pure oxygen, have been used by the author in collaboration with Merritt.

In conclusion, the author states that he has not yet found an acetylene flame the candle-power of which is constant. The most hopeful method of using the flame as a standard in photometry appears to consist in determining the candle-power of a specified area of the flame, and to use that as the source of light. The fluctuations in the radiation from a small area of the flame, were found to be comparable with the fluctuations from the flame of the Hefner lamp. The position of the area used would, however, have to be very carefully specified. The effects of purification of the acetylene, and of the degree of humidity of the air, on the flame have not yet been studied in this connection.

—J. A. B.

Illuminating Gas; Determination of Sulphuretted Hydrogen in ——. A. Müller.

See under XXIII., *page* 73.

Coal-Gas; Determination of Sulphuretted Hydrogen in ——. H. Leicester Greville.

See under XXIII., *page* 73.

Coal-Gas: New Method for the Volumetric Determination of Carbon Monoxide in ——. A. Smits, H. Raken, and P. C. E. Meerum Terwogt.

See under XXIII., *page* 73.

Gas Liquor: Valuation of ——. F. J. R. Carulla.

See page 23.

PATENTS.

Unconsumed Products of Combustion from Furnaces; Apparatus for Burning the ——. D. W. Stapp, Phillipsburg, Kansas, U.S.A. Eng. Pat. 1791, 1900. Date claimed under Internat. Convent., June 29, 1899.

The claims are for the combination with an engine, of a receiver located in the smoke arch or chamber, and having its mouth directed towards, and located in advance of, the diaphragm of said smoke arch, and connected to the firebox by means of a conveyor pipe, an air feeder connected to the feeder or air-pipe of the said receiver, a second receiver connected to the firebox or furnace and located in the rear of the diaphragm, the second receiver having its mouth reversely arranged to the first-named receiver, and an air feeder for the second receiver. The first receiver is in the form of an extended bell mouth directed towards the point of flow of the smoke, &c., from the engine firebox, and the air feeders of both receivers have their outer ends arranged so as to create a suction and a forced draught to return to the firebox the matter taken up by the receivers.—C. S.

Artificial Fuel; Manufacture of ——. E. Springborn, Bow, E. Eng. Pat. 24,055, Dec. 2, 1899.

The process is one for producing fuel from solid or semi-solid carbonaceous substances (*e.g.*, sewage or other refuse matter, earths or rocks of a non-metallic or carbonaceous nature, such as certain clays containing a low percentage of silicate, and also those containing bituminous substances, the silt of rivers or lakes containing vegetable or bituminous matter, and other earths of vegetable origin) by treatment with saccharine matter (a $\frac{1}{4}$ to 1 per cent. aqueous solution of sugar) and inflammable hydrocarbon (*e.g.*, coal tar with 10—15 per cent. of petroleum and 3—5 per cent. of tallow; or 90 per cent. of heavy petroleum and 10 per cent. of tallow), followed by an addition of an alkali carbonate, chloride, or nitrate ($\frac{1}{4}$ to 2 lb. per ton), the product being afterwards pressed into briquettes and dried. With materials poor in carbon an addition of 1—3 per cent. of soot, ground graphite, &c., may be made before the saccharine treatment, or a stronger solution of sugar may be used. —C. S.

Solid Materials; Method of and Apparatus for Treating ——*; Applicable to the Manufacture of Gas, Coke, and to other Purposes.* P. Naef. Eng. Pats. 23,415, 23,415A, 23,415B, and 23,415C, Nov. 23, 1899.

See under I., *page* 27.

Briquette; Combustible ——. J. Paucheur, Brussels. Eng. Pat. 13,707, July 31, 1900.

A "combustible briquette made on a foundation of coal by a scientific mixing of about 80 per cent. of coal dust, 17 per cent. of neat petroleum, and 3 per cent. of molasses to bind them."—C. S.

Fire-kindling Substances. H. H. Lake. From E. Jörgensen, Lauget, Norway. Eng. Pat. 15,018, Aug. 22, 1900.

The substance is "composed of petroleum or other combustible oils, to which is added powdered or finely divided infusorial earth, so as to impart to the whole a pulpy consistency."—C. S.

Artificial Fuel. Dr. Clemens Dörr, Cologne, Germany. Eng. Pat. 15,476, Aug. 30, 1900.

The claims are for: "A method of utilising carboniferous colliery waste, such as wash-heap waste, separated, *i.e.*, hand-sorted, coal-streaked slate, and all other waste material, the said materials being granulated either when in the condition in which they are dumped at the mine, that is to say, containing non-carboniferous admixtures, such as sand, stone, and the like, or after partial or total removal of the latter, and then being employed as combustibles, either each separately or mixed together, and after having previously been formed into cakes or not, as desired"; and for "the form of the method described in claim 1, in which coal slime, coal dust, small coal, or other waste material of small value are added to the materials mentioned."—C. S.

Chimney Chemical Cleansers. T. Huson, Liverpool. Eng. Pat. 24,375, Dec. 7, 1899.

The chimney cleansers in use consist of a strongly oxidising salt, such as potassium nitrate, mixed with sulphur or its equivalent, and a volatilisable salt, such as sodium chloride, acting as a diluent. But it is found that sodium chloride, being hygroscopic, is objectionable, and in the present invention it is replaced, preferably, by sodium sulphate, though precipitated calcium carbonate or finely-divided earth or silica may be used. The mixture recommended is composed of potassium nitrate, 56 parts; sodium sulphate, 26 parts; and sulphur, 18 parts: all in fine powder and thoroughly mixed.—E. S.

Gas for Illuminating and Heating Purposes. H. H. Boehndel, London. Eng. Pat. 23,572, Nov. 25, 1899.

Carburetting Air.—The manufacture of a highly absorbent body is claimed, by mixing absorbent materials, such as chalk, lime, powdered pumice stone, peat moss, kieselguhr, and the like, with a substance, such as magnesia or silicate of soda, causing such absorbent materials to hold together in a porous mass, which mixture is, by the addition of water, formed into a paste, which, when divided into small lumps or pieces, is dried and afterwards calcined.

That improvement in the production of combustible gas is claimed, consisting in passing a blast of air through a sealed vessel containing a highly absorbent material impregnated with a suitable hydrocarbon.—R. S.

Gas; Apparatus for Washing and Scrubbing ——. S. Chandler, jun., and J. Chandler, both of Surrey; and Kirkham, Hulett, and Chandler, Ltd., Westminster. Eng. Pat. 24,383, Dec. 7, 1899.

Columns for washing and scrubbing gas are claimed, wherein the plates, which are to be kept in a wet condition, are supported with their lower edges immersed in water, in such a manner that the gas to be treated, and which is admitted above the level of the water, has to pass downwards through the water and to pass upwards between the plates in order to escape, thereby producing a bubbling action, which maintains the plates in a wet condition. In apparatus for washing and scrubbing gas, the combination is further claimed of a casing, a pipe or pipes projecting up through the floor of the casing, a hood covering the pipe or pipes, and having its lower edges dipping into water, and bundles of plates arranged adjacent to the hood in such a manner that the gas, as it escapes from the hood through the water, will rise between the plates.—R. S.

Gas; Apparatus for the Production of ——. A. J. Boult, London. From A. Perrier, Marseilles. Eng. Pat. 25,009, Dec. 16, 1899.

The apparatus consists of (1) a carburetter, (2) an air-supply device, and (3) a gasholder. In apparatus for the production of gas, an air saturator is claimed, provided with several communicating chambers, arranged one above the other, to which liquid hydrocarbon is supplied from a reservoir, each of the chambers being further divided into several divisions, in order to compel the air, forced in by an air-bell, to take a zigzag or tortuous course through the liquid. In apparatus of the kind described, there is also claimed an air-supply device, consisting of an air-bell in a water receptacle, by the ascent and descent of which, automatically controlled, the air is drawn in and forced out respectively. The gasholder is of the usual form.—R. S.

Fire-Damp, Coal-Gas, Hydrogen, or other Gases; Improved Means for Indicating the Presence in the Atmosphere of ——. G. A. Lyncker and M. F. Mohr, Munich, Germany. Eng. Pat. 2094, Feb. 1, 1900.

A device is claimed for indicating the presence and accumulation of a gas, the specific gravity of which is not bove 0·6 (atmospheric air being = 1), such as methane, luminating gas, hydrogen gas, &c., in which a porous ylinder, closed at the bottom, and made of clay or the ke, is closed above gas-tight, by means of a corresponding hin metal foil membrane, which is conductively connected y means of two metal rings with one terminal, a second erminal being connected with a central contact screw crewed into a cross bar of one of the above rings, but nsulated from the latter, the said contact screw, with ts platinum point, being capable of adjustment above the entre of the membrane, in order that the sensibility of the pparatus may be varied according to the various conditions nd kinds of gas.—R. S.

as; Enrichment of ——. [*Carburetting Gas.*] F. W. C. Schniewind, New York, U.S.A. Eng. Pat. 10,588, June 9, 1900.

gas of high illuminating power is obtained from coke ovens nd other sources by drawing off separately the rich and the oor gases produced in a multiple series of ovens, scrubbing he poor gases with oil to eliminate and absorb the benzol ontained in the gases, then distilling the oils to recover he absorbed benzol, and mixing the distillate, without rther concentration, with the rich gases from the ovens, nd finally subjecting the mixed rich gases and benzol istillate to a condensing and washing treatment, in order remove ammonia and other impurities.—R. S.

urners for Gas or other Combustible Vapours used in Furnaces. T. Fletcher, A. Neil, and Fletcher, Russell, and Co., Ltd., Warrington. Eng. Pat. 15,501, Aug. 31, 1900.

n improvement applicable to burners for gas or other ombustible vapours used in connection with furnaces, onsisting in the combination with such burners of a projecting hollow cone, the larger end or base of which rests gainst the back of the wire gauze, and the smaller end hereof projects into the furnace. The object of the cone to protect the wire gauze when the blast is shut off, and remove the flame from the surface of the gauze.—R. S.

arburetted Air; Apparatus for the Cold Production of ——, *for Industrial and Domestic Purposes.* F. J. Lothammer, Paris. Eng. Pat. 15,930, Sept. 7, 1900.

n apparatus is claimed for the production of carburetted ir, so contrived as to ensure the formation of a combustible ixture of uniform composition and density throughout. he apparatus comprises an upright cylinder supported by gs, beneath which is a conical receiver, the latter forming e carburetter. The cylinder is divided into three chambers, ne above the other, the upper one consisting of the pure air hamber, in which the pressure is regulated by a weighted alve, and from which air flows into the carburetter. The iddle compartment forms the carburetted air chamber, nd it is connected with the carburetter by means of a large entral pipe, and with the "consuming apparatus" by an xit pipe. The lower chamber is the hydrocarbon reservoir, nd the lower part of it is connected with the lower part of e carburetter by means of pipes, and its upper part is onnected with the upper part of the carburetter by means f a bent tube, which ensures that the level of the liquid the carburetter shall remain constant.

A carburetter virtually consisting of a conical receiver is lso claimed, in which the level is maintained constant, e compressed air which has to be treated, flowing through the bottom of the receiver (the area at the base being rger than the area at the top) across metal gauze or perforated plates, this air afterwards meeting, in the liquid, ther plates of similar construction inclined in all directions. heated air jacket surrounds the carburetter so as to ompensate for the cold produced by the evaporation of e hydrocarbon used for carburetting.—R. S.

xplosive Gaseous Mixture; Device for Automatically Detecting and Indicating the Presence of an ——. J. G. A. Rhodin, Manchester. Eng. Pat. 1122, Jan. 18, 1900.

Device for automatically detecting and indicating the resence of an explosive gaseous mixture, comprising in its essential features a vessel through which a sample of the gas to be tested is caused to flow, and in which it is exposed to an electric spark. A by-passage from this vessel is kept normally closed by a valve carried by a pivoted tube or arm, which is overbalanced when an explosion in the vessel takes place, and thereby closes an electric circuit.—J. C. R.

Acetylene or other Hydrocarbons; Manufacture of ——, *from Carbide, and By-Products thereof.* G. J. Atkins, Tottenham. Eng. Pat. 22,425, Nov. 9, 1899.

Calcium or other carbide is decomposed by admixture with solids containing water or the elements thereof, either in unstable combination or as water of crystallisation. Calcium carbide is stated thus to yield acetylene gradually, together with useful by-products, which vary according to the nature of the solid employed. For instance, the hydrated monocarbonate or monosulphate of an alkali yields an alkaline residue, which with oil or grease may be employed to produce soap; beet, potato, or other starchy matter gives a residue from which solid starch and a solution of the albuminous and gelatinous matters may be obtained. The acetylene formed is stored in ordinary gasholders, which, however, are sealed in solution of silicate of soda to avoid the gradual diffusion of the gas, which occurs when water is used as the sealing liquid.—J. A. B.

Acetylene Gas; Generators for the Production of ——. A. L. Kieny, St. Denis, France. Eng. Pat. 23,432, Nov. 24, 1899.

A covered reservoir is divided into two compartments, in one of which is inserted a carbide receptacle to which water is supplied, while the gas thereby evolved passes through water in the lower part of the other compartment, the upper part of which serves to store the gas for the supply of burners, &c. The pressure of gas in this compartment is caused to control the flow of water to the carbide receptacle.—J. A. B.

Acetylene Gas for Street Lamps, Gate Posts, Carriage, and ordinary Illumination; Apparatus for the Production of ——. J. W. Edmundson, Dublin. Eng. Pat. 23, Jan. 1, 1900.

Within a cylinder containing water is a cylindrical bell, with detachable base, containing perforated trays, supporting carbide, traversed by a central pipe through which the generated gas passes to a purifier, comprising a washer and two superposed chambers containing sieves supporting purifying material.—J. A. B.

Acetylene Gas; Apparatus for the Production of ——. C. Meissner, Hornberg, Germany. Eng. Pat. 14,034, Aug. 4, 1900.

Carbide, contained in a funnel, drops into water in a generating tank until the pressure of the evolved gas raises a conical hood, which closes the nozzle of the funnel and interrupts the supply of carbide. The funnel is mounted on a cover, with downwardly extended walls sealed in an annular tank containing glycerin.—J. A. B.

Acetylene Gas; Generator for ——. J. Fazan, Apples s/Morges, Switzerland. Eng. Pat. 16,979, Sept. 24, 1900.

The crown of a bell, floating in a tank of water, supports a perforated cylinder in which is a cylinder containing baskets of carbide and having an orifice near its top, by which water gains access to the carbide. The gas evolved passes through a pipe, with cock, to the bell. Several generating cylinders may be combined with one bell.
—J. A. B.

Acetylene Gas Generating Apparatus. A. E. Adolfsson, Stockholm. Eng. Pat. 17,466, Oct. 2, 1900.

Between a carbide receptacle and a subjacent tank containing water is a closed vessel in which is operated, according to the movements of the gasholder into which the gas evolved passes, an oscillating vessel which is so constructed that when the opening from the carbide receptacle is open, that into the tank is closed, and *vice* *versa.* An oscillation of the vessel thus conveys a given quantity of carbide into the generating tank.—J. A. B.

Mixtures of Carbide of Calcium which are free from any Danger of Explosion in Generating Gas; Process to Manufacture ——. F. L. Toby and O. S. Lorch, both of London. Eng. Pat. 23,874, Nov. 30, 1899.

Five to 15 lb. of dried calcium chloride or other hygroscopic salt, and 90 lb. of calcium carbide, are ground together with the addition of a little oil, and to the mixture 2 lb. of tar are added. The whole is mixed, heated to about 120°, and, after cooling and standing for a few days, is compressed into briquettes of suitable size. The briquettes are stated to afford a more uniform generation of gas than calcium carbide alone, and the rapidity of generation may be increased by increasing the proportion of calcium chloride in the mixture. The briquettes are intended for use in generators in which the carbide is in excess of the water.—J. A. B.

Incandescent Gas Lighting; Impts. in connection with Burners used for ——. C. S. Snell, Saltash. Eng. Pat. 24,096, Dec. 4, 1899.

This relates to a burner suitable for high-pressure gas, which can automatically adapt itself to low-pressure gas should the pressure be reduced inadvertently or otherwise. At the mouth of the burner is provided a series of gas apertures, collectively large enough to maintain an effective flame within the mantle at ordinary low gas-pressure, but the central hole is of larger bore than the others, and, when closed, leaves sufficient aperture area in the remaining holes to pass enough gas when the latter is at high pressure. A disc, ball, diaphragm, or other convenient form of float valve is arranged below the gas apertures, and is so adjusted that at a certain degree of gas pressure it closes the central exit, leaving the maintenance of the light entirely to the remaining high-pressure apertures. A number of devices for applying this principle are described.—H. B.

Incandescence Bodies suitable for Use with Gas and like Burners. J. H. H. Duncan and The New Sunlight Incandescent Company, Ltd., London. Eng. Pat. 25,359, Dec. 21, 1899.

There are claimed mantles of the following composition:—alumina, 48 to 60 per cent.; chromic oxide, 5 to 10 per cent.; and thoria, 42 to 35 per cent. In preparing the mantles, either the usual impregnation process is employed, or solutions of the substances may be mixed with collodion, the mixture being afterwards extruded into threads in the known manner.—H. B.

Lamps; Manufacture of Vacuum Osmium ——. C. Auer von Welsbach, Vienna. Eng. Pat. 7211, April 18, 1900.

"I have found that the presence of traces of oxidising gases, such as water vapour, as well as of reducing dissociable gases or vapours containing a large proportion of carbon, such as, for example, vapour of fatty acids, is in a high degree prejudicial both to the durability as well as to the economy of osmium vacuum lamps. The agents first named are mostly developed from the glass of the bulb; the others come from the india-rubber and from the packings of the mercury pumps." The traces of hydrogen gas which are liberated during use by an osmium filament which has not been too highly heated in the process of manufacture, prevent the action of the oxidising gases on the filament; it is therefore important that the glass of the bulb should contain no reducible oxides capable of oxidising this hydrogen to water vapour. The substance of the invention will be seen from the claims:—(1) For an osmium vacuum lamp, a bulb consisting of glass fusible with difficulty, *e.g.*, potash-soda-glass, containing no oxides, such as oxide of lead, which when heated are reduced by hydrogen. (2) In the process of making lamps of this kind, preventing the presence of deleterious gases by connecting together by soldering, or by molten shellac, those parts of the vacuum-pump which communicate directly with the bulb, and avoiding any kind of fat in the packings of the pump. (3) An osmium lamp constructed in accordance with these two claims.—H. B.

Vapour Burners. A. Lecomte, Paris. Eng. Pat. 10,556, June 9, 1900.

A spirit burner in which a metallic body projects into the flame, conducting heat to the vaporising chamber, a spiral of wire gauze being arranged within the latter to promote the volatilisation of the spirit.—H. B.

Illuminating Power of [Incandescence] Gas Burners; Device for Increasing the ——. W. Theobald, Lee, and G. Theobald, Catford. Eng. Pat. 18,208, Oct. 12, 1900.

The device consists of a hollow or cup-shaped cap, placed upon the top of the lamp chimney, so that the passage for the draught is considerably lessened. With incandescent mantles the device "is effective especially when the gas is only partly turned on."—H. B.

Hydrocarbon Vapour Burners. A. E. Hartel, Philadelphia. Eng. Pat. 18,474, Oct. 16, 1900.

This relates to devices for preventing unvaporised hydrocarbon from passing to the burner from the vaporising chamber, for obviating the transmission of heat to the oil supply, and for effecting the preliminary heating of the vaporising chamber.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Brown-Coal Tar Purification; Chemical Function of Sulphuric Acid in ——, *and its Physical Significance.* R. Pauli. Chem. Zeit. 1900, **24**, [89], 969—970.

The separation of brown-coal tar into its components (light and heavy oils, and soft and hard paraffin wax) by distillation, is regarded as a physical process, the removal of creosote and resin by alkalis and sulphuric acid being considered chemical operations. In the absence of sufficient resin, the excess of acid attacks the valuable constituents, the term resin as used in this industry, being strictly definable as "loss from tar and oil by the action of sulphuric acid." As sulphurous acid is evolved in the operation, it seems probable than an oxidising action takes place. This was experimentally investigated in the following manner:—100 grms. of tar were placed in a flask on a water-bath, and so arranged that water-vapour could be led in at one end, gaseous products collected at the other by the help of an aspirator in a wash-bottle containing standard iodine solution, and a known amount of acid could be added to the flask when desired. About 3 grms. of concentrated sulphuric acid were so added when the tar had assumed a temperature of 50° C.; the flask was then well shaken for half an hour with the aspirator working freely. The amount of sulphuric acid consumed was estimated by titration, and found to be 1·123 grm. of which 0·81 grm. was represented by sulphurous acid retained in the wash-bottle. The loss of tar and the amount of resin obtained under these conditions were separately determined in a beaker as a more convenient vessel. The difference between 1·123 and 0·81 grm. of H_2SO_4 (0·313 grm.) represents acid spent in forming resin by sulphonation, so that the greater proportion was spent in oxidation. It was also noticed that the total weight of resin was less than the loss of tar by 2—3 per cent. Oxidation by iodine and chlorine was then attempted, only the former agent being found suitable. 8 grms. of iodine caused a tar loss of 8·02 grms., corresponding to the total amount of active oxygen in 3 grms. of H_2SO_4, fatty acids and olefines being attacked as well as aromatic hydrocarbons, and a specially dense and compact resin being obtained. The iodine value of the tar was 40 per cent.

The author experimented with 20 samples of brown-coal tar from different sources, and tabulated the specific gravity before and after addition of 3 per cent. of sulphuric acid, and the weight of resin formed. The specific gravity of the constituents removed (P) was calculated from the formula—

$$\frac{\text{Wt. of raw tar} \times \text{its sp. gr.} - \text{wt. of clean tar} \times \text{its sp. gr.}}{\text{Weight of resin } (\textit{i.e.}, \text{ tar loss})} = \text{P}$$

This varied from 1·049 to 0·889, the lower limit denoting moval of light constituents owing to excess of acid lative to the amount of heavy constituents. The practical timum value, he considers, is 0·930, and recommends that y batch of tar or oil should be tested and the proportion f acid adjusted so that the specific gravity of the con- ituents removed (P), calculated by the above formula, grees with this value, thus avoiding waste of acid and the nversion of valuable constituents into worthless resin.
—R. L. J.

etacresol in Mixtures of Cresols; Determination of ——. H. Ditz.

See under XXIII., *page* 73.

PATENT.

Mineral Oils, Liquid; Solidification of ——. H. B. Helbing and F. W. Passmore. Eng. Pat. 23,978.

See under XII., *page* 50.

IV.—COLOURING MATTERS AND DYESTUFFS.

ndigo; Oxidation of ——. G. v. Georgievics and L. Springer. Monatsh. für Chem. **21**, [5], 1900, 413—421.

n order to obtain a discharge pattern on Indigo-dyed goods, he material is printed with an alkali chromate and passed hrough a bath containing sulphuric and oxalic acid. The hromic acid liberated, oxidises and discharges the Indigo where printed. The oxidation proceeds rapidly in presence f oxalic acid, but very slowly with chromic acid and sul- huric acid alone. The rate at which the oxidation proceeds s proportional to the amount of oxalic acid present, and ence the action is a catalytic one. The oxalic acid can be eplaced by citric, tartaric, salicylic, benzoic, succinic, alonic, acetic, or formic acid, glycerin or alcohol, but these ubstances are much less active.

Oxalic Acid; Oxidation by Permanganate of ——. It s observed, in titrating oxalic acid with permanganate, that he first drops of the latter are only decolorised slowly at the eginning of the operation, but more rapidly subsequently. This is due, according to the authors, to the presence of manganese sulphate, and the decoloration is accelerated from the commencement by adding a trace of this reagent. They assume that the potassium permanganate acts on the manganese sulphate, forming manganese peroxide, and that this, in presence of sulphuric acid, is the oxidising agent. A peroxide could be detected in all stages of the oxidation by the liberation of iodine from potassium iodide, and the yellow coloration with titanium solutions. The peroxide can hardly be hydrogen peroxide, and is probably an organic peroxide, which the authors hope to isolate.
—T. A. L.

Indigo Carmine and Indigotin; Explanation of the Decrease in the Use of ——. W. Zänker. Leipziger Färber- u. Zeugdr.-Zeit. 1900, **49**, [12], 503—504.

Indigo carmine and other forms of sulphonated indigo, *e.g.*, the so-called Indigotin, have been largely displaced in recent years by the coal-tar dyestuffs. The chief advantages of Indigo Carmine depend on its property of level dyeing; even when the colour is unlevel, owing to the initial temperature of the dye-bath being too high, it becomes level on long boiling. The colour is also readily stripped from the fibre should the shade be too full. These advantages are not fully shared by any coal-tar dyestuff, but dark shades dyed with certain coal-tar dyestuffs are considerably faster to light than when Indigo Carmine is employed. This is not the case with pale shades, for not only is it difficult to find a level-dyeing dyestuff giving the same pale shades as Indigo Carmine and exceeding it in fastness, but also the tone of a faded Indigo Carmine colour is not nearly so unpleasant as that, for instance, of a faded Sulphocyanine or Patent Blue colour, the Indigo still showing a pale pure greenish-blue tint, while the coal-tar blue has become an objectionable dull green.

The decrease in the amount of Indigo Extract used in dyeing, which the author considers undeserved, may, however, be to a great extent attributed to the fact that it is so often sent into the market in an impure condition—the result of hasty and incomplete manufacture. Indigo carmine should consist entirely of the sodium salt of indigotin disulphonic acid, but the commercial extracts frequently contain more or less of the monosulphonate and even insoluble unchanged indigo, these impurities being due to imperfect sulphonation. Many of the disadvantages ascribed to the use of Indigo Extract are caused by the presence of these substances, since indigotin monosulphonate is not a good dyestuff for wool, the colours produced by it being pale, dull, and extremely fugitive.

This defect of commercial extracts is now well known to the chemists in several works, and in some cases the indigo is so thoroughly sulphonated that there is danger of falling into the opposite error, and by over-sulphonation destroying the colouring matter or producing an extract yielding colours which rub off very readily. Indigotin trisulphonate does not possess the same useful properties as the disulphonate; in weak solutions the dyestuff is attracted too quickly and in strong solutions too slowly, with the result in the former case of unlevel dyeing, while in the latter matching is rendered very difficult.

It is certain that very great care must be taken in the manufacture of Indigo Extract if this product is ever partly or wholly to regain the position which it formerly occupied.
—R. B. B.

Triphenylmethane; Relation between the Chemical Constitution of Dyestuffs derived from ——, and the Absorption Spectra of their Aqueous Solutions. P. Lemoult. Comptes Rend. **131**, [21], 839—842.

When solutions of the various dyestuffs containing 1 gram-molecule per 1,000 litres are compared in layers of equal thickness, all show a band in the red, and most another band towards the violet. The middle of the red band is situated, for all those which contain an atom of tertiary nitrogen in the para position with regard to the central carbon atom in two of the phenyl nuclei, about wave-length 6,860, and for all those which contain such a nitrogen atom in the three nuclei, about wave-length 6,660. These positions seem quite independent of the nature and positions of other substituting groups in the molecule.
—J. T. D.

Triphenylchloromethane; Preparation of ——.
M. Gomberg. J. Amer. Chem. Soc. **22**, [11], 752—757.

Carbon tetrachloride (1 part) and benzene (3·5 parts), thoroughly dried, are mixed in a round-bottomed flask, provided with a reflux condenser, and aluminium chloride (1·25 parts) is gradually added. After reaction, the mixture is heated for an hour on the water-bath, thoroughly cooled, and very slowly poured upon ice and water, avoiding all rise of temperature; benzene is also added, to dissolve the triphenylchloromethane. The benzene solution is separated, washed, dried over calcium chloride, and concentrated on the water-bath. On cooling, triphenylchloromethane crystallises out; the crystals are separated and washed with ether. The mother-liquor is concentrated by distillation under diminished pressure, and ether added, when a further portion of triphenylchloromethane separates, and a third portion is obtainable by a repetition of this treatment. The final mother liquors contain triphenylmethane carbinol, but no triphenylmethane. The yield of the chloro-compound is 70—85 per cent. of the theoretical.

The author prepares his aluminium chloride, very conveniently, by acting on aluminium in a combustion tube with a *rapid* stream of chlorine.—J. T. D.

Triphenylcarbinols by Alcohol [Malachite Green]; Etherification of ——. O. Fischer. Ber. **33**, [18], 3356—3357.

Malachite Green base is very readily converted into the corresponding ether by boiling with an alcohol or even by

allowing the alcoholic solution to stand. The methyl ether is obtained by dissolving Malachite Green base in boiling methyl alcohol, and allowing the concentrated solution to stand. The ether separates in white plates, which easily turn green. The product is very readily soluble in benzene, sparingly soluble in petroleum spirit and in ether. It melts at 151° C. The ethyl ether is always produced when the base is heated with ethyl alcohol to 80°—170° C., and preferably under pressure at 110—120° C. It forms colourless prisms, melting at 162° C. The benzyl ether is formed by heating the base with 3—4 times its weight of benzyl alcohol for about one hour to 170° C. The melt solidifies to a mass of crystals, and after washing with methyl alcohol the product is crystallised from a mixture of benzene and methyl alcohol, free from acid. It forms silky white needles, softening at 195° and melting at 198° C. The crystals remain colourless in an atmosphere free from acid, but turn green immediately in contact with acids. When treated with dilute sulphuric acid and distilled with steam, benzyl alcohol passes over, whilst the sulphate of the Malachite Green base remains behind.
—T. A. L.

Rosaniline Bases. G. v. Georgievics. Monatsh. für Chem. 21, [5], 407—412.

The views expressed by the author (Monatsh. 17, 4) as to the formation of a coloured base from pararosaniline have been controverted by H. Weil (Ber. 29, 2677; this Journal, 1897, 131). The author, however, considers that they receive fresh support from the work of Hantzsch and Osswald (Ber. 33, 285; this Journal, 1900, 236), who have shown the existence of *p*-rosaniline ammonium base, and he brings forward some further evidence in support of his view. When a cold magenta solution is treated with a large excess of soda lye, a red amorphous precipitate is obtained, which soon becomes crystalline, and yields quantitatively the carbinol base of rosaniline. When this is shaken with ether the latter remains colourless. If, however, only a very small excess of soda lye be employed, the red precipitate is only converted after some time, and incompletely, into the carbinol base, and on shaking with ether or, preferably, with chloroform about 10 times the quantity of ammonium base (weighed as hydrochloride) as of the carbinol, dissolves with an orange-yellow colour in the solvent. When a pararosaniline solution of known strength is titrated with soda lye, the solution only turns red litmus paper blue when a considerable excess of the latter reagent has been added. This indicates that part of the soda lye is neutralised by the carbinol base, which behaves like an acid towards strong bases. This view is confirmed by the following consideration. The rosaniline carbinol base separates even from very dilute solutions of the filtrate from the red precipitate, and hence the carbinol base, which is insoluble in cold water, must be dissolved by the excess of soda lye, since none of the base crystallises out when the magenta solution is neutralised with ammonia. The author is unable to confirm Weil's statement that rosaniline carbonate solution is decomposed by salt into rosaniline hydrochloride and sodium carbonate, which turns red litmus paper blue (*loc. cit.*). The base obtained by using a small excess of soda lye when freshly precipitated, dissolves completely in ether, but soon loses this property. The soluble portion must consist of the rosaniline ammonium base, although Hantzsch and Osswald doubt the existence in the solid state of such ammonium hydrates. The rosaniline ammonium bases decompose in aqueous solution even more rapidly than in the solid state, and assume the character of salts even in the total absence of carbonic acid. This is due to a combination between the ammonium and carbinol bases and the red colour which the carbinol base gradually assumes, and the coloration on filter paper produced by a solution of Rosaniline in ether is due to the formation of a "rosaniline rosanilate." It is suggested that a similar isomerisation takes place in the case of the bases of Safranine and Methylene Blue. Hanizsch and Osswald point out that the solid so-called free Phenosafranine possesses the conductivity of a salt.
—T. A. L.

Auramine from Tetramethyldiamidodiphenylmethane. J. Walter. Chem. Zeit. 1900, 24, [94], 1031—1032.

The original method by which Auramine was obtained—heating tetramethyldiamidobenzophenone with sal-ammoniac and zinc chloride—has been entirely superseded by the present process, which, according to the author, is due to him and Sandmeyer. The former had, in fact, deposited a sealed communication in May 1887, which was read in 1895 (this Journal, 1895, 744), and in which the production of Auramine was described, by heating tetramethyldiamidodiphenylmethane with sulphur and subsequently adding sal-ammoniac and zinc chloride. The present process consists in heating tetramethyldiamidodiphenylmethane with sulphur in a current of ammonia gas, and the author lays claim to having devised the plant for this purpose. The melt still gives 80—100 kilos. of commercial Auramine O containing about 8—10 per cent. of dextrin or sugar, and two such charges can be worked through in 24 hours. Excluding the production of the methylene base—from formaldehyde and dimethylaniline—the operation requires eight men by day and two at night, both charges being finished off in the daytime. Further reference is made in the paper to the synthetic production of pararosaniline from diamidodiphenylmethane already mentioned in the abstract quoted above.—T. A. L.

Azo Dyestuffs from β-Naphthol and α-Naphthylamine Sulphonic Acids to Wool; Behaviour of ——. G. v. Georgievics and L. Springer. Chem. Zeit. Rep. 1900, 24, [94], 352.

Wool dyed with the dyestuffs referred to is not a chemical compound of the dyestuff-acid with the keratin of the wool, although hitherto this has been assumed to be the case. The authors' experiments also show that some relation exists between the solubility and absorption of the dyestuffs. The colour acids are scarcely taken up at all from their aqueous solutions by the wool fibre, and only become so in presence of acetic acid, an increase in this acid producing a heavier shade. In fact, the colour acids are less soluble in dilute acetic acid than in pure water. No relation could be observed between solubility and affinity, but hitherto it has not been possible to determine whether there is not a relation between the strength of a colour acid and its affinity. With regard to the shades obtained, those from the 1·4 acid are the fastest to light, whilst those from the 1·1′, 1·2′, and 1·3′ acids are the most fugitive.—T. A. L.

Azo Dyestuffs from β-Naphthol and α-Naphthylamine Sulphonic Acids. G. v. Georgievics. Chem. Zeit. Rep. 1900, 24, [94], 351—352.

Of the seven possible dyestuffs having the formula $HO_3S.C_{10}H_6(\alpha)N:N.C_{10}H_6.OH(\beta)$ only Fast Red A from naphthionic acid and β-naphthol has been described. Investigation shows that the position of the sulphonic acid group has an important bearing on the properties of the dyestuffs, and similarities in the naphthylamine sulphonic acids are also present in the dyestuff derivatives of these acids. For instance, the dyestuffs from the acids 1·3′ and 1·2′ ($NH_2:SO_3H$) are almost undistinguishable, whilst the 1·2 and 1·1′ and the 1·4 and 1·4′ derivatives also exhibit a great similarity. In the face of this, Erdmann's statement that the 1·2 naphthylamine sulphonic acid has a conductivity about 2,000 times greater than the peri compound is somewhat strange. The proximity of the sulphonic acid group to the chromophoric azo group in the 1·2 and 1·1′ dyestuffs manifests itself in the yellow shade given by these compounds on wool, all the other dyestuffs giving red shades. On spectroscopical examination, all the dyestuffs transmit red and part of the orange-red almost unchanged, and none of the dyestuffs have any appreciable action on a photographic plate.—T. A. L.

Millon's Reagent. W. Vaubel.

See under XXIII., *page* 71.

Xanthorhamnin and Quercitrin; Sugar Constituents of ——. E. Votocek and V. Fric.

See under XXIV., *page* 76.

PATENTS.

digo Leuco Compounds and other Indigo Products, and Materials for Use therein; Manufacture and Production of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 23,123, Nov. 20, 1899. (Second Edition.)

ɪᴇ dialkyl esters of phenylglycocoll-*o*-carboxylic acid adily form formyl, carbethoxyl, or benzoyl derivatives, ich can be converted into indoxyl compounds, and subsently into Indigo. The conversion may be effected not ly by the action of caustic alkalis, but also by heating, or standing at the ordinary temperature with dilute alkaline utions. For this purpose the alkaline earths (except gnesia), the alkali alcoholates, sodium, ammonia, hot lium carbonate solution, and sulphuric acid of various engths may be employed. The resulting product is loxyl or indoxylic acid, or in the presence of alcohol an er is obtained. With concentrated sulphuric acid, indigo phonic acids are obtained. As an example of the method ployed, 1 kilo. of phenylglycocoll-*o*-carboxylic acid thyl ester is heated with 2 kilos. of formic acid (90 per .t.) for two hours to 150° C. After cooling, the solution iltered, and evaporated *in vacuo*. The residue is then solved in ether and extracted with sodium carbonate ution. The formyl compound is obtained by distilling the ether, and in order to convert it into indoxyl it is led with 10 kilos. of a 20 per cent. caustic soda solution of contact with the air. From this solution, after cooling, indoxyl may be precipitated, or Indigo may be obtained m it directly. The formyl ester prepared above may be verted into Indigo sulphonic acid by heating it on the er-bath with five times its weight of sulphuric acid, taining 4 per cent. of free sulphuric anhydride. When further increase in the blue colour formed can be erved, the melt is poured on to ice, and the Indigo honic acid is salted out.—T. A. L.

ligo Leuco Compounds and other Indigo Products: mpts. in the Manufacture and Production of ——. . Y. Johnson, London. From The Badische Anilin und oda Fabrik, Ludwigshafen, Germany. Eng. Pat. 3,123ᴀ, Nov. 20, 1899. (Second Edition.)

place of the acidyl derivatives mentioned in the foreng specification the patentees state that the acetylivative of the dialkyl esters of phenylglycocoll-*o*-boxylic acid can in the same manner be readily conted into indoxyl compounds (which are easily oxidised ndigo). For instance, 1 kilo. of the acetyl ester is heated h 5 kilos. of a sodium carbonate solution (8 per cent. $_2CO_3$) until all is dissolved. The solution is then diluted, .ed with 2 kilos. of caustic soda lye (20 per cent. NaOH), air is blown through the solution, when Indigo separates .—T. A. L.

o Colouring Matters [Black], and of Products for se therein; The Manufacture and Production of ——. . Y. Johnson, London. From The Badische Anilin und oda Fabrik, Ludwigshafen, Germany. Eng. Pat. 25,288, ec. 20, 1899. (Second Edition.)

treating dinitrochlorobenzene with *p*-aminophenol in imolecular proportions in presence of sodium acetate, it ds *p*-hydroxy-*o*-*p*-dinitrodiphenylamine, and the correnting derivative can be obtained from *p*-aminophenol-*o*-honic acid. The patentees now find that this compound ts sulphonic acid will condense with a further proportion initrochlorobenzene, yielding a phenol ether or sulphonic l thereof. The condensation can be effected in one ration, and it is unnecessary to isolate the intermediate npound. These new products, on heating with sulphur sodium sulphide, yield substantive cotton dyestuffs, ng greenish-black shades. On subsequent treatment n sulphuric acid and bichromate they give bluish-black des. For example, about 19 kilos. of *p*-aminophenol-lphonic acid and 5·5 kilos. of calcined soda are dis-ed in 140 litres of water, mixed with 10·5 kilos. of ined soda and 41 kilos. of dinitrochlorobenzene, and ebated for about three hours, until the latter product practically disappeared. The product of the reaction separates out on cooling as sodium salt in brilliant light yellow flakes, and may be recrystallised from water or alcohol. For the preparation of a dyestuff, about 40 kilos. of this sodium salt of *p*-dinitrophenoxy-*o*-*p*-dinitrodiphenylamine-*m*-sulphonic acid, 80 kilos. of sulphur, and 200 kilos. of crystallised sodium sulphide are heated together in an iron vessel provided with an agitator to 140° C. When the melt becomes solid at this temperature it is allowed to cool, and the mass is powdered, when it can be employed directly for dyeing. It dissolves readily in water to a bluish-green solution, from which the dyestuff can be precipitated by salt or ammonium chloride, whilst hydrochloric acid yields a yellowish-brown flocculent precipitate. The dyestuff gives greenish-black shades on unmordanted cotton fast to acids, alkalis, and soap. When the dyed fabrics are treated with bichromate and sulphuric acid, bluish-black shades are obtained fast to soap, chlorine, and sulphur. A further series of condensation products is also claimed, resulting in the formation of other nitrated phenol ethers by treating *p*-hydroxy-*o*-*p*-dinitrodiphenylamine with *o*-nitrochlorobenzene-*p*-sulphonic acid or with *p*-nitrochlorobenzene-*o*-sulphonic acid.—T. A. L.

Black Colouring Matter; Manufacture and Production of New ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 890, Jan. 15, 1900. (Second Edition.)

According to Eng. Pat. 3828 of 1894 (this Journal, 1895, 147), a process is described for obtaining Naphthazarin or Alizarin Black from 1.1′-dinitronaphthalene. In the present specification the same initial material is employed for the production of a new black dyestuff differing from Naphthazarin. The method consists in treating 1.1′-dinitronaphthalene in concentrated sulphuric acid at a high temperature with sulphuretted hydrogen or with sulphides. A Naphthazarin intermediate product is formed during this operation, which is converted into the new dyestuff. It can be rendered more soluble by treatment with sulphites or bisulphites, and in this condition can be used with a chromium acetate mordant for printing cotton fabrics, giving grey to deep black lakes. The new dyestuff can be produced at a price to replace logwood. About 100 kilos. of 1.1′-dinitronaphthalene are dissolved in 1,000 to 2,000 kilos. of sulphuric acid (96 per cent. H_2SO_4) at 130° C. A current of sulphuretted hydrogen is then passed through the solution until no unaltered dinitronaphthalene remains, which usually takes from 6—8 hours. After cooling, the melt is poured into 500 litres of water, boiled, and filtered. The residue contains some Naphthazarin, which can be removed by means of a solution of alum. The product dyes unmordanted wool violet-black, which becomes deep black on subsequent treatment with a chrome salt. In order to obtain the more soluble bisulphite compound, 200 kilos. of a 25 per cent. paste of the new dyestuff and 75 kilos. of sodium bisulphite solution (40 per cent. $NaHSO_3$) are heated from 4—6 hours at 95° C. The paste so obtained is standardised by adding water. The product is completely soluble in boiling water, and can be used for cotton printing.—T. A. L.

New Azo Colouring Matter [Red], and Lakes therefrom; The Manufacture and Production of ——. B. Willcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 25,511, Dec. 23, 1899. (Second Edition.)

Hitherto 2.1-naphthylamine sulphonic acid has found no technical application. It has, however, been discovered that when diazotised and combined with β-naphthol it yields a dyestuff which even in the form of its alkali salts is almost insoluble in cold water and very sparingly soluble in hot water. This property renders it a valuable product for the preparation of lakes. For example, a paste containing 1·1 kilo. of the sodium salt in 100 litres of water is mixed with a solution of 1 kilo. of crystallised barium chloride in 10 litres of water. After boiling, 100 kilos. of an aluminium hydroxide paste (containing 2½ per cent. of aluminium hydroxide) are added, and the lake is filtered off, washed, and dried.—T. A. L.

Azo Colouring Matters [Yellow], and Materials for Use therein; The Manufacture and Production of New ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 1227, Jan. 19, 1900. (Second Edition.)

The specification relates to the production of a new nitro-*m*-phenylene diamine sulphonic acid by sulphonating and nitrating *m*-dichlorobenzene in one operation. The product so obtained is treated with ammonia under pressure, yielding the new derivative, which, when combined with diazotised Primuline, gives a yellow dyestuff fast to washing, acid, and chlorine. About 1,500 grms. of *m*-dichlorobenzene are stirred into 4,150 grms. of fuming sulphuric acid (23 per cent. free SO_3) at a temperature below 70° C. The melt is then heated for two hours on the boiling water-bath, until a sample dissolves to a clear solution in water. After cooling to the ordinary temperature, a mixture of 2,050 grms. of fuming sulphuric acid (13 per cent. free SO_3) and 725 grms. of nitric acid (94 per cent. HNO_3) is added with constant agitation. The temperature rises to 70°—80° C., and the reaction is completed by heating for about two hours on the water-bath. The melt is then cooled and diluted with 10 litres of water, and the aqueous solution is treated with potassium chloride, which precipitates the potassium salt. About 350 grms. of this salt and 1,200 grms. of ammonia (30 per cent. NH_3) are heated in an autoclave to 150° C. for about six hours. On cooling, long reddish-yellow crystals of the potassium nitro-*m*-phenylene diamine sulphonate separate out. The free acid crystallises in silky yellowish needles. For the preparation of a dyestuff, about 66 grms. of Primuline are dissolved in 2 litres of boiling water. About 7 grms. of sodium nitrite are added, and the solution, when cold, is run into 43 grms. of hydrochloric acid (37 per cent. HCl) and 150 c.c. of water. When the diazotisation is complete, the diazo compound is run into a solution of 25 grms. of the new nitro-*m*-phenylene diamine sulphonic acid in 750 c.c. of water kept alkaline by means of sodium carbonate. The mixture is then heated to 60°—65° C. until a clear solution is obtained, which requires from 4—5 hours. The new dyestuff is ultimately salted out, filter-pressed, and dried. The product so obtained is readily soluble in water, and dyes brilliant yellow shades showing great fastness to washing, acids, and chlorine.—T. A. L.

Colouring Matters: Manufacture and Production of Products Useful in the Manufacture of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 1387, Jan. 22, 1900.

The action of certain sulphites—preferably bisulphites—on certain aromatic hydroxy and amino compounds, especially those of the naphthalene series, yields characteristic products, apparently ester-like compounds of hydroxyl derivatives with sulphurous acid. These substances, compared with the corresponding free naphthols or other naphthalene derivatives from which they are obtained, are more easily soluble in water. Those of the monohydroxy derivatives do not combine with diazo or tetrazo compounds, whilst the dihydroxy and aminohydroxy derivatives still possess this property, although in a less degree than the dihydroxy naphthalenes and aminonaphthols themselves. Certain of the aminonaphthol esters can be diazotised and employed for the manufacture of azo dyestuffs. The esters in general are tolerably stable to dilute hydrochloric and sulphuric acids. They are, however, hydrolysed by heating with concentrated sulphuric acid, solutions of the fixed alkalis, alkaline earths, and the like, yielding the corresponding hydroxy compounds. By heating with ammonia they are converted into amino derivatives. Hence it is possible, by employing this invention, to pass from hydroxy to amino compounds, and, on the other hand, from certain amino to certain hydroxy derivatives. The patentees, however, disclaim the process described in Eng. Pat. 16,807 of 1899 (this Journal, 1900, 732). The α-naphthol and α-naphthylamine derivatives with a free ortho and meta position, and β-naphthol or β-naphthylamine derivatives with a free *m*-position, are most readily acted upon, and certain rules hold good with regard to the di-derivatives. Of the benzene compounds those most suitable are *m*-derivatives, such a resorcinol, *m*-phenylene diamine, *m*-aminophenol, and th like. For example, in order to obtain the sulphurous aci ester of a naphthol sulphonic acid, 246 grms. of 1.4-naphtho sulphonic acid and 1 kilo. of bisulphite (40 per cen $NaHSO_3$) are heated on the water-bath for one hour, unt a test portion, after acidifying with hydrochloric acid an driving off the sulphurous acid, contains only a sma quantity of the initial material. The whole melt is the treated in a similar manner, yielding a solution of th easily soluble sulphurous ester of 1.4-naphthol sulphoni acid. On heating with ammonia it is converted int naphthionic acid. As an example of the conversion of naphthol into a naphthylamine, 144 grms. of β-naphtho 116 grms. of ammonium sulphite [$(NH_4)_2SO_3$], 500 c.c. c water, and 120 grms. of ammonia solution (20 per cen NH_3) are heated together in a closed vessel, with agitatio to 100°—150° C. until all the β-naphthol has disappeare The β-naphthylamine, which separates out, is then filtere off, and the mother-liquor is employed for a subseque operation. For the purpose of obtaining *m*-aminophen from resorcinol, 110 grms. of resorcinol, 116 grms. ammonium sulphite, 500 c.c. of water, and 100 grms. ammonia solution are heated at 100°—125° C. until th resorcinol has practically disappeared. The aminophen formed is extracted, and purified by shaking its acid an caustic alkaline solution respectively with ether. If in th example the ammonia solution be increased to 250 grm and the temperature be maintained at 125°—150° C. un the whole of the resorcinol has practically disappeare the product of the reaction is *m*-phenylene diamine. I this case it is necessary to boil the solution resulting fro the reaction with sulphuric acid in slight excess until fr from sulphurous acid, and to filter from any insolub matter. Any aminophenol formed may be removed.

—T. A. L.

Anthraquinone Dyestuffs; Manufacture or Production New ——. H. E. Newton, London. From The Fa benfabriken vorm. F. Bayer and Co., Elberfeld, German Eng. Pat. 23,637, Nov. 27, 1899.

By treating mono- or diamino-anthraquinone sulphon acids or their hydroxy derivatives with benzyl chloride th are converted into benzylated products of great technic value. The new products dye unmordanted wool from ac baths bluer or greener shades than the original material For instance, a solution of 10 kilos. of diamino-anthraruf disulphonic acid (Eng. Pat. 12,011 of 1897; this Journ 1898, 572) in 500 litres of hot water has slowly added to at 80°—90° C., 8 kilos. of benzyl chloride with consta agitation. The temperature is maintained until a samp dissolved in concentrated sulphuric acid and mixed wi boric acid no longer exhibits the characteristic absorpti spectrum of the boric ether of diamino-anthrarufin dis phonic acid. The new dyestuff is precipitated by cooli and adding concentrated brine. It forms, when dry, a bl powder soluble with a blue colour in water, and is preci tated unchanged by adding hydrochloric acid. It dissolv with a yellow colour in concentrated sulphuric acid, whi turns green on adding boric acid. The new dyestuff giv bright blue shades on unmordanted wool from an acid bat and greenish-blue shades on chrome-mordanted wool.

—T. A. L

Indazol, and Dyestuffs [Brown] therefrom; Producti of Derivatives of ——. R. B. Ransford, Norwoo From L. Cassella and Co., Frankfort-on-the-Maine, Ge many. Eng. Pat. 23,657, Nov. 27, 1899.

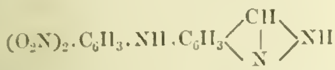
The amino-indazol obtained from nitrotoluidine—

$$(CH_3 : NH_2 : NO_2 = 1 : 2 : 4)$$

readily condenses with dinitrochlorobenzene—

$$(NO_2 : NO_2 : Cl = 1 : 3 : 4)$$

yielding a new indazol derivative, which may be used direct or after further nitration, for the production of dyestuffs heating with sulphur and alkaline sulphides. For examp 13·3 kilos. of amino-indazol, 20·3 kilos. of dinitrochlor nzene, and 25 kilos. of sodium acetate are boiled together dilute alcohol for several hours. The alcohol is then stilled off, and the dinitrophenylamino-indazol—



$$(O_2N)_2.C_6H_3.NH.C_6H_3\left<\begin{matrix}CH\\|\\N\end{matrix}\right>NH$$

parates as a brown powder. After recrystallisation from cohol it forms reddish-brown crystals melting at 261° C. order to convert it into a dyestuff, 15 kilos. of the product e heated with 30 kilos. of sulphur and 75 kilos. of sodium lphide for several hours to about 130° C. The melt may used directly for dyeing, and the product gives olive ades on cotton from a bath containing salt and sodium lphide. A brown dyestuff is formed if the dinitrophenylnino-indazol be treated in sulphuric acid solution with nitro lphuric acid before heating with sulphur and sodium lphide.—T. A. L.

louring Matters [Brown]; Impts. in the Manufacture of ——. R. B. Ransford, Norwood. From L. Cassella and Co., Frankfort-on-the-Maine, Germany. Eng. Pat. 25,754, Dec. 30, 1899.

s heating the dinitro-oxydiphenylamine obtained from 3.4 - dinitrochlorobenzene and 1.4 - aminophenol with ustic alkalis in aqueous solution, it is transformed into a own dyestuff which differs considerably from the initial aterial, since this latter, on heating with sulphur and kaline sulphides, yields Immedial Black, whilst the transrmed product when similarly treated glives a characteristic llowish brown dyestuff. The dinitrophenyoxytolylamine om dinitrochlorobenzene and amino-*o*-cresol behaves in e same way. For instance, 40 kilos. of dinitro-oxyphenylamine are dissolved in 80 kilos. of caustic soda lye 0° B.) and 240 litres of water, and boiled for 3—4 hours itil no more ammonia is evolved. After diluting, the new oduct is precipitated with hydrochloric acid, and forms, hen dry, a black amorphous powder. It dissolves readily presence of alkalis, and dyes unmordanted cotton intense own shades. 25 kilos. of the substance, 52 kilos. of dium sulphide, and 13 kilos. of sulphur, together with a tle water, are gradually heated to 160° C. and maintained this temperature until the melt becomes solid. It can be ed directly for dyeing, and dissolves readily in water, ving intense yellowish-brown shades on cotton from a arm bath containing salt. A subsequent chromate treatent turns the shade yellower and increases the fastness.

—T. A. L.

lue Mordant Dyestuffs of the Anthraquinone Series; Manufacture of ——. O. Imray, London. From The Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 24,954, Dec. 15, 1899.

CCORDING to Ger. Pat. 6526 (lapsed), sulphonic acids are otained by the action of fuming sulphuric acid on dinitrothraquinone or its reduction products, but these acids are ractically valueless. A method is described in Ger. Pat. ,490 by which they are heated with dilute alkalis under oderate pressure, when they yield blue mordant dyestuffs luble in water. In the present specification this method further improved by heating the products of Ger. Pat. 526 in the form of their lime lakes with aqueous alkalis, ith or without the presence of an oxidising agent, such as ltpetre, until they become insoluble in water. Under these onditions the sulphonic acid groups are removed, and the mino groups are replaced by hydroxyl. A mixture of 100 rms. of the product of Ger. Pat. 6526, 50 grms. of lime, 00 grms. of sodium hydroxide, 20 grms. of saltpetre, nd 3 litres of water is heated in a closed vessel provided ith an agitator for about 20 hours to 180° C., until a ample, when treated with hydrochloric acid, yields an soluble dyestuff. The whole melt is then boiled with ilute hydrochloric acid, and the hexahydroxyanthraquinones re filtered off. When dissolved in dilute sodium carbonate r alkali, or by washing with sulphuric acid, these products ield pure blue mordant dyestuffs.—T. A. L.

Blue-Violet Dyestuffs; Manufacture of ——. O. Imray, London. From The Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 1761, Jan. 27, 1900.

DYESTUFFS of the *o*-tolyldiphenylmethane series are obtained, according to this invention, from dibenzyl-*m*-toluidine. The products formed differ from those obtained from dibenzylaniline in being faster to alkali and bluer in shade. The dyestuffs are obtained either by oxidising the leucosulphonic acids of dibenzylamino-*o*-tolyltetramethyl- (or ethyl-) diaminodiphenylmethane, or by sulphonating the basic dyestuffs of the above-mentioned *o*-tolyldiphenylmethane derivatives. The leuco-sulphonic acids may be obtained by condensing tetramethyl- (or ethyl) diaminodiphenylcarbinol with *m* - toluidine (Ger. Pat. 27,032), benzylating, and then sulphonating with fuming sulphuric acid (25 per cent. SO_3); secondly, by condensing the said diphenylcarbinols with dibenzyl-*m*-toluidine, and then sulphonating; or, thirdly, by condensing the diphenylcarbinols with dibenzyl - *m* - toluidine disulphonic acid (Ger. Pat. 69,654). The basic dyestuffs employed for sulphonation may be obtained by condensing the above-mentioned carbinols with dibenzyl-*m*-toluidine and subsequent oxidation (Ger. Pat. 27,032), or by direct oxidation of the ketone corresponding to the said carbinols with dibenzyl-*m*-toluidine (Ger. Pat. 27,789). *Dibenzyl-m-toluidine* is readily obtained by adding a slight excess of benzylchloride to a hot mixture of *m*-toluidine and a concentrated solution of sodium carbonate. When the reaction is complete, the excess of benzyl chloride is driven off with steam, leaving dibenzyl-*m*-toluidine as a thick oil, which crystallises on cooling. On recrystallisation from alcohol, it melts at 72° C. Its disulphonic acid is formed by treating the base, dissolved in sulphuric acid monohydrate, with fuming sulphuric acid (25 per cent. SO_3). The acid yields salts readily soluble in water, which may be separated and purified in the usual manner. For the production of a dyestuff, the leuco-sulphonic acid of dibenzylamino-*o*-tolyltetramethyldiaminodiphenylmethane, obtained according to one of the methods instanced above, is dissolved in water in the form of its sodium salt. To this solution, made acid, is added, with constant agitation, the calculated quantity of lead peroxide paste. After making alkaline the solution is filtered hot, and the dyestuff is precipitated by adding salt to the filtrate at about 50° C. The product dyes wool bluish-violet shades.—T. A. L.

Indigo into an easily Reducible Form in Paste and in Powder; Process for transforming difficultly Reducible Crystalline ——. T. R. Shillito, London. From J. R. Geigy and Co., Basle, Switzerland. Eng. Pat. 1293, Jan. 20, 1900.

IN some of the technical processes for the production of artificial Indigo, the product is obtained in a crystalline condition, which can only be reduced in the vat with difficulty. By dissolving such Indigo in cold concentrated sulphuric acid, it can be precipitated unchanged by adding water at a low temperature, and it is then in such a condition that the addition of a sufficient quantity of hydrosulphite reduces it in a few minutes to Indigo White, the operation being conducted out of contact with air. One kilo. of crystalline Indigo is slowly stirred into 4 kilos. of well-cooled concentrated sulphuric acid. After a short time the green paste is poured on to water and ice. The Indigo is precipitated in an exceedingly fine condition, and, after filtering and washing, may be at once employed for dyeing purposes. It still remains easily reducible after drying and grinding. (See also Eng. Pat. 23,122 of 1899; this Journal, 1900, 1009.)—T. A. L.

Orange-Yellow Dyestuffs belonging to the Acridine Series; Manufacture of ——. C. D. Abel, London. From The Actiengesellschaft für Anilinfabrikation, Berlin, Germany. Eng. Pat. 1820, Jan. 29, 1900.

NEW orange dyestuffs of the acridine series are obtained by alkylating the naphthacridine derivatives described in Eng. Pat. 16,474 of 1898 (this Journal, 1899, 826). The alkylation can be effected by heating with alkyl haloids or with alcohols and mineral acids. For instance, 10 kilos. of aminotolunaphthacridine, 24 kilos. of methyl alcohol, and 12 kilos. of concentrated hydrochloric acid are heated under pressure for several hours at 160—170° C. After cooling, the excess of alcohol is distilled off, the residue is dissolved in water, and the dyestuff is salted out. It forms an orange powder, very easily soluble in hot water to an orange-yellow solution exhibiting, when dilute, a yellowish-green fluorescence. The solution is precipitated by adding sodium carbonate, caustic alkali lye, or ammonia. This base is scarcely soluble in water or benzene, but dissolves readily in alcohol or ether, and the solutions have a similar yellowish-green fluorescence. The dyestuff gives orange-yellow shades on tannin-mordanted cotton.—T. A. L.

Black Colouring Matter directly Dyeing Cotton; Manufacture of a ——. C. D. Abel, London. From The Actiengesellschaft für Anilinfabrikation, Berlin, Germany. Eng. Pat. 2531, Feb. 8, 1900.

Dinitro-chloro-oxydiphenylamine, having the formula [1.3.4], $(NO_2)_2 . C_6H_3 . NH . C_6H_3 . (OH) . Cl$, 1.2.4, when heated with sulphur and alkaline sulphides, yields a black cotton dyestuff. For the manufacture of the initial product, 15 kilos. of *o*-amino-*p*-chlorophenol are dissolved in 750 litres of hot water, mixed with 11 kilos. of sodium carbonate and 20·5 kilos. of dinitrochlorobenzene, the whole being then boiled for several hours. On cooling, the condensation product separates in red needles. In order to obtain the dyestuff, 50 kilos. of sodium sulphide, 20 kilos. of sulphur, and 15 litres of water are heated together, and 10 kilos. of the dinitro-chloro-oxydiphenylamine, produced as above, are added at about 80° C. The temperature is then raised and maintained for several hours at 140°–150° C. The heating is then continued at a somewhat higher temperature until the melt is quite dry and may be powdered, or else the mass is dissolved in water and the dyestuff precipitated from the aqueous solution by a mineral acid or by means of a current of air. The product so obtained readily dissolves in a dilute sodium sulphide solution, with an intense bluish-green coloration.—T. A. L.

Extraction; Method or Process of ——. P. Gulden, Leipsic, Germany. Eng. Pat. 16,716, Sept. 19, 1900.

An improvement in the method of extracting dyeing and tanning materials, fruits, leather, &c., which consists in carrying out the extraction and the evaporation simultaneously and *in vacuo*. The material to be extracted is placed in the digesters, together with a suitable quantity of the liquid solvent to be employed. The mixture is then heated, by means of steam coils or other suitable method, to a temperature not exceeding 60° C. At the same time a vacuum is obtained by means of an air-pump. Thus the surplus liquor is evaporated *in vacuo* after having penetrated the material under treatment, the juices thus obtained being allowed to pass over from one digester to another filled with new material until sufficiently concentrated.—M. C. L.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Yarn and Cloth Testing Machines. G. R. Smith, Ossett, near Leeds. Proc. New England Cotton Manufacturers' Assoc., Washington Meeting, No. 69, Oct. 1900.

The author has designed four machines which are suitable for testing any textile fibre, either as yarn or cloth. All the machines consist essentially of a beam which is balanced by suitable means before introducing the yarn or cloth to be tested.

The beam is provided with a jaw to fix one end of the yarn or cloth, the other end of the material being attached to another jaw, which is placed at a suitable distance away and connected with an arrangement which is moved by clockwork. When the material under test is stretched by the motion of this clockwork arrangement, the beam is tilted upwards sufficiently to allow water to flow into a graduated cylinder placed at one end of the beam; equilibrium is thus restored, and this action continues until the material breaks.

The amount of water in the cylinder is a measure of tension to which the material under test has been subjec —J. E. I

Impregnation of Fibrous Materials with Substances of Melting Point; Process for the ——. J. Ru Leipziger Färber- u. Zeugdr.-Zeit. 1900, **49**, [12], 4

The two methods hitherto employed for waterproo fabrics with paraffin, stearates, or wax are: (1) A roller is made to rotate in contact with the solid subst and the fibrous material is then led over this roller; The paraffin, &c. is dissolved in benzene or petroleum s and the material steeped in the solution.

According to the new process (Ger. Pat. 1900, 112,9 the substance is emulsified in water by means of a ce fugal machine. Paraffin, ozokerite, vegetable wax, bees and stearine or palmitine and their metallic compounds the waterproofing substances employed; one of thes melted and revolved in a heated centrifugal machine boiling water, by which treatment it becomes so fin divided that it will remain suspended for a long pe without separation.

The goods are impregnated with the emulsion and in drying process which follows the water evaporates, and emulsified substance melts and penetrates the fabric, t rendering it waterproof. Only small quantities of substance are required, and the appearance of the fabr not affected.—R. B. B.

Cuprammonium Solutions; Preparation of ——. Fremery, E. Bronnert, and J. Urban. Amer. 658,632, Sept. 25, 1900. Chem. Zeit. 1900, **24**, [906.

A mixture of copper and 16 per cent. ammonia solu is treated with air, the temperature being maintained b 5° C.—A. S.

Artificial Leather; Process for the Manufacture of —. Leipziger Färber- u. Zeugdr.-Zeit.

See under XIV., *page* 52.

PATENTS.

Fibre applicable to all sorts of Weaving and Spinning Processes for the Treatment or Separation of S Improved ——. G. C. Dymond, Liverpool. From Cruz-Pasqual-de-Bonanza. J. Selva-Javaloyes, D Quilez-Quilez, M. Gomez-Valdivia, and A. Alonso-Bl Elche, Alicante, Spain. Eng. Pat. 16,811, Aug. 18, 1

The fibre from palm limbs is extracted in three ways. The limbs are digested for five hours in boiling wat soda-lye (sp. gr. 1·045) at 90° C., and then passed, dried, through rollers to squeeze out gummy matters. fibres are then treated in the usual way to prepare t for spinning, &c. (2) The chemical method consist first drying the limb, and then digesting it for 48 hou soda-lye of 8° B. The fibres are now separable, and washed well with water for 24 hours and then treated a mixture of equal parts of cocoanut-oil and coloph They are then treated for four hours in a bath of d sulphuric acid of 5° B. (3) The third process consist first combing or hackling the limb and afterwards dige in soda-lye.—C. M.

Retting or Steeping Flax; Method of and Apparatus ——. A. Badoil, Marseille. Eng. Pat. 20,907, Oct 1899. (Foreign Application, April 15, 1899.)

Bundles of flax are placed in a series of tanks, which are divided into compartments, horizontally and vertic The horizontal divisions are made by perforated grid-pl Each division is arranged so that a cage can fit into it. whole is covered by a non-perforated plate and a lid. bundles are first digested in a soap solution at 70° to 8 for two hours, 8 kilos. of soap to 100 kilos. of stalks i proportion. The fibres are then removed, passed thr fluted rollers and then digested with hydrochloric solution (3 litres of acid to 30 litres of water for each kilos. of stalks) at 60° C. for one hour. After draining

washing, the stalks are bleached in a solution obtained by mixing 10 kilos. of chloride of lime, and 10 kilos. of sodium arbonate in 1,000 litres of water, this process being carried n at 30° C. for three hours. The flax is afterwards washed well with water, and dried in a hydro-extractor.
—C. M.

Mercerising, Scouring, or Dyeing Yarns; Apparatus for ——. W. Macconel, Netherlee, Renfrewshire. Eng. Pat. 1736, Jan. 27, 1900.

An apparatus consisting of a series of tanks containing he various liquids and an overhead rail. This rail is undulated, and carries on frames the yarn to be treated. As the pulley travels, the yarn dips alternately into the iquids, and is then raised to clear the tank before going on o the next.

The frames are arranged so that the yarn may either be tretched or remain unstretched.—C. M.

Textile Fabrics; Manufacture of ——. E. Marty, Riberac, France. Eng. Pat. 13,084, July 20, 1900.

Fabrics are made by spinning camels' hair, and then weaving alone or weaving with other materials, such as otton, hemp, &c., according to the quality required. It is laimed that fabrics made with camels' hair resist heat, water, sugar, acids, &c.—C. M.

mpermeable Threads and Fabrics; Production of ——. W. G. Heys, Manchester. From E. Sénéchal de la Grange, Paris. Eng. Pat. 16,332, Sept. 14, 1900.

r is claimed that the following mixture can be made into erfect threads by any process by which artificial silk is made:—100 kilos. of dry nitrated cellulose is mixed with 5 kilos. of indiarubber solution, and 5 kilos. of stannous hloride.—C. M.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, AND BLEACHING.

Stains and Unevenness in Dyed Woollen Tissues; Some Causes of ——. G. Robrecht. Färber-Zeit. 1900, **11**, [22], 349—352.

tains and cloudy patches in woollen tissues are sometimes aused by imperfect wetting-out of the latter when they have been sent into the dyehouse in the dry state. The tissues hould be passed through boiling water to ensure complete aturation before being dyed. Tissues which are received in the dyehouse in the wet state are better not so treated, provided that they have been well washed after milling, as he water is apt to produce stains in them. This is especially he case when pale colours are dyed.

Unevenness in dyeing is often caused by defective construction and defective heating of the dyeing machines. Stains are due to dirty dye vessels and winches, dirty barrows or trucks (used in carrying the pieces to and from he dyehouse), soot from the works' chimneys, rusty iron nails (wooden pegs should be used) in the winches, resin in he wood of new dyeing machines, frothy dye-liquors, scum on the surface of the dyebath (frequently from the dyestuffs), oil drops from overhead shafting, dyestuff-dust blown about the dyehouse by draughts of air (due to faulty arrangement of the dyehouse), presence in the tissue of oxalic acid left after removing iron stains, drops from the roof or overhead beams (the last is a prolific source of stains).

In removing stains, not only the stained part, but the tissue for some distance about it, should be treated. The reagent, for instance, soap, must also be thoroughly removed before dyeing or redyeing.—E. B.

Aniline Black, over-dyed with Basic Dyestuffs; The Bronzing of ——. F. A. Roesler and H. Hackl. Färber-Zeit. 1900, **11**, [22], 357—358.

The bronze-like appearance of Aniline Black, which has been printed upon cotton tissues and dyed over or "topped" with basic dyestuffs, is principally due to the colour-lakes being superficially deposited upon the printed parts, but is partly due to the nature of the Aniline Black and of the dyestuff employed. The defect is strongly shown with Magenta, Methyl Violet, Crystal Violet, Victoria Blue, and Brilliant Green, less so with Methylene Blue, New Methylene Blue, Capri Blue, Nile Blue, Safranine, and Methylene Violet 3 R A extra. To prevent it to some extent, the following method of dyeing is recommended:—Mordant the printed tissue with an acetic acid solution of tannic acid, fix with tartar emetic, thoroughly rinse to remove the imperfectly fixed mordant, dye for some time in the cold with the basic dyestuff, next raise the temperature to 38° C., and maintain this temperature till the bath is exhausted, then add acetic acid and carry the temperature to the boiling point. The tissue is afterwards well washed and dried. Dyeing at the ordinary temperature has the effect of causing the dyestuff chiefly to become fixed upon the unprinted parts of the tissue. The object of the addition of acetic acid, and of the boiling of the dyebath, is to remove the loosely fixed colour-lake.—E. B.

Unions with Diamine Dyestuffs; Dyeing of ——. W. E. Fearnsides. J. Soc. Dyers and Colourists, **16**, [12], 258—263.

For drabs, fawns, &c., Diamine Catechin B is an ideal dyestuff, being fast to light, stoving and hot-pressing; in conjunction with Diamine Fast Yellow B and Diaminogene B, varied shades are obtained, which are level and fast to light.

In the dyeing of light shades, it is important to keep on the light side of the pattern, since, if the shade be too dark, it is very difficult to strip the wool, which indeed can only be done effectively by means of potassium permanganate and sodium bisulphite.

Again, in dyeing shoddy unions which have been stripped with potassium bichromate and sulphuric acid, it is best to neutralise the goods thoroughly with alkali previous to dyeing, otherwise uneven results will be obtained.

Dress goods and crépons containing mercerised cotton, are dyed with less sodium sulphate than usual, the material being entered into the dye-bath at or near the boil, and the boiling continued during the whole of the dyeing process in order to cover the wool. (The ordinary process consists in dyeing for a considerable time below the boil.) In this connection, avoid dyestuffs which have a greater affinity for cotton than wool. In the case of dark shades, the mercerised cotton has a tendency to dry up "bronzy," but this appearance can be removed by running the goods for 15 minutes in a fresh hot bath containing sodium sulphate. In all cases, the addition of a small amount of acetic acid in washing is recommended.

Two-coloured ("shot") effects upon crépons are obtained by dyeing the wool with acid dyestuffs, washing and dyeing the cotton in a cold concentrated bath containing sodium sulphate and carbonate and substantive dyestuffs; Diamine Black R M W, Diamine Black B H, Diamine Sky Blue, Diamine Fast Yellow A, and Diamine Orange D, are largely used in this connection.

However, where the cotton is to be dyed black, the following process is employed:—Dye the cotton with Diamine Black B H at 100° F. (if higher temperature, the wool will be stained), diazotise and develop with phenylene diamine, and finally dye the wool in acid bath.

Quite recently a new method of dyeing, by a combination of the dyeing and milling process, has been adopted, chiefly for the production of black. A full black is obtained by adding 1—1½ per cent. of Milling Black B to the soap solution and milling for at least 60 minutes; the wool, which is only slightly but uniformly tinted, is dyed in acid bath with 2—5 per cent. sulphuric acid, and the boiling is reduced to a minimum in order to diminish the bleeding effect of the cotton.

The addition of sodium sulphate in the milling yields a more intense black, but this advantage is more than counter-balanced by the increased scouring which is necessary to remove the soap in the presence of a salt, and which consequently diminishes the intensity of the black. In all cases, scouring must not be done at a temperature above hand-warmth nor for too long a time.

Generally, most substantive dyestuffs can be applied in the manner described, only they are not fast enough to acids to withstand cross-dyeing. However, for mixtures in which the wool has been dyed either in the loose state or as yarn, the cotton is advantageously stained or even dyed to shade, by adding the dyestuff to the soap solution in the milling process; moreover, this procedure is more economical than the older process of dyeing the cotton cold in the washing machine.—J. E. H.

Linen Dyeing; Some Notes on ——. Textile Colorist, **22**, [262], 291—292.

In dyeing with the basic colours, if full shades be required, it is necessary to mordant the linen before dyeing, by steeping it in a solution of tannic acid, varying in strength from 1 lb. for pale shades to 3 lb. for deep shades, allowing the linen to remain in this mordanting solution from 6 to 12 hours, according to the depth of shade required.

When dyeing bright colours, the best tannic acid should be employed; for dark shades, sumach may be used with advantage. After mordanting, the tannin is fixed on the linen fibre by steeping the goods for half an hour in a solution of tartar emetic, the amount employed being equal in weight to that of the tannin used. If only pale shades are required, it is not necessary to mordant the linen before dyeing. The dyeing is best effected by working the goods for 20 minutes in a cold solution of the dyestuff, then gradually raising the temperature to a boil, and finally working the goods for half an hour at this temperature. The goods are then washed in water and dried.

The Rosaniline Blues require the addition of 5—8 lb. of alum to each 100 galls. of the dye-bath, in order to thoroughly fix the dye on the linen fibre, and the temperature of the dye-bath should not exceed 180° F. or the colour is liable to be injured; it is recommended to allow the linen to remain in the bath until the latter has cooled down to 100° F. before removing the goods.

In dyeing with the direct cotton dyes, the most economical results are obtained by making the dye bath as strong as possible, and dyeing at a boil; about 10—20 lb. of Glauber's salt or common salt are added to the dye-bath for each 100 lb. of linen to be dyed. The dye-bath is seldom exhausted of colour; it is therefore economical to retain it for future use, adding from two-fourths to three-fourths of the original amount of dyestuff used for each succeeding lot of goods to be dyed. Some of the direct dyestuffs may be treated with chromium chloride, chromium fluoride, chromium sulphate, potassium bichromate, or copper sulphate, in order to increase the fastness of the colour to washing and light, and in some cases to increase the depth of shade; the quantities recommended are 7—9 oz. for medium shades and 2—3 lb. for deep shades.

Many of the direct dyes may be diazotised and developed after dyeing by treatment in a cold solution of sodium nitrite and hydrochloric acid for 15—20 minutes, using 1—3 lb. of sodium nitrite according to the depth of shade required, together with three times this amount of acid; the goods are now transferred for 15—20 minutes to the developing bath, which contains β naphthol, resorcinol, phenylene-diamine or some other developer.

The "Sulphyl dyestuffs" are useful for dyeing linen. Among these are the Immedial Blacks, Blues, and Browns, &c., &c. In using these colours the linen is dyed in a very strong dye-bath at a boiling temperature, keeping the goods underneath the surface of the liquor during the dyeing. The dye-bath may be used over again by strengthening it with 50—70 per cent. of the original quantity of the dyestuff used. After dyeing, the excess of liquor is squeezed out of the goods and returned to the dye-bath, the linen being then well washed and treated with a solution of potassium bichromate or copper sulphate in order to develop and fix the colour on the fibre.—M. C. L.

Lactic Acid in Calico Printing; Some Applications of ——. F. Oswald. Bull. Soc. Ind. Mulhouse, Sept.—Oct. 1900, 313—316.

Of the two isomeric modifications of lactic acid, only the α-hydroxypropionic acid is of interest to the calico printer. Its chief value depends on the fact that a solution of considerable strength, *viz.*, 16° B. can be prepared containing the lactates of aluminium, tin, and calcium, whereas it is not possible to prepare any other solution suitable for u in printing containing these three metals in combinati with the same acid. The solution is made from 600 grn of aluminium sulphate, 300 grms. of stannous chlori 100 grms. of quicklime, and 1,000 grms. of lactic ac these ingredients are heated together until dissolved, a yield about three litres of solution at 16° B. The printi colour is prepared with starch thickening, olive oil, Alizar and the above solution of lactates, or the last may replaced by aluminium and calcium acetates, stannic oxi and lactic acid. The colours are considerably brighter th when no lactic acid or lactate is used, and good results t also obtained with Alizarin Orange, Alizarin Bordeaux, &

The author's experiments point to the possibility dyeing a Turkey-Red with only two paddings, the probal sequence of operations being as follows:—Pad w Alizarin and Turkey-Red oil with or without the additi of ammonia, dry, pad in solution of mixed lactates, d and steam.

Chromium lactate also possesses features of interest a is best prepared by dissolving chromic oxide in lactic ac When this is used in printing with Alizarins, the sha are brighter than those obtained with the acetate or nit acetate.

Lactic acid is useful in printing basic colours with tan and tartar emetic, and especially in conjunction wi Indulines.

Stannous lactate owing to its reducing properties c serve as a discharge for direct colours. If basic colo are added, coloured discharges are produced, but for white discharge, stannous chloride is added to the thicken lactic acid. In either case printing of the discharge m be followed by steaming.

Finally, lactic acid may be employed in preparing thickening to replace "acid starch thickening." For t purpose the starch is heated with water, and while still h the lactic acid is added and the mixture cooled.—R. B. I

Irisamine in Calico-Printing; Application of ——. W. Hofacker. Färber-Zeit. **11**, [21], 337.

Irisamine G (Cassella) is a new dyestuff of the Rhodaa series, and yields brilliant rose shades.

In addition to the usual mode of application with tan acid and antimony, it may be fixed by means of a salt chromium oxide (Cr_2O_3), in which case the shades quite as fast to light and washing, and, if possible, m brilliant, than those obtained with tannic acid.

The fixation with chromium should be especially servi able for the production of brilliant rose shades in co bination with steam colours. The quantity of chromi acetate (18° B.) employed, must not exceed 50—75 per litre of printing colour.—J. E. H.

Colouring Matters [Blacks on Cotton] on the Fib Method for the Detection of Certain ——. Leipzi Färber- u. Zeugdr.-Zeit. 1900, **49**, [12], 487.

To determine whether black cotton has been dyed with sulphur dyestuffs (Vidal, Immedial, Katigen, Sulpho colours, &c.), the fibre is boiled with a solution of stann chloride in hydrochloric acid. A strip of paper moisten with lead acetate solution is held in the steam from boiling solution, and is coloured brown or black if sulp colours be present.

Aniline Black is identified by treating the cotton fo short time with cold hydrochloric acid, when fibre a solution both become green. Aniline Black dyed by one bath process, is distinguished from an oxidation bla by the green colour of the ash in the former case, due to presence of a large amount of chromic oxide; the one b black also rubs off much more readily than the oxidat black.

In order to ascertain if Direct Blacks have been used combination with Aniline Black, the cotton is boiled some time together with white cotton in water containin little soda; if Direct Blacks are present, the white cotton stained. Should the dyed cotton bleed very strongly, a the reactions for Aniline and Sulphur Blacks be not giv the colour has been produced by means of direct dyest alone.

Logwood may be detected by the red colour of solution nd fibre when the latter is boiled with dilute sulphuric cid : on neutralising with soda, the red changes to a yellow. y repeated extraction with sulphuric acid, the logwood may e completely removed, and the fibre then tested for the resence of other colouring matters.

If tannic acid has been employed in conjunction with iron, he ash will contain a considerable amount of ferric oxide, nd if this is the case, the presence or absence of logwood hould also be determined.

Basic colours which are employed for topping or blooming" blacks on cotton, may be extracted by cold oncentrated alcohol, to which a few drops of hydrochloric cid have been added.—R. B. B.

Leather; Dyeing, Staining, and Finishing of ——. M. C. Lamb. Leather Trades' Rev. 33, [764], 871.

ontinental Methods of Dyeing: The Two-Tray Method. —The skins to be dyed are divided into packs—say, for xample, four packs. A strong solution of the dyestuff be used is prepared, a quantity being dissolved sufficient dye all the skins. This stock liquor is conveniently ade up into four times as many pints of dye-liquor as here are packs to be dyed—in this case 16 pints. Two ye-trays are provided similar to English dye-trays, but ot so deep, and three separate dye liquors are prepared ith hot water, each sufficient to take one pack of skins, e skins being paired flesh to flesh. One of the liquors hould contain one pint of the strong stock solution, the econd two pints of the same, and the third one quarter of e solution that remains. These liquors may be termed espectively 1, or weak liquor; 2, or medium liquor; and or strong liquor. The first liquor is poured into one of e trays, and a pack of skins worked in it, these being urned, just as is customary in the English tray method. he second, or medium liquor, is placed in the second tray, nd the pack of skins is removed from the weak liquor and orked in the medium. By the passing of the pack of kins through the weak liquor, this becomes exhausted of s dye, and may be thrown away, and into the empty tray e strong liquor is poured, and in this strong liquor, the yeing of the pack of skins is completed.

These two remaining liquors now form the weak and edium liquor for the next pack. The pack of skins is uccessively passed through the first, and then on to the econd, the spent liquor is thrown away, and a fresh liquor prepared with one-third of the remaining stock solution, oured into the empty tray, and in this strong liquor, the econd pack goes through its final working. These two quors now form the weak and medium liquor for the third ack. To finish this third pack of skins, one-half of the emaining stock liquor is used; and for the finishing of the urth pack, the remaining stock liquor is put into the ath.

The temperature of the several baths should be between 5° and 50° C., and the packs should be worked in each ath from 5 to 10 minutes.

By the above process each pack of skins goes through ree separate baths, commencing with a weak bath, when e skins are naturally greedy for the dye, and finishing ith a strong hot liquor, which may be much stronger than e bath used in the ordinary English tray method. This nishing liquor produces a fullness and evenness of shade nobtainable by the English process, and the method is xtremely economical in the use of dyestuffs.

The Dip Method.—A wooden vat or tray, 3 ft. in length, ½ ft. in width, and 1 ft. deep, is tilted up lengthwise at n angle of about 45°, so that the dye liquor in the tray uns to its lower end. The skins to be dyed are paired, nd are dyed pair by pair. About half the quantity of the oncentrated dye solution usually required to dye a pair of kins is placed in the tray, together with hot water enough o make 1½ gall. The skins are worked up and down ve or six times, being lifted out of the liquor each time. he remainder of the concentrated dye solution is now dded, and the process repeated until the requisite depth f shade is acquired.

By this process only one pair of skins is dyed at a time, consequently, out of a pack of about four dozen skins at least half a dozen shades can be sorted out.

This method, usually adopted on the Continent, even ignoring its other disadvantages, is quite unsuitable for this country on account of the great amount of labour required for it, and the quantity of dyestuff wasted.

—J. G. P.

PATENTS.

Sulphur Dyestuffs; Method of Dyeing with ——. O. Imray, London. From The Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main. Eng. Pat. 24,455, Dec. 8, 1899.

In this patent the application of the sulphur dyestuffs is described, after the manner employed in the hydrosulphite indigo vat, by first transforming them by means of hydrosulphites into their leuco derivatives, then dyeing with them in this form, and finally developing the colour by oxidation. The method of carrying out the process is exactly the same as with indigo, and indigo may be used in combination with the sulphur colours in this way. Other indigo vats, *e.g.*, the lime and copperas vat, do not give similar useful results. The oxidation may be brought about either by exposure to air or by treatment with metallic salts or other oxidising agents.

Among the most suitable dyestuffs for this vat-dyeing process are Immedial Blue C, Immedial Black G, and V extra, Katigen Blue, Vidal Black, Clayton Fast Black D, and the dyestuffs obtained according to Eng. Pat. 24,538, of 1898 (this Journal, 1899, 1012).—R. B. B.

Dyeing or Printing with Azo Colouring Matters; Process for the Production of Grounds on Cotton in ——. T. R. Shillito, London. From J. R. Geigy and Co., Basle, Switzerland. Eng. Pat. 25,618, Dec. 28, 1899.

In the production of grounds for azo-colours, *e.g.*, Paranitraniline Red, on the cotton fibre by means of phenols, naphthols, and their derivatives, a rosin soap, made from rosin and alkali, is added to the padding solution instead of Turkey-red oil, olive oil, or any of the additions hitherto employed. Or, the rosin soap may be separately applied previous to the application of the grounding solution.

—R. B. B.

Discharging Indigo-dyed Silk Goods; Impts. in ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen a Rhein, Germany. Eng. Pat. 2689, Feb. 10, 1900.

The Indigo-dyed silk goods are first discharged in the usual or any suitable manner, *e.g.*, with bichromate followed by sulphuric and oxalic acids, and subsequently submitted to the bleaching action of reducing or oxidising agents, such as sulphurous acid, in the gaseous or liquid condition, or as bisulphite, hydrogen peroxide, or other bleaching agent.

—R. B. B.

Dyeing, Bleaching, and other Liquids and Gases, through the Materia contained therein; Sliver Cans or Receptacles to Permit of the Circulation of ——. H. Honegger, Duisburg a Rhein, Germany. Eng. Pat. 7214, April 18, 1900.

Cans for the reception of slivers during the bleaching and dyeing processes, &c. are furnished with a removable perforated cover, a perforated false bottom, and a solid real bottom with a hollow seating. This seating fits on a projecting hollow pin attached to the false bottom of the vessel containing the dye or other liquor, and the liquor is made to circulate through the slivers from below, returning to the outer vessel through the perforated lid of the sliver cans.

For the purpose of making the can in a smaller and more convenient form, it may be composed of two parts, the upper of which is a removable extension of the lower or actual can, and serves as a guiding arrangement when the slivers are laid on the drawing frame, as well as when they are compressed by the movable cover.—R. B. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Potassium Chlorate; Electrolytic ——. A. Brochet. Ind Electrochim. 1900, **4**, 41—43. Through Science Abstr. **3**, [11], 893.

Continuing previous investigations the author now concludes that in cold and only slightly alkaline or acid solutions of potassium chloride, the only primary electrolytic product is hypochlorite, the reduction of which can be prevented by adding bichromate as proposed by Müller, some of this hypochlorite is then oxidised to chlorate in a manner not yet ascertained, but probably in part through the agency of bichromate, as there seems to be no electrolysis of water. In hot alkaline solutions the conversion into chlorate is more rapid, but not complete. The question of the direct formation of chlorate in more strongly alkaline solutions remains undecided, but the author agrees with Oettel.—W. G. M.

Chlorates: Decomposition of ——. *Part III. Calcium Chlorate and Silver Chlorate.* W. H. Sodeau. Proc. Chem. Soc. **16**, [229], 209.

When calcium chlorate is decomposed slowly, about 0·6 per cent. of its total chlorine is evolved, whether the pressure be 760 mm. or 4 mm., but the proportion exceeds 2 per cent. when the decomposition under atmospheric pressure is rendered violent. As the proportion of free chlorine is independent of the pressure of the gaseous products, the calcium chloride in the residue is not produced by the action of chlorine upon oxide first formed.

When silver chlorate is heated to about 350° C. it explodes with a yellow flash, about 7 per cent. of its chlorine accompanying the oxygen. When slowly decomposed, the influence of pressure is even greater than in the case of lead chlorate. At atmospheric pressure, only 0·2 per cent. of its chlorine remains free, but 22·6 per cent. is obtained at $2\frac{1}{2}$ mm. pressure, and more than 36 per cent. should be obtained if the action between chlorine and silver oxide could be completely eliminated.

It is concluded that oxygen and chlorine are produced during the slow decomposition of either chlorate by two simultaneous independent reactions represented by the equations $2M(ClO_3)_2 = 2MCl_2 + 6O_2$ and $2M(ClO_3)_2 = 2MO + 2Cl_2 + 5O_2$ (where $M = Ca$ or Ag_2). With calcium chlorate the "chloride" decomposition proceeds at about 180 times the rate of the "oxide" decomposition, whilst with silver chlorate the ratio is less than 1·8 : 1.

The probability of the "oxide" decomposition being endothermic suggests an explanation of the increase of chlorine in rapid decomposition at high temperature.

Silver chlorate differs from the chlorates of potasssium, barium, and calcium in its highly explosive nature and in the occurrence of an extremely strong secondary action between chlorine and the oxide, but resembles the chlorates of potassium, barium, calcium and lead, in that no free chlorine is produced by displacement from the chloride.

Iron Nitride. G. J. Fowler.

See under XXIV., *page* 77.

Electro-Chemical Industry in France. L. Guillet.

See under XI. A., *page* 48.

Sulphuric and Nitric Acid; Early Manufacture of ——, Oscar Guttmann.

See page 5.

PATENTS.

Acetic Acid of High Percentage and on a Large Scale, by means of Fractional Distillation; Process and Apparatus for the Production of ——. E. Edwards, London. From The Krauschwitzer Thonwaarenfabrik für Chemische Industrie (vormals Ludwig Rohrmann) Company, Krauschwitz, Germany. Eng. Pat. 25,297, Dec. 20, 1899.

The acetic acid vapour coming from the generating vessel is condensed in a long and capacious horizontal cooler, whence the acid is led to three storing tanks, from any o of which it may flow through suitable valved pipes, b gravity, into a stone chamber of cubical form, lin externally with lead, heated by a steam coil, and provide at the top with a pipe leading to a stoneware condensin arrangement, whence the acid flows into a tank below. I connection with this there are two more stone retorts, ea successively smaller than the preceding one, and similarl provided with condensing and storing adjuncts. The crud acetic acid received from the cooler into one of the storag tanks is of about 70 per cent. strength, and contain sulphurous acid; it is allowed to rest for 24 hours, when is run into the first and largest of the stone retorts, till th retort is two-thirds full. The acid is then carefully heate and the sulphurous acid which comes off first is allowed t escape. The weak acetic acid of the early part of th distillation is collected separately; apart from this, the fir third of the distillate is of 56 per cent., the second of 70 pe cent., and the last third of 85 per cent. strength. The fir third condensed, is sold as 56 per cent. acid, whilst the othe portions are oxidised by addition of 2 per cent. of sodiu chromate, and, after rectifying, an acid is obtained of 90 pe cent., which is oxidised by potassium permanganate, pu glacial acid being ultimately obtained, besides acid intermediate strength.—E. S.

Sulphuric Acid by the Catalytic Process; Manufacture ——. E. Raynaud, Spy, Belgium, and L. Pierron, Jett Saint Pierre, Belgium. Eng. Pat. 16,254, Sept. 12, 190 (Under Internat. Convent.)

In case the temperature be kept uniform, at which com bination of sulphurous acid with oxygen is effected b catalytic bodies, the gases are first brought into conta with such bodies containing but a small proportion platinum (say about 5 per cent.), and next with bodi containing about 40 per cent. of platinum, and finally wit such as contain about 10 per cent. A portion of th gaseous mixture while rich is thus "first converted by t substance of slight richness, and, as it becomes impoverishe it is subjected to the action of substances of greater richne which complete the conversion." The final contact wit the poorer bodies causes the re-formation of any sulphuri acid first formed, which may, through excessive actio have become decomposed. Or catalytic bodies of unifor richness may be used, by such regulation of the temperatu in the successive parts reached by the gases, that th reaction may begin at about 300° C., advancing to 500°, an then declining to about 400°, the variation of temperatu acting similarly to the variation in the first example of th richness in platinum of the catalytic bodies employe Hydrogen sulphide may, after purification, replac sulphurous acid in the process.—E. S.

Sulphurous Acid; Process for the Purification of — E. Raynaud and L. Pierron, both of Belgium. Eng. Pa 16,253, Sept. 12, 1900. (Under Internat. Convent.)

Crude sulphurous acid gas is passed through one or mo towers charged with porous material, such as Kieselguh by which it is absorbed. The material is then heated by suitable device, whereby the gas is said to be liberated a pure state. Several towers or columns may be arranged form a circuit, so that those in which the porous materi is saturated may be cut off temporarily, and the gas free.—E. S.

Hydrates of the Peroxides of Lime, Baryta, Magnesi and the like; Manufacture of ——. G. F. Jaube Paris, France. Eng. Pat. 17,460, Oct. 2, 1900.

To obtain calcium peroxide hydrate, 78 parts of sodiu peroxide is intimately mixed with 74 parts of dry hydrat lime, and the mixture is strongly compressed into cylinde of 500 grms. each. Such a cylinder is immersed in 5 lit of water with 1 kilo. of ice, in an enamelled iron vat, whi is itself cooled. The temperature is kept below 10° After an hour or two, the cylinder is disintegrated, and t calcium peroxide may be separated by filtration, washe and dried, first at ordinary temperature in a closed vess d lastly at 100 C. or above. The filtrate consists of ustic soda solution. Barium peroxide and magnesium roxide, and the like, may be similarly obtained.—E. S.

eroxide of Sodium, either alone or with the addition of other Salts; Preparing Compressed ——. G. F. Jaubert, Paris, France. Eng. Pat. 17,461, Oct. 2, 1900.

ODIUM peroxide is compressed in a steel pastille mould rmed of a cylinder closed at one end and into which a unch is forced, giving a pressure of 7,000 kilos. on a rface of about 25 sq. cm., the cylinder being charged with 0 grms. of the powder. Such compressed peroxide is ated to have great advantages in use over the uncompressed roxide, especially in respect to liability to explosive decomposition in presence of water, and dangers of fire. For me purposes, it is preferred to compress an intimate xture of the peroxide with potassium bisulphate, for nich latter the sodium salt, or oxalic or tartaric acid may substituted.—E. S.

lid Hydrosulphites; Manufacture and Production of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 901, Jan. 15, 1900.

RST example: zinc dust is added to a sodium bisulphate lution of stated density, and the solution, after filtering, heated to 50°—60° C., and sodium chloride is stirred ; on cooling, solid sodium hydrosulphite separates in ystals. Second example: a strong, hot solution of ic hydrosulphite is treated with sodium chloride to tain crystals of a "new zinc-sodium double salt." If id zinc chloride be dissolved in the zinc hydrosulphite ution, zinc hydrosulphite is obtained as a solid salt. agnesium hydrosulphite solution, treated with sodium loride, yields a magnesium-sodium hydrosulphite. Third ample: sodium hydrosulphite solution, in which zinc loride is dissolved, gives a precipitate, separable by ration, of a "new zinc-sodium double salt." Fourth ample: solid calcium chloride, or magnesium chloride, is solved in zinc hydrosulphite solution to obtain the zinc-lcium or the zinc-magnesium double salt. Fifth example: the paste from the filter or cake from the filter-ess, obtained by the process described in the first ex-ple, is washed with acetone or alcohol or the like, until ater is removed, and is then dried, preferably *in vacuo.* ie same washing process is generally applicable. Refer-ee is made to Eng. Pat. 19,762, 1899 (this Journal, 1900, 0).—E. S.

kaline-Earth Silicides, and a Combination of Silicon and Hydrogen, and Process for their Manufacture. B. J. B. Mills, London. From The International Chemical Company, New Jersey, U.S.A. Eng. Pat. 14,124, Aug. 7, 1900.

LKALINE earth silicides are formed by reducing a comund containing the alkaline earth metal combined with ygen and mixed with silica by heating with carbon in an ctric furnace. A compound of silicon and hydrogen mbined in equal molecular proportions, is made by reduc-g a mixture containing the alkaline earth metal and the iceous material by heating with carbon in an electric rnace, and treating the resulting silicide with dilute acid. is yellow, crystalline, non-explosive compound is insoluble water and in acids, and is decomposed by caustic alkaline utions. Chemical compounds are claimed consisting of icon combined with an alkaline earth metal in the proportions represented by the formula RSi_2, R indicating e alkaline earth metal; and of silicon combined with rium in the proportion represented by the formula $BaSi_2$, ese compounds being white, or bluish white substances of etallic appearance, having a crystalline fracture, and idising slowly in the air to silicon dioxide and an alkaline rth metal oxide, or to silicon dioxide and barium oxide d are decomposed by pure water, with the formation of e alkaline earth metal hydrate, silica, and free hydrogen of barium hydrate, silica, and free hydrogen respectively. —G. H. R.

VIII.—GLASS, POTTERY, ENAMELS.

Pottery Glazes; Solubility of Certain Lead Glasses or Frits used in the Preparation of ——. W. Jackson and E. M. Rich. Paper read before the Manchester Lit. and Phil. Soc. Chem. Trade J. 1900, **27**, [702], 331.

THE authors carried out experiments to determine what factors, apart from chemical composition, affect the amount of lead oxide dissolved on treating lead frits with dilute hydrochloric acid. The results show that the solubility is increased in a very marked manner by increase of fineness, the solubility of the same frit, reduced to different degrees of fineness, varying from 1 to 15 per cent. of the material used. After the action of the acid has proceeded for a short time, the whole of the soluble lead appears to have been extracted. It was found, however, that this was not due to the absolute insolubility of the remainder, but to the formation of an insoluble layer on the surfaces exposed to the action of the acid, which protects the enclosed particles from further action. When this layer was removed by chemical or physical means, it was found possible to extract more lead oxide from the frit, and by continually removing this insoluble layer, practically the whole of the lead oxide could be extracted.—A. S.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Timber; Preservation of ——. O. Chanute. Eng. and Mining J. 1900, **70**, [21], 606.

THE more important of the new methods for the preservation of timber are as follows:—

The Creo-Resinate Process.—In this process it is proposed to use creosote and resin, together with a small percentage of formaldehyde.

The Water-Creosote Process.—An emulsion of creosote and water is forced into the wood.

The Hasselman Process.—The wood is boiled in a solution of the sulphates of copper and iron with alumina and kainite.

The Allardyce Process.—The wood is treated first with a solution of chloride of zinc and then with tar oil.

The Naphthenic Acid Process.—This consists in "injecting into the wood a solution of a copper salt of naphthenic acid, the naphthenic acid being obtained from Russian petroleum.

The author recommends the adoption in the United States of the following three features of European practice:—

(1) The careful testing, chemically, of the antiseptics to be injected.

(2) The uniform injection of the wood with stated and liberal quantities of the antiseptics.

(3) The adequate seasoning of the wood before treatment. This is stated to be essential, if good results are to be obtained; otherwise the antiseptic will not be uniformly distributed, and some portions of the wood will decay before others.

The author concludes from his experience that if "the ties (wood) are injected with reasonable uniformity, and with the equivalent of ½ lb. of dry zinc chloride to the cubic foot, as is done in Germany, "Burnettizing" makes them last 10 to 12 years in the track, with ordinary exposure; while perhaps half that quantity will produce the same result in the more arid regions of the United States; that the zinc-tannin process will impart to them a life of 12 to 14 years, and the zinc-creosote process may extend this to 14 or 16 years."—A. S.

Mortars [Cement]; Injurious Action of Saline Liquids on ——. Deval. Bull. Soc. d'Encouragement, 1900, **6**, [11], 669.

TABLETS, 2 mm. in thickness, cut from briquettes made from pure Portland cement, were immersed in water for periods of seven days, three months, and six months respectively, after which they were placed in solutions of magnesium sulphate and calcium sulphate, and the time noted of the first appearance of disintegration and their final destruction. The results obtained, confirm the observations of Vicat, *viz.*, that old mortars better withstand the action of sea-water than freshly made ones.—H. H. B. S.

Portland Cement; Manufacture of ——, from Blast-Furnace Slag by the Forell Process. C. Steffens. Chem. Zeit. Rep. 1900, **24**, 359.

This process has been working satisfactorily for several years in the Lollar Portland Cement Works. The raw materials, consisting of wet granulated slag and hard limestone, are broken, mixed, and passed through a drying chamber heated by the hot gases from the kiln. The dried mixture is finely ground, and is then mechanically conveyed to the revolving kiln, which is a special feature of the process. The clinker, on leaving the kiln, is white hot, and only loosely balled together. The usual operations of making into balls and drying are entirely dispensed with. The total consumption of coal amounts to from 18 to 20 per cent. of the clinker produced. The cement is of good quality, and the process is expected to be put in operation at other works when the prejudice at present existing against slag cements has disappeared.—H. H. B. S.

X.—METALLURGY.

Iron and Steel Production; Direct ——. C. Otto. Chem. Zeit. 1900, **24**, 1033—1034.

Blast-furnace practice in America has shown that the coal consumption in the Leadville furnaces is higher than in those of Pueblo, which are at an elevation 5,000 ft. lower. This is due to the lower atmospheric pressure at the higher level. By working under pressure several advantages would be gained, and notably an economy in time. Although a good ore mixed with carbon is readily reduced in the earlier stages of the reduction, six hours is necessary to complete the reaction. But by invoking the assistance of mechanical energy the time may be shortened. By thermal calculations it is shown that if the reduction be effected at a pressure of one atmosphere above the normal, the time of reduction may be reduced by one-half, the external heat applied being, of course, increased in correspondence with the reduction in the time, and the ore being sufficiently finely crushed to allow of the reaction being completed in the shorter period. By doubling the difference of temperature between the inside and the outside of the reduction vessel, the time of reduction may be again reduced by one-half. Such a pressure-furnace (working at + 1 atmosphere pressure) has been tried by Bessemer. Cast steel has been made experimentally in a similar way by a Westphalian works. 1·5 kilo. of scrap-steel with 5 kilos. of ore and 1·25 kilo. of wood-charcoal dust were placed (in a crucible) first in an ordinary wind furnace, and then in a special blast furnace, with the result that 4·575 kilos. of cast steel were produced, containing, per cent., 0·46 C., 0·07 Si, 0·07 Mn, and 0·014 S.—W. G. M.

Soft Steel and Wrought Iron; Influence of Copper in Retarding Corrosion of ——. F. H. Williams. Proc. Eng. Soc. Western Pennsylvania, **16**, Sept. 1900, 231—232.

Three pieces of soft Bessemer steel containing 0·078, 0·145, and 0·263 per cent. of copper, and one piece without copper, were dipped simultaneously into water and hung up to dry many times a day for a month, and were then cleaned from corrosion, and the loss in weight determined. Whilst the loss in the steel was 1·85 per cent., the losses in the copper steels were respectively 0·89, 0·75, and 0·74 per cent. only. Similarly, whilst a soft steel lost 1·65 per cent., and three samples of wrought iron lost 0·76, 0·89, and 0·87 per cent., a wrought iron containing 0·393 per cent. of copper lost only 0·53 per cent. Consequently copper not only reduces the corrosion of soft steel to within that of wrought-iron, but reduces the corrosive susceptibility of the latter metal as well.—A. W.

Iron and Alloys of Iron; Effect of Temperature Magnetic Properties of ——. R. L. Wills. Phil. M 1900, **50**, 1—37; through Science Abstr. **3**, [11], 879.

Ewing has divided the process of magnetising magn metals into three stages: (1) where there is low perm ability and almost no retentiveness; (2) where t magnetisation curve rises rapidly and permeability is hig and (3) where permeability decreases and the saturati point is approached. Heat causes the transition from sta to stage to occur under a lower magnetising force, and t author now reports the effect of temperature on t permeability for low magnetising force. Rings of iron a of Fe—W, Fe—Al, and Fe—Ni, and of a steel containi Cr and Mn, non-magnetic when unannealed, but magne after annealing, were wound with the magnetising coi and the induction was measured ballistically on reversi the magnetising current. By raising the temperatu gradually under constant magnetising force, permeabili temperature curves were obtained for different values of t magnetising force. These are now published, together wi μ-H curves for constant temperatures up to 800° C.

—W. G. M

Gold Ores at Cripple Creek, Colorado; Sampling a Milling of ——. S. F. Hazlehurst. Eng. and Mining 1900, **70**, [19], 545.

There are five samplers now in active operation in t Cripple Creek district, whilst another one will be rea about the beginning of 1901. The sampler of t National Gold Extraction Company has a capacity of ab 200 tons a day. The ore is first passed through a Bla crusher, 9 by 15 ins.; then through a set of rolls, 14 24 ins.; after which it is screened through a $\frac{1}{4}$-in. mesh, a passed into a "Vezin cut-out," by which it is reduced $\frac{1}{25}$ of its bulk. It is then "coned" and quartered, pas through an Engelbach grinder, and dried over steam pip The method of sampling employed by the other compan is essentially the same as the foregoing, but the Rio Gra Sampling Company can deal with 409 tons, the Eagle (Sampling Company with 450 tons, and the Taylor and Br ton and Cripple Creek Sampling and Ore Companies with tons a day. In the milling establishment of the Colora Ore Reduction Company there are a cylindrical drier the White-Howell pattern, a system of fine-crushing r consisting of three sets of Davis rolls, 14 by 27 ins., with sets of revolving screens, and a Ropp roaster. The ore crushed to $\frac{1}{2}$-in. mesh, dried, reduced to a No. 24 mesh the fine-crushing apparatus, and then roasted. The roas ore is treated either by the cyanide process or by chlori tion, according to its character. For the cyanide proc there are four tanks of 50 tons capacity each, two of 65 t each, and two of 150 tons each; all the tanks are provi with filter bottoms. After the ore-pulp has remained sufficient time in contact with the cyanide solution, latter is drawn off, the pulp is washed with water, and residual tailings are sluiced over a system of riffles, order to obtain as complete an extraction as possible. T gold is recovered from the cyanide solution by precipitat with zinc, and is worked up in the usual manner.

For the chlorination process, there are three barrels, t of 10 tons capacity each, and one of five tons; they lined with sheet lead, and are provided with filter bott of hard wood and lead, and with covers which can screwed on; they are mounted on trunnions. The roas ore-pulp is introduced, together with the requisite quanti of bleaching powder, sulphuric acid, and water, into barrels, and the latter are set in motion. After a suffici time, the chloride of gold solution is drawn off, the p washed with water, and the gold precipitated from solution by sulphuretted hydrogen. The solution is allo to settle, and any slime which may be held in suspensio recovered by passing the supernatant liquid through a fi press. The sulphide of gold is roasted in a muffle t free from sulphur, and is then melted and cast into bars

The Economic Gold Extraction Company's mill ha capacity of 300 tons a day, and comprises six rolls, 16 36 ins., each of which is fed from a 5-ton hopper; incli screens; seven roasters of the Argall type; and "economic ore cooler," of which the following is a b description:—"It is a shell, 18 ft. in length by 6 ft. in diameter, a continuous channel 360 ft. long being made inside by pieces 2 by 1 ins., riveted to the shell, 12 ins. apart. It is raised at the far end, where it is furnished with discharge spouts; the cylinder revolves under water, which is constantly cooled by a sprayer." The capacity of the cooler is about 60 tons in 24 hours, and the temperature is reduced from 1,600° F. to 150 or 200° F.

The ore is crushed by the rolls, and, after passing over the screens, has become reduced to from No. 16 to 20 mesh. The crushed ore is roasted, cooled, and then treated by chlorination in the usual manner. The mill tailings are subjected to further treatment on Wiltley tables.—A. S.

Telluride Gold Ores of Cripple Creek, Colo., and Kalgoorlie, West Australia. T. A. Rickard. Eng. and Mining J. 1900, **70**, [21], 611.

In the Cripple Creek district, Colorado, the lodes partake of the composition of the prevailing rocks, which is mainly andesitic breccia, lying upon granite, with bodies of phonolite, rachytic phonolite, nepheline basalt, &c., penetrating both he granite and the breccia. At Kalgoorlie the prevailing rock is schistose, and the lodes are generally bands more highly schistose than the encasing rock, and impregnated to a notable degree with disseminated pyrites and secondary calcite.

The ores from Cripple Creek and Kalgoorlie present ppreciable differences in chemical composition. The Cripple Creek ore contains a high proportion of alumina, anging from 15 per cent. in the granitic ores to 25 per cent. in those occurring with phonolite and allied rocks; a trace of magnesia; up to 4 per cent. of lime; from 55 to 70 per cent. of silica, the amount being highest in the granitic ores; and from 1·5 to 2 per cent. of sulphur. The Kalgoorlie ore contains from 2 to 12 per cent. of lumina; from 5 to 15 per cent. of secondary carbonates of lime and magnesia; from 45 to 60 per cent. of silica; —2·5 per cent. of titanic acid; and from 4 to 8 per cent. of sulphur. In both ores the percentage of iron is a little higher than that of sulphur, but in about the same ratio.

The Kalgoorlie ore is the better from the smelters' standpoint, being less silicious and containing a much smaller percentage of alumina. The Cripple Creek ore can only be melted satisfactorily when mixed with other ores, so as not to impair the fusibility of the slag.

The Cripple Creek ore can be satisfactorily treated by either the cyanide or chlorination process. The Kalgoorlie ore is not suitable for chlorination, on account of its high percentage of lime and magnesia, but is very amenable to cyanidation.

The Kalgoorlie ore yields the finest specimens of the telluride of gold, calaverite; samples analysed had a specific gravity of 9·377, and contained nearly 42 per cent. of gold, with less than 1 per cent. of silver. In the Cripple Creek ore, the calaverite is generally finely disseminated, and somewhat obscured by the presence of sylvanite; it has a specific gravity of 9, and contains 38—40 per cent. of gold, and about 3 per cent. of silver.—A. S.

Gold Ores at Mount Morgan, Queensland; Chlorination of ——. E. W. Nardin. Proc. Inst. Civil Eng. **142**, [4].

THE lower-grade ore, containing about 11 dwt. of gold per on, is treated with a solution of chlorine gas in water, and he gold precipitated with charcoal. The plant at the new West Works, which is capable of treating 100,000 tons of ore annually, consists of 16 vats, each of 100 tons capacity, four chlorine stills, one set of four towers in which the gas is absorbed by trickling water, four closed-in storage tanks for the chlorine solution, four similar gold-liquor storage tanks, 12 charcoal filters, three vacuum and three force pumps. The chlorinating vats have each a false bottom of wood, upon which are layers of gravel and sand of decreasing size. The finely ground ore is thrown in on the top of this, and the chlorine solution run in above and withdrawn below by the aid of a vacuum of about 5 lb. per square inch. The escaping liquors from each vat are tested until they contain plenty of free chlorine, when washing water is run through.

The parts of the plant are built at different levels, to avoid pumping as much as possible. The stills are made of flags, 5 ins. thick, jointed with india-rubber, like ordinary chlorine stills for the making of bleaching powder. The joints of all the pipes carrying chlorine gas or solution are also "grouted" with tar and fireclay, &c. The gold-liquor pipes, pumps, &c., are made of the usual cast-lead, hardened with a small percentage of antimony. The filtering vats have a wooden false bottom covered with cheese cloth, on which is put about 2 ft. of finely crushed charcoal, which is afterwards burnt and the ash smelted. The sulphuric acid for making the chlorine is manufactured at the Company's works from imported sulphur. The cost for chlorine alone amounts to a trifle over 5½*d.* per lb., and the total cost for chlorinating and precipitating is about 4*s.* 1½*d.* per ton of low-grade ore, with an extraction of 92·06 per cent., leaving 22 grains in the residue.

The treatment of the richer ore, of an average of about 4 oz. of gold per ton, at the top works, is exactly the same, after the ore has been roasted to get rid of the 11 per cent. of sulphur which it contains. The extraction in this case is 95 per cent., leaving about 4 dwt. 6 grains in the residue. The chlorinating period, however, is much longer, with a consumption of 11·47 lb. of chlorine per ton of ore, as compared with 2·51 lb. for the low-grade material.—A. W.

Platinum; New Method of Separation of the Metals accompanying ——. E. Leidié. Comptes Rend. **131**, [22], 888—891.

1. *Elimination of Foreign Metals.*—The residues from the extraction of platinum and iridium are roasted in the air, reduced in hydrogen, washed with hydrochloric acid, and again reduced in hydrogen. They are then mixed with twice their weight of common salt, and heated to redness in a stream of chlorine, any volatile products being collected. These products and the residue are extracted with water, and the process is repeated with the insoluble portion. The aqueous solution is allowed to stand for a day, filtered from any insoluble chlorides, heated to 100° C., and a slight excess of sodium nitrite added, when any iron falls as ferric hydroxide, and any gold as metal. On now adding sodium carbonate, all the other metals are precipitated, while the platinum, palladium, iridium, rhodium, and ruthenium remain in solution as sodio-nitrites, the osmium as sodium chloro-osmite. The liquid is heated to boiling, and filtered.

2. *Separation of the Platinum Metals.*—(*a*) Excess of sodium hydroxide is added, and a stream of chlorine passed through the liquid contained in a distilling apparatus entirely of glass, at first in the cold, afterwards at 50°—60° C. The distillate of perosmic and per-ruthenic anhydrides is received in dilute alcohol, which reduces the anhydrides to the metallic state. The two metals are separated by the method of Deville and Debray. (*b*) The alkaline liquid is now saturated whilst hot with hydrochloric acid, enough sodium nitrite added to convert the chlorides again into the double nitrites, and ammonium chloride added to saturation. Iridium and rhodium are precipitated as ammonio-nitrites. These are dissolved in hot hydrochloric acid, the solution evaporated and treated with water, and the solution saturated with ammonium chloride; the rhodium remains dissolved, while ammonium chloro-iridate is precipitated. This is collected, dried, and heated to 450° C. with sodium chloride; the sodium chloro-iridate formed is soluble in water, and is thus separated from any double rhodium salt it may have contained. The solution is precipitated with ammoniumc hloride as ammonium chloro-iridate, which gives the metal as reduction in hydrogen. The rhodium salt from which the iridium has been separated is concentrated to crystallisation; the crystals are redissolved, transformed into sodio-nitrite, then into ammonio-nitrite, which is precipitated (any iridium present remaining in the solution, provided that it be not saturated with salammoniac); this precipitate is converted into double chloride, which is then reduced by hydrogen. (*c*) The liquid from which the rhodium and iridium have been precipitated is evaporated to dryness, the residue heated with hydrochloric acid, dried, and calcined. From the residue, the alkali

salts are dissolved out by water, and the remaining metals dissolved in aqua regia; the excess of acid is evaporated, the residue dissolved in water, and a reducing gas (preferably nitric oxide) passed through On now saturating with ammonium chloride, ammonium chloroplatinate falls, which is collected, recrystallised, and reduced in hydrogen. To the mother-liquor, mercuric cyanide is added, when palladious cyanide is precipitated. This is decomposed by heat, the palladium dissolved in nitric acid, and converted into ammonium chloro-palladite, which is reduced in hydrogen at a red heat, and the metal cooled in carbon dioxide.—J. T. D.

Calcium Carbide and Silicon Carbide as Reducing Agents for Metallic Oxides, Salts, and Earths. B. Neumann.

Chem. Zeit. 1900, **24**, 1013—1014.

Moissan, Warren, and Frölich have, at different times, described the use of calcium carbide as a reducing agent for metallic oxides. This reduction takes place in accordance with the equation $3M'_2O + CaC_2 = CaO + 3M'_2 + 2CO$, where M′ is a monovalent metal; it is readily effected, but leaves the reduced metal mixed with lime, which is only fluxed with difficulty. The author uses salts, and preferably haloid salts, a certain (sufficient) amount of oxide being added to allow of the removal of carbon as carbon monoxide, according to the general equation—

$$2M'_2O + 2M'Cl + CaC_2 = 3M'_2 + CaCl_2 + 2CO.$$

By this means, using salt or NaCl + KCl as a flux, and heating the whole mixture in a crucible, Ag, Cu, Ni, and Pb are readily reduced and recovered in quantity; Sn and Zn are for the most part volatilised; Fe, Cr, and Mn do not yield a regulus of metal. Alloys also, such as bronze, brass, and German silver, can be produced from mixed chlorides. In all these reductions carefully dehydrated chlorides should be employed. If NaCl be substituted for part of the metal chloride, sodium is reduced, but is distilled off, an attempt to prepare a lead-sodium alloy having proved unsuccessful.

Sulphates are also reduced ($M'_2SO_4 + 2M'_2O + CaC_2 = 3M'_2 + CaSO_4 + 2CO$), but fluorspar or other flux is required for the $CaSO_4$ produced. Ni and Pb were thus reduced, but Fe, Cr, and Mn gave no regulus. Mixtures of $CuSO_4$ and SnO_2, and $ZnSO_4$ and CuO, gave bad results. Sulphates mixed with CaC_2, without the addition of oxide, yielded sulphides (as, for example, Cu_2S).

Carbonates behaved, in the main, like sulphates, white-lead ores and malachite giving good results. Roasted *erubescite* gave a black copper, owing to the iron present; roasted PbS + ZnS gave a brittle crystalline mixture of zinc and lead. Tinstone and raw calamine each gave a low yield of metal. Mixtures of tinstone and copper ores produced an inferior ferruginous alloy; copper ore, with calamine was, however, more satisfactory. Molybdenum glance gave minute grains of metal. Spathic iron ores, hæmatite, and garnierite were not reduced.

Other carbides, such as silicon carbide, gave similar results, soda being added in this case to flux the silica produced. Even, however, with calcium carbide at its present low price (other carbides are excluded by their cost), the process is not likely to find an application on a large scale. The use of oxides and chlorides alone need be considered; but chlorides require an expensive dehydrating process, whilst oxides from roasted ores are usually too impure. Hence, for the ordinary metals, reduction by carbon is cheaper, whilst for the more valuable metals the method of reduction with the aid of aluminium (requiring as it does no extraneous heat) is preferable. Frölich has stated that about $\frac{1}{10}$—$\frac{1}{4}$ ton of CaC_2 is required to reduce 1 ton of Cu; but, according to the author's figures, 342 kilos. of the pure carbide—much more, therefore, of the commercial carbide—would be used per 1,000 kilos. of copper.—W. G. M.

Uranium and Vanadium Ores; Analysis of ——. O. P. Fritchie.

See under XXIII., *page* 70.

Ferrochrome; Determination of Carbon in ——. A. A. Blair.

See under XXIII., *page* 70.

PATENTS.

Iron and Steel Wire, Rods, and the like Articles; Formin a Protective Coating on ——. O. G. Moseley, Ma chester. Eng. Pat. 24,496, Dec. 9, 1899.

The coating is produced by enclosing the article withia tube or chamber, heating it by a current of electricit passing through it, and surrounding it with a "barffing agent, which may be the usual hot producer-gas of th Bower-Barff process, or preferably the hot products c combustion of gas or oil mixed with, and injected into th chamber by dry steam under pressure, in such a mann that little or no air is drawn in at the same time.

An apparatus is claimed for this purpose illustrated f the treatment of wire. It consists of a tube closed at bot ends except for small central holes to allow the wire to b drawn through from one drum on to another. Close to th entering end is a side tube connected with the dry stea injector, the latter being conveniently arranged between th fuel burners, which are under a small hood, so that th injection of the steam draws in with it the hot products combustion direct from the flames and without any appr ciable quantity of air. An exit is provided for them nea the other end of the barffing tube. At the ends of the tub are electric terminals, which are attached to the wire so th the portion travelling through the barffing agent in the tub can be heated.—A. W.

Tool Steel; Making of ——. R. W. James, Londo From The Bethlehem Steel Co., South Bethlehem, Pa U.S.A. Eng. Pat. 10,738, June 12, 1900.

A metal-cutting tool is formed of air-hardening tool ste containing not less than one-half per cent. of chromiu and not less than one per cent. of tungsten or molybdenu or a mixture of these substances, the said tool or its cuttin portion being heated prior to use to a temperature of n less than 1,725° F., in order to make it capable of efficie use and adapted to retain its efficiency at high temperature The thermal treatment may be varied, and a separate clai is made for each variation in the method of producing t metal of this composition as follows: heating to a temperature of or over 1,725° F.; to a temperature of or ov 1,850° F.; and, after heating to 1,725° or over, to t following fluctuations,—cooling rapidly to below 1,550 cooling the tool and reheating to above 450° and belo 1,350°; cooling and reheating to above 700° and belo 1,240°; cooling to a temperature not over 1,240°, a afterwards maintaining for several minutes between 1,24 and 450°; cooling to below 1,550° and maintaining f several minutes between 1,350° and 450°; cooling to belo 1,550° and maintaining for several minutes between 1,24 and 700°; and, lastly, coating the portion of the tool to l treated, with fusible slag previous to heating to 1,725° F. over until the slag is melted.

In addition to the 10 claims three others are made: o for a similar steel-cutting tool containing not less than 1 p cent. of chromium and not less than 4 per cent. of tungste or its equivalent, heated to 1,725°; another for the meth of producing the same; and the third for a similar met tool containing not less than 3 per cent. of chromium an not less than 6 per cent. of tungsten or its equivalen heated to 1725° F.—A. W.

Moulding Material for Use in Casting Steel. E. Sa Malstatt-Burbach, Prussia. Eng. Pat. 18,120, Oct. 1 1900.

In place of the fire-clay in the usual moulding mater which necessitates a long drying and burning process bef use, coal-slate is added to the silver sand and coke, and t mixture air-dried at a moderate temperature, the innermo parts not necessarily being dried. A convenient mixtu consists of three parts of silver sand, six parts of coal-sl (black-batt or bituminous shale), and one half part of cok —A. W.

ead from Zinc; an Improved Process for Separating ——, when both Metals exist together in Solution as Nitrates, Chlorides, or partly as Nitrates and partly as Chlorides. G. E. Davis and A. R. Davis, both of Manchester. Eng. Pat. 253, Jan. 4, 1900.

inc oxide is added to the solution of the mixed lead and nc salts, and carbonic acid gas is passed through, whereby ad carbonate is precipitated, zinc replacing lead in the olution. It is preferred to conduct the process in two ages; in the first stage less than the theoretical quantity zinc oxide is used, mixed with the lead precipitate of a evious second stage operation; in the second stage an cess of zinc oxide is used.—E. S.

res [Lead, Zinc, Silver, &c.]; Treatment of Complex and Refractory ——. F. Ellershausen, London. Eng. Pat. 483, Jan. 8, 1900.

e raw ores are smelted in a blast furnace or cupola, th plenty of lime, so as to leave very little zinc in the g. and the fumes generated at the throat of the furnace drawn off by means of a fan or exhauster which rapidly xes them with water, so as to obtain them in chemical d mechanical combination. The water absorbs the lphur dioxide, which in turn dissolves part of the zinc, ving an insoluble portion containing sulphides of lead d zinc with varying proportions of zinc sulphide and ide. The whole is conveyed to settling tanks, the clear uor, when cooled, is used again in the fan, and the posited material is treated with boiling crude caustic uor, which decomposes the lead compounds, forming a posit of metallic lead, containing the volatilised silver, ilst the insoluble zinc compounds suspended in the liquid la are recovered by removing and diluting with water, l afterwards suitably treated. The soluble zinc in the water, when sufficiently concentrated, is recovered by ating it with the alkali solution remaining after the position of the metallic lead.

 claim is made for the apparatus for this process conncted in accordance with a diagrammatic illustration. e inlet opening of the fan is in connection with the throat he furnace, and the outlet connected to a pipe leading to rough or launder, contained in a closed chamber, and ning to the settling tanks. Water is supplied through opening in the top of the fan casing on to the revolving des. If the mixing be incomplete with one fan, the fumes drawn through and washed in a second one. This is ne by nearly closing a valve in the exit pipe, so that the ter can pass along, but without the fumes, which are hdrawn through a side pipe between the first fan and valve, to the inlet of the second fan, and so on, the exit e leading to the same launder.—A. W.

phide Ores [Lead, Zinc, Gold, &c.]; Treatment of ertain Mixed ——, for the Recovery of their Valuable Constituents. G. E. Davis and A. R. Davis, both of Manchester. Eng. Pat. 710, Jan. 11, 1900.

e treatment is a combination of operations in which the xed sulphide ores are attacked by dilute nitric acid, ninating impurities from the resulting solution of nitrates zinc, lead, iron, &c., by the addition of a regulated ntity of zinc oxide with agitation and heat to remove iron, &c., separating the lead from the purified solution a further regulated quantity of zinc oxide and then sing through it carbonic acid gas, evaporating the residual ution of zinc nitrate to a suitable strength, specific gravity about 1·5, and furnacing the same for the production of e oxide and gaseous nitrogen compounds, and the overy of the latter as nitric acid, together with the ous fumes from the original operation of the nitric acid the ore. The ore residue containing silica, sulphur, and phate of lead, together with gold and silver, may be ted in any convenient manner.

 separate claim is made for the use of the nitrate of solution for diluting the nitric acid to be used for cking the ore, so as to obtain a stronger ultimate solution he same for evaporation.—A. W.

Zinc Ores; Treatment of Complex ——. G. de Bechi, Paris, and The General Metal Reduction Company, Ltd., London. Eng. Pat. 985, Jan. 16, 1900.

Zinc-bearing sulphide ores are mixed and roasted with 15 to 30 per cent. of silica, siliceous sand or other siliceous matter, whereby the zinc is rendered more completely soluble in acids than when the ore is roasted by itself, and consequently the residue, after leaching, is in a condition more suitable for further metallurgical treatment (this Journal, 1899, 1026).—A. W.

Aluminium Alloys. L. G. Baudelot, Arques-la-Bataille, France. Eng. Pat. 873, Jan. 15, 1900.

The claims are for the addition of cobalt to alloys of aluminium with copper, German silver, or other analogous metals, with the production of the alloys, aluminium-copper-cobalt and aluminium-German silver-cobalt, and a method for obtaining the same as follows:—A rich alloy, of copper or German silver, 800 parts by weight, with cobalt 200 parts, and aluminium 3,000 parts, is first prepared, and 200 parts of it are added to 800 parts of molten pure aluminium at a bright red heat to obtain the final alloy. —A. W.

Aluminium with other Metals; Manufacture of Composite Articles of Cast ——. L. G. Baudelot, Arques-la-Bataille, France. Eng. Pat. 874, Jan. 15, 1900.

The cast aluminium is attached to cores or strengthening pieces of other metals, such as steel, &c., by covering or coating the said cores or pieces with an alloy or a metal, such as tin, brazing metal or the like, which will enable the aluminium to afterwards adhere to the same. In the case of steel the metal is first coated with brazing metal and then with tin to prepare it for the aluminium.—A. W.

Aluminium; Process of Soldering ——. J. Novel, Geneva. Eng. Pat. 8518, May 8, 1900.

In soldering aluminium to itself or to other metals, the parts are first tinned in conjunction with a flux consisting of a mixture of stearic acid, oleic acid and resin, or stearic acid with oleic acid or resin, in suitable proportions, and are then soldered in the ordinary way, using a soldering flux composed of the same materials.—A. W.

Crucibles and Crucible Furnaces. A. Reynolds, Sheffield. Eng. Pat. 1004, Jan. 16, 1900.

The crucible is built up on a supporting plate or frame having a large free air space below, and consists of a thick bed of refractory material with a circular sunken recess on its upper surface into which the wall of the crucible, consisting of a tube of refractory material open at both ends, is placed and packed with fire-clay. The bed is perforated with a large conical hole which is filled by a plug of refractory material, held up in its place from underneath by a plate secured by bolts and cotters. The upper truncated surface of the plug, forming the central part of the bottom of the crucible, is partly hollowed out so as to slope to the centre, from whence a vertical tapping hole runs right through the middle of the plug to the air space underneath. The tapping hole is closed at its lower end by a small plug of refractory material supported on a swinging plate held up by a cotter. A number of crucibles may be built on the same hearth, each one with a separate tapping hole accessible from the air space below, the object being to tap the contents without removing or disturbing the crucible, which can then be made of larger size.—A. W.

Metallic Alloys; Production of Nickel Coloured and Silver Coloured ——. M. Ekker, Erzsebetfalva, and J. Krajcsics, Budapest, both in Hungary. Eng. Pat. 17,390, Oct. 1, 1900.

To produce nickel-coloured alloys, the following materials are placed in layers in the smelting pot in the order given, commencing at the bottom with 3,750 parts by weight of old copper, then 20 of phosphor bronze, 7,000 of nickel, 80 of pulverised magnesium, a further 3,750 parts of old copper, 20 of aluminium, 8,000 of zinc, 150 of cadmium, 20 of zinc ash, and, finally, 7,500 parts of old copper on the top. The whole is then melted, stirred, mixed with about 20 parts by weight of sal-ammoniac powder, and the alloy cast in moulds.

Similarly, for the silver-coloured alloys, the following materials are arranged in layers in the same order and melted and mixed with 10 parts of sal-ammoniac powder, *viz.*, 6,000 parts by weight of nickel, 20,000 of copper, 1,000 of zinc, 100 of pulverised magnesium, 300 of cadmium, 20 of zinc ash, and 10 of aluminium.

Compositions for the manufacture of alloys according to these formulæ are specially claimed.—A. W.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Electro-Chemical Industry in France. L. Guillet. Génie Civ. 1900, **37**, 146—149, 172—173, 186—190, 219—220, 229—231, 254—256. Through Science Abstr. **3**, [11], 894—895.

This is a review of the whole chemical industry of France. With regard to the electro-chemical portion of the papers, caustic soda is produced in works at Lamothe and Montiers, by two companies using respectively the Griesheim and Outhenin-Chalandre processes respectively, the annual output at Lamothe being 2,500 tons. Alkalis and bleaching powder are made by the Société Fives-Lille at Bozel, in Savoy, where 8,000 h.p. is available. At St. Michel, the Société d'Électro-chimie manufactures potassium permanganate, ammonium persulphate (made from the sulphate, and used in bleaching and photography) chlorates and perchlorates; the last two compounds are also made by Berges, Corbin, and Co., at Chedde (Savoy), the two companies producing 3,000 out of the 3,850 tons of chlorate made in France. Ammonium perchlorate is now being made for use in the manufacture of mining explosives; and the electro-thermal reduction of phospherus is about to be used for the first time in France. Eight factories, situated respectively at Sechilienne, Epierre, St. Michel, Giffre, N.D. de Briançon, Bellegarde, Froges, and St. Beron, manufacture calcium carbide, but though they have, in all, 14,400 h.p. available, it is not all used for the purpose.
—W. G. M.

Electric Furnace [Calcium Carbide]; Development of the ——. M. Keller. Paper read before the International Congress of Electricity, Paris. Eng. and Mining J. 1900, **70**, [19], 549.

The author divides electric furnaces, designed for the manufacture of calcium carbide, into three classes:—(1) Arc furnaces, based on the Moissan and Siemens type. (2) Resistance furnaces, based on the Héroult type. (3) Incandescence furnaces, based on the Cowles type (see this Journal, 1889, 678). Arc furnaces may be further subdivided into three classes: —(*a*) furnaces with both electrodes movable; (*b*) furnaces with one electrode fixed, forming usually the floor or hearth; (*c*) multiple arc furnaces, in which the floor of the furnace generally acts as the common secondary electrode for the arcs, which form between it and the three or more primary electrodes fixed around it; polyphase currents are mostly used with these furnaces.

Arc furnaces are not suitable for the manufacture of carbide, because of the loss of energy occasioned by the temperature of the arc being considerably above that required; and loss of material owing to the finer particles of the charge being carried away by the "blowing" of the furnace.

In resistance furnaces the temperature attained is directly related to the sectional area of the electrodes. For the production of carbide, an E.M.F. of 20—25 volts is sufficient, but "heavier" currents are required than with arc furnaces, and conductors of larger sectional area must therefore be provided.

The incandescence type of furnace permits the utilisation, within a limited area, of the greatest amount of energy, and avoids the most serious defect of the second type, namel that the currents must always traverse the whole depth the layer of materials already fused.

Electric furnaces may also be classified according to t kind of current employed. Furnaces heated by means alternating currents have recently been widely adopte because the dynamos yielding monophase or polypha currents are better adapted to stand the resistance variatio incidental to electric furnace operations. Furnaces e ploying monophase currents are best arranged in serie but with arc-heating, it is better to connect the furnaces parallel. In the furnace designed by Bertolus in 189 triphase current was used, and three carbon electrod were connected to the three terminals of the dynam whilst the hearth of the furnace itself provided the comm return electrode. In later forms the three different phas of the current have been utilised in separate furnaces, a these, therefore, each operate as though worked wi monophase current.

The carbon for the electrodes is subjected to spec treatment in order to increase its conductivity. For fu naces in which vertical electrodes are used, the latter a generally formed square or rectangular in section, whi for other types of furnace, cylindrical carbons are mos used.

With arc furnaces the E.M.F. required, varies c siderably, and depends upon the conductivity of the ga which are emitted from the heated substances. For production of calcium carbide, an E.M.F. of 50—60 vo is required; for corundum, 50 volts; and for the producti of iron by the electro-thermal method, 20 volts. In sistance furnaces, a lower E.M.F. is generally sufficie With incandescence furnaces practically any E.M.F. up 80 or 100 volts can be used, for the resistance increa with the increase of the length of the bed of materi through which the current has to pass, and this may varied at will.

According to recent estimates the total energy emplo in electric furnace operations is 230,000 h.p., of wh total, 185,000 h.p. are used in the production of calci carbide, 27,000 h.p. for aluminium, 11,000 h.p. for cop and 2,000 h.p. for carborundum. It is stated that in latest form of the Gin and Leleux furnace, it is poss to obtain 6·20 kilos. of carbide per kilowatt day 24 hours, or, in other words, a thermal efficiency of 75 cent.—A. S.

Sulphuric Acid Solution; Electrolytic Reduction Substances Reducible with Difficulty in ——. J. Ts Zeits. Phys. Chem. 1900, **34**, 187—228. Thro Science Abstr. **3**, [11], 893—894.

The author seeks for a general method for the prepara of organic compounds by electrolytic reduction, and experimented with caffeine. This substance can only reduced in sulphuric acid solution when the cathode is material (lead or mercury) showing a high cathode-poten The surface of the cathode should be coated electrolytic with spongy lead to prevent the disturbances in reduc due to the contamination of the cathode by traces of for metals. Reduction is slightly hastened by a rise of t perature. Within certain limits the current-yield is ne proportional to the current. For equal strengths of solu and equal current concentration per litre of liquid at cathode, the current density is without any great influ on the reaction, but the reduction increases slightly as current density diminishes. With equal strength of solu and current concentration, and with the same rela between cathode-area and volume of cathode liquid, reaction is the same for all sizes of apparatus of sir construction.—W. G. M.

Sulphuric Acid containing Iron; Electrolysis of Dilute — *[Effect of Iron in Sulphuric Acid for Secondary teries.]* K. Elbs. Zeits. für Elektrochem. 1900, [19], 261—262.

Two similar gas (H-O) voltameters with bright plati electrodes were placed in series. In one voltameter sulphuric acid (sp. gr. 1·175) was employed, whilst antities of iron were added to the acid in the other. The sults are given in the following table:—

mount of Iron in Acid.	Current Density.	Loss of H_2O Gas.
Per Cent.	Per Sq. Dm.	Per Cent.
1	2·230	48·3
	0·920	64·3
	0·228	97·4
0·1	6·4	3·0
	4·9	3·6
	2·27	7·2
	1·123	11·9
	0·366	24·1
	0·355	25·1
0·01	2·217	1·7
	1·150	1·9
	0·360	6·3

If formed lead plates are substituted for the bright tinum electrodes the values are scarcely altered. The d results which would be obtained if the sulphuric acid in ondary batteries contained iron are obvious from the ove table. Not only iron and manganese, but all metals ich have a changing valency produce the same effect. s now usual to specify that the acid for secondary batteries ll be free from iron. The question arises as to how far s must be complied with, especially if it be remembered t iron gives very pronounced reactions, and that traces easily detected.

he author considers that if the amount of iron present the acid be less than 0·01 per cent. it will practically e no injurious effect. In order to ascertain whether amount of iron lies below this limit he employs the lowing rapid tests. About 10—15 c.c. of the acid are ersaturated with aqueous ammonia. If no turbidity, due erric hydroxide, be produced after standing a few minutes, acid contains at most only 0·008 per cent. of iron. Acid taining 0·005 per cent. of iron is immediately coloured e on adding potassium ferrocyanide, or red on adding assium thiocyanate.

f therefore an acid shows the presence of iron when ed with potassium ferrocyanide or potassium thiocyanate, not when tested with ammonia, it may safely be used secondary batteries.—J. S.

Manganous Salts at the Anode; Behaviour of ——. Elbs. Zeits. für Elektrochem. 1900, 7, [19], 260—261.

E products obtained at the anode during the electrolysis manganous salts may contain manganic salts, *Braunstein*, permanganic acid, according to the nature and quantity he acid employed, and to other conditions of experiment. e term "*Braunstein*" is employed as a collective name to ote all brown precipitates, consisting of hydroxides or er derivatives of manganese peroxide.

or the exclusive production of permanganic acid the ditions are:—The manganous salt of a strong acid in y dilute solution, a large excess of the acid, and a tempe-ure not exceeding 80° C. Several difficulties occur in case of manganous sulphate. Although the conditions experiment are varied within wide limits, manganic phate, braunstein, and permanganic acid or two of these ducts are usually formed. Manganic sulphate and per-nganic acid both produce a deep violet-red coloration, ich, however, can be distinguished by the absorption ctrum. Manganic sulphate absorbs the yellow and green rtion of the spectrum uniformly, whilst permanganic acid sufficient dilution shows the five well-known absorption ds.—J. S.

Potassium Chlorate; Electrolytic ——. A. Brochet.

See under VII., *page* 42.

Ampère-Manometer. G. Bredig.

See under XXIII., *page* 69.

PATENTS.

Gases Generated in Electrolytic Apparatus; Improved Means for Carrying off the ——. W. Bein, Berlin, Germany. Eng. Pat. 24,058, Dec. 2, 1899.

The electrolytic apparatus described is an improvement on that claimed for in Eng. Pat. 21,838, 1894 (this Journal, 809, 1895), and provides means for leading off the gases generated at the lower electrode without disturbing by ebullition the layer formation of the cell. The electrodes are substantially horizontally arranged at the top and bottom of the electrolytic cell in so far as a layer of the electrolyte is provided between the electrodes, which is to be kept undisturbed and serves as a diaphragm. Each lower electrode is covered with a frame or box provided with a slanting cover of osmotic pervious material, and having recesses at its side to enable the liquid to enter the frame, the latter causing the gases generated at the lower electrode to escape beyond the impervious partition to a compartment from which they are drawn off.—G. H. R.

Electrical Accumulators; Method of Producing Electrodes for ——. C. Luckow, jun., Cologne, Germany. Eng. Pat. 24,960, Dec. 15, 1899.

The claim is for a method of rendering metals capable of storing electricity by subjecting them in shapes suitable for electrodes to the electrolysis of aqueous solutions of the alkali and alkaline earth hydroxides, such solutions being strongly diluted, so that a very high degree of electrolytic dissociation of the dissolved constituents takes place.
—J. C. R.

Electrolytic Apparatus. W. Barnes, Massachusetts, U.S.A. Eng. Pat. 1457, Jan. 23, 1900.

The apparatus comprises an hermetically sealed electrolysing cell containing a diaphragm, which divides it into two compartments, the one containing an anode, and the other the cathode, and both electrically connected with an electrical generator. An hermetically sealed feed regulator connected by pipe to the cell, is actuated by the level of the liquid in the latter, and there are conduit connections from it to the cell, and also between it and the intermediate feed reservoir, which has an inlet, whilst the main feed reservoir has an outlet which discharges into the inlet without being in contact with it. There is a vacuum-creating device for, and operatively connected with, at least one compartment, comprising a conduit which is both a vacuum and a gas-escape conduit. A vacuum chamber on a lower level than the cell is connected with at least one compartment of it, and with the feed reservoir, between which and the vacuum chamber is a testing device with a conduit to the feed regulator. Various modifications are described and illustrated.—G. H. R.

Electrodes for use in Electro-chemical Processes. O. Lauckner, London. From A. Vogelsang, Dresden. Eng. Pat. 14,104, Aug. 7, 1900.

Relates to the construction of electrodes of platinum foil, or other metal which is not acted upon by the electrolyte. The examples shown are intended for the production of bleaching liquors from common salt solutions.—J. C. R.

Electrolytic Meters. A. Wright and The Mutual Electric Trust, Ltd., both of Brighton. Eng. Pats. 23,315 and 23,316, Nov. 22, 1900.

These inventions relate to methods of measuring electric current by means of electrolytic meters. According to the specifications the meter may be placed in a circuit forming a shunt or by-pass to the main current. This, it appears, has hitherto not been practicable, on account of the polarisation in the electrolytic cell. By the present arrangements these drawbacks are overcome by means of an extraneous source of electricity, like a primary or secondary battery, or thermopile, placed in circuit with, and opposed to the electrolytic cell.—J. C. R.

(*B.*)—ELECTRO-METALLURGY.

Iron and Nickel; Electro-Deposition of ——, from a Solution of the Sulphates. F. W. Küster. Zeits. für Elektrochem. 1900, **7**, [19], 257—259.

Reference is made to the experiments of Tœpffer (this Journal, 1900, 156), who found that the alloy obtained on electrolysing the mixed sulphates of iron and nickel, was relatively richer in iron the lower the current density used. Exterpolation of the curves showed that for zero current density, iron free from nickel should be deposited.

This result was quite unexpected, since nickel is a nobler metal than iron, the decomposition point of nickel solutions being about 0·1 volt lower than that of iron solutions.

The author has, by a novel method, re-determined the potentials necessary for the liberation of iron and nickel from solutions of their sulphates, and confirms the fact that nickel is deposited at about 0·1 volt lower than iron. As a possible explanation of the anomaly he suggests that, although nickel is deposited first, the ratio :— *liberated* H_2 | *deposited* Ni, may for a given E.M.F. be greater than the ratio :— *liberated* H_2 | *deposited* Fe.—J. S.

Metals; Electrolytic Cleansing of ——. J. Reyval. Écl. Électr. 1900, **24**, 91—92. Through Science Abstr. **3**, [11], 897.

In the process patented by the Vereinigte Elektricitäts Aktien Gesellschaft of Vienna (French Pat. 292,333 of 1899) an alkali-metal salt is used as electrolyte; the metal to be cleansed forms one electrode (aluminium or zinc would be made cathodes, but iron, copper, or copper alloys would be anodes), and carbon, or a metal not attackable by the solution, or by the ions present, forms the other electrode. With Al or Zn the aluminate or zincate formed at the cathode diffuses through the solution until, meeting the free acid from the anode, hydroxide is deposited. Similarly, iron or copper salts, formed at the anode in cleansing these metals, are ultimately precipitated by the alkaline solution flowing from the insoluble cathode. Thus, the electrolyte is always regenerated, and the dissolved metal is deposited as a hydroxide, which may be recovered. To cleanse steel sheets for galvanising, they are, as anodes, opposed to thicker sheets of iron as cathodes, in a solution of sodium sulphate. In this process, which is said to be rapid and economical, an E.M.F. of from 4 to 8 volts suffices to produce a current density of 140 ampères per square metre [13 ampères per square foot].—W. G. M.

PATENT.

Electro-Deposition of Metals upon Iron and Steel. H. M. Punnett, and H. M. Punnett, jun., Birmingham. Eng. Pat. 24,668, Dec. 12, 1899.

(1) The articles to be coated are suspended through the medium of a permanent magnet or magnets, so arranged within the electrical circuit as to constitute a return-current conductor; and (2) the same, but with the said magnets energised by a separate current.—J. C. R.

XII.—FATS, OILS, AND SOAP.

Wax; Acid and Saponification Values of ——. Modification of Hübl's Method of Determining them. O. Eichhorn.

See under XXIII., *page* 74.

PATENTS.

Mineral Oils, Liquid; Solidification of ——. H. B. Helbing and F. W. Passmore, London. Eng. Pat. 23,978, Dec. 1, 1899.

Petroleum is converted into a solid mass by mixing it with a concentrated aqueous solution of a salt of caseïn, preferably the sodium salt, in the proportion of, say, 20 parts of caseïn dissolved in 100 parts of decinormal caustic soda solution to 1,000 parts of petroleum. The emulsion poured into moulds and allowed to stand, when it gradua thickens.—D. B.

Mineral Oils, Liquid; Solidification of ——. H. Helbing and F. W. Passmore, London. Eng. 23,979, Dec. 1, 1899.

To every 1,000 parts of the freshly-made emulsion, prepa in accordance with the method described in the previ specification, there is then added 10 parts of ordin commercial 40 per cent. formaldehyde solution. product is at once poured into moulds and left to hard The relative proportions of the ingredients may according to the particular kind of product which i desired to obtain.—D. B.

Oil from Dirty Waste; Extracting ——. J. Heywo Clayton, Manchester. Eng. Pat. 25,228, Dec. 20, 189

The oily waste is placed in a closed receiver between perforated plates, where it is extracted with a stream carbon bisulphide, made to travel in an upward directio means of a pump. From the outlet of the receiver liquid passes to a steam-heated still, the oil remaining, the solvent travelling through a condenser to a storage into which the pump suction dips. From the lowest p of the condensing coil an escape pipe conducts any vapo and gases beneath the level of water in a small tank, whe they pass away through a vertical shaft provided wi descending current of water. At the end of each ext tion, steam is admitted to the base of the receiver, w drives into the condenser all the remaining solvent. The recovered are drawn off from the still at proper intervals —F. H.

Oil-yielding Seeds; Process for Treating ——. [*L leum, &c. Manufacture.*] M. Bärwinkel, Hamburg. Pat. 11,860, June 30, 1900.

In this process, oil-cake or crushed oleaginous seeds mixed with metallic oxides, such as manganese perox lead monoxide, zinc oxide, or the like, or else with sulp or metallic sulphides, such as those of antimony or The product is then brought into a revolving drum, he to a temperature ranging between 80° and 168° C. several hours, and submitted to the action of oxidi gases, such as air or oxygen. In the case of lins 9 parts thereof may be mixed with 1 part of sulp and treated as above; and the result is a homogen substance, closely resembling linoleum, and capable being rolled into sheets. Cork or similar filling mate may be added if desired; but by this process the nat solid matter of the seeds remains in the "linoleum." claims are for the employment either of the oxides sulphides, or of oxidising gases, or for both together. —F. H.

XIII.—PIGMENTS, PAINTS, RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*B.*)—RESINS, VARNISHES.

Exudation Resins. M. Bamberger and E. Vischne Monatsh. für Chem. **21**, 564—570.

Lariciresinol (chiefly the isomeride of m. pt. 95° C.; this Journal, 1899, 1134) was subjected to destruc distillation. From 427 grms. there were collected 257 g of distillate, consisting of a watery layer (about 80 gr and an oily layer; while uncondensable gases, cont ing carbon dioxide and hydrocarbons, were also for and a hard, bright charcoal remained in the retort. watery layer was slightly acid, and from it there separated, after neutralisation, an aldehyde, but in qua too small for further examination. The oily layer p solidified, and by filtration there was separated from crystalline substance, which, after repeated solution crystallisation from alcohol, proved to be pyroguai $C_{12}H_{10}.OCH_3.OH$. The alcoholic mother-liquors yie a second crystalline substance, but not in quantity suffi for identification. The oil was distilled under 33—35 pressure, and chiefly yielded two fractions, one at 9

110° C., principally guaiacol, the other at 200—230° C., containing much pyroguaiacin, and a second substance, probably a methoxy-derivative of pyrogallol. About 40 grms. of guaiacol and about 25 grms. of pyroguaiacin were obtained.—J. T. D.

Resins of the Conifers ; Recent Researches on ——. A. Tschirch. J. Pharm. Chim., 6th ser. **12**, [9], 409—413.

The author divides the resins into three groups :—(1) *Tannol resins*, which contain esters of resin alcohols, esino-tannols, which afford reactions analogous to those f tannins. These resino-tannols form benzoic or cinnamic sters. (2) *Resene resins*, which contain no tannol esters, ut consist mainly of resenes, a group of bodies which are ndifferent to alkalis and to other reagents. (3) *Terpino-esins*, or acid resins, analogous to resinolic acid.

Tannol Resins.—This group comprises the benzoresins, ontaining esters of benzoic or cinnamic acid, such as enzoin, Peru and Tolu balsams, acaroid resin, dragon's lood, resin of aloes, and storax, and the umbelliferous gum esins, ammoniacum, galbanum, sagapenum, asafetida, and mbelliferous opopanax.

Resene Resins include the burseraceous oleoresins, myrrh, libanum, burseraceous opopanax, Mecca balsam, elemi, dellium, tacamahaca, mastic, dipterocarpous dammar, oona resin, and Manilla copal.

Terpenoresins.—This group includes coniferous resins, e resin of *Polypus officinalis*, and the resins of the æsalpinæ, copaiba balsam, and Zanzibar copal.

Method of Examination.—The resinous product is dis-lved in ether, and agitated successively with (1) a 1 per nt. solution of ammonium carbonate ; (2) a 1 per cent. lution of sodium carbonate ; (3) solutions of potassium drate, 0·1 per cent. and 1 per cent.

Resinolic acids are dissolved by these solutions ; resenes main in the ether, with any essential oil present, which y be subsequently removed by steam distillation. All niferous resins, except amber, contain no esters, but nsist solely of resinolic acids, resenes, and essential oil. e majority of these acids are amorphous, and are moved by the sodium carbonate solvent ; only a few e soluble in the solution of ammonium carbonate. The rmer may be separated by crystallisation, or by precipita-n with lead acetate. The following are the constituents the chief coniferous oleoresins examined :—

Venice Turpentine.—Laricinolic acid, $C_{20}H_{30}O_2$; α- and larinolic acids, $C_{18}H_{26}O_2$; and laricoresene.

Strasburg Turpentine.—Abienic acid, $C_{13}H_{20}O_2$, soluble ammonium carbonate ; abietolic acid, $C_{20}H_{28}O_2$; α- and abietinolic acids, $C_{16}H_{24}O_2$; and abietoresene, $C_{19}H_{30}O$.

Canada Balsam.—Canadinic acid, $C_{19}H_{34}O_2$, soluble in umonium carbonate solution ; canadolic acid, $C_{19}H_{30}O_2$; and β-canadinolic acids, $C_{19}H_{30}O_2$; and canadoresene, $_{1}H_{40}O$.

Jura Turpentine.—Picea-pimarinic acid, $C_{13}H_{20}O_2$, luble in ammonium carbonate ; picea-pimaric acid, $_{0}H_{30}O_2$; α- and β-picea-pimarolic acids, $C_{25}H_{44}O_2$; and roresene, $C_{21}H_{36}O$.

Bordeaux Turpentine.—Pimaric acid [pimarinic ?], $_{4}H_{22}O_2$, soluble in ammonium carbonate ; pimaric acid, $_{0}H_{30}O_2$; α- and β-pimarolic acids, $C_{15}H_{26}O_2$; and bordo-sene.

Sandarac.—Sandaracolic acid, $C_{45}H_{66}O_7$ or $C_{13}H_{20}O_2$; llitrolic acid, $C_{65}H_{84}O_8$ or $C_{15}H_{20}O_2$.

Amber.—Succino-abietic acid, $C_{80}H_{120}O_5$ or $C_{32}H_{48}O_2$; d succinsilvinic acid, $C_{24}H_{36}O_2$.

The following constituents, noted by others, have been nfirmed by the author :—

American Colophony.—Abietic acid, $C_{19}H_{28}O_2$.

Galipot.—Pimaric acid, $C_{20}H_{30}O_2$.

Comparison of these figures shows several homologous rmulæ. Thus, pimaric acid is the homologue of abietic id, laricinolic acid of larinolic acid, pimaric acid of marolic acid. The acids of Canada balsam only differ the number of their hydrogen atoms ; pimaric, picea-naric, and laricinolic acids have a common formula. The thor does not accept the theory that resins are formed by oxidation of terpenes. Having allowed oil of turpentine resinify in the air, only traces of resinolic acids were found to have been formed. The products of oxidation were chiefly resenes. The formation of the resenes of the terpenoresin, or terpinoresenes in this manner seems, therefore, possible. Resinolic acids do not appear to be derived from terpenes, but to possess some bonds in common with them. On submitting abietic acid to dry distillation with zinc dust, naphthalene and methylnaphthalene are among the products obtained ; naphthalene is also among the bodies obtained on heating colophony. If, however, colophony be distilled with slaked lime, no naphthalene results, but terpenes are formed, and if pimaric acid be heated with hydriodic acid and phosphorus, terpenes are also produced. These results establish the fact that the coniferous resins contain both a naphthalene group and a terpene nucleus.

A peculiar hydrocarbon, fichtelite, which possesses this structure, is already known ; it seems probable that pimaric and abietic acids may be derivatives of this body.—J. O. B.

(*C.*)—INDIA-RUBBER, &c.

India-Rubber from Different Species of Sapium. Pharm. J. 1900, **65**, [1585], 511.

R. Thomson has recently exhibited some leaves of a species of sapium from the United States of Colombia, and stated that the plant yielded a very valuable india-rubber. Hemsley, in the "Icones Plantarum," pl. 2647, gives a description of *Sapium verum*, from which the best, or "Colombian Virgen," rubber is obtained. Another species, *S. jenmani*, Hemsl., is described in the same work, pl. 2649. According to Thomson, it yields an abundance of rubber of inferior quality. The leaves of *S. verum* are elliptic, oblong, leathery, with many lateral veins, and are rounded at both base and apex. The leaves of *S. jenmani* are thinner and narrower, and the apex is acuminate with an obtuse point.—A. S.

Balata and Gutta-Percha ; Purification of ——. Arends. Chem. Zeit. 1900, **24**, [83], 897.

The author has carried out experiments to ascertain the suitability of balata as a substitute for gutta-percha, and also as to the use of the cheaper carbon tetrachloride in place of chloroform for the purification of the two substances. The following method for the purification of balata is given :—Commercial balata is cut into small pieces, boiled with acidulated water, washed, and dried. The dry substance is dissolved in a mixture of equal parts of petroleum spirit and carbon tetrachloride, the liquid allowed to settle, the clear portion decanted, and, after the addition of some water, the solvent distilled off. The residual purified balata is freed from any traces of the solvent still present, then well beaten and rolled out. Gutta-percha can be purified in a similar manner, except that the purified product frequently requires to be bleached, if a white preparation be desired.

The author considers that balata can satisfactorily replace gutta-percha in the preparation of traumaticin, gutta-percha-plaster mulls, &c. He also draws attention to the various directions in which carbon tetrachloride can be applied in analytical practice.—A. S.

PATENTS.

Gutta-Percha ; Manufacture of ——. Siemens Bros. and Co., Ltd., Westminster, and W. Dieselhorst, Old Charlton, Kent. Eng. Pat. 25,494, Dec. 23, 1899.

It has hitherto been found somewhat difficult to dry gutta-percha after the preliminary washing without the use of so elevated a temperature that the material is liable to be injured. To overcome this inconvenience, the gutta-percha is masticated at a more moderate temperature in a vessel where a partial vacuum is maintained by means of a pump, the vapours passing first through a surface condenser. In order to prevent any accidental contamination of the gutta-percha with the lubricating oil of the masticator-shaft bearings, each shaft, between its stuffing box and the masticator proper, passes through a catch vessel, and has a circumferential groove cut upon it. By this device the oil escaping from the gland collects in the catch pit, for it cannot pass the groove ; while any gutta-percha working its way along the shaft also falls into the pit, and cannot be drawn back into the apparatus by the vacuum.—F. H. L.

India-Rubber and Gutta-Percha; Process for Producing a Substitute for ——. E. Zuhl, Berlin. Eng. Pat. 18,536, Oct. 17, 1900.

To imitate gutta-percha (A) 2 kilos. of paraffin, 6 kilos. of pitch, and 2·5 kilos. of Chinese wood-oil are melted and mixed together. 1·1 kilo. of sulphur chloride and afterwards 100 grms. of powdered sulphur are next added, and the whole is heated for an hour to 160° C. (B) 2 kilos. of pitch and 1 kilo. of wood-oil are heated together under cover for eight hours at 280°, then vulcanised with 150 grms. of sulphur chloride as above. The material obtained resembles india-rubber in respect of durability and insulating power, but is less elastic, and is weak under torsion. To obviate these defects, (C) 100 grms. of india rubber are dissolved in 300 grms. of molten naphthalene at the lowest possible temperature, and incorporated with 400 grms. of wood-oil and 700 grms. of pitch, asphalt, or the like; the naphthalene is volatilised by a current of steam, and the residue is vulcanised as before. (D) 1 kilo. of A is dissolved in 3 kilos. of naphthalene, mixed with 100 grms. of india-rubber in the same quantity of solvent, and the naphthalene removed with steam.—F. H. L.

XIV.—TANNING, LEATHER, GLUE, SIZE.

Raw and Tanned Hides; Use of Spirit in the Removal of Fat from ——. A. Wünsch. Ledermarkt, 1900, [75]; through Zeits. Spiritusind. 1900, **23**, [47], 429.

Raw hides always contain a large proportion of fat, which ought to be removed before tanning, since the mordanting and tanning liquors penetrate better, and are more easily removed afterwards, if the fat be previously extracted. When benzene is used alone for this purpose with wet or dry hides, the penetration is less uniform and the removal of fat is less complete than when a mixture of alcohol and benzene is employed. In this case, not only is fat recovered which would otherwise be saponified by the alkaline depilatory, but the leather also is softer and more valuable.

The soaked hides, after having been pressed and allowed to drip, are placed in a wooden drum, which is mounted in a somewhat larger stationary cylinder, which can be hermetically closed, and in which, by means of tooth gearing, the inside of the cylinder may be made to rotate. When the interior is filled with a pack of hides, the cylinder is closed and the drum rotated. At first, dilute alcohol is brought into contact with the skins. This liquor, by suitable pipes, is then drawn off and replaced by a mixture of benzene and strong alcohol, which may be further strengthened with more benzene if required. After treatment the mixture is run off, and the hides rinsed with a little alcohol.

The cylinder is now opened, and the hides, deprived of fat, are taken out, and replaced by a fresh pack to be treated. The apparatus is fitted with the necessary feeding pipes from the alcohol and benzene reservoirs, as also waste pipes and pressure valves. The benzene, alcohol, and fat can be recovered from the solutions, the former being used in subsequent packs.—J. F. B.

Brown Shoe Calf; Manufacture of ——. Leather Trades Rev. **33**, [764], 869.

Treatment of Fresh Market Calf.—The skins are thoroughly soaked in two or three changes of clean water, and are then limed, after which they are unhaired and fleshed, and may be run through a washing tumbler in soft water for about an hour. After leaving the washing tumbler, they are then put into a weak puer at a temperature of about 35° C., and are then passed on to a strong puer. When sufficiently reduced, they are scudded and then drenched, the object of the drench being to remove all traces of lime salts, to clean the skin, and to open it up into proper condition to receive the tan. They are then ready to be tanned in a weak gambier liquor of about 5° Bk. [Barkometer].

In starting new liquors, one pint of acetic acid should added to the paddle for every five dozen medium calf ski the object of this acid being to keep the fibres open.

The skins are kept in motion in the paddle till colour off, and are then put on a horse to drip overnight. Th are then placed in a similar liquor of 10° Bk., and the pr cess repeated until a strength of 20° or 25° Bk. is reach when the goods should be thoroughly struck throu They are now introduced into a fresh paddle containin gambier liquor of 25° Bk., to which about 2 galls. of go oakwood extract have been added; and the process tanning continued until, by the addition of oakwood extr the strength registers 35° Bk. The time taken depends u the substance of the skin. After tanning, the skins sho be laid in pile to drain, and then oiled with best N foundland cod oil, laid in pile for a day, and then hung the sheds to dry.

Splitting, Shaving, Sumaching, &c.—The tanned sk are wet back, sammied until in condition for shaving, or stout enough, split with a band-knife splitting machine, splits being used for waxing linings, &c. After shavi they are soaked in water, brushed over on the grain wit soap solution (made up of 2 lb. of soft soap and 3 galls hot water), then rinsed in a tub of hot water, soured sulphuric acid, and afterwards sumached. The sumach may be done in a drum taking 2½—3 buckets of sum with 7—8 pails of water, at a temperature of 50° C. skins are run in this for about three hours, washed u warm water, allowed to drain, and then dried to fix tannin.

Dyeing and Finishing.—The skins are now wetted ba put into a paddle and dyed, the dyeing generally being d with acid dyestuffs. Suitable shades of brown can be p cured from Cuba and Indian Yellow R and Fast Brow toned down with blue or green. A little sulphuric aci added to the dye-bath to develop the shade. After dye the skins are washed up, struck out on the grain s strained on boards, and dried. When dry, they are moved from the boards, flamed to pattern, set out on f and grain, and hung up in a warm room or shed u thoroughly dry; they are then stuffed, the first stu being made by boiling two medium sized cow-heels three hours in water, to which are added ½ lb. of l moss, 1 pint of linseed oil, ¼ lb. of Castile soap; w cool the liquid is strained through calico. This sh make from 3 to 3½ galls. The stuffing is put on wit flannel cloth, rubbed well in, and smoothed with the h The goods are hung up, and afterwards receive a sec coat, consisting of the same solution diluted to half stre with water. The skins are finished by perching wit moon knife, after which they receive another coat stuffing in the dry state, are hung up, brushed up wit stiff brush or brushing machine, and finished by rol with a plain roller.—J. G. P.

Artificial Leather; Process for the Manufacture of — Leipziger Färber- u. Zeugdr.-Zeit. 1900, **49**, [12], 49

Equal parts of grey wool and Italian hemp are fe together, and the sheets of felt thus obtained are wa and dried and then impregnated with a specially prep mixture. This mixture contains boiled linseed oil, phony, turpentine, glycerin, and vegetable wax, t ingredients being heated together on the water-bath the addition of ammonia, until a homogeneous mass res a solution of gum and a casein solution containing sod bichromate are then added, also an antiseptic, and mi colours according to the shade required. The mixtu heated until it is viscous, and is employed in this cond for impregnating the felt, after which treatment the mat is dried at the ordinary temperature, steeped in a sol of aluminium acetate, and finally dried by pressure bet heated rollers. The product is stated to be espe suitable for the manufacture of boot soles.—R. B. B.

Leather; The Dyeing, Staining, and Finishing of — M. C. Lamb.

See under VI., *page* 41.

PATENTS.

Leather; Improved Process and Composition for Tawing Skins in the Manufacture of ——. G. W. Adler, Philadelphia, U.S.A. Eng. Pat. 24,680, Dec. 12, 1899.

THE skins are first treated with a solution of aluminium sulphate and sodium chloride; after which they are subjected to treatment with sodium thiosulphate if a fine grain be required; the goods are now revolved for one hour n the drum, in a solution made by dissolving 6 lb. of hrome alum, 3 lb. of sodium sulphate, 3 lb. of sodium hloride, and ½ lb. of potassium or sodium acetate in 3—6 gallons of water; these quantities being sufficient for 100 lb. of skins prepared for tanning.

It is claimed that by this method it is possible to produce a material which possesses the qualities of a chrome-tanned eather together with the characteristics of an alum-tawed skin.—M. C. L.

Extraction [Tanning or Dyeing Materials, &c.]; Method or Process of ——. P. Gulden. Eng. Pat. 16,716, Sept. 19, 1900.

See under IV., *page* 38.

Hides and Fibrous Materials; Apparatus for Treating ——. J. F. Lester, Atalanta, U.S.A. Eng. Pat. 17,480, Oct. 2, 1900.

Our claim of this invention is that the tanning or cleaning may be accomplished without removing the material under treatment from the chamber in which it is placed. For the pparatus used for such treatment, the combination is laimed of "a suitable chamber for containing the material, ne or more independently-controlled fluid tanks, a supply ipe for creating a pressure within the chamber, a valve egulating the supply of fluid to the pump, and a valve-ontrolled discharge-pipe."—M. C. L.

XV.—MANURES, Etc.

Thomas Slag; Detection of Mineral Phosphate in ——. N. von Lorenz.

See under XXIII., *page* 69.

XVI.—SUGAR, STARCH, GUM, Etc.

Beetroot Juice: Krause's Method for Determining the Purity of ——. H. Claassen. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1900, **18**, [4], 250—251. From Centralbl. Zuckerind. 1900, [41], 809.

THE hydrometer used by Krause is graduated in two ways, ue giving the actual degree Brix of the digestion juice, he other, that of the original juice of the beetroot. The lculation has been established as follows:—Since 104·2 rms. of pulp contain 4·2 grms. of marc, the dilution of he juice is 100 grms. to 400 c.c. If the beetroot juice be 1° Brix, the diffusion juice is 2·715. The polarisation ound, relates not to 25 grms. of beetroot juice, but to 6·048 grms. of pulp. Krause calculates thus:—2·715 × 6·048 ÷ 25 = 2·8288° Brix, which corresponds to 11° Brix f the original beetroot juice. The figure 11 of the Brix cale is therefore placed opposite the figure 2·8288 of the rix scale of digestion juice.

The author, however, pronounces strongly against the use f too fine a pulp, for it is difficult to weigh exactly, and ives trouble from froth.

It remains to be determined if the duration of the digeson has an influence on the result, if the solid constituents f beetroot marc may not gradually dissolve, and thus ifluence the readings of the hydrometer, and if there is version of sugar. Further, it remains to be proved that gestion without acetate of lead gives the same polarisation s the ordinary method with acetate of lead. These various oints should be definitely fixed before the new method is lowed to make its way into practice.—L. J. de W.

Diffusion Juice by the Separation Process; Purification of ——. A. V. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1900, **18**, [4], 252. From Die deutsche Zuckerind. 1900, [29], 1166.

IN a preceding number of the same journal, Szyfer has drawn attention to the purification of raw juice by the process elaborated by Steffen for desaccharifying molasses. In laboratory tests a sucrate was obtained of 96·70 purity, leaving 0·65 of sugar in the waste liquors. On the large scale, after evaporating the juice obtained by decomposing the sucrate with carbonic acid, a syrup of purity 96 was obtained. In another case, on treating a diffusion juice of purity 88·50, a syrup was obtained of purity 96·61, and saline quotient 53·13; the exhaustion of the beetroots had been pushed to the extreme, and the scums of the decomposition of the sucrate still contained 1·90 per cent. of sugar.

In criticising Szyfer's experiments, the author states that the separation of sugar as saccharate is difficult in solutions containing more than 7 per cent. of sugar. The idea of applying the separation process to diffusion juice has already been entertained by Stammer, but the cost, considering the considerable quantity of lime necessary, prohibited its application industrially. Desaccharifying molasses by separation is practised in factories where the tri-saccharate is used in place of lime in defecating diffusion juice at the first saturation, so that there is no longer an excessive consumption of lime. The conditions for properly carrying out the separation have been indicated by Steffen in his patents and still hold good.

Szyfer thinks that only 7 to 8 of lime should be used per 100 of beetroots, but this quantity would be too small for roots containing 14 to 16 per cent. of sugar, for hitherto it has been considered that 80 of lime per 100 of sugar is necessary to give a satisfactory result in separation. In any case 8 per cent. is already three times the amount actually required. The cost of manufacture would be considerably increased, and the present plant insufficient.—L. J. de W.

Sugar Liquors; Influence of Alkalinity on ——. Zscheye. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1900, **18**, [4], 254. From Die deutsche Zuckerind. 1900, [30], 1194.

THE principal cause of the grey colour of sugars is the solubility of salts of iron in sucro-calcic solutions. It is advisable to saturate at the second carbonating to about 0·03 of alkalinity, calculated as lime, so as to decompose all the sucro-calcic compounds formed during defecation, and to precipitate the iron salts which have entered into solution. It must also be noted that the organic acids set free by sulphurous acid, likewise dissolve the iron in the juice, and the presence of small quantities of invert sugar may have the same effect. In any case a certain alkalinity must be maintained at every stage. These observations have been confirmed by Strandes. In a new factory no sulphurous acid is used, but the lime is allowed time to act on the juice, and by boiling and agitation, the defecation is effected under conditions favourable to a full purification. The sugars obtained are always of a fine yellow colour.
—L. J. de W.

Third-Jet Sugar and Molasses; Composition of the Insoluble Matter of ——. H. Pellet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1900, **18**, [4], 193—194.

WHEN molasses and solutions of certain sugars of low quality are examined, they are found not to be absolutely clear, but the turbidity persists and does not collect rapidly at the bottom of the vessel. This insoluble matter was collected by filtration and analysed.

Third jet sugar gave 0·264 grm. of insoluble matter per 100 grms. of sugar. After ignition there remained 0·130 grm., or about 50 per cent. of organic matter as loss.

Molasses gave a total residue of 0·0467 grm. per 100 grms. of sugar, containing 42 per cent. of organic matter.

The mineral residues gave the following results :—

——	3rd Jet Sugar.	Molasses.
Silica soluble in alkalis	74·7	97·9
Sand	5·7	Nil.
Alumina and peroxide of iron..	7·6	0·6
Lime	9·1	1·5
Sulphuric acid..................	2·6	Traces.
Copper	Traces	..
Various (phosphoric acid, nil)..	0·3	..
	100·0	100·0

It appears that these insoluble substances, apart from organic matter, consist of silica soluble in alkalis, which is found in the products as gelatinous silica. The composition will evidently vary with the method of working adopted in the sugar factories, and the study of these deposits may serve to explain many obscure facts in manufacture.—L. J. de W.

Sugar; Action of Ozone in the Manufacture of——. Herzog. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1900, **18**, [4], 252—254. From Die deutsche Zuckerind. 1900 [30], 1197.

From an examination of recent publications on the action of ozone on sugar and beetroot and factory juice, the following conclusions are drawn, *viz.*:—that the subject requires a more thorough study before it can be proved that there is no danger of destruction of sugar; that the influence of ozone on beetroot juice appears to be directed to the destruction of those constituents which give it its characteristic odour and taste; and that there has been no proof of an increase in the quotient of purity or of a strong decolorisation by the action of ozone alone.—L. J. de W.

Beetroot Diffusion Juice; Warm Diffusion and Warming ——. M. Melichar. Zeits. Zuckerind. Böhmen, 1900, **25**, [1], 8—15.

In criticising Claassen's views on diffusion, the author divides the heat into the useful portion which is carried by the diffusion juice, and the lost heat which is left in the spent pulp and waste waters.

With the high price of fuel at the present time, it is desirable to consider whether diffusion shall be carried out in the old costly way as hitherto, or the so-called hot diffusion shall be adopted, in which the highest diffusion temperature is given to the first diffuser which is filled with fresh chips.

With regard to the proposal to heat cooled diffusion juice with open spent steam from the quadruple effect, it is pointed out that there exist heaters with high transmission coefficient, which are capable of readily heating the juice without dilution; moreover, diluted juice necessitates an increase of surface of evaporation in addition to the direct disadvantage.—L. J. de W.

Diffusion Juice and Massecuites; Organic Acids Extracted by Ether from——. K. Andrlik, K. Urban, and V. Stanek. Zeits. Zuckerind. in Böhmen, 1900, **25**, [2], 83—89.

In diffusion juices organic acids extractible by ether vary greatly in quantity; their acidity ranged from 24·5 to 39·4 c.c. of normal alkali per 100 grms. of sugar, mean 29·1 c.c. The above figures, however, are not to be considered as limits. Of this acidity, oxalic acid accounts for from 7·6 to 15·3 c.c., mean 10·77 c.c., of normal alkali. Acids volatile with steam were only present in small quantities, equivalent to from 1·4 to 3·3 c.c., mean 1·9 c.c., of normal alkali per 100 grms. of sugar. Only a portion of the organic acids gets through into the massecuite, numbers corresponding to from 6·1 to 14·2 c.c., mean 9·3 c.c., of normal alkali were obtained. Including the oxalic acid, 68 per cent., or about two-thirds, of the organic acids are removed by the saturation processes; excluding the oxalic acid, of which only very small traces remain after saturation, 49·3 per cent., or about one half, of the other acids are removed.

The quantity of organic acids extractible with ether, varies with the season; the mean difference between the organic acids of the massecuites of two seasons corresponded to 3·8 c.c. of normal alkali per 100 grms. of sugar. Apparently the quantity of organic acids extractible with ether increases during the boiling of the syrups; the increase observed up to the final molasses, corresponded on an average to 0·52 c.c. of normal alkali per 1 per cent. of ash. The quantity of volatile acids increases during saturation and evaporation up to the first massecuite; this increase amounted to 51 per cent. of the volatile acids originally present in the diffusion juice.—J. F. B.

Filtration [Sugar] through Animal Charcoal. F. Stolle. Zeits. Ver. deutsch. Zucker-Ind. 1900, **50**, [537], 872—883.

An attempt is made to determine the quantity of the constituents of revivified char which are dissolved by varied treatment in the filter. Revivified char was preferred, since the employment of new char for refined liquor is exceptional. 35 kilos. of the char are put into a malleable iron filter, 6 ft. long, and washed with water at 30°, 50°, and 80°—90° C. for two days, samples being taken every few hours, the water having a head of 6 ft., and being run at the rate of 1 litre in 7 minutes. In each case both water and char are analysed. Previous to each experiment the char, after fermentation, is treated with caustic soda, then with the calculated quantity of hydrochloric acid, and with frequently renewed boiling water until the washing water is neutral. It is then passed through a Klusemann washing machine, dried thoroughly, and carefully burned at a temperature of 500° to 550° C., and finally packed in the filter for the experimental washing.

With water at 30° C., 28 hours elapse before the water is free from calcium and sodium sulphates; sodium chloride and carbonate show for some time afterwards. Calcium carbonate begins to appear when the sulphate is absent. Calcium sulphide could not be detected; iron, only in the first sample.

With water at 50° C., sodium sulphate disappears after 8 hours washing, calcium sulphate after 12 hours, sodium carbonate after 17 hours, and sodium chloride after 22 hours. Calcium carbonate begins to show at the eighth hour and before the sulphate is absent. Ammonia, even after 12 hours, can be quantitatively determined, and traces of iron show throughout.

When water at 80°—90° C. is used, calcium sulphate, sodium chloride, and sodium sulphate disappear after 8 hours, and sodium carbonate after 12 hours. The solution of calcium carbonate begins after 4 hours, while the sulphate is still present. Iron is present in traces throughout, and ammonia in measureable quantities fo 12 hours.

When steam was passed through, the condensed water showed the same percentage of calcium sulphate throughou the experiment, but calcium carbonate was not dissolved. The following table shows the composition of the char :—

Temperature of Water.	A.	B.	30°	50°	80°—90°	Steam
Carbon	8·140	6·138	7·086	7·032	7·150	6·984
Sand and clay .	0·308	0·466	0·519	0·330	0·234	0·416
Calcium carbonate.	10·28	7·187	6·590	6·590	6·570	7·100
Calcium sulphate.	0·0717	0·058	0·009	0·010	0·0105	0·0432
Calcium sulphide.	0·132	0·040	0·0014	0·0783	0·121	0·0631
Nitrogen (Kjeldahl).	1·044	0·549	0·5236	0·6003	0·678	0·686

Column A. is new char before use. B. the revivified cha after being frequently used; this was the char taken fo the experiments.—L. J. de W.

Beet-Molasses; Presence of Lactic Acid in ——. A Schöne and B. Tollens. Zeits. Vereins deutsch. Zucker Ind. 1900, [538], 980—981.

Since lactic acid is formed by the action of lime or stronti on aqueous solutions of cane sugar at 100°—125 C., th probability exists that the acid will be present in beet-molasses, and this supposition the authors confirm. Of 13 samples of molasses examined, eight contained lactic acid in such a quantity that it could be separated and converted into zinc lactate, identified by analysis; in the others, the acid was detected qualitatively. The authors conclude, therefore, that lactic acid is a constant constituent of beet-molasses.—H. T. P.

Cane Sugar; Action of Strontia upon Solutions at 125°—128° *C., of* ——. A. Schöne and B. Tollens. Zeits. Vereins deutsch. Zucker-Ind. 1900, [538], 978—979.

The authors have carefully examined the changes occurring when a saccharose solution is heated with strontia, under pressure at 125°—128° C., and find, that although small proportions of lactic acid and other decomposition products are formed, no trace of raffinose is produced. The same result has already been shown to obtain when cane sugar solutions are heated to 100° C. with lime or strontia. It is concluded, therefore, that the raffinose present in beet-molasses, pre-exists in and is wholly derived from the beet, and is not formed during the manufacturing process.

—H. T. P.

PATENTS.

Sugar; Method and Apparatus for Refining ——. J. Robin-Langlois, Paris. Eng. Pat. 23,134, Nov. 20, 1899.

This invention consists of devices for quickly refining ugars by taking them in the raw and crystallised state and hen washing, turbining, drying, and grinding, for the purpose of agglomeration into a pasty mass. The claims re for apparatus for carrying out the different processes.

—J. L. B.

Saccharine and other Crystallisable Liquids; Concentration and Crystallisation of ——. *Process and Apparatus for* ——. J. McNeil and C. McNeil, Govan, Lanarkshire. Eng. Pat. 23,598, Nov. 27, 1899.

The crystallisation of saccharine and other crystallisable olutions is carried out in a series of vessels all working nder diminished atmospheric pressure and heated by xhaust or low pressure steam. The first vessel works ntermittently by drawing in charge after charge of the iquid to be treated, bringing each to a hot saturated condition, then forming the grain and dropping it into a vessel placed underneath. From this receiver the mass is drawn up to the second vessel in the series and some syrup or thick juice is run in to increase the size of the grain. The mass then passes into the third vessel where more syrup is added, this process being continued throughout the series.

—J. L. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Glycogen in Yeast; Appearance and Disappearance of ——. R. Meissner. Centralbl. Bakteriol. (II. Abth.), 1900, **6**, 517; through Woch. für Brau. 1900, **17**, [45], 669—670.

Vortmann observed in certain cases of fermentation of wine musts that the carbonic acid evolved, was in excess of the amount calculated from the sugar consumed. This was noticed especially in the later stages when the fermentation was of protracted duration. He attributed it to the consumption by respiration of the reserve materials of the yeast: glycogen and fat. In 1895, Will studied the formation of glycogen in the yeast cell under favourable nutrition and its disappearance during auto-fermentation. Laurent found that the glycogen might amount to 32·58 per cent. of the dry substance of the yeast. Lindner has observed the formation of glycogen at the expense of other dead cells. The author finds that the dilute solution of iodine often only gives a yellow coloration, and recommends a solution containing 20 parts of potassium iodide and 7 parts of iodine in 100 of water; this gives a sharp and rapid coloration. The reaction was obtainable in the case of yeast from must cultures 22 hours old, even with daughter cells having diameter one-fifth of that of the mother cells; younger buds only showed a yellow coloration. Some races only gave the brown reaction after some time; others showed it immediately after the first yellow coloration. The author confirms the observation of Will and Lindner that the distribution of glycogen is very irregular. During the secondary fermentation, glycogen was still detected after some time, both in quiescent and fermenting cells. In wine fermentation the quantity of glycogen is greatest at the end of the primary fermentation, after which it gradually decreases. Whilst still a fair amount of sugar is unfermented a number of the cells pass into the quiescent stage and lose some of their glycogen; this change is recognised by the granular structure of the cell contents and the shrinkage of the cells; the quiescent cells are less resistant to iodine, and give the glycogen reaction at once. The rate of disappearance of glycogen varies with different races; some cells containing glycogen are found even in starved deposits. It does not do to wait for the disappearance of all the glycogen before separating the yeast from the wine. The production and consumption of glycogen in the cells may proceed simultaneously. The author regards the glycogen as a "transitory" reserve material which secures a constant supply of sugar for the yeast, and aids it in its struggle for existence.—J. F. B.

Zymase from Sterilised Yeast. E. Buchner. Ber. 1900, **33**, [17], 3307—3310.

The author has amplified his previous observations on the preparation of active zymase extracts from yeast previously dried and sterilised. Bottom-fermentation beer yeasts were carefully dried at a pressure of 30 mm., at temperatures ranging from 35° to 100° C. The dried yeasts were then subjected to the action of dry heat in a current of hydrogen for a considerable time, namely, for from 8 to 10 hours, at temperatures ranging from 95° to 110° C. To meet possible objections, all the preparations were then tested for sterility by careful observation of their behaviour in beer wort for three weeks. All the preparations having been proved sterile, they were then extracted by trituration with a 10 per cent. solution of glycerin in water, with the aid of sand and kieselguhr. After pressing, extracts were obtained which were still active to an extent varying from one quarter to one half of the activity of the extracts prepared from the fresh yeast. Thus a considerable quantity of active zymase was recovered in spite of the high temperature and the loss of zymase attendant on the manipulations and imperfect solubility in the dry state. To the author's mind, the above results conclusively dispose of the theory advanced to explain the fermentative activity of his extracts by the presence of living protoplasmic residues.—J. F. B.

"Zymase, Buchner's"; Remarks on the Paper by Macfadyen, Morris, and Rowland on ——. E. Buchner. Ber. 1900, **33**, [17], 3311—3315.

The author considers that several points in the paper by Macfadyen, Morris, and Rowland (this Journal, 1900, 1127), dealing with the preparation and properties of expressed extracts from English top-fermentation beer yeasts, are open to criticism. In the first place, the bibliography of the English authors is not quite complete, no notice being taken of Lange's work on top-fermentation distillery yeasts (this Journal, 1898, 779), amongst others. Certain apparent discrepancies are found in regard to the relative effect of the extracts on different sugars. In some cases glucose is fermented twice as strongly as maltose, and in other cases the relations are exactly reversed; the only difference in the extracts producing these results lies in the age of the yeast before extracting. Again, in regard to the action of antiseptics, discrepancies of a similar nature are noticed; in some cases toluene has a greater retarding effect than thymol; in others, thymol is more inhibitive than toluene. Buchner comments on the general weakness of the fermentative power of the extracts prepared by the English authors; very few samples were as active as Buchner's extracts, whilst many possessed less than half the normal activity. It is also pointed out that with concentrations of sugar below 20 per cent., such as were largely used by the English authors, the mere addition of thymol is not sufficient to suppress the activity of micro-organisms. Top-fermentation yeasts are always more or less impure, and with such low concentrations of sugar, the authors' results are vitiated in the absence of proof of the sterility of their liquids. Finally, Buchner refers to one of his former papers (this Journal, 1899, 778) on the question of the so-called "auto-fermentation" of the extracts. In that case he had determined the "auto-fermentation" in extracts of Munich yeast, and he now gives results of experiments with Berlin yeast. The quantity of gas evolved by the latter without addition of sugar is somewhat higher than in the case of the Munich extracts, probably owing to a higher content of glycogen, but it never exceeds 10 per cent. of the total quantity of gas evolved when sugar is added. The very large quantities of gas evolved by the extracts from the English yeasts without sugar may be due to glycogen, or very probably to the activity of bacteria.—J. F. B.

"*Zymase; Buchner's* ——"; *Enzyme Theory versus Plasma Theory.* Windisch. Woch. für Brau. 1900, **17**, [46], 681—682.

Contributing to the discussion on the paper of Macfadyen, Morris, and Rowland (this Journal, 1900, 1127), the author first remarks on the extreme difficulty at first experienced in preparing active yeast extracts. The very erratic results might be explained by assuming that zymase is not secreted and stored up in large quantities, but is only formed when there is work for it, that is, under the stimulative influence of the presence of sugar. When the yeast is removed from the fermenting liquid, the small quantity of zymase would be rapidly digested, and no more would be formed. Bottom-fermentation yeasts are always fully immersed in the saccharine medium, and are kept at low temperatures. Top-fermentation yeasts are exposed to the air, and, owing to their position at the surface of the liquid, they are not in constant contact with saccharine wort; moreover, at the high temperatures employed in English breweries, they are far more susceptible to the action of the proteolytic enzyme. The author quotes numerous instances in nature where the secretion of an enzyme is determined by excitement due to the presence of the particular substance which it attacks, *e.g.*, the animal digestive enzymes, &c. Lange's work showed that the extracts from top-fermentation distillery yeasts were less active than those from bottom-fermentation brewery yeasts, and also contained less nitrogen. How far the weaker activity of the extracts from top-fermentation yeast depends on the particular conditions of growth outlined above remains to be investigated.—J. F. B.

Aspergillus Niger; The Proteolase of ——. *II.* G. Malfitano. Ann. de l'Inst. Pasteur, 1900, **14**, 60; through Woch. für Brau. 1900, **17**, [46], 690.

The enzyme has the character of a proteolytic diastase, very similar to papaïn and the proteolytic enzyme of malt. It acts upon gelatin, nucleoproteins, globulins, and albuminates, but it only attacks albumin if the latter has undergone a previous decomposition, since it cannot dissolve coagulated albumin. The particular reaction of the medium most favourable to its activity is that of neutrality towards Methyl Orange, that is, acidity due to acid phosphates.
—J. F. B.

Fermentation Vats [*Distillery*]; *Tar Coating for* ——. G. Heinzelmann. Zeits. Spiritusind. 1900, **23**, [48], 438. (Compare also this Journal, 1900, 839 and 761.)

Further evidence is now to hand that the tarring of the vats inside can be effected without any damage to the course of fermentation, and to the use of the more solid matter of the spent wash as fodder. A good way of applying the tar, so as to avoid any subsequent ill effects, is to use it boiling. At the end of the season, when the vats have dried, a coat of boiling coal-tar is given; it is allowed to remain a fortnight before applying a second coat. In this way sufficient time is afforded before the next season for the coating of tar to become perfectly hard and harmless. Tar should certainly never be applied shortly before tl vats are required for use. The removal and oxidation the objectionable volatile constituents of the tar are co siderably facilitated by its application whilst boiling; tl boiling tar also penetrates the wood more readily.

The main object in tarring the vats is to dispense wi the trouble of having to lime them every time aft emptying, and it is sufficient to wash them with war water, finishing up with a thorough brushing. But th latter operation is sometimes omitted by the workmen, an since it is absolutely essential, it is best to sprinkle tl tarred vats with lime, and then insist on its being brush off. The use of lime is an additional safeguard, as growt of moulds can occur even on tarred surfaces. Moreov the use of lime destroys the organisms which have lodg on the copper cooling worms, and which are not removat by the hose alone.—J. F. B.

Potato Spirit from the Mashing Space; High Yields ——. Schirmann. Zeits. Spiritusind. 1900, **23**, [48 438.

The author complains of the large number of fraudule processes purporting to give higher yields of spirit p cent. of the mashing capacity. Whilst not denying th yields of 12 per cent. and more can be obtained with go materials and up-to-date plant, he holds that those peop who state that high yields should be the rule and not t exception, do so out of ignorance.

In obtaining a high yield, the first question that arises whether it is obtained economically, and without a gre waste of starch. Whilst frequently obtaining a yield 12 per cent. from his mashing space with good potato the author also very often has the greatest trouble getting 9·5 per cent. with potatoes poor in starch.

It is more important to utilise the whole of the r material efficiently than to obtain high yields at a lo Concentrated mashes are frequently difficult to attenu down to the lowest gravity (less than 1° Balling is oft demanded), on account of certain properties and constitue of some kinds of potatoes.—J. F. B.

Fermentation Gases; Utilisation in the United States ——. H. Medinger. Woch. für Brau. 1900, **17**, 701 702.

In the Milwaukee breweries the methods of Schlitz a Pabst are in use. Fermentation is carried out in t settling tank (capacity, 320 hectolitres) and in fermenti vats (capacity, 110—120 hectolitres). The vats are p vided with two openings, one carrying a pipe for conducti the gas to a receiver, and the other for introducing t yeast and other manipulations; sometimes an observati glass is also provided.

The wort is made from malt, with maize or rice adjunct it comes from the brewing house into a collecting tank; then passes through the coolers into the settling ta Here it is pitched with yeast and aërated four times 36—48 hours for five minutes with filtered air. T further fermentation is conducted in the fermenting va in which the wort is cooled, sometimes as low as 1·5° and remains 10—14 days without aëration. The gas collected from both the settling tank and the fermenti vats. The covers of the vats are kept saturated w water to prevent shrinkage of the wood. In some N England breweries the gas is freed from bad-smelli impurities and pumped into the Lager vats under pressu whereby, it is said, the ripening of the beer is consideral hastened.

Wittemann, of New York, has introduced a process whi is said to work very well: the gas flows at a pressure about $\frac{2}{3}$ lb. per sq. in. into a carbonic acid factory, whe it is treated by a special process and compressed. In Californian brewery the gas is used without purification gassing the beer, but the latter has not a good flavo The collection of the gases of fermentation is especia advantageous to those breweries which cask their be under pressure before bottling. The cost of the Americ method is not great; in one case known to the author, t lteration cost 525*l.*, and was borne by the carbonic acid actory, the cost of the gas to the brewery being reduced o one-twentieth.—J. F. B.

Melitriose [Raffinose]; Is a Special Enzyme required for the Hydrolysis, by Micro-organisms of ——? A. Bau.

Woch. für Brau. 1900, **17**, [47], 698.

N their paper on certain species of Amylomyces (this Journal, 1900, 1128), Sitnikoff and Rommel suggest that, ince glucose is fermented but raffinose is not hydrolysed by ome of the species, this sugar may require the presence of special enzyme for its hydrolysis. The author points out hat those species which did not hydrolyse raffinose also ad no effect upon cane sugar. He lays great stress on he close analogy between the nature of the attachment of he fructose group to the melibiose residue in raffinose and hat of the fructose and glucose groups in cane sugar. Both sugars are non-reducing, and both are very easily split up by weak acids into reducing sugars; and, since Fischer proposed the formula $C_6H_{11}O_5—O—C_6H_{11}O_5$ for ane sugar, the author thinks that a similar argument will pply for the connection of fructose to melibiose to form affinose, *i.e.*, $C_6H_{11}O_5—O—C_{12}H_{21}O_{10}$. The author grants hat the anhydride linkage between the glucose and galacose groups of melibiose is of quite a different nature; nelibiose is only split by strong acids (mineral acids and xalic), and requires the presence of a special enzyme, nelibiase, for its hydrolysis before fermentation. But he olds that the ordinary cane-sugar enzyme, invertase, is ufficient for the resolution of the simple —O— connection, nd that, whenever invertase is present, raffinose [melitriose] split up into fructose and melibiose.—J. F. B.

nvertin or Invertase in Grapes; Presence of ——. V. Martinand.

Comptes Rend. **131**, [20], 808—810.

HE must of grapes, made after careful cleansing and erilising of their outer surface, was found to contain nvertase, which was identified by the temperature of its aximum activity, and by the influence of acetic acid on hat activity. Unit quantity (that capable of inverting ·2 grm. of sucrose in an hour, at 56° C., in presence of per cent. of acetic acid) was contained in from $\frac{1}{10}$ to $_5$ c.c. of the must of various grapes. The same amount was und in the extract from 2·5 grms. of fresh vine leaves. he amount in the grape is more than enough to invert all e sugar it contains. When the invertase in the must is estroyed by heat, the wine formed from it contains praccally no invertase, while that made from the fresh must ontains it in considerable quantity. Invertase in wine, en, comes as a rule from that in the must, not from the rmenting yeast. This diastase does not oxidise so readily s some others, for it is contained in considerable amount the must made from currants which have been allowed take up again their natural water by soaking, while the xidising diastase contained in the fruit is oxidised and estroyed in the drying process. Invertase disappears together, however, in the oxidising disease of "*casse*," as ell as in the microbian diseases known as "*tourne*" and *pousse*."—J. T. D.

merican Wines; Composition of ——. W. D. Bigelow.

U.S. Dept. Agric. 1900, Bulletin No. 59.

his bulletin contains tables giving the results of analyses f 845 samples of American wines of known origin from e various wine-producing States. The largest number of nalyses relate to the wines of California, the material from e other States being as yet rather meagre. For purposes f comparison, the reports of the German "Weinstatistik ommission" are quoted on the subject of European ines.

Alcohol.—The American wines generally contain a higher ercentage of alcohol than the European; this is especially e case with the wines produced in the warmer parts of alifornia. Fermentation does not yield more than 11·5 rms. of alcohol per 100 c.c.

Glycerin.—Unfortunately many of the analyses of merican wines do not include determinations of the glycerin; the results obtained ranged from 0·163 to 1·083 grm. per 100 c.c. The German authorities quote limits from 0·4 to 1·0 grm. per 100 c.c., with extreme cases of 0·2 and 1·39 in rare instances. The glycerin content of American wines, so far as has been determined, is lower than that of European wines.

Glycerin to Alcohol Ratio.—This ratio is considered of great importance in judging the purity of wine. The later German statistics put this ratio at from 6 to 14 parts of glycerin per 100 of alcohol. The glycerin-alcohol ratio of American wines of known purity often falls below the minimum limit of 6 per cent.

Sugar-free Extract.—This is got by subtracting the sugar, −0·1 grm., and, in the case of plastered wines, the potassium sulphate, −0·1 grm., from the grms. of total extract per 100 c.c. According to the later opinions, the minimum limit should be 1·6 grm. per 100 c.c. for white wines and 1·8 for red wines in Europe. For Californian wines, Curtis puts the average extract at 2·90 for red wines and 2·0 for white (six months old), or 2·65 for red and 1·75 for white (two or three years old). He regards with suspicion a red wine lying outside the limits 2·4—3·25 and a white wine outside 1·5—2·4 grms. of sugar-free extract per 100 c.c.

Ash.—The German commission puts the limits of ash between 0·44 and 0·11 grm. per 100 c.c., regarding with suspicion anything less than 0·14 or more than 0·35. The American wines answer to this specification, and the same standards may be applied. Curtis gives the average ash contents of American wines as 0·28 grm. per 100 c.c. for red and 0·21 for white wines.

Extract to Alcohol Ratio.—This ratio is used as a test for the fortification of wine by added alcohol or its dilution with water. This ratio is not included in the tables for American wines in this bulletin.

Total Acid.—The acidity of European wines lies between 0·4 and 1·5 grm. per 100 c.c., calculated as tartaric. The acidity may vary during ageing. The acidity of Californian wines (six months old) averages 0·525 grm. per 100 c.c. for red and 0·570 for white: less than 0·450 is suspicious.

Volatile Acid.—The high volatile acidity of American wines is undoubtedly largely due to imperfections in the methods of fermentation. But it is very probable that with equal perfection, the volatile acids of American wines would still be higher than in European wines. For Californian wines up to three years old, Curtis proposes a volatile acidity of 0·14 per cent., as against the German maximum of 0·12 per cent. There has been a great improvement as regards volatile acids in American wines in recent years.

Reducing Sugar.—Imperfect fermentation also accounts for a high percentage of reducing sugar; for this reason American dry wines often exceed the 0·1 grm. per 100 c.c. which is regarded as the standard for European wines.

Plastering is of rare occurrence in American wines.

The remainder of the bulletin contains full descriptions of the analytical methods employed and the tests for the detection of various preservatives.—J. F. B.

"Saccharin" in Wine and Beer in the Absence of Salicylic Acid; Detection of ——. F. Wirthle.

See under XXIII., *page* 72.

Yeast from Grain Distilleries; Classification as a Food-stuff and Examination of ——. S. Rohn.

See under XVIII. A., *page* 58.

Methyl Alcohol in Mixtures; Detection of ——. S. P. Mulliken and H. Scudder.

See under XXIII., *page* 71.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(A.)—FOODS.

Meat Extracts: The Food Value of ——. L. Fürst. Chem. Zeit. 1900, **24**, 994—995.

After reviewing the various statements made by Bremer, König, Bömer, and others, concerning the true nutritive constituents of meat extracts, the author comes to the conclusion, already generally accepted, that the proportion of albumoses, peptones, and albumins in the extracts is too small to give any food value to the same.

The amount of extract usually taken is too small to have any but a stimulative effect.—W. P. S.

Yeast from Grain Distilleries: Classification as a Food-stuff and Examination of ——. S. Rohn. Zeits. Unters. Nahr. und Genussmittel, 1900, **3**, [11], 756—763.

By a recent enactment, pressed yeast for bakers' use has been brought under the food-stuff laws in Germany. It must be the pure product of the fermentation of grain, and must not be mixed with potato flour nor with beer yeast.

Detection of Potato Flour.—For small quantities, up to 2 per cent., the best means of detection and estimation is the microscope. With higher proportions, the granules cannot be counted with sufficient accuracy to give reliable results. One or two per cent. of potato flour does not necessarily indicate wilful adulteration, as the yeast may become contaminated to this extent by using the presses, vessels, and pipes for other purposes. There is as yet no really good method for the quantitative estimation of starch in yeast; the author suggests that an iodine colorimetric method or a saccharification method might be worked out successfully.

Detection of Beer Yeast.—An expert has no difficulty in distinguishing grain-fermentation yeast from beer yeast when both are pure, either by taste or by the small black specks of hop resins present in the latter. But to determine the composition of mixtures is a very difficult matter, especially when the proportion of beer yeast is less than 25—30 per cent. The only chemical test is the behaviour towards raffinose (Bau, this Journal, 1898, 937). Beer yeasts of the bottom-fermentation type ferment this sugar completely, whilst the top-fermentation distillery yeasts convert it into melibiose. By this test the detection of less than 20 per cent. of beer yeast could only be effected by very careful comparative fermentations; moreover, the author has often met with distillery yeasts which ferment raffinose completely but slowly. Microscopic examination is useless for the detection of beer yeast in distillery yeast, owing to the numerous variations of both kinds.

Detection of Molasses Yeast.—The detection of yeast derived from molasses fermentation, when mixed with that of grain fermentation, is practically impossible. Even experts are unable to distinguish with certainty between the two kinds in the unmixed state. Since the number of pressed yeast factories working molasses is very small, the Government must resort to official supervision if it desires to control the sale of this kind of yeast.

Testing the Fermentative or Working Power of Yeast.—There is no absolute measure of the fermentative power of yeast; the most general method of testing is that of Hayduck and Meissl. The tests vary in different factories and have only a relative value, depending entirely on the conditions of manufacture and employment.

The yeasts of highest fermentative power are not always those most suitable for bakery purposes, and official tests are hardly called for.

The annual production of pressed yeast in Germany is 21 million kilos. from 954 distilleries.—J. F. B.

Oranges; Artificial Colouring of ——. Pum and Micko. Zeits. Unters. Nahr. und Genussmittel, 1900, **3**, [11], 729—735.

The authors contradict a statement made by Hotter of Graz, that "blood" oranges are often made artificially by injecting colouring matters under the skins of ordinar yellow oranges.

Extensive experimental trials showed that in no cas could any staining of the orange be effected with natura or artificial dyestuffs which could possibly deceive th simplest purchaser after the orange was peeled.—J. F. B.

Tea; Theine in ——. J. Kochs. Rev. Cult. Colon. 7 494. Pharm. J. 1900, **65**, [1586], 537.

The author has determined the percentage of theine i several varieties of Chinese tea The samples were a pure, and had preserved their aroma owing to the package having been hermetically sealed. The results of th analyses were:—Souchong, 2·83; Flower Pekoe, 4·36 Scented Tea, 3·08; Pouchong, 3·44; Congou, 3·83; an Oolong, 3·66 per cent. of theine. A Brazilian tea, Ch Morumby, contained 3·11 per cent. of theine. The marke value of a sample of tea and its suitability for use depen not only upon composition, but also upon the appearanc aroma, and taste of both leaf and infusion. Tea fro Assam, Ceylon, and Java is better packed, and cons quently has more aroma than that from China and Japa According to W. Krohn, formerly German Consul Futschau, only the Chinese, scented Orange Pekoe tea i artificially flavoured. The author states that this tea is excellent quality, and that the flavouring is in no wise a attempt to adulterate the article.—A. S.

Maize in Wheaten Flour; Detection of ——. G. Embre

See under XXIII., *page* 72.

Maize in Wheaten Flour; Detection of ——. E. J. Beva

See under XXIII., *page* 72.

Dulcine (Phenetol-Carbamide) in Foods and Beverage Detection of ——.

See under XXIII., *page* 72.

PATENTS.

Foodstuffs; Process and Apparatus for Preserving —— J. J. Möller, Flensburg, Germany. Eng. Pat. 24,80 Dec. 13, 1899.

The apparatus for preserving foodstuffs or for disinfecti any articles consists of an inner vessel fitting loosely in a outer containing vessel. On the upper periphery of t outer vessel, two troughs or grooves are made, corr sponding with two projecting flanges on the periphery the lid, in such a manner that a double "liquid seal" produced. The inner trough, which is in communicati with the interior of the vessel, is filled with a readi volatile antiseptic, whilst the outer groove is filled with to prevent evaporation of the antiseptic into the air. further receptacle also containing the antiseptic suspended inside the vessel by a flange or lips from t top. In this way the vapours of the antiseptic come in contact with the contents of the vessel and efficient preserve them from the action of bacteria.—J. F. B.

Milk, &c.; Pasteurising and Sterilising ——. E. v Bühler, Charlottenburg, Germany. Eng. Pat. 25,32 Dec. 21, 1899.

The milk or liquid to be treated is gradually heated in t batteries joined together according to the counter-curre principle, each battery being composed of two or mo pasteurising or sterilising apparatus connected togeth In one of the two batteries the previously heated liquid further heated by an independent heating medium; it then passed to the other battery where its heat is utilis for the preliminary heating of a fresh supply of liquid. —J. F. B.

Milk; Production of Condensed ——. A. Gürb Würzburg, Germany. Eng. Pat. 25,484, Dec. 23, 189

Skimmed milk is concentrated by freezing out the water the form of ice whilst rotating in a centrifugal machi Freezing is effected by introducing a refrigerator cooled ine into the rotating machine; as the ice accumulates, it separated from the heavier concentrated milk by the ntrifugal action. The cream may then be added to the ndensed milk.—J. F. B.

lood, Milk, &c. in the Form of Dry Powder; Obtaining th Solid Constituents of ——. R. Stauf, Posen, Germany. Eng. Pat. 14,724, Aug. 16, 1900.

he process claimed is carried out by converting the liquid to a fine spray, bringing the spray of atomised liquid into ntact with an ascending current of hot air, so that the liquid nstituents are completely vaporised and the dry powder oduced is collected. The apparatus consists of spray oducing jets supplied with air under pressure, and a shaft rough which a current of heated air passes into a spacious amber in which the dry powder is deposited.—J. F. B.

ennet Ferment; Preparation of ——. J. R. Hatmaker, London, from J. A. Just, New York. Eng. Pat. 877, Jan. 15, 1900.

Liquid extract of rennet is prepared by digesting the omachs in a relatively weak solution of calcium chloride, terwards adding additional calcium chloride to the extract order to precipitate the mucus, which is then removed. or the extraction of the rennet, the inventor prefers an per cent. solution of calcium chloride; this is then made up 10—18 per cent. for the separation of the mucus; more an 18 per cent. of calcium chloride would precipitate the rment. The calcium chloride solutions must be made rfectly neutral to litmus. Both the product and the ocess for making the same are claimed.—J. F. B.

rewers' Spent Grains; Manufacture of a Food from ——. J. Schroeder and L. Diefenthal, Osnabrück, Germany. Eng. Pat. 11,639, June 27, 1900.

he inventors claim the process for the manufacture of a od product, possessing many advantages, by mixing the ent grains from breweries or distilleries with substances ntaining gluten or other nitrogenous proteid bodies and en submitting the product to a baking process as in the nufacture of bread. The use of crude molasses in the xture is also claimed. Crushed rye with a small proporon of flour, is mentioned as giving good results.

—J. F. B.

rbonating Apparatus. E. E. Murphy, Boston, U.S.A. Eng. Pat. 14,136, Aug. 7, 1900.

a carbonating apparatus there are claimed, an inlet e for supplying liquid under pressure, a gas-inlet e for supplying gas under less pressure than that the liquid, a mixing chamber for the gas and liquid constant open communication with the liquid supply der initial liquid pressure, and normally filled with gas d liquid, a valve normally closing said gas inlet pipe by e pressure in said mixing chamber, and adapted to open tomatically by the pressure of the gas, upon a reduction pressure in the mixing chamber below the gas pressure admit the gas which flows into the mixing chamber by its n pressure, independently of the flow of the liquid, means subdividing and combining the gas and liquid," (a tallic sponge composed of layers of wire cloth), "means retarding the flow of the liquid from the liquid supply e into the mixing chamber to allow the gas to fill the xing chamber before it is filled with the liquid, a passage ablishing communication between the mixing chamber d the storage reservoir, a valve controlling said passage, outlet for the carbonated liquid from the storage reservoir, d a valve controlling said outlet." The liquid is admitted der a pressure of from 175 to 200 lb., and the gas at from 5 to 150 lb.—E. S.

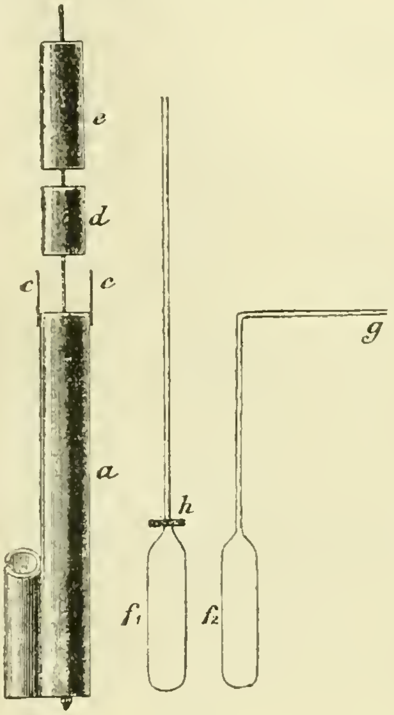
bumin and Meat Extract; Preparation of ——. G. Deycke, Constantinople. Eng. Pat. 16,060, Sept. 10, 1900.

he process for obtaining albumin from flesh, fish, &c., nsists in finely chopping the material, treating it with a –3 per cent. soda lye at about 37° C., filtering, shaking e filtrate with ether, precipitating the albumin by means dilute acid, freeing it from liquid, washing with alcohol and drying. The meat extract is prepared by mixing the liquid which was filtered from the albumin with alkali until it has only a slight acid reaction, concentrating, dialysing, and evaporating to dryness.—J. F. B.

(*B.*)—SANITATION; WATER PURIFICATION.

Water; Apparatus for taking Samples of ——, *for Bacteriological Examination.* H. Röttger. Chem. Zeit. 1900, **24**, 873.

The glass test-tube f_1, of 10—15 c.c. capacity, is drawn out to a capillary at the end. The capillary is bent at right angles in the middle, as in f_2; and after the apparatus has been sterilised by boiling water, it is sealed up vacuous. It is then rested in a brass case *b*, soldered to a lead cylinder *a*, about 2 cm. wide and 20 cm. long, bored throughout its length to pass a cord by which the whole is suspended. At the upper end of the lead cylinder are soldered two brass wires, *c c*. In use, the bulb of the test-tube rests in *b*, and the bent capillary passes between *c* and *c*, which prevent it from twisting round; the loose lead cylinder *d*, threaded on to the cord, and the lead disc *h* resting on the glass portion of the apparatus, serve to keep it in place. The whole is then lowered by means of the cord to any desired depth, the depth being indicated by indicating strings attached to the cord at intervals of 1 metre. As soon as the capillary has reached the position from which the sample is to be taken, the lead cylinder *e*, hitherto held in the hand, is allowed to fall down the cord, the force of impact on reaching *d* serving to break the capillary. The vacuous bulb at once fills with water, and the whole is drawn up to the surface, whereupon the capillary is again sealed up to preserve the sample until it is required for examination.



—W. G. M.

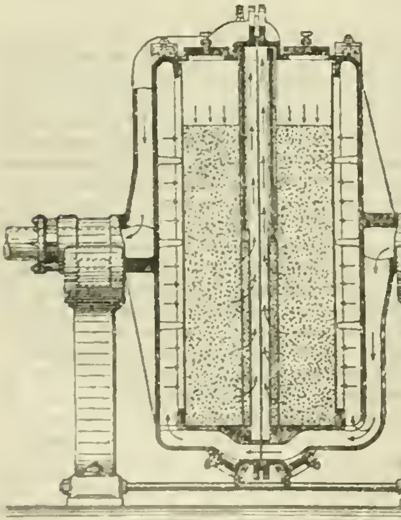
Ferruginous Waters; Purification and Rapid Filtration of ——. O. Kröhnke. Zeits. angew. Chem. 1900, [46], 1154—1161.

Water largely depends for its purity on the amount of natural filtration it undergoes, and this is proportional to the depth from which it is drawn. The water found in low-lying districts often contains iron, which, if present in a greater amount than 1 mgrm. per litre, seriously impairs the industrial value of the water.

The methods of removing iron, however, are now so efficient, that the question of purification should always be considered before costly and uncertain borings are commenced for fresh sources. Iron is usually present as ferrous carbonate or bicarbonate, which on oxidation is converted into insoluble ferric hydrate with liberation of carbon dioxide. The mechanical shock of contact with angular particles, for example, with quartz sand, withdraws an appreciable amount of iron from solution, as laboratory experiments show. If the iron occur as sulphate, its removal is more difficult: chemical means must be employed, such as the addition of lime, magnesite, &c. The purification of potable waters requires extreme care and meets with little favour in Germany. The author reviews the methods of treatment applied to ordinary ferruginous waters, which all depend on oxidation followed by filtration. This may be attained by showering the water through the air and passing it through a surface filter.

A better method is to allow it to percolate through a bed of coke or brick, which after a time still further improves in efficiency, owing to the iron-mud which deposits in its lower layers, and the accumulation of organic matter which exerts a fermentative action. Various types of plant are referred to, including the common household expedients (the animal-charcoal filter and the "Leckfässer," common in some districts). The special advantages claimed for the Linde-Hess filter, consisting of wood-shavings impregnated with tin-oxide as an oxygen carrier, are considered illusory.

The filtering apparatus itself as distinguished from the oxidising portion, requires special consideration owing to the difficulty of effectually cleansing it. Surface filters are cleaned by raking over their contents with or without the aid of a stream of water or high pressure steam. Drum filters, which can be agitated, have many advantages. An American type, illustrated in the original paper, is rotated on a vertical axis, water under pressure being driven through in a reverse direction to that of filtration. The author exhibits a side elevation of the system adopted by the "Allgem. Städtereinigungsgesellschaft" in Hamburg, which consists of a large coke percolator made in sections, so that repairs can be effected without stopping the whole plant, and through which the water passes into a special filter, patented by himself. This is formed of a series of drums, any number of which can be coupled up as desired, mounted on a horizontal shaft. The internal arrangement will be seen from the annexed diagram:—



The water flows in at one end through the hollow axis, passes through the metallic sieve diaphragms into the chambers which are only partially filled with sand, and out again by the axis.

The special advantages claimed are the very la filtering surface and the rapid and effectual method cleaning. For this, the drum or drums are whirled by aid of a windlass, the loose sand scours itself thorougl clean, and the dirt is washed out through the sides again a current of water, the whole operation being automatic occupying but a few minutes.—R. L. J.

Algæ; Soluble Colouring Matter of Blue-Green —— R. Kolkwitz.

See under XXIV., *page* 77.

PATENTS.

Refuse Destructors. A. J. Liversedge, London. Eng Pat. 23,209, Nov. 21, 1899.

The combinations claimed include: two or more ce separated from each other so far as the ash-pits and grates are concerned, but communicating in their up portions; a separate supplementary combustion chamb a special supplementary air duct in the bridge, co municating with a source of air supply under pressu special clinkering or charging doors with small sup mentary openings and doors on their faces; a refuse-stor bunker with distributing and charging trucks, the botto of all being on the same level as each other and as fire-grates of the cells; and an overhead railway w elevating apparatus and clinker trucks or barrows provi with means of attachment to the elevator.—C. S.

Refuse Consuming Furnaces or "Destructors." W. J. G Leyton, Essex. Eng. Pat. 1743, Jan. 27, 1900.

The opening through which the refuse is introduce arranged so as to deliver the same direct on to the hea which latter, and the openings provided for stoking charge, are placed at such a distance above the level of fire-bars, that a body of incandescent fuel is always ready to fire the next supply of refuse and maintain combustion there.—C. S.

Disease Germs; Improved Means for Destroying — C. M. Johnson, Redhill, Surrey. Eng. Pat. 22, Nov. 16, 1899.

Disease germs are destroyed or expelled from the ani system by means of "an electric current of high voltage low ampèrage, producing the violet or ultra-violet ra which may be used alone or "in combination with medici drugs, and chemicals."—L. A.

Sewage to Filters or on to Land; Apparatus for Re lating the Delivery of Liquids, especially in connec with the Delivery of ——. D. Cameron, J. F. Com and A. J. Martin, Exeter. Eng. Pat. 18,322, Sept. 1899.

Referring to previous specifications, Nos. 3003 of 1 and 5671 of 1898 (this Journal, 1897, 459; and 1899, 5 a check-valve is placed in the siphon by which actuating bucket is emptied, so that the filtered efflu from the filter previously filled, which fills the sip may not pass into the bucket thereby. The filling of previous filter will, therefore, have no immediate effect the filter under consideration, but when such previous f is discharged, such discharge will cause the return, thro the siphon, of the contents of the actuating bucket, wh will then rise and permit the opening of the valve admit sewage to the next filter in rotation.

Means are described for definitely storing sufficient li to fill a filter. These consist substantially of a v actuated by a pair of floats immersed, respectively, in liquid on the up-stream and down-stream side of the va A proper opening of the valve is secured by means weighted lever, connected with the floats in such a mar that it opposes their motion, but that such opposi becomes less as soon as such motion has commenced. connection of the valve with the floats is made by mean a slotted link, in such manner that the motion of the f which opens the valve is not communicated to the le until the float has risen sufficiently to cause the weig ver to become overbalanced. The valve is then lifted ght off its seat, and cannot again close until the liquid on he upper side of the valve, has fallen sufficiently to cause he buoyancy of the second float, added to the weight of he first, to again overbalance the lever in the reverse irection.

In order to facilitate the opening of the admission valve) a filter, a cylindrical counterweight is suspended from the alve lever within the discharge well of the filter supplied y such admission valve. When the discharge well fills, he weight of the cylinder will be wholly or partially eutralized, and will therefore not oppose the closing of the dmission valve to the same extent as it would if the cylinder ere still suspended in air.

An improved inlet for admitting crude sewage to a septic ink, furnished with a flap-valve for closing the opening if esired, is also described.—L. A.

acterial Treatment of Sewage Effluent and the Like. R. F. W. Smith and the Pioneer Investment Trust, Ltd., London. Eng. Pat. 550, Jan. 9, 1900.

EWAGE effluent which has undergone treatment in a icteria bed or septic tank is sterilised and aerated by rcing into it ozonised air or oxygen, in order to destroy ithogenic microbes.—L. A.

ewage or other Liquid; Apparatus for the Automatic Intermittent Discharge of ——, to and Withdrawal from Filter Beds. H. B. Killon, Manchester. Eng. Pat. 2647, Feb. 10, 1900.

SERIES of siphons, floats, and valves is so arranged, in onnection with a corresponding series of filter beds and central chamber, that, upon the collection of a regulated iantity of liquid in the central chamber, such liquid is itomatically discharged by one or other of the siphons on one or other of the filter beds. Another series of floats id valves connects the filter beds in such a manner that each filter bed, in rotation, becomes full, the liquid inding in the previously filled filter bed is automatically scharged.—L. A.

ewage and other Effluents, especially of Municipal Draining Systems; Method of and Apparatus for Purifying ——. O. Freysoldt, Stettin, Germany. Eng. Pat. 13,752, July 31, 1900.

HE strained sewage passes into the hollow walls of a ries of heated evaporation chambers, into which it is rayed. The steam or other vapours are exhausted into e air through scrubbers, and the mud flows into a ilecting chamber, or on to a bed of soil.—L. A.

ater; Production of Reagents, specially designed for Purifying ——. H. H. Lake, London. From The Jewell Export Filter Co., New York, U.S.A. Eng. Pat. 12,862, July 17, 1900.

SOLUTION of ferric sulphate is prepared by generating O_2, passing the gas into water, forming ferrous bisulphite y leading the solution of sulphurous acid over iron, and xidising it by means of a current of air.—L. A.

(*C.*)—DISINFECTANTS.

luorescent Bodies; Antiseptic Action of ——. A. Raab. Zeits. für Biologie; through Pharm. Zeit. **45**, [59], 569.

TRONGLY fluorescent bodies, such as acridine, act as owerful antiseptics in sunlight, while they show but slight ction in the dark. Thus, a 1 : 20,000 solution of that body as found to kill infusoria, when exposed to sunlight, in x minutes, whereas, in the dark, the same organisms sisted its action for 24 hours. Similar results were btained with solutions of quinine sulphate and of Eosine. would therefore appear that these bodies act as anti- ptics, not directly from their inherent chemical properties, it indirectly by the chemical activity of the fluorescent ght rays of their solutions.—J. O. B.

PATENTS.

Disinfectant or Deodorising Composition; Manufacture of a New or Improved ——. R. H. Gordon, Glasgow. Eng. Pat. 15,979, Sept. 8, 1900.

THE following ingredients—sulphate of lime, 16 drachms; carbolate of camphor, 1 dr.; carbonate of ammonia, 2 drs.; carmine, 1 grain; strong ammonia solution, 2 fluid drs.; water, 8 fluid drs.—are mixed, and the paste, before it has set, is moulded into tablets or poured into small metal boxes, which can be carried about the person or placed in an apartment or elsewhere.—L. A.

Disinfectant Compound; Improved ——. D. McClellan Kelsey, Saratoga Springs, New York, U.S.A. Eng. Pat. 17,713, Oct. 5, 1900.

THE following ingredients, when mixed together, form a dry powder or flour, which is adapted for sprinkling wherever an effective disinfectant and deodoriser is required:—Hydrated calcium sulphate, 17 parts; charcoal, 2 parts; dried peat, 1 part; sublimed sulphur, 0·3 part; ferric oxide, 0·1 part; crude carbolic acid, 0·04 part.—L. A.

XIX.—PAPER, PASTEBOARD, Etc.

Russian Paper Industry. Papier Zeit. 1900, **25**, [93], 3487—3488.

ACCORDING to a report issued by the Russian Department of Commerce and Industry, on the position of the paper industry up to the end of 1897, paper and the allied industries comprise 558 factories, with an annual production of 51·7 million roubles and employing 39,363 hands.

Paper-making has been established in Russia for 200 years; the principal raw material is still old linen rags, since linen is very plentiful, being worn by the peasant classes. Russia exports large quantities of linen rags, on which there has been for some time an export duty of 0·3 rouble per pood; there is no import duty. The introduction of mechanical woodpulp has caused a considerable lowering of the cost of paper. The grinding of wood has become established in districts where forests and water-power are available. In Finland, especially, this industry has reached large proportions and considerable quantities are exported; Finnish wood cellulose, also, is exported to Russia and other countries. In spite of extensive forests and pyrites deposits, the manufacture of wood pulp in Russia proper (excluding Finland) is not very great, on account of the dearness of fuel, and the greater part of the wood material employed is imported. Roofing boards, made with millboard soaked in pitch, are very largely used in Russia; the home production is not sufficient, and these boards are still subject to a duty of 0·6 rouble per pood. In Russia the production of mechanical wood pulp is estimated at 10,000 tons, and of wood cellulose at 16,000 tons; the imports of wood materials in 1897 amounted to 35,000 tons. Finland is the main source of the mechanical pulp, and most of the cellulose comes from Germany and Belgium.

The most important paper works are in the district of St. Petersburg. Mechanical and chemical wood pulps are used principally in the north and west; in the other parts of the country, linen rags are the chief material. Cotton rags only constitute about 10 per cent. of the total quantity of rags employed. Most of the paper made is of medium and low grade; the demand for high qualities is small and is supplied from abroad. Only three or four factories manufacture products equal to the German standard or "normal paper." The papers containing wood stuff are weaker than German paper of the same class.

Amongst the allied industries, the manufacture of wall paper takes the first place; this industry has attained a high development and the products are exceptionally good.
—J. F. B.

Paper; Detecting Forgeries on ——. G. Bruylants and L. Gody. Paper read before the Belgian Academy of Medicine. Scientific American Supplement, 1900, **50**, [1300], 20,833.

THE authors communicate a method for the detection of frauds and alterations on business papers. They found that if the paper under examination be subjected to the action of iodine vapour, any irregular wetting or rubbing is plainly indicated. The erased surfaces assume a yellow or brownish tint. If, after being subjected to the action of the iodine, the paper on which an erasure has been made be moistened, it becomes of a blue colour, the intensity of which varies with the length of time of contact between the paper and the iodine vapour, whilst, after again drying, the erased portions are more or less darker than the remainder of the sheet. When the erasure has been so rough as to remove a considerable portion of the material, exposure to iodine vapour, wetting, and drying, result in less intensity of coloration on the parts erased. The action of the iodine also differs according to the quality of the paper. It is stated that irregular wetting and rubbing can be detected by this process after the lapse of three months. More characteristic, but considerably weaker, reactions are obtained if the paper, before examination, be immersed in a water-bath for 3—6 hours.—A. S.

PATENTS.

Material resembling Celluloid, and for other Purposes: Glazing, Covering, and Moulding of Surfaces for Producing ——. C. Hellriegel, London. Eng. Pat. 22,186, Nov. 6, 1899.

Instead of making articles entirely of celluloid, a foundation of pasteboard, paper, or similar material, shaped, coloured, and printed as required, is coated with a thin layer of collodion in a centrifugal machine; it is then placed in a machine of special design, and first hot- and then cold-pressed under moulds or forms. The working table rotates round a vertical axis in such a manner that the action of the press is continuous. The process and the machine are claimed.—R. L. J.

Material suitable for Wrapping Purposes, also for the Manufacture of Envelopes as well as Bags for the Reception of Various kinds of Produce, such as Bacon, Hams, Flour, Frozen or Chilled Meat, and the Like; Manufacture of ——. W. J. Ward, Longsight, Manchester. Eng. Pat. 23,603, Nov. 27, 1899.

Calico, muslin, or the like is placed on rollers and run on the surface of the endless wire of a paper-making machine. The prepared pulp is run on the material and wire. The whole goes through the various rollers and drying cylinders and can afterwards, if required, be run through a bath of melted wax, the excess of wax being afterwards squeezed out.—C. M.

Celluloid in Films, Pellicles, and other Forms; Manufacture of ——. O. Imray, London. From The Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a. Main, Germany. Eng. Pat. 25,434, Dec. 22, 1899.

Certain aromatic sulphonic acids, either separately or mixed, of the general formula, $R.SO_2.A$, where R denotes an aromatic radical or its substitution product, and A is an aliphatic or "aromatic ether residue," or a substituted NH_2 group (*e.g.*, glyceryl paratoluene sulphonate, paratoluene sulphonamide, or paratoluene alkyl amide), may be used as substitutes for camphor in the manufacture of celluloid. Films or pellicles may be also produced, on photographic paper, for example, by adding one or more of these compounds in small quantity to the ordinary solution of nitrocellulose. Cloth may be similarly impregnated. The substitutes, and films made in the way described, are claimed.—R. L. J.

Fireproof Wood-Pulp for use in the Manufacture of Boards and other Articles; Making ——. F. E. Keyes, New York, U.S.A. Eng. Pat. 4309, March 6, 1900.

The fireproofing solution itself is used in the grinding machine instead of water only, thus avoiding the expense of drying the screened pulp, and mixing it with the solution in a special beater. The impregnated pulp is pressed and dried in the usual manner.—R. L. J.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Cerite Earths of Monazite Sand; Separation of ——. R. J. Meyer and E. Marckwald. Ber. 33, [1 3003—3013.

The raw material used consisted of a mixture of oxalates of cerium, didymium, and lanthanum, with sm quantities of yttrium earth oxalates. It contained 25 cent. of water, as determined *by combustion*, it bei impracticable to dry the oxalates at a sufficiently hi temperature, owing to the risk of decomposition.

Conversion of Oxalates into Soluble Nitrates.—T oxalates are boiled with KOH solution, with the addition hydrogen peroxide. The oxalic acid is completely deco posed, and a yellowish, crystalline precipitate is obtain containing the Ce as a mixture of ceric hydroxide a peroxides. The precipitate is sucked off by a filter pun washed, dried at 120° C., and it then dissolves readily concentrated nitric acid to a dull-red solution. Drying t precipitate for some time at 120° C. is necessary for destr ing the peroxides; otherwise, on subsequently dissolving HNO_3, these would act like H_2O_2, causing partial reducti of the ceric solution.

If it is not desired to obtain the Ce at once in the ce form, the oxalates are added gradually to twice their wei of nitric acid (1·4 sp. gr.), and the liquid is kept boili with the occasional addition of a few drops of fuming nit acid, till the development of gas ceases, the oxalic a being thus destroyed. If not boiled long enough, oxa nitrates are formed, which would separate out on cooling

To the brownish nitric-acid solution, ammonium nitr is added (80 grms. per 100 grms. of the original oxalate and on evaporating the solution to about one-third of volume and cooling, the double nitrates crystallise almost quantitatively.

Separation and Purification of the Ceria.—Witt a Theel's process (this Journal, 1900, 766) is recommend for this purpose: it consists in oxidising the Ce by mea of ammonium persulphate, in a solution of the nitra which is kept neutral by the addition of $CaCO_3$. This p cipitates the Ce to the last trace, but the precipit (consisting of basic ceric sulphate and $CaSO_4$, with sm quantities of Di and La salts) cannot be completely fr from Di and La by a reasonable amount of washing. I dried at 120° C., powdered, and dissolved in 10 times its wei of warm, boiled-out nitric acid (1·4 sp. gr.); ammoni nitrate, dissolved in a small quantity of water, is added amount equal to 1½ times the weight of the dried p cipitate; and the double nitrate $(NH_4)_2Ce(NO_3)_6$ cryst lises out quickly in a fairly pure condition. It is purif by recrystallising once or twice from concentrated nit acid; the crystals are sucked off on a platinum cone, a are dried over H_2SO_4 and KOH. The pure ceria obtai on igniting some of the double nitrate will have a very p yellow tint, which does not disappear on further purificati of any kind. In making this test the salt should be igni on porcelain and not on platinum, as the latter is distinc attacked and colours the oxide.

Separation of the Yttrium Earths.—In the present ca where the proportion of yttrium earths is small, precipi tion by K_2SO_4 is good enough. The filtrate from t cerium separation is heated to boiling, and while a stro current of steam is passed through it, finely ground K_2S is added in small portions till the Di absorption lines ha almost disappeared from the solution. The fractionati should not be carried further, to avoid precipitation yttrium earths; the loss of Di and La is trifling. The l liquid is decanted from the crystalline precipitate, which sucked off and washed with cold saturated K_2SO_4 solutio

Conversion of the Double Sulphates into Nitrates.—T sulphates are boiled for a short time with five times th weight of concentrated nitric acid, and the mixture poured into boiling water (1,500 c.c. per 100 grms. double sulphates), complete solution ensuing. Ammoni oxalate is added (75 grms. per 100 grms.), and stro ammonia to saturation; the precipitated oxalates are suck ff and converted into nitrates by boiling with nitric acid as bove described. The liquid is evaporated on a water-bath ll no more HNO_3 is given off, and the syrup is diluted ith hot water.

Separation of Didymium and Lanthanum.—The authors onsider the method consisting in the fractional precipita- on of the boiling, nearly neutral, nitrate solution with nely sifted magnesia (Muthmann and Rölig's process; nis Journal, 1898, 789) is the best in every respect for nis purpose. The material should be subjected twice to ns treatment.—H. B.

are Earths; Combination of Hydrogen with the Metals of the ——. C. Matignon. Comptes Rend. **131**, [22], 891—892.

y reducing the metals from their oxides by means of agnesium, in an atmosphere of hydrogen (see next bstract), the author has shown that thorium, cerium, nd lanthanum (in the case of these three confirming Vinkler's work), praseodymium, neodymium, and samarium ll combine rapidly with hydrogen, producing when cold a arometric vacuum in the apparatus. These hydrides ssociate at high temperatures; and the same apparatus in hich they are prepared allows of the measurement of eir dissociation pressures at various temperatures.
—J. T. D.

are Earths, Metals; Direct Combination of Nitrogen with ——. C. Matignon. Comptes Rend. **131**, [21], 837—839.

HEN the oxides of these metals are heated with slight excess magnesium powder, in sealed tubes containing nitro- n, the magnesium reduces them to the metals, which then mbine directly with the nitrogen, producing a vacuum in e tube. If the tube contains atmospheric air, a mixture oxide and nitride of the metal is formed, and the argon ntained in the original air is left. Nitrogen thus unites th thorium, cerium, lanthanum, praseodymium, neody- ium, and samarium. Winkler had already proved that e first three of these are reducible from their oxides by agnesium; these experiments establish the fact for the t three. The heats of formation of thorium and cerium ides are greater than those of the other oxides; samarium ide seems to have the smallest heat of formation. By parating the mixture in the tube into two portions, hausting the nitrogen by heating one portion, and then plying heat to the other, the pure metal is obtained, ixed with excess of magnesium, which can be distilled off n longer application of heat.—J. T. D.

Cinchona Alkaloids. W. v. Miller and G. Rohde.
Ber. 1900, **33**, [17], 3214—3237.

inchotoxine is an isomeride of cinchonine, obtained by ating that alkaloid in acetic acid solution for 36 hours der a reflux condenser. The differences in crystallo- aphic form between cinchotoxine and the cinchonicine, tained by Pasteur by heating cinchonine and cinchoni- ne salts, are now found to be due to dimorphism; the two bstances are thus identical.

Isonitrosocinchotoxine, $C_{19}H_{21}N_3O_2$, is obtained by the tion of amyl nitrite (1 mol.) upon cinchotoxine in the esence of sodium ethylate (1 mol.). By the action of ethyl iodide in chloroform solution, it gives an addition mpound, from which the hydriodic acid is not removed caustic alkalis, but only by the prolonged action of cess of sodium ethylate. The separated base is probably entical with the isonitroso compound of Claus's so-called ethylcinchonine. The action of excess of amyl nitrite on cinchotoxine produces a substance identical with troso-isonitrosocinchotoxine (Ber. **28**, 1070).

Quinotoxine is the isomeride of quinine corresponding to nchotoxine, and is obtained in a similar manner. It is entical with Pasteur's quinicine. The simplest method of eparation is as follows:—Quinine is dissolved in the oper quantity of dilute sulphuric acid; the solution of e bisulphate is evaporated in a dish until a pellicle forms, d is then further evaporated in a large conical flask in an -bath at 140°—150° C., the water vapour being aspirated ay. The crystalline cake melts to a brown mass, and is n transformed into the isomeric quinicine bisulphate after 1—2 hours. The base is set free by caustic soda, dissolved in ether, the solution dried over potash, filtered from unchanged quinine, and the solvent removed. The base may be purified by recrystallisation of the oxalate or tartrate, but cannot itself be obtained crystalline.

Quinotoxine unites with *p*-bromphenyl-hydrazine, forming a hydrazone. Nitrous acid converts quinotoxine into the nitroso-compound $C_{20}H_{23}N_3O_3$, and the nitroso-isonitroso-compound $C_{20}H_{22}N_4O_4$. The former gives a crystalline hydrazone, melting at 140° C., with phenylhydrazine. Methyl iodide converts quinotoxine into methylquinine and its iodomethylate. Isonitrosoquinotoxine is obtained in a similar manner to isonitrosocinchotoxine; its compound with methyl iodide is similar to the corresponding derivative of cinchotoxine.—A. C. W.

α- *and β-Isocinchonine.* Z. H. Skraup and R. Zwerger. Monatsh. für Chem. **21**, 535—563. *β-Isocinchonine; Constitution of ——.* Z. K. Skraup, H. Copony, and G. Medanich. Monatsh. für Chem. **21**, 512—534.

BOTH of these alkaloids are obtained from cinchonine by heating it on the water-bath with sulphuric acid of sp. gr. 1·7; the α-compound is formed first, and on further heating is transformed into the β-compound. To obtain the latter, 15 grms. of cinchonine bisulphate are heated with 60 c.c. of sulphuric acid for about 40 minutes, the mixture quickly cooled and poured on ice. The acid is then nearly neutralised with ammonia, ether and excess of ammonia are added, and the alkaloid is thoroughly extracted with more ether. After distilling off the ether, the residue is treated with hot hydrochloric acid (about 5 × normal) till just acid; on cooling, the bulk of the alkaloid separates as hydrochloride, and a second crop can be obtained from the mother-liquors. A single recrystallisation yields a perfectly pure product.

Both α- and β-isocinchonine agree with cinchonine in forming addition compounds with hydriodic acid; and as they also, like cinchonine, yield on oxidation formic, as the only volatile acid, they probably contain the same vinyl group as cinchonine. Moreover, β-isocinchonine, like cinchonine, yields, with methyl iodide, two isomeric quaternary iodethyl compounds; one white and stable, the other yellow and unstable.

But while cinchonine contains a hydroxyl group, the authors could not obtain evidence of a hydroxyl group in α- or β-isocinchonine, nor of a ketonic group.

Cinchonine, when its acid sulphate is heated, is converted into the isomeric cinchonicine, which is ketonic. Both α- and β-isocinchonine also undergo isomeric change when similarly treated; but while the α-compound yields two isomers, that chiefly formed being ketonic, the other not, the β-compound yields but one, which has no ketonic group.

Both α- and β-isocinchonine yield, on oxidation with chromic acid, products similar to those from cinchonine; that is to say, not only cinchoninic acid, but also meroquinine or analogous substances.

Both from their mode of preparation, and from the action of heat on the acid sulphates, it would seem that the α-compound is constitutionally nearer to cinchonine than is the β-compound.—J. T. D.

Alkaloids; Precipitation of ——, by Picric Acid. T. Chandelon. Assoc. belge des Chim. Through Chem. Zeit. 1900, **24**, [89], 974.

THE author has previously described the separation of certain alkaloids from the viscera of animals, and the identification of the former by precipitation with oxalic acid (see this Journal, 1885, 554). He has now investigated the utility of picric acid for the same purpose, employing pure alkaloids in the following manner:—

0·01 grm. of alkaloid was placed in 15 c.c. of dry ether and allowed to stand for 48 hours. 3—4 c.c. of the clear liquid was then mixed with an equal volume of a concentrated solution of picric acid in cold dry ether. Three degrees of solubility were thus observed, the alkaloids marked with an asterisk being only partially soluble in the given amount of ether:—

(*a*) *Entirely Precipitated.*—Cocaine (crystalline), quinidine (amorphous), *atropine (crystalline), pilocarpine, and *strychnine.

(b) *Entirely Unprecipitated.*—Coniïne, veratrine, *solanine, narcotine, *colchicine, *aconitine (crystalline), *caffeine, and *theobromine.

(c) *Partially Precipitated.* — Quinine (amorphous), *codeine, brucine (crystalline), *cinchonine, nicotine, thebaine, and papaverine.

Of the first and last series, quinine, quinidine, nicotine, strychnine, and brucine separated immediately; the others in the course of 24 hours. From weaker solutions, the crystals grow larger, but more slowly. Each alkaloid (except brucine) has, from a given solvent, a single characteristic crystalline form, which may be readily recognised and distinguished under the microscope, if the crystals are protected from evaporation of the solvent on the object glass, by flooding them with paraffin oil, after decanting the mother liquor. Brucine crystallises in two ways, either as large rectangular prisms truncated on two sides of the ground line (basal pinakoids), or as spherical conglomerates with a polarising effect like that of starch grains; but these never appear together from the same solution. The alkaloids may be recovered from the picrates in the usual manner.

The above results are only true when precipitation is effected from ether. If chloroform is substituted, the change may affect (1) the solubility of the alkaloidal salt, coniïne picrate, for example, being insoluble in chloroform; (2) the crystalline form, *e.g.*, nicotine picrate crystallises better from chloroform than from ether, and with a different habit.

Contrasting these observations on the picrates with those previously made on the oxalates, it appears that the two derivatives of a given alkaloid may differ (1) as to solubility; coniine, for instance, is precipitated by oxalic and not by picric acid; and (2) as to crystalline habit in a marked manner in cases where both are insoluble. Thus, strychnine oxalate forms needles, and the picrate rhombic tablets with saw-like markings.—R. L. J.

Strychnine and Brucine; Action of Bromine on ——. C. Kippenberger. Zeits. anal. Chem. 1900, **39**, [10], 609—627.

Action of Bromine Water containing Bromine Salts.—On mixing a solution of a strychnine salt with bromine water containing, *e.g.*, 50 grms. of KBr per litre, the nearly insoluble hydrobromic acid monobromstrychnine superbromide is formed ($C_{21}H_{21}BrN_2O_2.HBr.Br_2$); but when there is a large excess of bromine, the corresponding dibrom-superbromide is produced in slight amount.

If, in the reaction, large quantities of a bromine salt be present, and the strychnine salt solution contain some free acid, the superbromide ($C_{21}H_{22}N_2O_2.HBr.Br_2$) is formed, together with some of the superbromide ($C_{21}H_{22}BrN_2O_2.HBr.Br_2$). The production of the latter is favoured by the addition of sodium chloride. These compounds are slightly soluble in water, and the solubility is increased by acids.

Brucine under analogous conditions forms corresponding compounds, but its hydrobromic acid superbromides are much more soluble than the strychnine compounds.

From the results of his experiments the author concludes that no exact analytical method for the quantitative estimation of strychnine and brucine can be based on the reaction between these alkaloids and bromine.—C. A. M.

Terpenes and Essential Oils. O. Wallach. XLIX. Annalen, 1900, **313**, [3], 345—370.

Phellandrene.—In preparing the nitrosite, the mixture of phellandrene and sulphuric acid should be stirred continuously whilst the sodium nitrite solution is being dropped in; the temperature should not exceed 4° C. The crude product is very unstable, and should be rapidly purified; it is dissolved in the least quantity of chloroform, a little alcohol and ether added, and the clear liquid cooled in ice for 3—4 hours, when crystallisation occurs. The freezing-point method indicates the double formula $(C_{10}H_{16}N_2O_3)_2$.

On oxidation by strong nitric acid, phellandrene nitrosite gives two isomeric compounds $C_7H_{10}N_2O_4$, terephthalic acid, isopropylsuccinic acid, and an isomeride of the last named. Oxidation by permanganate produces isoprop succinic and isobutyric acids.

Reduction of Terpinene Nitrosite.—The nitrosite w rapidly reduced in alcoholic solution by sodium. T products were distilled in steam, the distillate was caught an aqueous solution of oxalic acid, from which, after remo of the alcohol, ether extracted neutral products. The ba products were obtained by adding alkali, and were th purified by distillation *in vacuo*. The base, $C_{10}H_{17}N$ boils at 209°—210° C.; its carbamide melts at 171° C. af recrystallisation from methyl alcohol. It is not identi with any compound hitherto known. By the action nitrous acid, followed by oxidation with chromic acid, was converted into an unknown ketone of carvone-l odour, which forms an oxime melting at 96°—98° C. T non-basic products of the reduction contained cymene an ketone, $C_{10}H_{16}O$, which forms an oxime melting at 83°—84° When the oxime is warmed with sulphuric acid it regenera a ketone of pure carvone odour.

Oxidation of Pinene.—When oil of turpentine has b oxidised by means of potassium permanganate in order obtain α-pinonic acid (Ber. **29**, 22), a camphoraceous smel noticed on evaporating the liquid. The volatile substa was obtained by distilling and fractionating the distillate. The fractions boiling between 170°—2 and 200°—215° C. reacted with semicarbazide soluti The semicarbazone is derived from a ketone, $C_9H_{14}O$, boil at 209°—211° C., and identical with the nopinone obtai by Villiger by the oxidation of nopinic acid (Ber. 1927). The oxime could not be obtained crystalline, the ketone forms a very characteristic compound w benzaldehyde, $C_9H_{12}O:CH.C_6H_5$. It is obtained allowing a mixture of equal mols. of the two substances stand with sodium ethylate for some time, and then dilut with water; the compound crystallises from methyl alco in colourless transparent crystals, which melt at 106° C.

Pinocamphone, $C_{10}H_{16}O$, is a ketone obtained, toget with pinylamine, by the reduction of nitrosopinene. oxime melts at 86°—87° C.; on reduction by sodium alcoholic solution it yields pinocamphylamine, $C_{10}H_{17}N$ a liquid base which combines with carbonic acid.—A. C.

Geranium; Development of Terpene Compounds in t ——. E. Charabot. Comptes Rend. **131**, [20], 806—

The author has examined geranium oil prepared fr the green plants in July and in August, and from completely matured plants in September. (Compare, lavender and mint, this Journal, 1900, 272 and 372.) finds that, as the plant matures (1) the acidity diminish (2) the oil becomes richer in esters; (3) the amo of total alcohol slightly increases, but that of free alco diminishes; (4) the proportion of rhodinol to gera increases. He finds that before maturity there exist n traces of a ketonic constituent (menthone) or none all; also that this is formed at or after maturity, w the plant possesses its maximum respiratory activ The rhodinol is possibly formed by hydrogenation of geraniol (Tiemann has already realised this reaction the laboratory), but the author will not yet com himself to this hypothesis; while the menthone is probably formed from the rhodinol by its oxidation rhodinal, which (this Journal, 1900, 769) is then conve by isomeric change into menthone.—J. T. D.

Sandal Wood [Amyrol], West Indian ——. H. v. So and W. Rojahn. Chem. Zeit. Rep. 1900, **24**, [94], 34

It has already been shown (this Journal, 1900, 464) West Indian sandal wood contains a new sesquiterp alcohol, $C_{15}H_{25}OH$, termed amyrol. According to investigations this amyrol contains mixed with it an isom alcohol. Amyrol boils at 299° C., has a rotation + 36 a specific gravity at 15° C. of 0·987. It is converted dehydrating agents into a sesquiterpene, $C_{15}H_{24}$. Sa wood contains another compound, *Amyrolin*, $C_{24}H_{12}O_3$, wh separates from alcohol in colourless slightly fluores crystals, melting at 117° C. Amyrolin dissolves in alcoh potash with a yellowish-green fluorescence; on prolon boiling, the potassium salt of an acid is formed, which not yet been obtained in a pure state.—T. A. L.

Thujene, a New Tricyclic Terpene. L. Tschugaeff. Ber. 1900, **33**, [16], 3118—3126.

SEMMLER, who discovered thujone, could not obtain thujene from thujyl chloride (Ber. **25**, 3343). Also Wallach (Annalen, **272**, 111 ; **286**, 107) and Semmler, by the dry distillation of thujylamine hydrochloride, obtained a terpene, "thujene or tanacetene." It is apparently a monocyclic compound. Wallach has found that isothujylamine hydrochloride yields a terpene on dry distillation, which is most probably identical with the above thujene. This compound, n view of its relationship to isothujone, should be called sothujene. The true tricyclic thujene has now been prepared by the author.

Thujone was reduced to thujyl alcohol by boiling with odium in absolute alcohol. Thujyl alcohol was boiled with sodium and toluene or xylene on the sand-bath, the soluion was poured off from the sodium and treated with carbon bisulphide and methyl iodide, in order to obtain thujylxanhogenic methyl ester. After distilling off volatile matters n steam, the residue was taken up in ether, the solution dried, ether driven off, and the residue subjected to dry distillation. The distillate was rectified and boiled over sodium ; t then forms a limpid liquid of slight odour, boiling at 51°—152°·5 C., and with the specific gravity $d\,\frac{20°}{4°}$ = 0·8275. It thus differs in physical properties from all erpenes hitherto known ; it also differs in chemical properties. It produces no nitrosochloride. The action of two toms of bromine gives, with evolution of hydrobromic cid, a reddish-brown syrup, soluble in alcohol to a deeped solution. Thujene is rapidly oxidised in the air; it nstantly decolorises permanganate. Thujene, as also pinene and limonene, when shaken with a hot strong soluion of mercuric acetate containing free acid, gives in a few minutes a fine pearly crystalline substance, insoluble in most organic solvents and in water. The author has not yet been able to regenerate unaltered thujene from this ompound.—A. C. W.

Rose Oils; Occurrence of Phenylethyl Alcohol in ——. H. von Soden and W. Rojahn. Ber. 1900, **33**, [16], 3063—3065. (See also this Journal, 1900, 768—769; 1036 and 1037.)

THE small proportion of phenylethyl alcohol in rose oils distilled by steam, as compared with the large percentage n extracted oils, is due to the considerable solubility of the alcohol in water ; it is contained in the distilled water, from which it may be extracted by ether. The hypothesis of Walbaum, that the alcohol is not developed in the rose petals until they are dry, is therefore unnecessary. Stephan and Walbaum obtained mere traces of phenylethyl alcohol n working up 11 kilos. of German rose oil; the authors obtained larger quantities (though still a small percentage) by extraction with dilute caustic soda. Thus it is possible hat the alcohol is present partly in the form of esters. Rose preparations obtained by extraction should contain a arger proportion of the alcohol ; two technical products have now been examined :—

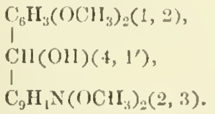
Rose Pomade, prepared by the maceration of fresh roses with warm fat. By the method of Hesse (this Journal, 1899, 396) 0·56 per cent. of volatile oil was obtained from the pomade. That portion of the volatile oil which was extracted from the water coming over in the steam distilation was several times shaken with 4 per cent. caustic soda solution. The phenylethyl alcohol dissolved was then extracted by ether; it constituted 46·5 per cent. of the total volatile oil.

"*Rose Pure*," a brownish-yellow viscous oil, obtained by the extraction of free rose petals by means of a volatile solvent. This oil was distilled with steam until the distillate was almost odorless. The phenylethyl alcohol, obtained as before, was 25 per cent. of the total volatile oil.

This alcohol is thus a normal and important constituent of the essential oil of roses. Small quantities were also found in Bulgarian (Turkish) rose oil.—A. C. W.

Papaverinol. L. Stuchlik. Monatsh. für Chem. 1900, **21**, [8], 813—830.

ACCORDING to Goldschmidt, papaverine is a tetramethoxybenzylisoquinoline ; on oxidation by potassium permanganate it forms a ketone, which, on reduction, should yield the alcohol, papaverinol—



$$\begin{array}{l} C_6H_3(OCH_3)_2(1,\ 2), \\ \mid \\ CH(OH)(4,\ 1'), \\ \mid \\ C_9H_4N(OCH_3)_2(2,\ 3). \end{array}$$

The best yield is obtained by adding a slight excess of zinc dust in small quantities at a time to a solution of papaveraldine in glacial acetic acid, heated on the water-bath. After diluting and removing zinc as sulphide, sodium carbonate was added almost to neutralisation, and the solution then precipitated by ammonia. The precipitate was dissolved in dilute hydrochloric acid, the solution filtered from unreduced papaveraldine, decolorised by animal charcoal, the base precipitated by ammonia, and recrystallised from methyl alcohol. The small, almost white, needles melted at 137° C. Papaverinol is readily soluble in organic solvents, but very slightly soluble in water. The hydrochloride is very soluble and difficult to crystallise ; it was obtained crystalline by dissolving the base in dry ether, passing in dry hydrochloric acid gas, dissolving the precipitate in alcohol, and adding ether to incipient turbidity. After some hours the salt then separates in fine yellowish needles, forming star-shaped groups. It begins to darken at 180° C., and melts at 200°—202° C.

Papaverinol hydrochloride is similar as regards physiological effect to papaverine.—A. C. W.

Nitrosalicylic Acid and Nitrosulphonic-salicylic Acid. R. Hirsch. Ber. 1900, **33**, [17], 3238—3241.

AN almost quantitative yield of nitrosalicylic acid is obtained by the following process :—100 grms. of salicylic acid are dissolved in 300 grms. of cold strong sulphuric acid. The mixture is cooled to 0° C., and a mixture of 90 grms. of nitric acid and 270 grms. of sulphuric acid then added in portions. The temperature must not exceed 10° C. The excess of acid is drained off, and the residue twice boiled with 2 litres of water. Nearly pure α-(m)-nitrosalicylic acid remains.

Nitrosulphonic-salicylic acid is obtained by heating 100 grms. of salicylic acid for 30 minutes on the water-bath with 500 grms. of sulphuric acid, allowing to cool to 30° C., and adding a mixture of 90 grms. of nitric acid and 270 grms. of sulphuric acid in portions of 10 c.c., the temperature being kept between 30° and 40° C. Excess of acid is drained off, the residue dissolved in water, and the solution neutralised by barium hydrate. On cooling, the neutral salt separates in fine yellowish-red needles.—A. C. W.

Poisonous Boraginaceæ. K. Greimer. Archiv. **238**, 505. Pharm. J. 1900, **65**, [1584], 490.

THE author found that *Anchusa officinalis*, *Cynoglossum officinalis*, and *Echium vulgare* all contain a poisonous alkaloid, cynoglossine. The physiological action of this alkaloid is similar to that of curare. *Symphytum officinalis* also contains a toxic alkaloid, *symphyto-cynoglossine*, similar in chemical constitution to cynoglossine, but differing in its physiological action. The above-mentioned plants also contain a notable quantity of choline, and a toxic glucoside, *consolidin*, which, when hydrolysed with acids, splits up into glucose, and an alkaloid, *consolicine*. The latter is three times as powerful, as regards its physiological action, as the glucoside, consolidin, from which it is derived.—A. S.

Angophora; New Species of ——. R. T. Baker. Proc. Linn. Soc. N.S.W. 1900, 84. Pharm. J. 1900, **65**, [1584], 489.

THE New South Wales tree, popularly known as "Coolabah," appears to constitute a new species, and is named by the authors *Angophora melanoxylon*. It is a medium-sized tree, from 40 to 50 ft. high, and with a diameter up to 3 ft. ; the bark is somewhat similar to a "Box" bark, and is much less fibrous than that of *A. subvelutina*, F. v. M., or *A. intermedia*, D.C. The botanical characters of the tree are described in detail. The kino obtained from the tree forms brownish coloured, very friable masses, having a dull fracture. It is but little soluble in cold water, forming a whitish turbid solution; the turbidity disappears on boiling, but again appears when the hot solution is cooled. The substance causing the turbidity was extracted with ether, and was found to be aromadendrin. No eudesmin is present. The presence of that substance in the kinos of some Angophoras indicates a chemical connection between those trees and the Eucalypts. Eudesmin appears to be the more common in the Eucalypts, but in the kinos of some species, both eudesmin and aromadendrin are present: up to the present, aromadendrin alone has only been found in one species, *E. calophylla* of Western Australia. The tannin present in the kino of *Angophora melanoxylon* gives a green coloration in a very dilute aqueous solution, with one drop of ferric chloride solution, and in that respect differs from the kino of *E. calophylla*, which gives a blue coloration under similar conditions.—A. S.

Aloïn: Oxidation of ——, by means of Potassium Persulphate and Caro's Acid. E. Seel. Ber. 1900, **33**, [17], 3212—3214.

The author has examined the products of the oxidation of aloïn from Barbados aloes. The action of potassium persulphate yields different products according to the quantity of the reagent, excess of which produces a pale-red compound in almost quantitative yield. It appears to be an unstable oxygen addition compound. It is also formed by the electrolytic oxidation of aloïn in dilate sulphuric acid, or by means of potassium percarbonate. Caro's reagent, obtained from potassium persulphate and sulphuric acid (this Journal, 1900, 172), or Baeyer's mixture of hydrogen peroxide and sulphuric acid (Ber. **33**, 124), produces a brownish-red powder, from which chloroform extracts tetrahydroxymethyl-anthraquinone, $C_{15}H_{10}O_6$.
—A. C. W.

Erysimin; New Glucoside from Erysimum Seeds. Schlagdenhauffen and Reeb. Comptes Rend. **131**, [19], 753—755.

The seeds of various species of *Erysimum*, freed from fatty matters by extraction with petroleum spirit, are lixiviated with alcohol; the residue, after evaporating the alcoholic solution, is dissolved in water, precipitated by sodium sulphate, and the precipitate redissolved and reprecipitated by sodium sulphate two or three times. The crude glucoside is dissolved in alcohol, the solution filtered and evaporated, the residue dissolved in water and precipitated by lead acetate. After removal of the lead by sulphuric acid and neutralisation by ammonia, the solution is evaporated to dryness and the residue extracted with alcohol. Evaporation of the alcoholic solution yields the pure substance. This is a pale-yellow amorphous mass, slightly hygroscopic, soluble in water or alcohol, not in ether, chloroform, benzene, or carbon bisulphide. It melts at 190° C., and begins to decompose at a slightly higher temperature. It gives the reactions of a glucoside, and the results of analysis are expressed by the empirical formula $C_4H_7O_2$. It is a violent poison to warm-blooded animals and to frogs.

The seeds appear also to contain an alkaloid, which, however, the authors have not yet obtained in a pure state.
—J. T. D.

Frangula, Sagrada and Rhubarb, Soluble Active Glucosides of ——. E. Aweng. Apoth.-Zeit. **15**, 537. Chem. Centr. 1900, **2**, [14], 766.

The author has before shown that the above-mentioned drugs contain two groups of active constituents; the primary glucosides easily soluble in water, and the secondary glucosides slightly soluble in water. Both groups are completely extracted by 70 per cent. alcohol.

Frangula Bark.—If the alcoholic (70 per cent.) extract be evaporated to expel the alcohol, then treated with dilute ammonia, and the solution faintly acidified with acetic acid, the secondary glucosides separate in large flocks, and can be easily filtered off, whilst the primary glucosides remain in the filtrate. The latter contains Kubly's "frangula acid." This may be obtained in a crystalline form from a mixture of equal parts of benzene and absolute alcohol; if it be heated in aqueous solution for a long time, the acid becomes insoluble, but again becomes soluble if dissolved in ammonia and reprecipitated with acetic acid. Baryta water does n produce a precipitate in the aqueous solution of the ac although the foreign substances that are contained, togeth with "frangula acid" in the aqueous percolate of the ba and are also present in Kubly's red acid, are precipitated this reagent. The pure acid reddens blue litmus paper. is a secondary glucoside, and on hydrolysis yields, besid the sugar, frangularhamnetin, which dissolves in concentrat alkali to a yellowish-red solution, changing to golden-yell on dilution, and is probably a decomposition product rhamnetin.

The secondary glucosides of frangula bark cont emodin, chrysophanic acid and frangulin, soluble in benzer a glucoside soluble in a mixture of benzene and absol alcohol, which yields emodin on heating with dil sulphuric acid; and another glucoside, insoluble in t solvents mentioned, but which dissolves in caustic soda a violet solution, and corresponds to the "eisenemodi described by the author.

Sagrada.—The secondary glucosides have not yet b examined. The primary glucosides contain "frang acid" and a glucoside, which on hydrolysis yields emod The two glucosides may be separated by 96 per cent. alcoh The *emodin glucoside* is almost completely precipita from its aqueous solution by baryta, gelatin solution, a formalin.

Rhubarb.—Only the primary glucosides were examin They contain the same compounds as those of sagra With ammonia, "frangula acid" (from all three dru gives yellow, emodinglucoside (from sagrada and rhubar bright raspberry-red solutions. Emodinglucoside appe to be more active than "frangula acid," and this f becomes important in connection with the valuation rhubarb.—A. S.

Corybulbine into Corydaline; The Conversion of — Alkaloids of Corydalis Cava. J. J. Dobbie, A. Laud and P. G. Paliatseas. Proc. Chem. Soc. **16**, [229], 2 (See also this Journal, 1896, 125—826.)

Corydaline, $C_{18}H_{15}NO(OCH_3)_4$, differs from corybulbi $C_{18}H_{16}NO(OCH_3)_3$, by CH_2, and contains four metho groups, whilst the latter alkaloid contains only three. T authors have now proved that corybulbine contains hydroxyl group and forms a mon-acetyl derivati $C_{18}H_{15}N(OCH_3)_3O.C_2H_3O$. By treatment with concentra hydrogen iodide the two alkaloids yield the same phen derivative, $C_{18}H_{15}N(OH)_4HI$. Corybulbine can be read converted into corydaline by treatment with equival quantities of methyl iodide and potassium hydroxide methyl alcohol solution. The artificial corydaline agrees melting point, solubility in various reagents, and spec rotation with the natural alkaloid. The platinichlori ethyl sulphate, and hydroiodide of the natural and artifi substances have been compared and found to be identica

Hyoscyamus Muticus, and of Datura Stramonium gro in Egypt; The Alkaloids of ——. W. R. Dunstan a H. Brown. Proc. Chem. Soc. **16**, [229], 207.

In a previous paper (this Journal, 1891, 1177) the auth showed that *Hyoscyamus Muticus* grown in India contai 0·1 per cent. of hyoscyamine, which is readily isolated i pure state. Subsequently Gadamer (see this Journal, 18 171) in a brief note recorded the fact that the same p grown in Egypt contains more than ten times this quant Through the kindness of Mr. E. A. Floyer, the auth have been enabled to examine a specimen of the plant fr Egypt. They find it to be much richer in hyoscyam than the sample of Indian growth previously examie The seeds furnished 0·87 per cent. and the stems and lea 0·59 per cent. It remains to be determined whether Indian plant is always poorer in alkaloid, or whether it a peculiarity of the sample examined.

The authors call attention to the Egyptian plant as important source of the alkaloid hyoscyamine.

Datura Stramonium grown in the Egyptian desert a contains hyoscyamine, unaccompanied by other atropace alkaloids, to the extent of 0·35 per cent.

An abundant supply of either plant could be obtai from Egypt.

‘*Tutu.*” *Part I.* T. H. Easterfield and B. C. Aston. Proc. Chem. Soc. 16, [229], 211.

The authors have examined three varieties of tutu—*Coriara uscifolia, C. thymifolia, C. angustissima*—which cause erious loss of stock in New Zealand, and have isolated from hem a glucoside, *tutin*, $C_{17}H_{20}O_7$, along with acetic, gallic, uccinic, and other acids. From *C. thymifolia* quercetin or n isomeric compound was obtained; and from *C. angus-issima* a volatile acid, $C_5H_8O_4$, which has not been identified.

Tutin was obtained in colourless crystals melting at 08—209° C. (uncorr.), and is perceptibly volatile at 120°—30° C. Its solubility is 1·9 grms. in 100 grms. of water t 10°; 1·5 grms. in 100 grms. of ether at 10°; 8·2 rms. in 100 grms. of alcohol at 16° C. It is very soluble acetone, sparingly soluble in chloroform, insoluble in enzene and carbon bisulphide. Its optical rotation was etermined, and gives $[\alpha]_D^{19°} = +9·25°$.

The authors also discussed the formula for coriamyrtin, nd conclude that the formula $C_{15}H_{18}O_5$, which is half that sually accepted, harmonises better with the facts. A omparison of the chemical and physical characters of tin and coriamyrtin proved that these substances are not entical.

A note by Prof. Marshall on the pharmacology of tutin ates that its action is similar to that of coriamyrtin, but more slowly produced, and it is much less toxic. Its tion is exerted mainly on the medulla oblongata, and the sal ganglia of the brain.

Nux Vomica; Determination of ——. F. C. J. Bird.

See under XXIII., *page* 75.

lkaloids; Use of Tannin in Purifying Residues containing ——. C. Kippenberger.

See under XXIII., *page* 74.

emon Oil; Determination of Citral in ——. Schimmel's Semi-ann. Rep., Oct. 1900, 25.

See under XXIII., *page* 75.

emon Oil; Determination of Citral in ——. E. J. Parry.

See under XXIII., *page* 75.

Lichens; Constitution of ——. VI. W. Zopf.

See under XXIV., *page* 77.

arvone; Analysis of Oils containing ——. E. Kremers.

See page 16.

PATENT.

mphor: Pinyl Oxalate and Pinyl Formate; Process for the Production of ——. C. K. Mills, London. From The Ampère Electro-Chemical Company, Jersey City, U.S.A. Eng. Pat. 14,754, Aug. 17, 1900.

rpentine (5 parts) from any recognised source, if conning sufficient pinene, is heated with anhydrous oxalic id (1 part) to 120°–130° C., the resulting product is ated with caustic alkalis in excess, and the mixture of mphor and borneol so obtained is steam-distilled to move impurities.

The borneol is then oxidised to camphor. The inventor ims this process in its various stages, and also the interdiate products, pinyl formate and pinyl oxalate.

—R. L. J.

XXI.—PHOTOGRAPHY.

ght; its Influence on the Action of Chlorine on Metallic Silver.—II. V. v. Cordier. Monatsh. für Chem. 21, [7], 655.

e author gives an account of his further experiments on s subject. The formation of silver chloride is not reased under the influence of red light; whilst it is ler the influence of violet and blue light, although the ucing action, which takes place at the same time, is also reased. Light filtered through a sufficiently thick layer chlorine gas, behaves generally like red light. Filtration of the light through dry chlorine weakens its influence on the reaction very little or not at all; with moist chlorine, however, there is a considerable weakening, which may be increased by the addition of small quantities of hydrogen.

Röntgen rays have practically no influence on the reaction.—J. W. H.

Sensitiveness of Photographic Plates; Increasing the ——. R. Neuhauss. Phot. Rundsch. 1900, 14, 233. From Chem. Zeit. Rep. 1900, 24, [90], 336.

Photographic plates may be rendered more sensitive by a preliminary very short exposure to light. The author recommends that the plates should be exposed in the dark room, before the red lamp, until on development a very slight fog appears. The time required for this preliminary exposure should be ascertained once for all, and is then applicable to all plates made from the same emulsion.

—J. S.

Absorption Spectra; Plates for Photographing ——. A. Miethe. Zeits. angew. Chem. 1900, 1199.

The method which Formánek has already described (this Journal, 1899, 611) for differentiating colouring matters and for examining mixtures thereof, becomes still more useful if the absorption spectra can be photographed and preserved for reference. Ordinary photographic plates are not suitable for this purpose, as the characteristic absorption bands of the dyestuffs lie principally in the less refrangible part of the spectrum; and even commercial colour-sensitive (ortho-chromatic) plates are not completely satisfactory, for their sensitiveness stops at about the wave-length 590. The author publishes two formulæ for the preparation of either slow or rapid plates, which have given good results, and which permit an impression of the spectrum to be obtained up to the Fraunhofer line A.

Rapid Plates.—The bath is made by dissolving 1 grm. each of Glycin Red (Kinzelberger), Quinoline Red, and Quinoline Blue (with a little ammonia) separately in 500 c.c. of 93 per cent. alcohol, filtering after a few days. 20 c.c. each of the red dye solutions are then poured into 150 c.c. of water, 50 c.c. of alcohol are added, and the mixture is allowed to rest for two hours. 2 c.c. of the blue solution are next introduced; and after another two hours' standing, the liquid is carefully filtered. Finally, 3 c.c. of ammonia and 1 c.c. of the Quinoline Blue are added, and the whole is diluted with 150 c.c. of water and the same quantity of alcohol.

Slow Plates.—The bath consists of 100 c.c. each of 1 : 5,700 aqueous solutions of Diazo Black (Bayer), and Iodeosine, with 3 c.c. of ammonia.

Bromide plates, which are as free as possible from fog, are thoroughly cleaned and dusted, and immersed for two minutes in either of the baths; they are then held under a rose, soaked for two minutes in distilled water, and dried as quickly as possible, preferably in a cupboard with artificial draught.

The rapid plates are sensitive from the ultra violet to the wave-length 680. If they are required to photograph bands in the green, yellow, and red, they are used behind a screen of Tartrazin or Martius Yellow. If bands in the blue also are to be recorded, the screen should be a very weak aqueous solution of Neutral Red, when the plates give an uniform image from E to the violet. The slow plates are sensitive even to less refrangible light; their range extends to the extreme end of the visible red. As their sensitiveness is uniform beyond the line 500$\mu\mu$, for work at the red end of the spectrum, they should be protected by a somewhat stronger screen of Martius Yellow; for an image of the whole spectrum, a stronger filter of Neutral Red should be used. They require about three times the exposure of the rapid plates. Both kinds keep for at least five or six days, but they are advisedly used before they are four days old. All manipulations should be carried out in absolute darkness, especially with the slow plates. Development is rather prolonged. The author recommends the Welsbach mantle as a source of light for observing the absorption bands of colouring matters; for it contains a large proportion of the less refrangible rays, and therefore easily gives an uniform spectrum with a comparatively translucent colour screen.

—F. H. L.

Photographic Fixing Baths. Brit. Jour. Phot. **47,** [2116], 741.

Eder first suggested the addition of an acid to the ordinary fixing bath to prevent staining, but, unfortunately a decomposition takes place which may be injurious to both plates and papers. Briefly, the addition of an acid to excess of sodium thiosulphate results in the formation of sulphurous acid, sulphuretted hydrogen, a sodium salt of the acid used, sodium sulphate, sulphur, sodium bisulphite, pentathionate, and acid sulphide. The addition of alum to prevent "frilling" has a similar effect. Lainer states that if the acid be added to a solution of sodium sulphite, and the mixture then poured into the solution of sodium thiosulphate, no deposition of sulphur takes place. He suggests the addition of 50--100 parts of acid sulphite lye to every 1,000 parts of thiosulphate solution (1:4). As a substitute for the lye he recommends: solution of sodium sulphite (1:4), 60 parts; tartaric acid solution (1:2), 20 parts. His alum bath contains saturated solution of alum, 1,000 parts; saturated solution of sodium sulphite, 300 parts; solution of thiosulphate (1 . 4), 1,250 parts. Mercier showed that on using an organic acid in the fixing bath, the addition of an acetate, citrate, or tartrate prevented any deposition of sulphur, and that the plate could be safely transferred to the fixing bath after development without washing. The following is his formula:—

	Parts.
Anhydrous sodium thiosulphate	100
Potassium metabisulphite	20
Sodium citrate	5
Sodium chloride	20
Potash alum	20
Water	1,000

The acid fixing bath, when properly made, preferably with an organic acid, the acid being added to the sodium sulphite solution and the mixture then added to the thiosulphate solution, gives results remarkably free from stain or deposit, and is far superior to the ordinary bath.

—J. W. H.

Photographic "Reducer"; Ammonium Persulphate as a ——. D. Myblin. Atelier des Phot. 1900, **7,** 108; through Chem. Zeit. Rep. 1900, **24,** 344.

The author is unable to accept either of the theories advanced by Lumière Bros. (this Journal, 1898, 870; 1899, 856) and Namias to explain the "reducing" action of ammonium persulphate upon negatives. His own idea is as follows:—The solution penetrates the gelatin film where most silver is congregated (*i.e.*, the high lights of the positive picture), attacks the metal, and converts it into silver sulphate, which partly dissolves. The persulphate is (chemically) reduced to sulphate, oxygen being liberated. By the action of the water, free sulphuric acid is also formed, which dissolves the gelatin, chiefly that which surrounds the disappearing image. The process will continue until the deepest particles of silver are reached, that is, until the whole picture is ruined. Nevertheless, the image is not wholly destroyed, for the negative still retains a faint blue colour, which is probably due to the undissolved silver sulphate that resists the action of washing with water. In the fixing bath, the blue colour disappears; but by mechanical intensification, the remaining image can be somewhat strengthened.—F. H. L.

Trichromatic Photography; Optics of ——. F. E. Ives. Brit. Jour. Phot. **47,** [2116], 742.

For the correct reproduction in colour by photographic methods, the obtaining of the three colour records must involve a strictly quantitative photographic analysis, for no other will admit of the correct synthetical reproduction of the spectrum itself, the only test for any trichromatic process. By positive synthesis of the colour records, the image is built up by adding light to light, red, green, and blue, but in the production of paper prints the picture is obtained by superposing coloured shadows. It will be clear that since red, green, and blue are the colours in positive synthesis, their complementary colours, or minus red (cyan blue), minus green (bright crimson), and minus blue (yellow), are the printing colours; the white printing surface, however, not being illuminated by a mixture red, green, and blue light only, but by all the spectru rays, makes it necessary to consider the absorption of th colours in the intermediate spectrum regions; on th account the absorption of the printing colours should n conform to the Maxwell curves, but should be greatest f the pure colours, and fall gradually to the next "primary in the spectrum. In any case, however, a slight but pe ceptible degradation of colour takes place unless the prin be viewed in a mixture of pure red, green, and blue light.

—J. W. H.

PATENTS.

Transparent Photographic Films. J. E. Thornton, Altrin ham, and O. F. S. Rothwell, Hulme, Manchester. En Pat. 17,165, Aug. 24, 1899.

The invention consists of a stripping film mounted on transparent paper base. The paper is made transparent any suitable method, and rolled and glazed (without th treatment the grain of the paper would appear in the imag obtained); the stripping medium, preferably consisting aluminium or zinc salts of fatty or resin acids, is th applied, and, after drying, the coating with sensitive emu sion takes place in the ordinary way. Such a film, althoug quite adherent to the base, can be stripped dry, and nee neither heat nor solvent to facilitate the operation.

—J. W. H.

Photo-Printing and Developing; Apparatus for —— J. W. Vickers and H. W. Rumsey, London. Eng. Pa 1530, Jan. 24, 1900.

The invention relates to means of reproduction of engineer and other drawings by photography. Exposure is made incandescent gas light; arrangements are described f moving the series of lights to different parts of the f printing frame used; development is carried out in a cyli drical vessel, the print being clamped to a frame capable rotation.—J. W. H.

XXII.—EXPLOSIVES, MATCHES, Etc.

Nitrogen Iodide. O. Ruff. Ber. 1900, **33,** [16], 3025.

Chattaway has shown that "nitrogen iodide," prepared aqueous solution, has the composition NH_3, NI_3 (Pro Chem. Soc. 1898, **15,** 17—22). Recently C. Hugot, by t action of iodine on liquid ammonia, has obtained t compounds NI_3, $3NH_3$, and NI_3, $2NH_3$ (Ann. Chim. Phy [7], **21,** 5). At the low temperatures attained by the m of liquid air and alcohol, the author has prepared simil compounds with different amounts of ammonia crystallisation. At −60° C. a substance is obtained havin the composition NI_3, $12NH_3$, and crystallising in brownis red leaflets. At −35° to −40° C. NI_3, $3NH_3$ is produce crystallising in olive-green needles. These, when dried *vacuo* at −35°, turn a light brownish-green colour, and th have the composition NI_3, $2NH_3$. Dried *in vacuo* at −2 they are converted into the ordinary "nitrogen iodide NH_3, NI_3, in the form of reddish-violet needles.

Sodium amide, iodine and liquid ammonia react togeth to form a substance of the composition Na_2 NI_3.—A. M.

Chlorates; Decomposition of ——. Part III. Calci Chlorate and Silver Chlorate. W. H. Sodeau.

See under VII., *page* 42.

Explosives; Heat Test for ——. W. Cullen.

See page 8.

PATENTS.

Explosives. J. Fuehrer, Vienna. Eng. Pat. 16,277, Sept. 13, 1900.

The inventor claims the use of aluminium or other lig metal mixed with material which will convert it into oxi on firing. This oxidation sets free a large amount of hea A suitable mixture may, for instance, be made of ammoniu nitrate, aluminium, and charcoal in the proportio $4NH_4NO_3 + 2Al + C$.—A. M.

Explosives; Manufacture of ——. E. Gathman Washington, U.S.A. Eng. Pat. 18,920, Oct. 23, 1900.

The invention relates to propulsive explosives made in t form of rods having a number of longitudinal perforation

In rods thus constructed, but without any provision other han the longitudinal apertures for permitting the ignition lames to communicate with the more distant portions of he rods, the gases are generated within these perforations n such great volume, that these passages cannot accommodate their flow, and the rods are therefore burst open and roken into fragments, thereby causing a sudden and langerous rise of pressure in the bore of the gun. In order o obviate this difficulty, the inventor makes a number of V-shaped cuts half through the rods, these cuts being nade alternately on opposite sides of the rods. He claims a longitudinally multi-perforated powder rod having lternate cuts or grooves on its opposite sides, each pair of aid cuts or grooves intercepting the several longitudinal rforations."—A. M.

xplosives: Manufacture of ——. E. Gathmann. Washington, U.S.A. Eng. Pat. 18,923, Oct. 23, 1900.

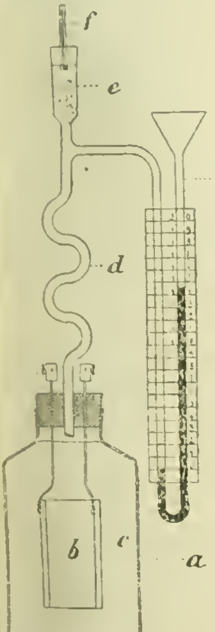
HE invention described is similar to that of Eng. Pat. 8,920 (preceding abstract), except that in this case the ansverse cuts are of different form, each cut intercepting ll the longitudinal perforations. Diagrams and descripons are given of a number of ways in which this may be rried out.—A. M.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

mpère-Manometer. G. Bredig. Zeits. für Elektrochem. 1900, 7, [19], 259—260.

HE ampère-manometer devised by the author is shown in e accompanying figure. The bottle *a* is nearly filled with 2 per cent. solution of sodium hydroxide, and contains o concentric cylindrical nickel electrodes *b* and *c*, which e insulated from each other by means of several glass rods. he oxygen and hydrogen given off are conveyed through e bent tube *d* to the wider portion *e*, which is loosely ugged with cotton-wool. After being filtered by the tton-wool (which must be renewed from time to time) the gases escape through the capillary tube *f*. A manometer *g* attached to the tube *d* registers the excess pressure within the apparatus. This excess pressure, for a capillary tube of given length and bore, will rise as the rate of evolution of the gases increases, and, for not too large excess pressures, will be approximately proportioned to the rate of evolution of the gases according to the Poiseuille formula.



The rate of evolution of the gases is, however, proportional to the current strength, and hence small internal excess pressures (above that of the atmosphere) will be very nearly proportional to the current strength. The current strength in ampères can thus be measured as a pressure.

The author employs several capillary tubes which are so adjusted that 1 ampère produces a deflection of, *e.g.*, 1 cm., 10 cm., &c., on the water manometer; so that by simply interchanging the pillary tubes the range and sensitiveness of the instrument n be altered at will.

The temperature coefficient is about + 0·56 per cent., so at for the ordinary variations in the temperature of the oratory, the instrument is liable to an error of about per cent. An E.M.F. of 1·6—2·0 volts is required. If dew becomes deposited inside the capillary tubes, it can easily be removed by washing with water, alcohol, and ether.

The ampère-manometer is not a precision instrument, but it has been found very useful in analytical and synthetical electrolysis.—J. S.

INORGANIC CHEMISTRY.—QUALITATIVE.

Thomas Slag; Detection of Mineral Phosphate in ——. N. von Lorenz. Chem. Zeit. Rep. 1900, 24, 355.

THE process depends upon the detection of fluorine, which is assumed to be always present in mineral phosphates, and always absent in Thomas slag. The slag is treated with concentrated sulphuric acid in a beaker covered with a large watch-glass, upon the under side of which, and therefore exposed to the fumes generated, a small filter paper moistened with a dilute solution of soda is caused to adhere. After exposure to the fumes for about five minutes, the paper is washed with a few c.c. of water, and the wash-water is then acidified with acetic acid and tested by the addition of a solution of calcium chloride acidified with acetic acid. The production of a white precipitate or turbidity on or before boiling indicates the presence of fluorine, and indirectly of mineral phosphate.—H. H. B. S.

INORGANIC CHEMISTRY.—QUANTITATIVE.

Chromic Acid; The Iodometric Estimation of ——. K. Seubert. Zeits. angew. Chem. 1900, [46], 1147.

THIS paper is virtually an introduction to the one following.

Potassium Bichromate on Potassium Iodide in the presence of Sulphuric Acid; Action of ——. K. Seubert and A. Henke. Zeits. angew. Chem. 1900, [46], 1147—1154.

AFTER a series of experiments on the influence of time on the completeness of the reaction, of mass on its speed, on the influence of dilution, the author concludes that, for perfect safety, the molecular ratio—

$$K_2Cr_2O_7 : KI : H_2SO_4 = 1 : 18 : 110$$

should be adopted, under which conditions the reaction proceeds so rapidly that titration can be at once proceeded with. This ratio converted to parts by weight is = 1 : 10 : 36 in a total volume of 2,000. The following practical points are mentioned: 0·15 grm. $K_2Cr_2O_7$ (= 0·05 grm. Cr), requiring about 30 c.c. N/10 thiosulphate, is a convenient quantity to use when determining chromium. The chromate should be placed in a 500 c.c. stoppered flask, neutralised if necessary, the reagents added in the above ratio, avoiding concentrated H_2SO_4, and diluted before titration with 200—300 c.c. of water.—R. L. J.

Tungsten Trioxide; Separation of ——, *from Molybdenum Trioxide.* M. J. Ruegenberg and E. F. Smith. J. Amer. Chem. Soc. 22, [11], 772—773.

WHEN the two metals are both present as trioxides, they are readily and completely separated by sulphuric acid of sp. gr. 1·378, in which tungsten trioxide is completely insoluble. The analytical figures were equally accurate, both in the case of mixtures in various proportions of the two oxides alone and in the case of mixtures of the two with a large excess of ferric hydroxide.—J. T. D.

Arsenic; New Method of Determining ——. O. Ducru. Comptes Rend. 131, [22], 886—888.

THE solution containing the arsenic in the form of arsenic acid, is concentrated, or is evaporated to dryness and re-dissolved in the least possible amount of water; any alkali carbonates are decomposed by hydrochloric acid, and ammonia is added, just to alkaline reaction. Into a conical flask is put, in the proportion of 10 c.c. per 100 mgrms. of expected arsenic, a solution of cobaltous chloride containing 75 grms. of the crystallised salt per litre. To this is added ammonium acetate solution, made by saturating 40 per cent. acetic acid with 20 per cent. ammonia, so as to form about one-fourth of the whole bulk of the liquid finally contained in the flask. This is followed by 3 per cent. of the same total volume of 20 per cent. ammonia, and then the solution of arsenic is added. The flask, closed by a porcelain stopper, is heated in the water-bath or steam oven till the deposition of crystals has ceased, cooled, allowed to stand for a few hours, and the precipitate is then collected on a filter and washed with cold water. The precipitate can now be treated in any of the following ways:—(*a*) Dried in the steam oven to constant weight, and weighed on the tared filter as $Co_3(AsO_4)_2.NH_3.7H_2O$. (*b*) Transferred as completely as possible to a large crucible, into which the rest is also got by solution on the filter in hot dilute nitric acid; the acid is then evaporated on the water-bath, and the crucible very gradually heated to dull redness till constant in weight. This plan is not so accurate as the former, but the weight of the residue in the crucible multiplied by the empirical coefficient 0·3193 gives fairly constant results. (*c*) Dissolved in hot dilute hydrochloric acid, the arsenic removed by Wohler's method, or the cobalt precipitated by bromine and soda, and in either case the cobalt determined by electrolysis of the ammoniacal solution of the sulphate. Co_3 corresponds to As_2. The author's figures, for amounts of arsenic from 1 to 500 mgrms., are very satisfactory.—J. T. D.

Ferrochrome; Determination of Carbon in ——. A. A. Blair. J. Amer. Chem. Soc. 22, [11], 719—723.

In burning ferrochrome with acid potassium sulphate in a stream of oxygen in a combustion tube, with copper oxide in the after part, carbon may get into the absorption apparatus from the oxidation, by the sulphuric acid, of the corks: the boat may become cemented into the tube by the spattering of the acid sulphate, and the tube is often broken by the swelling of the copper oxide, caused through absorption of sulphuric acid. The author avoids these difficulties by using a platinum tube for the combustion and substituting platinised asbestos for the copper oxide. Two platinum boats are used (Fig. 1), one inside the other. The lid of the inner boat is so arranged that particles of the melted sulphate spirted against it drip into the outer boat, and the tube is kept clean. The platinum tube ha ground joint at the rear end, is constricted at the fore for the reception of the platinised asbestos, then further c stricted, bent at right angles, and fused to the narrow gl U-tube filled with beads. The two plugs, of pum wrapped in platinum foil, are pushed in behind the b and serve to check diffusion backwards, and consequ deposition of sulphuric acid near the joint. The gen arrangement of the apparatus (Fig. 2) for the most p explains itself. D D contain chromic acid solution (grms. with 300 c.c. of strong sulphuric acid per litr and stand on a copper plate heated by a Bunsen burn E is filled with glass beads, F with pumice saturated w chromic acid, and G with calcium chloride. The gu tube beyond the absorption apparatus is connected with aspirator to relieve the otherwise high pressure in apparatus.

Fig. 1.

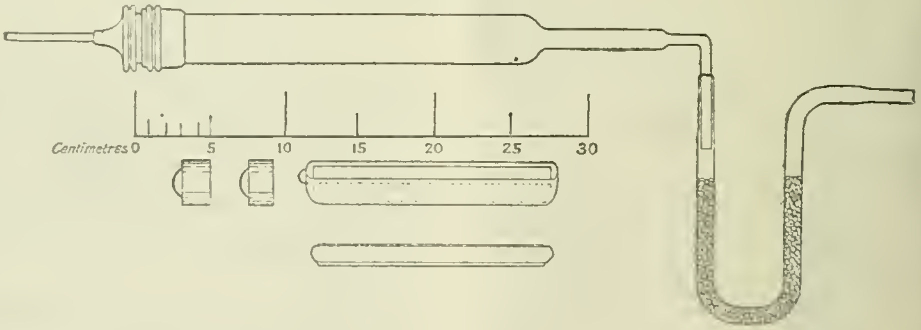
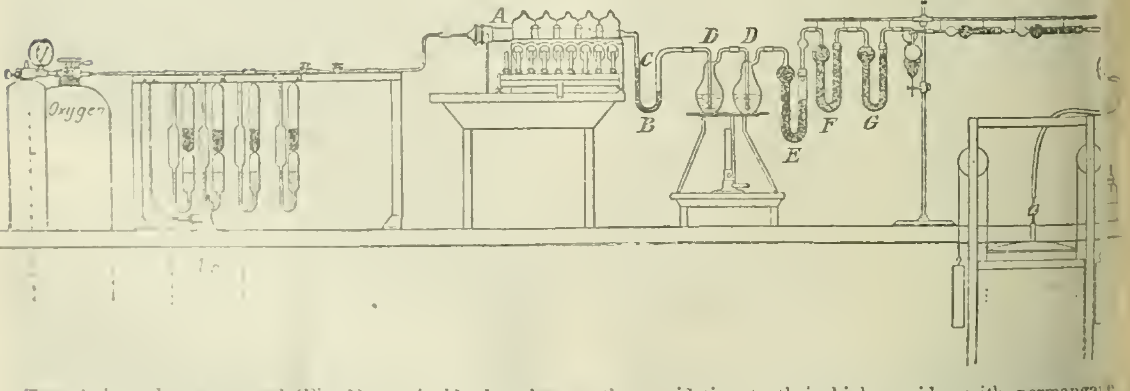


Fig. 2.



The method is as follows:—Put 25 grms. of acid phate in the boat, and melt it. When cold, spread ove 1 grm. of finely divided ferrochrome, put the boat into platinum tube, followed by the plugs, and connect up apparatus, sending a slow stream of oxygen throu. Heat the platinised asbestos first, then work backwa till the whole of the boat is red-hot. After 20 minu turn off the oxygen, and allow the tube to cool for half hour in a current of air. A slow current of oxygen m be used to ensure the condensation of the sulphuric hydride, and the tube must be heated very gradually, so t the sulphur dioxide may never be in excess of the oxyg A combustion takes about two hours and a half.—J. T.

Uranium and Vanadium Ores; Analysis of ——. C. Fritchie. Eng. and Mining J. 1900, 70, [19], 548.

The following method, which is particularly adapted to analysis of the mineral carnotite, depends upon the duction of the uranium and vanadium in sulphuric solution to their lower oxides by metallic aluminium, then oxidation to their higher oxides with permanga solution. Metallic aluminium was found to be prefer to either zinc or sulphurous acid as a reducing agent.

0·5 grm. of the finely powdered mineral is moistened with water and digested for one hour with 10 c.c. of nitric acid, at a temperature at which the liquid boils gently. The solution is diluted with 10 c.c. of water, neutralised with a saturated solution of sodium carbonate, 5 c.c. excess of the latter added, and then 20 c.c. of a 20 per cent. solution of caustic soda. The whole is boiled gently for about half an hour and then allowed to settle. The uranium, vanadium, and iron are all precipitated by the sodium carbonate, but the vanadium is redissolved on boiling with the excess of caustic soda. The precipitate is filtered off and washed a few times with caustic soda solution. Water must not be used for washing, or some of the precipitate may pass through the filter. The filtrate should not give any uranium reaction when acidified with nitric acid and treated with potassium ferrocyanide. The whole of the vanadium is contained in the filtrate, but it is better to weigh out a fresh sample of the material for the determination of this constituent.

The precipitate is dissolved on the filter with 20 c.c. of hot dilute nitric acid (1 : 1), and the solution run into the original flask, where it is diluted with about 40 c.c. of water, treated with ammonia until a slight permanent precipitate is formed, and then with 40 c.c. of a saturated solution of ammonium carbonate, which has been freshly prepared and heated slightly to remove any excess of carbon dioxide. The uranium is readily soluble in the excess of ammonium carbonate, whilst the iron remains undissolved. The liquid is heated to incipient ebullition for a few minutes, and the iron precipitate filtered off and well washed with a per cent. solution of ammonium carbonate. The filtrate, which should not give any vanadium reaction (red coloration) when acidified with nitric acid and treated with hydrogen peroxide, is treated with 20 c.c. of dilute sulphuric acid (1 : 1), added gradually, and boiled until dense white fumes are given off. It is then cooled, diluted to bout 100 c.c., about 4 sq. ins. of sheet aluminium cut into ix strips added, and the liquid boiled until the yellow olour changes to a sea-green. The solution is diluted, and itrated whilst hot with a standard solution of permanganate. The uranium equivalent of the permanganate is obtained by multiplying the iron equivalent by 120 56.

For the determination of the vanadium, 0·5 grm. of the re is moistened with water and heated with 10 c.c. of itric acid and 10 c.c. of sulphuric acid, until the whole of he nitric acid is expelled and dense white fumes of sulhuric anhydride are evolved. The solution is cooled, iluted, and reduced with aluminium. It is then further iluted, and titrated whilst hot with permanganate. The umber of c.c. of permanganate solution used, less the umber of cubic centimetres required for the uranium and on, is the permanganate required for the oxidation of the anadium. The vanadium equivalent of the permanganate obtained by multiplying the iron equivalent by 51·1 112. The end reaction is slow with vanadium, and permanganate must be added gradually until a permanent pink is obtained.

—A. S.

Titanic Acid ; Colorimetric Determination of ——.

J. Brakes.

See page 23.

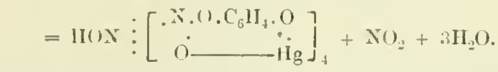
ORGANIC CHEMISTRY.—QUALITATIVE.

Millon's Reagent. W. Vaubel. Zeits. angew. Chem. 1900, [45], 1125—1130.

MILLON's reaction which is given by phenolic substances nd derivatives thereof, such as albuminoids, consists in the production of a red coloration or the separation of a ed precipitate on adding Millon's reagent to a solution of he substance and if necessary, warming. The reagent is btained by adding sufficient mercury to nitric acid to produce the mercurous salt. For example, one part by weight of metallic mercury is dissolved in one part by weight of nitric acid (sp. gr. 1·4), the mixture being ually gently warmed and then diluted with two parts by weight of distilled water. Hence the reagent contains gether with some nitric acid principally mercurous nitrate nd nitric oxide. Possibly part of the latter is converted the atmospheric oxygen into nitrogen dioxide and since it is necessary that these gases should be present, it is advisable to employ only gentle heat in preparing the reagent. The author has investigated the behaviour of a number of substances to Millon's reagent and arrives at the following conclusions. (1) Substances of the formula 1.4 $C_6H_4OH.X$, such as tyrosin, *p*-diphenol, phenolphthalein and hydroquinone give the reaction. (2) The same is also the case with substances of the formula 1.2 $C_6H_4OH.X$ and 1.2.4 $C_6H_3OH.X_2$ such as pyrocatechol, guaiacol, *p*-nitrosalicylic acid; of the formula 1.2.3 $C_6H_3OH.X_2$ and 1.2.3 $C_6H_2OH.X_3$ such as *α*- and *β*-naphthol, 1·4 bromo- and chloro-*α*-naphthol and bromo-*β*-naphthol, and also substances like resorcinol and *m*-cresol of the general formula 1.3 $C_6H_4OH.X$. (3) Substances of the general formula 1.2.4.6 $C_6H_2OH.X_3$ such as tribromophenol, dibromo-*p*-diphenol, dibromotyrosin, dibrom-*o*-cresol, dibromo-*p*-cresol and dibromo-*p*-nitrophenol and these of the formula 1.3.5.$C_6H_3OH.X_2$, like orcinol and phloroglucinol, do not give the reaction. The same is also true of thymol and pyrogallol. (4) In the case of phenol the following reactions take place :—

$$2C_6H_5OH + 2NO + O = 2C_6H_4OH.NO + H_2O.$$

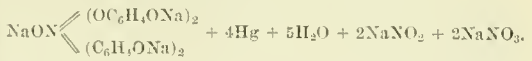
$$C_6H_4OH.NO + 4HgNO_3 + NO + 3C_6H_5OH$$



$$= HON \vdots \left[\begin{array}{l} .N.O.C_6H_4.O \\ \cdot \qquad\qquad\quad \cdot \\ O\text{———}Hg \end{array}\right]_4 + NO_2 + 3H_2O.$$

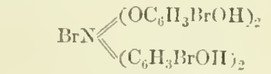
(5) On heating with soda lye, these products lose mercury and a compound is obtained soluble in soda lye with a reddish brown colour and precipitated by acids—

$$HON(NO_2C_6H_4OHg)_4 + 9NaOH =$$



$$NaON\begin{array}{l} \nearrow (OC_6H_4ONa)_2 \\ \searrow (C_6H_4ONa)_2 \end{array} + 4Hg + 5H_2O + 2NaNO_2 + 2NaNO_3.$$

(6) By the action of bromine these compounds yield products of the type—



$$BrN\begin{array}{l} \nearrow (OC_6H_3BrOH)_2 \\ \searrow (C_6H_3BrOH)_2 \end{array}$$

(7) No reaction takes place with Millon's reagent in the case of di-*o*- and di-*m*-substituted compounds. (8) In the case of the naphthols, only *β*-naphthol yields a product analogous to that from phenol. Other naphthol derivatives so far as they have been investigated give nitroso compounds.—T. A. L.

Methyl Alcohol in Mixtures ; Detection of ——. S. P. Mulliken and H. Scudder. Amer. Chem. Journ. 1900, 24, [5], 444—452.

THE method given by the authors for the detection of methyl alcohol in mixtures, *viz.*, oxidation of the alcohol to formaldehyde followed by condensation of the latter with resorcinol with the formation of a red precipitate, is objected to by Jandrier on the grounds that acrolein answers to the test, and that the test is interfered with by furfurol; he further recommends the use of gallic acid as a reagent for the formaldehyde, but the authors find that the colours thus obtained are also given by the oxidation products of many other compounds. An improved method of applying the resorcinol test is as follows :—Only that part of a mixture is tested for methyl alcohol which can be completely distilled between 50° and 100° C., and which, after distillation, gives a clear, colourless solution when shaken with two or three times its volume of water. A blank experiment should be made on the liquid before the latter is oxidised, to make sure that no precipitate or coloured ring is formed. No solution suspected to contain phenols, alkaloids, or organic bases should be tested without preliminary treatment. Methyl alcohol may be separated easily from most colouring matters, oils, resins, sugars, glycerin and glycols by distillation; from phenols and acids by distillation with aqueous caustic alkali; from bases by distillation from strongly acidified aqueous solutions. Should the blank experiment, without oxidation, yield a coloration or precipitate, and the solution also give aldehydic reactions with ammoniacal silver nitrate and with Schiff's Rosaniline aldehyde reagent, 12 c.c. of the alcoholic distillate, which must contain at least 75 per cent. of water, is heated in a stoppered bottle with 3 grms. of resorcinol and 1 c.c. of concentrated sulphuric acid in a water-bath for two hours at 70°—80° C.; the cooled solution is diluted to 50 c.c. with water, 5 c.c. being then distilled off and tested in the usual way. If ethyl alcohol be present with methyl alcohol in the liquid, acetaldehyde will be formed on oxidation, but this is got rid of by the new method of testing. Two c.c. of the liquid are made up to 6 c.c. with water and then treated six times in succession with intermediate cooling with a short, closely-wound spiral of light copper wire which is heated to redness and superficially oxidised, and then plunged into the liquid. The test-tube, which should be 6—7 ins. long, is next fitted with a double-bored stopper, one hole containing a piece of glass tube connected with a Bunsen pump, and the other fitted with a piece of glass tube drawn out to a very fine capillary, the end of which reaches nearly to the bottom of the tube. The latter is then immersed about two-thirds in water at 25°—30° C., the air passage partially stopped by a screw-clamp, and gentle suction applied so as to saturate the liquid with air. The clamp is next screwed tight, and the pump turned full on, when a stream of bubbles, consisting of acetaldehyde, alcohol, and water vapours, rises from the capillary. After one-half the liquid has been boiled away in this manner, to the residue is added one drop of a solution of one part of resorcinol in 200 of water, the liquid being then carefully poured into a second tube containing sulphuric acid, so that no mixing occurs. After standing for three minutes, the tube is rocked slowly to produce a gentle mixing of the layers. If methyl alcohol be present, this treatment will cause the separation of more or less voluminous flocks of a characteristic rose-red colour. One part of methyl alcohol in 2,000 parts of the solution as prepared for oxidation, can be detected in this way. With a mixture of ethyl and methyl alcohols in the proportion of 100 parts of the former to three of the latter, the test answers, but it cannot be depended on if there be only two parts of methyl to 100 of ethyl alcohol. The only substances giving the same reaction as methyl alcohol with the above described test are the methyl esters and ethers (including methylal) and secondary and butyl alcohols.

—T. H. P.

Maize in Wheaten Flour; Detection of ——. G. Embrey.
Analyst 1900, **25**, [297], 315—316.

Baumann's quantitative method (this Journal, 1899, 301) has not given satisfactory results in the author's hands, and he has, therefore, devised the following modification:—Mixtures of pure wheat and maize flours are prepared containing respectively 10, 15, 20, 25, and 30 per cent. of the maize. Weighed quantities (0·2 grm.) of each of these and of the sample under examination are placed in test tubes (15 cm. × 2 cm.) which are fitted with paraffined corks. To each are added 20 c.c. of potassium hydroxide solution (18 grms. per litre), and the tubes shaken uniformly for three minutes. Twelve drops of hydrochloric acid (HCl of sp. gr. 1·16, 50 c.c.; water, 100 c.c.) are next introduced and the tubes whirled in a centrifugal machine at 600 revolutions per minute. One c.c. of the clear liquid is transferred to a Nessler tube, and diluted to 50 c.c., after which 1 c.c. of an iodine solution (I, 0·25 grm.; KI, 1 grm.; water, to 250 c.c.) is added. The tint obtained compared with those of the standard tubes gives the proportion of maize within about 5 per cent. For a more exact determination, 10 c.c. of the clear liquid from each tube are boiled for two hours with 1 c.c. of dilute sulphuric acid (1:7), then neutralised, diluted to 50 c.c., and run from a burette into a boiling mixture of Gerrard's solution, 10 c.c., and Fehling's solution 2 c.c., until the colour is discharged. The percentage of maize is obtained from the standard tube of which the same amount is required to discharge the colour.

Gerrard's Solution is prepared by diluting 10 c.c. of freshly-prepared Fehling's solution with 40 c.c. of water, and adding a solution (about 5 per cent.) of potassium cyanide from a burette, until the blue colour is only just perceptible. During the addition of the cyanide, the diluted Fehling's solution is kept boiling and constantly stirred in a porcelain dish.—C. A. M.

Maize in Wheaten Flour; Detection of ——. E. J. Bev
Analyst. 1900, **25**, [297], 316.

According to the author the following test of A. C. Wil
gives satisfactory results:—The flour is mixed with cl
oil and examined under the microscope with a ¼ c
objective. Wheat or other starches are practically invisi
whilst the hilum of maize is indicated by a black dot
star.—C. A. M.

"Saccharin" in Wine and Beer in the Absence Salicylic Acid; Detection of ——. F. Wirthle. Ch
Zeit. 1900, **24**, 1035.

Schmitt's method of detecting saccharin (*cf.* this Jour
1887, **6**, 681) consisting of heating the extracted substa
with caustic soda for half an hour in the oil-bath at 250°
has not always proved satisfactory. This may be due to
incorrect use of the thermometer, as the author finds
when using two exactly similar thermometers, one complet
immersed, the other so far immersed that the merc
column projects 37° above the cork, the indications at
same moment were 260° and 221° respectively. Results
satisfactory if the treatment with soda last for 15 min
at a temperature indicated as 210°—220° C., when
thermometer is placed with the mercury column project
37° above the cork. It is recommended that 100 c.c. of
wine to be tested be evaporated to about 20 c.c., which
then transferred to a separating funnel, any residue be
washed in with a few drops of caustic soda and some wa
the whole is then acidified strongly with sulphuric acid,
shaken three times successively with 50 c.c. of ether.
ethereal solution is filtered into an Erlenmeyer-flask,
shaken with 10 c.c. of a 5 per cent. solution of caustic so
after which the ether is distilled off. The residue is rin
into a small porcelain dish, about 1 grm. of solid cau
soda is added, and the whole is heated slowly in an air-b
to 215° C., after which it is kept for 15 minutes a
temperature indicated as 210°—220° C. by a thermome
of which the mercury column projects 37° above the c
After cooling, the mixture is taken up with hot water,
is then carefully acidified with sulphuric acid and sha
with ether and petroleum spirit. The evaporation-resi
from the resulting ethereal solution is diluted with a
c.c. of water. The addition of a few drops of very di
ferric chloride solution will produce a beautiful violet-col
even if only 1 mgrm. of saccharin had been present
100 c.c. of the wine. Wines containing no saccharin, e
though they contained much tannin, showed at most a d
yellow-red (never a violet) coloration under these conditi
It is recommended always to try a blank experim
simultaneously with a wine test, evaporating the alcoh
solution of 1 mgrm. of saccharin with 1 c.c. of caustic s
solution, and then adding 1 grm. of the solid soda. Bee
tested in the same way; the author having found that
presence of hops (and of tannic acid from that source)
without influence on the applicability of the test.

—W. G.

Dulcine (Phenetol-carbamide) in Foods and Beverag Detection of ——. J. Bellier. Ann. de Chim. Ana
5, 333. Pharm. J. 1900, **65**, [1587], 616.

Dulcine, in concentrated sulphuric acid solution, if trea
with a few drops of formaldehyde, and the mixture dilu
with water, gives a turbidity or precipitate, whilst sacch
does not. With less than 1 mgrm. of dulcine, a disti
precipitate is obtained by dissolving in 1 c.c. of sulphu
acid, adding 1 drop of formaldehyde, and diluting w
water to 5 c.c. In order to apply this reaction, the dulc
is extracted from syrups, lemonade, waters, &c., by mak
alkaline, and shaking out with acetic ether. Beer is trea
with sodium phosphotungstate, acidulated with a few dr
of sulphuric acid, filtered and made alkaline, before shak
out. Fruit syrups, preserves, confectionery, and sim
articles are rendered fit for extraction by dilution
precipitation with basic lead acetate. Wines should
first treated with mercuric acetate.

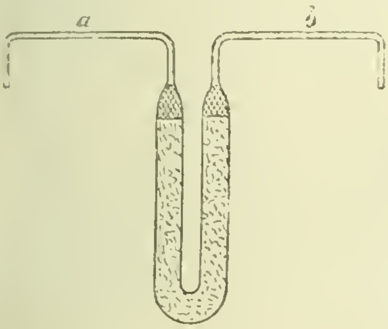
For the quantitative determination of dulcine, the sam
is evaporated, if necessary, to free from alcohol, trea
with the purifying precipitant, filtered, the solution m
alkaline, and twice extracted with acetic ether (50 c.c. e

me). The evaporation residue of the extract is dissolved ı from 1 to 5 c c. of concentrated sulphuric acid, a few :ops of formaldehyde added, and the solution, after standing ır 15 minutes, diluted to ten times its volume. After anding for 24 hours, the precipitate is collected on a tared lter, washed with distilled water, the filter and contents rained between filter paper, dried and weighed.—A. S.

ORGANIC CHEMISTRY—QUANTITATIVE.

'oal Gas; New Method for the Volumetric Determination of Carbon Monoxide in ——. A. Smits, H. Raken, and P. C. E. Meerum Terwogt. Zeits. angew. Chem. 1900, [40], 1002—1004. (Compare this Journal, 1898, 377 and 490.)

HE principle of the method depends on the oxidation of e carbon monoxide to carbon dioxide, which is subquently absorbed by caustic potash. The oxidising agent nployed is I_2O_5 at a temperature of 150°—180° C. In e accompanying illustration, the ⋃-tube A is filled with mixture of I_2O_5 (about 8 grms.) and asbestos. Two bestos plugs keep the mixture in position, and immeately above these plugs the limbs of the ⋃-tube are ached to two capillary tubes *a* and *b*. The tube *a* is nnected to the gas burette, whilst *b* communicates with KOH pipette.



A

n performing an analysis, the illuminating gas, previously ed from carbon dioxide, heavy hydrocarbons and oxygen, passed through the I_2O_5 pipette, heated at 150°—180° C. e iodine liberated sublimes into the tube *b*, whilst the $_2$ is absorbed by the KOH pipette. If there is any dency for the tube *b* to become blocked up by the limed iodine, this can easily be overcome by passing gas backwards and forwards rapidly through the paratus, in order to distribute the iodine between the es *a* and *b*. Finally, the gas is passed through very wly to complete the oxidation.

After allowing the I_2O_5 pipette to cool down to the mal temperature, the diminution in volume of the gas resents the amount of carbon monoxide contained in it. e authors have confirmed the statements made by Nicloux Gautier, *viz.*, that under the above conditions, neither rogen nor methane is attacked by the hot I_2O_5 or the cent iodine.

n subsequently determining the hydrogen and methane, ections must be made on account of the free space in I_2O_5 and palladium pipettes. Assuming that the lysis was made with 100 c.c. of illuminating gas, and t *a* c.c. were removed by the caustic potash pipette, c. by the fuming sulphuric acid pipette, *c* c.c. by the sphorus pipette, *d* c.c. by the iodine pentoxide pipette, c. by the palladium pipette, and that the remaining . of gas was found to contain *g* c.c. of methane: then true percentages of hydrogen and methane are—

$$H_2 = \frac{e}{A}(A + p) - \frac{p + q}{5} \text{ per cent.}$$

$$CH_4 = \frac{g}{f} \cdot \frac{A + p}{A}(A + q - e) \text{ per cent.}$$

re *p* represents the free space in the I_2O_5 pipette, *q* the space in the palladium pipette, and A is the volume of the gas immediately before absorbing the hydrogen, *viz.*, 100 − (*a* + *b* + *c* + *d*).

The spaces *p* and *q* should, of course, be kept as small as possible, and *p* should be redetermined from time to time as the I_2O_5 gradually becomes used up.—J. S.

Sulphuretted Hydrogen in Coal-Gas; Determination of ——. H. Leicester Greville. J. Gas Lighting, 1900, **76**, [1958], 1264.

The author published some years ago a method for the rapid determination of sulphuretted hydrogen in gas liquor. The process is based upon the use of a standard solution of ammoniacal copper sulphate, which reacts with the sulphuretted hydrogen with formation of copper sulphide. The results obtained differ at the most by only 0·025 per cent. from those obtained by precipitation as arsenic sulphide. It is now proposed to apply this method to the determination of sulphuretted hydrogen in coal-gas. The gas is passed into Harcourt tubes, such as are used for the ordinary volumetric determination of carbon dioxide and sulphuretted hydrogen. The first tube is charged with a solution prepared by mixing 1 volume of strong liquid ammonia with 10 volumes of water; and the second is filled with pure distilled water. A small piece of lead test-paper is placed in the outlet of the second tube, as a check on the total absorption of the sulphuretted hydrogen by the solutions. After a definite quantity of the gas has been drawn through the apparatus, the contents of the tubes are washed into a porcelain basin and titrated with the ammoniacal copper solution, which is of such strength that each c.c. equals 0·05 grain of sulphuretted hydrogen. It is stated that $\frac{1}{10}$ cb. ft. of gas can be passed through in 10—15 minutes without the slightest discoloration of the lead test-paper.—A. S.

Sulphuretted Hydrogen in Coal-Gas; Determination of ——. A. Müller. J. für Gasbeleucht. **43**, [42], 792—793.

The author applies Schulte's process for the estimation of sulphur in iron (Stahl und Eisen, 1896, 865) to the estimation of sulphuretted hydrogen in gas in the following manner:—A known volume—about 15 litres—of the gas is bubbled slowly through 25 c.c. of a solution consisting of 25 grms. of cadmium acetate and 200 c.c. of acetic acid, made up to a litre with distilled water. The volume of gas may be measured by means of a small meter, or by means of a bottle having the necessary capacity between its mouth and a mark slightly above a tubulure near its bottom. The bottle is filled with water covered by a layer of petroleum, and is connected through the tubulure with a levelling vessel, by lowering which it is filled down to the mark with gas, which is then forced, by raising the levelling vessel, through the solution of cadmium. After the gas has been bubbled through the solution, the bubbling tube is washed into the latter and removed. There is then added to the solution, after warming to 50°—60° C., 10 c.c. of a solution made by dissolving 80 grms. of pulverised crystals of cupric sulphate in 750 c.c. of water, and adding, when cool, 175 c.c. of concentrated sulphuric acid, and making up to a litre with distilled water, and filtering. The liquid changes in colour, on addition of the copper solution, from yellow—due to suspended cadmium sulphide, which can be filtered off and washed only with difficulty—to brownish-black, due to the formation of cupric sulphide, which is filtered off, well washed with hot water, dried, and ignited. The cupric oxide thus obtained is weighed, and the weight (in grammes) multiplied by $\frac{34}{79 \times 1 \cdot 43} = 0 \cdot 301$, gives the volume (in litres) of sulphuretted hydrogen in the volume of gas dealt with, on the assumption that the temperature of the latter was about 18° C., at which temperature a litre of sulphuretted hydrogen weighs 1·43 grms.—J. A. B.

Metacresol in Mixtures of Cresols; Determination of ——. H Ditz. Zeits. angew. Chem. 1900 [42], 1050.

Referring to the method of estimation described by Raschig (this Journal, 1900, 857), the author points out that it has the great advantage of giving directly the amount of metacresol, though it is not applicable when the mixture of cresols contains a large proportion of phenol, or when xylene is present. He considers that in the case of pure cresol mixtures, the method first described by himself and Cedivoda (Zeits. angew. Chem. 1899, 873 and 897), is the most suitable.

About 1 grm. of the anhydrous cresol mixture is weighed out, dissolved in water with the aid of some sodium hydroxide, and the solution diluted to 250 c.c. Two portions of 25 c.c. each are transferred to well-stoppered flasks, and decomposed with a sufficient quantity of Koppeschaar's bromide-bromate solution, and 10 c.c. of hydrochloric acid (1 : 1). After being shaken for exactly one minute, 20 c.c. of a 5 per cent. solution of potassium iodide are introduced, the iodine which separates titrated with standard thiosulphate after one hour, and the amount of bromine absorbed calculated from the result. The quantity of metacresol is then obtained from the equations—

$$x + y = a \quad \text{and} \quad \frac{3\text{Br}\,x + 2\text{Br}\,y}{108 \cdot 08} = b,$$

in which x = the amount of metacresol : y, the sum of the ortho- and para-cresol : a, the weight of the total cresols ; and b the weight of bromine absorbed, hence—

$$x = a - y = a - \frac{2 \cdot 2195a - b}{0 \cdot 7397} = \frac{b - 1 \cdot 4798a}{0 \cdot 7397}$$

If the cresol mixture contain any traces of water, the latter is removed preferably by heating 5 to 10 grms. of the mixture in a small fractionating flask, and after removal of the water distilling over the cresol. According to the author's experimental results, the accuracy of the method is within 0·5 per cent.

It is not possible to determine separately by this method each of the individual constituents in a mixture of phenol with the three cresols, but it suggested that this problem may be solved by a combination of the author's method with that of Raschig. The only difficulty is that in the latter, the presence of more than 10 per cent. of phenol interferes, but this may be obviated by adding to the mixture a known quantity of pure metacresol, or a definite quantity of a cresol mixture which is free from metacresol, so as to reduce the total amount of phenol below 10 per cent. (this Journal, 1900, 278).—C. A. M.

Wax ; Acid and Saponification Values of ——. Modification of Hübl's Method of Determining them. O. Eichhorn. Zeits. anal. Chem. 1900, **39**, [10], 640—645.

The modification recommended consists in the use of amyl alcohol as a solvent.

Determination of the Acid Value.—About 6 grms. of the wax are heated with 60 c.c. of pure amyl alcohol until the liquid boils, when it is titrated with decinormal potassium hydroxide solution. The advantage over the ordinary method is that the last drops of alkali can be added at a temperature of about 60° C. without the wax separating, and thus avoiding a partial saponification. Hence in all the experiments described, the results were considerably lower than those usually obtained. Thus, with a pure yellow wax, the respective values were 22·34 and 22·8. In the case of Carnauba wax it is best to use only 3 grms. and 120 c.c. of amyl alcohol. The value found by the author (9·71) is the highest yet recorded.

Determination of the Saponification Value. — About 5 grms. of the wax are placed in an Erlenmeyer flask, into which are then introduced 60 c.c. of amyl alcohol and 25 c.c. of normal alcoholic potassium hydroxide, and the same quantities of amyl alcohol and alkali are placed in a second flask for a blank determination. Both flasks are then placed in a boiling water bath, where they are left for 30 minutes, with occasional shaking at first. 1 c.c. of a 1 per cent. phenolphthalein solution is now added, and the excess of alkali titrated with semi-normal hydrochloric acid.

The author states that all the waxes examined by him gave too low results when saponified by the usual Hübl method. That the action is complete in 15 minutes in the new method is shown by the following results, taken from the author's longer table :—

—	Saponification, 15 minutes.	Saponification, 30 minutes.	Saponification, 50 minutes.	Saponi tion 90 min
Wax, No. 1	94·6 94·3 } 94·4	94·5 94·5 } 94·5	94·3 94·4 } 94·3	94·
" No. 8	89·2 89·6 } 89·4	89·5 89·6 } 89·5	89·3 89·4 } 89·3	89·
" No. 7	86·3 86·5 } 86·4	86·5 86·4 } 86·4	86·5 86·5 } 86·5	86·

The presence of ceresin neither prevents nor retards saponification. With Carnauba wax the mean saponi tion value of 95·1 was obtained.—C. A. M.

Proteid Nitrogen in Vegetable Matter ; Determinatio ——. G. S. Fraps and J. A. Bizzell. J. Amer. C Soc. **22**, [11], 709—719.

A comparative study of the methods of Stutzer (co hydroxide), Mallet (phosphotungstic acid at 90° C.), Wiley (bromine), as applied to the precipitation of prot in vegetable materials. The authors conclude that- Phosphotungstic acid does not precipitate prot completely at 90° or 100°, though at 60° C. it precipit practically the same amount as does copper hydroxide; Extraction of proteids with hot water does not always concordant results ; (iii) Bromine is not a suitable pre tant for proteids in vegetable materials ; (iv) The Stu method is that open to the fewest objections. It is car out as follows :—Place 0·7 grm. of the substance i beaker, add 100 c.c. of water, heat to boiling (substances rich in starch, heat on the water bath for minutes) ; add a quantity of copper hydroxide mix containing about 0·5 grm. of the hydroxide ; stir thoroug filter when cold, wash with cold water on the filter, determine the nitrogen in the precipitate, adding suffi potassium sulphide solution to precipitate all copper mercury. If the substance is rich in alkaline phosph add a little concentrated solution of alum before adding copper hydroxide. It is not certain that albumoses completely precipitated by copper hydroxide ; but in rare cases when they do occur, they can be precipitate the addition of tannic acid after the copper hydroxide.

—J. T.

Alkaloids ; Use of Tannin in Purifying Residues cont ing ——. C. Kippenberger. Zeits. anal. Chem. 1 **39**, [10], 627—633.

Acetone has been found by the author to be a suit solvent for alkaloids in combination with tannin, and separating them from albuminous substances. It diss the freshly precipitated tannates of the following alkalo —Brucine, strychnine, atropine, morphine, aconi veratrine, papaverine, narceïne, thebaïne, codeine, eme nicotine, coniine, sparteine, quinine, narcotine, and coc On the other hand, the precipitates formed by tanni solutions of albumin and peptone did not yield any of the albuminous constituents to the solvent after b treated with acetone for 1½ hour, although tannin was f in solution.

In applying this principle in forensic analysis the fol ing method is recommended :—The substance under amination is extracted with *acidified* alcohol, and alcohol evaporated. The residue is stirred into a paste a little water and acetone, mixed with tannin, and g warmed with a sufficient quantity of acetone containi few drops of hydrochloric acid. The filtrate from th mixed with 10 to 20 c.c. or more of glycerin, together some water and 1 or 2 c.c. of hydrochloric acid, evapor on the water bath so as to expel all acetone, diluted water and filtered. The liquid is then ready for extrac with chloroform.

The author still advocates the retention of his fo method of direct extraction with glycerin containing ta (Zeits. anal. Chem. **34**, 303—308) for cases in w alkaloids which are volatile with steam are present.

—C. A.

ux Vomica; Determination of. F. C. J. Bird. Pharm. J. **65**, [1587], 574.

an alternative for the method of Dunstan and Short, in ich the alkaloids are extracted by hot percolation with a oroform-alcohol menstrum, the author recommends a thod of cold maceration in a solvent of amyl alcohol, oroform, and ether, as being more rapid, more conient, and not requiring the same degree of comminution the drug.

Process for Analysing Nux Vomica Seeds.—5 grms. of seeds, in No 10 powder, are triturated in a mortar with ution of potash (10 per cent.) 2 c.c. until uniformly istened. The extraction menstrum is composed of amyl hol, 1 vol.; chloroform, 3 vols.; ether, 4 vols.: 20 c.c. this mixture is placed in a separator previously plugged ve the stopcock with cotton wool, and the moistened der added to it. The whole is macerated for half an ir. with occasional agitation; at the end of that time a ssure ball is adapted to the separator and the liquid ed out, as completely as possible, by air pressure. The dual drug is again covered with a fresh portion of ent, and again macerated, with occasional agitation, for minutes, and the liquid removed as before. This process epeated until a drop of the extract, when evaporated, s no reaction with Mayer's alkaloidal reagent. Usually to six extractions will be sufficient. To remove all alkaloids, the mixed ethereal extracts are then shaken with a mixture of dilute sulphuric acid, 6 c.c., and er, 25 c.c., in three successive portions. The acid tions are transferred to a 200 c.c. separator half filled water at 21° C. and having the neck above the stopk plugged with a very small pledget of cotton wool. this, a freshly prepared solution of potassium ferroide (1·25 grms. in water, 25 c.c.) is added, and the rater completely filled with water at 21° C. and closed a cork carrying a thermometer. The temperature is fully maintained at 21° C., the contents of the separator ted occasionally for 30 minutes, then allowed to remain st for 90 minutes. A pressure ball is then fitted, and mother liquor forced out. The residual precipitate is hed with 50 c.c. of a mixture of 5 c.c. of dilute sulric acid and 19 c.c. of water at 37·7° C., the liquid g removed by air pressure as before. The remainder he wash water is then employed in a similar manner. shing being completed, the stopper is inserted, the rator inverted, the cotton plug displaced by a stiff wire ed through the stopcock; 10 c.c. of water is then d to suspend the precipitate, 75 c.c. of chloroform and . of strong solution of ammonia are introduced, and whole well agitated. After separating the chloroformic r, the aqueous portion is shaken out with another ion of that solvent. To the mixed chloroformic extracts, . of amylic alcohol is added, the solvent evaporated off, the residual strychnine weighed when dry. An addition ·002 grm. is made to the weight obtained, as the valent to the amount of strychnine ferrocyanide dissolved e wash-water.

e packing of the cotton wool in the neck of the separ demands some care, or it may either be displaced by tion, or, if too tight, impede the flow of liquid. To d this, a single tuft of wool, about 3 cm. in diameter, is ed lightly in the neck of the separator by means of a ted glass rod, the point of which is passed down to the of the stopcock. In this way the wool forms a hollow , which filters rapidly and has no tendency to become laced.

lternative Method for Analysing Liquid and Solid racts of Nux Vomica.—The following method obviates ulties met with in separating immiscible solvents due e presence of varying quantities of fatty oil in extracts x vomica. To wash the alkaloidal extracts, ammonium onate solution is substituted for that of ammonium ate usually employed, since it exhibits less tendency to an inseparable emulsion. 10 c.c. of liquid extract grm. of solid extract, dissolved in hot water, 6 c.c., alcohol, 90 per cent., 2 c.c.) is placed in a small sepa (No. 1), with chloroform, 10 c.c., and ether, 5 c.c., after agitation, strong solution of ammonia, 4 c.c., is added. The mixture is agitated and separated, the immiscible layer being run into a second small separator (No. 2), and shaken out with three successive portions of 5, 5, and 3 c.c. of 10 per cent. ammonium carbonate solution, the washed ethereal liquid being then passed on to a third small separator (No. 3).

To the mixed aqueous washings in No. 2, chloroform, 10 c.c., and ether, 3 c.c., are added. This is shaken out and run off into the mother liquor in No. 1, well shaken, and the ethereal layer run into (empty) No. 2, washed with ammonium carbonate solution twice, using 3 c.c. each time; the washed ethereal extract is run off into No. 3. To the mixed aqueous washings in No. 2, another 13 c.c. of the ether-chloroform solvent is added, and again shaken out as before, and transferred to No. 1. The ethereal layer is washed in No. 2 with 1 c.c. of ammonium carbonate solution. From the washed ethereal extracts in No. 3, the alkaloid is then removed by shaking out with a solution of dilute sulphuric acid, 6 c.c., in water, 25 c.c., used in three portions of 11, 10, and 10 c.c. From this stage the process is conducted as directed for the assay of the seeds

Tincture of Nux Vomica.—100 c.c. of tincture is evaporated to 8 c.c., 2 c.c. of alcohol, 90 per cent., is added, and the process continued as described under the liquid extract.
—J. O. B.

Lemon Oil; Determination of Citral in ——. Schimmel's Semi-ann. Rept., Oct. 1900, 25.

Although the cyanacetic method of E. J. Parry (this Journal, 1900, 384) is found to give fairly accurate results with mixtures of limonene and citral, it is not found to be workable with commercial lemon oils. From the presence of foreign substances, probably derived from the constituents of the peel, a thick layer of insoluble, waxy matter is formed in the graduated tube of the Hirschsohn flask, which renders correct reading of the volume of the supernatant liquid impossible. The problem of devising a workable method for the determination of citral in lemon oil has, therefore, yet to be solved.—J. O. B.

Lemon Oil; Determination of Citral in ——. E. J. Parry. Chem. and Druggist, **57**, [1091], 1000.

Messrs. Schimmel and Co. raise (see preceding abstract) two objections to the author's method (this Journal, 1900, 384). The first objection raised is, that, although the results are satisfactory, a certain proportion of the citral passes over in the distillation at very low pressure, whilst this is made up by an absorption of limonene by the cyanacetic acid. They find, they say, as much as 1 per cent. of citral goes over in the distillation, and therefore 1 per cent.—or rather more, as the results are always a little too high—of limonene is absorbed by the acid, or, taking into account the concentration, the aqueous reagent is said to absorb 2·5 per cent. of its volume of terpene. This, on the face of it, is very improbable. The author has distilled many samples of lemon oil, keeping the pressure down to the lowest possible limit, possibly below even 10 mm., and he has never found any portion of the limonene to contain more than merest traces of citral. Indeed, in general, unless the pressure has been allowed to rise, there is practically no absorption by any of the usual aldehydic reagents.

The second objection raised, is that the reading is obscured by the presence of the stearoptene in the concentrated oil. He has not found that there is much more difficulty in reading the dividing line in this case than in the case of several other absorption processes, and he does not think it more than a trifling difficulty in the process. He reiterates his claim that this method yields more accurate results than any other.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Reaction Velocities; Influence of Chemically Indifferent Solvents on ——. N. Menschutkin. Zeits. Phys. Chem. 1900, **34**, 157—167. (Through Science Abstr. **3**, [11], 887.)

From the results of fresh experiments here given and from those previously obtained (Ber. 1897, **30**, 2966), the influence of various solvents on reactions between aromatic amino compounds and allyl- or methyl-bromide, &c., is examined. It appears: that chemical reactions between organic non-electrolytes in fluid systems occur in a similar manner whether the bodies interact directly or in the presence of indifferent solvents; that the regularities in the relations between the velocities of formation depend on chemical structure and are independent of the presence of indifferent solvents; that the presence of solvents facilitates the study of such relations, and that, with aromatic compounds showing side-chain isomerism, the relative magnitude of the reaction velocities of the isomers often depends on the nature of the solvent used.—W. G. M.

Reactions: Change of Weight in Chemical and Physical ——. A. Heydweiller. Phys. Zeits. 1900, **1**, 527—529. (Through Science Abstr. **3**, [11], 886—887.)

Continuing Landolt's experiments (Zeits. Phys. Chem. 1893, **12**, 1), and examining the reactions of Fe with $CuSO_4$ in neutral, acid and alkaline solutions; of $CuSO_4$ and KOH; of oxalic acid and ammonia; of $BaCl_2$ and H_2SO_4; and also the solution of $CuSO_4$ in neutral and acid aqueous solutions, and the mixing of $CuSO_4$, and dilute H_2SO_4 solutions. the author finds the greatest alteration in weight to be 0·229 mgrm.: that the changes are in all cases but one decreases; and that they are not proportional to the reacting masses; in many cases they are produced only in the presence of small quantities of foreign substances, and are therefore probably due to a secondary action.

—W. G. M.

Radio-Active Lead and Rare Earths. K. A. Hofmann and E. Strauss. Ber. **33**, [16], 3126—3131.

The authors have obtained, from various minerals, lead compounds and rare earths which did not contain a trace of Bi, Ba, Ti, Th, or U, but which, nevertheless, on testing by 24 hours' exposure to a gelatin-bromide photographic plate, were found to be radio-active.

Active Pb from Pitchblende.—The mineral was heated with soda for several hours, the mass extracted with water, the residue decomposed by repeated evaporation with hydrochloric acid, extracted with hot water, and the lead precipitated by H_2S. The $PbSO_4$ obtained by evaporation of the PbS with nitric and sulphuric acids, was strongly radio-active.

Active Pb and Rare Earths from Bröggerite.—Bröggerite consists mainly of uranate of uranium, thorium, and lead. The mineral was decomposed by repeated evaporation with sulphuric acid. Both the lead rendered insoluble as $PbSO_4$, and that subsequently precipitated from the solution were found to be active, through the methods of purification precluded the possibility of polonium being present. The ammonium sulphide precipitate from the solution of the mineral was oxidised by aqua regia and the earths precipitated with oxalic acid. The ignited precipitate was converted into sulphates, dissolved in hot water, thrown down by a large excess of ammonium bicarbonate, and the earths remaining insoluble were purified by precipitation as oxalates from their chloride solution. Thoria, in the authors' opinion, was thus excluded, as were also radium, polonium, and lead, yet the oxalates were radio-active and the oxides obtained on ignition were still more so. The ignited U_3O_8 obtained from bröggerite was active, but by repeated crystallisation of the oxalate, inactive oxalate, yielding inactive U_3O_5, was obtained in the more readily soluble fractions.

Active Pb, Ba, and Rare Earths from Cleveite.—Cleveite was decomposed in the same way as *bröggerite*, and yielded active Pb, Ba, ThO_2, and rare earths. On the other hand the $PbCl_2$, which crystallised out from the hydrochloric acid solution of the mineral, was inactive.

From *autunite*, *copper-uranite*, and *zeunerite* were obtained radio-active Ba, Pb, Bi, and U; on the other hand As, Cu, Fe, Al, and Zn were inactive. *Samarskite* yielded active $PbSO_4$, ThO_2, and rare earths. *Euxenite*, however, yielded ThO_2, rare earths, TiO_2, and Pb only in the inactive condition, and U_3O_8 very strongly active.—H. B.

Hydrogen Peroxide on Thiosulphates: Action of —— A. Nabl. Ber. 1900, **33**, [16], 3093.

In the presence of very dilute sulphuric acid, accordin the author, the action takes place as shown by the equati

$$2Na_2S_2O_3 + H_2O_2 = Na_2SO_4 + Na_2SO_3 + S_2H.OH.$$

Dilute sulphuric acid must be added gradually during course of the reaction to neutralise the basic body S_2H. The latter has not yet been obtained pure in suffic quantity to establish its exact composition. It is a w base having reducing properties, and in many resp resembles hydroxylamine. With mercuric chloride it g a precipitate consisting of a mercuro-mercuric double This property has been utilised to separate the base f the sulphate and sulphite, with which it is mixed. mercury compound was filtered off, washed, and decomp with sulphuretted hydrogen. The solution was then tracted with a mixture of sulphuric acid and alcohol. sulphate of the base was filtered off, washed with et alcohol, dissolved in water, and decomposed with ba carbonate. By this means a colourless solution was obta having a green fluorescence and a strong alkaline reacti

—A.

Cadmium Selenide. Fonzes-Diacon. Comptes Rend. [22], 895—897.

Crystallised cadmium selenide, CdSe, is obtained passing hydrogen selenide, largely diluted with hydro over red-hot cadmium chloride. It is isomorphous zinc selenide similarly obtained. Hydrogen selenide gi in a solution of cadmium sulphate, a chocolate-br precipitate of cadmium selenide; but in a solution cadmium halide, it gives a yellow or orange double salt ($3CdSe.CdI_2$).—J. T. D.

Xanthorhamnin and Quercitrin; Sugar Constituent ——. E. Votocek and V. Fric. Zeits. Zucke Böhmen, 1900, **25**, [1], 1—7.

Contrary to the view hitherto held that rhamnose i only sugar constituent of xanthorhamnin, the latter is fo to contain galactose also.

The glucoside was prepared from Persian berrie digestion with 85 per cent. alcohol on the water-bath, purified by repeated recrystallisation from alcohol. D lation with 12 per cent. of hydrochloric acid, gave a furfural, which furnished phloroglucide, equal to 37·52 37·9 per cent. of rhamnose, calculated on the dry xant hamnin. Now, as Liebermann and Hörmann found 5 per cent. of the sugar by titration with Fehling solution presence of another sugar, not a methyl-pentose, was dicated. This was further confirmed by the polaris and cupric reducing power of a large quantity of subst

The syrup obtained on hydrolysis gave an osazone w purified by soaking with acetone on a porous tile, fus 196° C., the melting-point of galactosazone. In appear it also agreed with that substance. The presenc galactose was further confirmed by the mucic acid test, finally, a mixture of 2 mols. of rhamnose and 1 m galactose gave polarisation equal to that found directly

The hydrolysed syrup from quercitrin (Quercitron b was found to contain neither galactose nor mannose only rhamnose.—L. J. de W.

Gentianose and Sucrose in Fresh Gentian Root; Si taneous Presence of ——. E. Bourquelot and Hérissey. Comptes Rend. **131**, [19], 750—752.

From the mother liquors in the preparation of gentiop (this Journal, 1900, 846), the authors were abl extract, by systematic treatment with alcohol, the s gentianose (this Journal, 1898, 257). The residue this extraction contained another, more highly de rotatory sugar, which was extracted by methyl alcohol, finally obtained in a pure state, when it was found t cane sugar. The authors suggest that as gentia though its constitution is not yet clearly made out, tainly contains at least as many carbon atoms in molecule as cane sugar, the latter may arise in the through the molecular change or decomposition of gentia

—J. T.

thritol in Trentepohlia Jolithus. M. Bamberger and A. Landsiedl. Monatsh. Chem. **21**, 571—573.

RING the extraction of this alga with ether, there eared in the boiling flask first, brownish, afterwards te, crystalline crusts, which, after recrystallising from hol and from glacial acetic acid, had the appearance, e, melting-point, and composition of erythritol.

—J. T. D.

a; Soluble Colouring Matter of Blue-Green ——. . Kolkwitz. Zeits. Vereins deutsch. Zucker-Ind. 1900, 38], 1015—1016.

author draws attention to the fact that the blue-green uring matter—"Phykocyan"—present in many *Algæ* *lycystis*, *Oscillaria*, and *Nostoc*), although retained by living plant, becomes readily soluble and diffusible in r when the plant dies. The aqueous solution is indigo- in colour, and exhibits a fine blood-red fluorescence. A omenon of this kind, occurring, for example, in the e water from sugar factories, &c., in which liquid, are very apt to appear, must not, therefore, too ily be ascribed to the presence of an aniline dyestuff.

—H. T. P.

; Production by Lactic Bacteria of Acetic Acid in —. C. Bartel. Centralbl. Bakt. (II. Abth.), 1900, 9; through Zeits. Spiritusind. 1900, **23**, [48], 438.

formula for the decomposition of milk sugar into lactic $C_{12}H_{22}O_{11} + H_2O = 4C_3H_6O_3$, is not correct, other acts being also formed, such as ethyl alcohol, carbon de, and acetic acid. The author's experiments were ted mainly to the estimation of the acetic acid. Leich-'s *B. lactis acidi* was employed and allowed to ferment both with strong aëration and in absence of air. The tities of acetic acid produced in the two cases were as : As regards the effect of temperature on the produc- f acetic acid, it was found that the quantity increased e temperature was lowered. The smallest proportion etic acid was produced at the temperature at which etic bacteria thrive best. Hence it is concluded that acid is a pathogenic product of the cell life of the rium.—J. F. B.

d β-Naphthol: Comparison of ——. Maximowitch. erap. Gaz. **24**, 402. Pharm. J. 1900, **65**, [1587], 2.

author states that the preference for β-naphthol for inal use is not well-founded. It is shown that hthol is three times as antiseptic as β-naphthol and one-third as poisonous; also β-naphthol is not so well ted by the stomach, and causes irritation of the us membrane of mouth and stomach.—A. S.

ns: Composition of ——. *VI.* W. Zopf. Annalen, , **313**, [3], 317—344. (See this Journal, 1898, 807.)

ria latebrarum Ach.—After extraction of this lichen wo vols. of hot ether, and removal of about five-sixths solvent, leprarine and atranoric acid crystallise out anding, whilst roccellic acid, $C_{17}H_{32}O_4$, remains in on, from which it is obtained in colourless plates on vaporation. When carbon dioxide is passed through a on of roccellic acid in sodium carbonate, the sodium salt ipitated; under the same conditions hydroxyroccellic $C_{17}H_{32}O_5$, remains in solution. If the above mixture rarine and atranoric acid be boiled for a moment with l, the former dissolves, whilst the latter remains ble, but if boiled for an hour with absolute alcohol, ine is converted into hæmatommic acid.

leprarine, $C_{21}H_{20}O_{10}$, be boiled with methyl, ethyl, or l propyl alcohol and two drops of strong hydrochloric eprarinine (melting at 135° C.), lepraridine (melting 120°—121° C.), or lepraline (melting point 100° C.) is ed respectively. These three substances are insoluble stic alkalis, which colour them yellow; their alcoholic ons redden litmus, and give a wine-red coloration with of ferric chloride.

ophora vellea (L.) Ach. — The ethereal extract s gyrophoric acid, which was identified by its decom- n into orsellinic acid and its ethyl ester on long with absolute alcohol.

Cladonia Deformis L.—From this lichen zeorine and usnic acid were extracted. *Cladonia cyanipes Sommerfelt* also contains usnic acid in fair quantity.

Parmelia incurva (Pers.) Fr. contains usnic acid.

Rhizocarpon viridiatrum (Flörke).—From this lichen, by extraction with chloroform, removal of the solvent, and gradual evaporation of the ethereal solution of the residue, rhizocarpic acid was obtained. The same acid had been previously found in *Rhizocarpon geographicum L.* (Annalen, **284**, 114).

Pertusaria amara (Ach) Nylander.—Hesse has recently found five different substances in a lichen he supposed to be identical with *P. amara*, but did not obtain picrolicheoine (J. prakt. Chem. **58**, 501). From what follows, it would appear that Hesse's lichen could not be *P. amara*. The material employed by the author was tested by taste; no other *Pertusaria* has an intensely bitter taste. On concentration of the ethereal extract, a white crystalline powder was obtained. It gave red salts with alkalis, and was identical with salazinic acid (Annalen, **306**, 309—311). The ethereal extract, on further concentration, yielded a substance melting at 175°—176° C. with evolution of gas, dissolving in alkalis to red solutions, and expelling carbonic acid from carbonates; it is identical with picrolichenine.

Evenia furfuracea L.—This lichen, as also *Parmelia olivetorum Nyl.*, contains a substance giving a red coloration with bleaching powder; the author regarded this substance as erythrin, Hesse as lecanoric acid. It is now proved to be a new compound, for which the name olivetoric acid is proposed. The lichens are extracted by cold absolute alcohol, and the filtered extract precipitated by water. After purification, the substance melts at 141°—142° C., the alcoholic solution reddens litmus and is coloured violet by ferric chloride. Dilute potash gives a yellow solution, turning red on boiling. Baryta water gives a yellow solution, which changes to green and then becomes colourless. Analysis indicates the formula $C_{27}H_{35}O_8$.

—A. C. W.

Iron Nitride. G. J. Fowler. Proc. Chem. Soc. **16**, [229]. 209.

NITRIDE of iron was prepared by three different methods: by the action of ammonia on (*a*) finely divided iron, (*b*) ferrous chloride and bromide, (*c*) iron amalgam. Of these methods (*a*) is the most convenient. The substance was found to correspond to the formula Fe_2N. The temperatures of the formation of iron nitride in ammonia and of its decomposition in hydrogen are identical. These results confirm the conclusions of Stahlschmidt. Heated in a current of nitrogen, iron nitride begins to decompose at about 600°; it is slightly magnetic; its specific gravity is 6·35.

When oxidised in air or oxygen, only traces of oxides of nitrogen are produced; heated in a current of air, the substance begins to be converted into ferric oxide and nitrogen at about 200° It takes fire in chlorine either spontaneously or when slightly warmed, ferric chloride and nitrogen being formed, but no trace of nitrogen chloride. It is only slowly attacked by bromine, the action probably being due to the presence of hydrobromic acid in the bromine as an impurity. An ethereal solution of iodine has no action on it.

Dilute hydrochloric and sulphuric acids yield the corresponding ferrous and ammonium salts, hydrogen being liberated, according to the following equation: $2Fe_2N + 6H_2SO_4 = 4FeSO_4 + 2NH_4HSO_4 + H_2$.

The simultaneus action of hydrogen peroxide and sulphuric acid is not distinguishable from that of the acid alone. Nitric acid acts only slowly on the nitride even when strong; the products formed vary with the concentration of the acid.

Gaseous hydrochloric acid begins to attack the nitride at about 220°, and at 350° the reaction becomes rapid, the substance being completely converted into ferrous chloride and ammonium chloride. Gaseous hydrogen sulphide has a precisely similar action at 200°.

Nitric oxide acts similarly to oxygen, and converts the nitride into oxide, the reaction beginning at about 120° and becoming rapid at 170°. Carbon dioxide oxidises the nitride at about 530°. On heating the nitride in steam at 100°, ammonia is very slowly formed. The nitride heated with sodium and carbon yields sodium cyanide.

PATENTS.

Abrasive Material from Bauxite or other Hydrous Oxides of Aluminium: Processes of Manufacturing ——. B. J. B. Mills, London. From The General Electro-Chemical Company, New Jersey, U.S.A. Eng. Pat. 16,529, Sept. 17, 1900.

Bauxite or other hydrous oxides of aluminium may be transformed into a hard material suitable for abrasives by first calcining the soft amorphous aluminium hydrate to drive out the water, and then heating it to a state of quiet fusion in an electric furnace, after which it is allowed to cool slowly into a solid crystalline mass. A finer grain of crystal may be obtained by agitating the mass while cooling.—G. H. R.

Tobacco: Free or Partly Free from Nicotine; Production of ——. F. W. Haase, L. Broeckmann, and C. Haase, Bremen. Eng. Pat. 23,808, Nov. 29, 1899.

The process claimed is for the production of tobacco free or partly free, from nicotine, with improvement in its quality, by macerating the leaf tobacco in an aqueous solution of hydrogen peroxide, with or without the addition of ammonia. The treatment is continued for a length of time sufficient to convert the nicotine into oxynicotine and nicotinic acid, either completely or to the desired extent. Oxynicotine is non-volatile, and only produces small quantities of volatile pyridine bases on combustion. The oxidation products of the nicotine may either be left in the treated tobacco, or, if desired, may be removed by washing and pressing.—J. F. B.

New Books.

Microbes et Distillerie. Par Lucien Lévy, D. ès Sc., &c., Professeur à l'Ecole nat. des Ind. agric. de Douai et à l'Institut d. ferment. de Bruxelles. Georges Carré et C. Naud, 3, rue Racine, 3, Paris. 1900. Price Fr. 10.

8vo volume, containing introduction, 316 pages of subject-matter, and the table of contents. The text, illustrated with 85 engravings, is divided into two parts. 1st. A Systematic Study of Microbes from the two points of view of morphology and physiology. 2nd. The Theory of their Application. In this section, the applications considered are those of the Spirit Distillery, &c., Culture of Yeasts, and in the Brewery, &c.

Die Arzneimittel-Synthese auf Grundlage der Beziehungen zwischen Chemischem Aufbau und Wirkung. Für Aertze und Chemiker. Von Dr. Sigmund Fränkel, Docent für med. Chemie an der Wiener Universität. Julius Springer's Verlag, Monbijouplatz 3, Berlin, N. 1900. Price M. 12.

This work is devoted to the chemistry of those materials used in the latest developments of pharmacology. It is an 8vo volume, containing introduction, subject-matter filling 520 pages, and the alphabetical index. The following are the main heads of the work, which is divided into two special parts, *viz.*, The General and The Special. General Part: I. Theory of the Actions of Inorganic Bodies. II. Of Organic Bodies. III. Significance as to Modes of Action of the Atomic Groups. IV. Changes which the Substances undergo in the Organism. Special: I. General methods for building up bodies of equal physiological action from substances of known effects, in which, however, certain objectionable counter-reactions shall be absent. II. Antipyretics. III. Alkaloids. IV. Narcotics and Anaesthetics. V. Antiseptics and Astringents. VI. The Ichthyol Group. VII. Substances which act on the Intestinal Membranes and Lining. VIII. Camphors and Terpenes. IX. Reducing Agents for the Epidermis. X. Glycerophosphates. XI. Diuretics. XII. Gout Specifics.

Handbook of Industrial Organic Chemistry. Ada for the Use of Manufacturers, Chemists, and all interc in the Utilisation of Organic Materials in the Indus Arts. By Samuel P. Sadtler, Ph.D., F.C.S., Profe of Chemistry in the Philadelphia College of Pharmacy, in the Franklin Institute of the State of Pennsylv &c. Third Revised and Enlarged Edition. J. B. Lip cott Company, Philadelphia, U.S.A. 1900. Price 36, Southampton Street, Covent Garden, London.

Large 8vo volume, containing prefaces, table of cont 503 pages of subject-matter, and an appendix of pages. The work concludes with an alphabetical in of subject-matter. It is illustrated with 126 engrav and 16 diagrams. The following subjects of Techno are treated of:—I. Petroleum and Mineral Oil Indu II. Industry of the Fats and Fatty Oils. III. Esse Oils and Resins. IV. Cane Sugar Industry. V. St and its Alteration Products. VI. Fermentation Indust A. Nature and Varieties of Fermentation. B. Malt Liq and the Industries connected therewith. C. Manufac of Wine. D. Manufacture of Distilled Liquors or Ar Spirits. E. Breadmaking. F. Manufacture of Vine VII. Milk Industries. VIII. Vegetable Textile Fi IX. Textile Fibres of Animal Origin. X. Animal Tis and their Products. A. Leather Industry. B. Glue Gelatin Manufacture. XI. Industries based upon Dest tive Distillation. XII. Artificial Colouring Matters. X Natural Dye-Colours. XIV. Bleaching, Dyeing, and tile Printing. In each of the foregoing groups res tively, a general method of treatment is adopted, following subdivisions representing the course laid d I. Raw Materials. II. Processes of Treatment. III. ducts. IV. Analytical Tests and Methods. V. Bibliogra and Statistics.

The Newer Remedies. Including their Synonyms, Sou Methods of Preparation, Tests, Solubilities, Incom bles, Medicinal Properties, and Doses as far as kn together with Sections on Organo-Therapeutic Ag and Indifferent Compounds of Iron. A Refer Manual for Physicians, Pharmacists, and Students. Virgil Coblentz, M.A., Ph.D., &c., Professo Chemistry and Physics in the New York Colleg Pharmacy, &c. Third Edition. Revised and very enlarged. P. Blakiston's, Son and Co., 1012, Wa Street, Philadelphia, U.S.A. 1899.

8vo volume containing preface to third edition, and pages of subject-matter, followed by appendix coverin pages. As the substances are arranged alphabetical the text, there is no need of an alphabetical index. author says in his preface: "In addition to giving as plete a list as possible of all modern medicinal synth the author has endeavoured to include all such propri combinations as are made up of mixtures containing o more of these synthetics; also such other preparatio employ specially coined titles, many of which are decept similar to those of well-known chemical compounds."

Trade Report.

LEGISLATION; TARIFF CHANGES AN CUSTOMS REGULATIONS.

France.

Allowance to Sugars of French Colonies during season, 1900–1901, "*for waste in manufacture.*"—I the provisions of Article 2, Section 1, of the Law of 13th July, 1886, sugars of French Colonies shippe France, are entitled to an allowance for waste in manufa equivalent to the average excess-yield obtained by home sugar industry in the preceding season. This ave excess-yield having been equal to 28·72 per cent. in season 1899–1900, French colonial sugars imported France during the season from the 1st September, to the 31st August, 1901, will receive an allowance for of 28·72 per cent.

esiduum from the manufacture of Maize-Starch.—This le (also known as gluten meal, gluten-cake, maize-cake, , and imported in powder, lumps, or loaves), when it tains less than than 10 per cent. of starch, is to be free uty under No. 166 of the Tariff as "cake of oilseed and t." When containing more than 10 per cent. of starch, to be dutiable as maize in the grain, under No. 72 of Tariff, at the rate of 3 francs per 100 kilos., gross ght (1*s.* 2¼*d.* per cwt., gross weight).

New Zealand.

Customs Divisions.

Articles, and how Classified.	Unit.	Rate of Duty.
her, viz., "mineral kip," chrome dressed; kip.	Lb.	4*d.*
her, "tan hide"; as buff..................	"	3*d.*
ganese borate, and resinate; as articles l materials suited only for, and to be d solely in, the fabrication of goods in Colony.	..	Free.
ganese oxide; as chemicals not otherwise umerated in the tariff.	*ad val.*	15 %
line (nucoa butter); as articles not erwise enumerated in the tariff.	..	Free.
of myrban; as articles and materials ted only for, and to be used solely in, the rication of goods in the Colony.	..	"
neol (artificial oil of violets); as articles materials suited only for, and to be used ly in, the fabrication of goods in the ony.	..	"
n-killer, Battle's; as insecticide	..	"

Netherlands.

lt for purifying Gum Copal and Gum Dammar.—A h Decree, dated the 26th October last, exempts salt red for purifying gum copal and gum dammar from se duty.

irit in Perfumed Waters.—A Dutch Decree, dated the Nov., provides that, in the case of perfumed waters oilet waters exported by manufacturers in quantities ining at least 50 litres of spirit at 50 per cent., drawback e Excise duty paid shall be allowed for the quantity of contained in the exported liquids.

stoms treatment of Casein.—It has been decided by the h Customs authorities that casein, if it does not contain sweetening substances, fats, or salt, is to be admitted the Netherlands free of duty.

the other hand, a liquid composed of casein, lime-, oil, and a little phenol, and used in the manufacture of colours, is to be dutiable at the rate of 5 per cent. *ad val.*, as a colouring matter prepared with oil.

Greece.

Treatment of Copper Sulphate.

The following words are to be added to class 103 paragraph *a*, under which the articles specified will be exempt from import duty—"and sulphate of copper (blue vitriol) as well as chemical preparations of sulphate of copper mixed with other materials employed against peronosporus."

Sulphate of copper (blue vitrol) was formerly dutiable under class 103, paragraph *b*, of the Tariff at the rate of 5 drachmæ per 100 okes.

Servia.

Import Duty on Olein.

Under a Decree of the Servian Ministry of Finance dated the 17th March last, olein is to be subject to duty under No. 266 of the Servian Tariff at the rate of two dinars per 100 kilos. (9¾*d.* per cwt.), instead of being free of duty as heretofore under No. 273.

New Venezuelan Customs Tariff.

See Bd. of Trade J., Jan. 10, *p.* 84.

United States.

Customs Decisions.

"*Iraldeine.*"—"Iraldeine," a preparation containing alcohol, is dutiable under paragraph 2 of the Tariff, as an alcoholic compound, at the rate of 60 cents per lb. and 45 per cent. *ad valorem.* It is immaterial that the alcohol contained in the compound is of small commercial value as compared with the value of the article as imported.

Dyestuffs from Coal Tar.—So-called "Alizarin Black," "Alizarin Black G A," "Alizarin Black F," and other dyestuffs, produced by various methods from coal-tar products and from substances other than alizarin or anthracene, are dutiable at the rate of 30 per cent. *ad valorem.*

Phthalic and Tetra-chlor-phthalic Acid, and Anhydride.—1. So called phthalic acid or anhydride, a product of coal tar used in making the phthalein series of dyestuffs, is exempt from duty under the provision for phthalic acid in paragraph 464 of the present Tariff Act.

2. Tetra-chlor-phthalic acid or anhydride is dutiable at the rate of 25 per cent. *ad valorem* under the provision for "all other acids not specially provided for," &c., in paragraph 1 of the Tariff, being a distinct and different article from phthalic acid.

United States Mineral and Metal Production.

Eng. and Mining J., Jan. 5, 1901.

Products.	Customary Measures.	1899.				1900.			
		Quantity.		Value at Place of Production.		Quantity.		Value at Place of Production.	
		Customary Measures.	M. Tons or Kilos.	Totals.	Per M. Ton or Kilo.	Customary Measures.	M. Tons or Kilos.	Totals.	Per M. Ton or Kilo.
NON-METALLIC.				Dols.	Dols.			Dols.	Dols.
1 Asbestos......................	Sh. T.	912	827	13,860	16·76	1,100	998	15,400	15·43
2 Barytes.......	"	32,656	29,607	137,071	4·63	41,910	38,021	171,831	4·52
3 Bauxite......................	L. T.	36,813	37,402	101,235	2·71	23,145	23,515	71,749	3·05
4 Bromine......................	Lbs.	433,003	196	125,571	640·67	512,743	232	143,568	618·83
5 arborundum	"	1,741,245	790	156,712	198·37	2,660,000	1,207	239,400	198·34
6 ement, nat. hydraul.	Bls.	10,150,947	1,381,332	5,175,950	3·75	8,832,210	1,201,883	4,256,233	3·54
7 ement, Portland	"	5,805,620	1,053,365	10,141,431	9·91	8,503,308	1,542,376	11,947,614	7·75
ement, slag..................	"	244,757	44,408	360,800	8·10	493,150	89,473	715,067	7·99
oal, anthracite..................	Sh. T.	60,622,398	54,996,279	103,753,780	1·89	54,255,540	49,220,303	97,229,032	1·97
oal, bituminous..................	"	191,456,350	173,688,061	172,301,679	0·99	220,592,239	200,119,966	224,502,483	1·12
oal, cannel..................	"	36,639	33,239	91,597	2·76	25,000	22,680	60,750	2·68
oke..................	"	18,025,256	16,352,405	42,081,002	2·57	18,928,372	17,171,706	48,456,384	2·82
obalt oxide..................	Lbs.	10,200	4,627	15,810	3·42	11,200	5,080	20,160	3·96
opper sulphate	"	67,903,370	30,801	3,530,975	114·64	76,959,486	34,909	3,770,278	108·00
opperas	Sh. T.	13,770	12,492	108,508	8·69	13,785	12,506	110,280	8·82
rushed steel	"	337	306	47,250	154·41	345	313	48,300	303·31
luorspar	"	24,030	21,869	152,355	7·00	23,456	21,279	114,700	5·35
uller's earth	"	13,620	12,356	81,900	6·63	15,700	14,243	89,750	6·30

United States Mineral and Metal Production—*cont.*

No.	Products.	Customary Measures.	1899.				1900.		
			Quantity.		Value at Place of Production.		Quantity.		Value at Place of Production
			Customary Measures.	M. Tons or Kilos.	Totals.	Per M. Ton or Kilo.	Customary Measures.	M. Tons or Kilos.	Totals.
					Dols.	Dols.			Dols.
	Non Metallic—*cont.*								
19	Garnet	Sh. T.	2,565	2,327	72,672	31·23	2,913	2,643	83,890
20	Grahamite	„	3,150	2,858	97,650	34·17	3,300	2,991	105,000
21	Graphite, amorphous	„	1,030	934	8,240	8·82	340	308	3,000
22	Graphite, crystalline	Lbs.	3,632,608	1,647,740	145,304	0·09	3,518,731	1,596,086	143,648
23	Graphite, artificial	„	405,870	18,410	32,475	0·18	845,000	38,329	67,600
24	Iron ore	L. T.	25,341,000	25,746,456	58,284,300	2·26	26,117,315	26,839,992	79,251,947
25	Lead, white	Sh. T.	103,466	93,864	10,812,197	115·20	90,853	82,121	9,962,868
26	Lead, red	„	10,199	9,252	1,070,895	115·67	9,918	8,998	1,096,633
27	Lead, orange mineral	„	928	842	139,200	165·32	829	752	98,112
28	Lepidolite	„	124	112	4,600	41·07	100	91	3,700
29	Limestone flux	L. T.	6,707,435	6,814,754	3,475,525	0·51	6,964,255	7,075,683	3,691,055
30	Litharge	Sh. T.	10,020	9,090	1,032,060	113·53	10,209	9,261	1,121,663
31	Magnesite	„	2,000	1,814	7,600	4·19	2,768	2,511	10,518
32	Monazite	Lbs.	330,000	150	18,480	123·20	350,000	159	19,600
33	Petroleum, crude	Bls.	57,234,304	8,007,368	64,143,890	8·01	63,100,596	8,828,090	75,365,685
34	Phosphate rock	L. T.	1,823,391	1,852,565	7,031,785	3·80	1,599,990	1,625,590	5,569,131
35	Pyrites	„	178,408	181,263	588,323	3·22	208,409	211,743	694,318
36	Salt	Bls.	19,861,948	2,522,610	5,437,941	2·16	20,905,099	2,655,097	6,471,098
37	Slate, roofing	Squares	1,098,374	332,146	3,055,988	2·78	987,412	298,198	2,775,698
38	Slate Manufactures	..	..	..	540,434	..	..	..	516,755
39	Soda, manufactured	M. T.	..	387,020	5,925,276	15·31	..	395,902	6,655,113
40	Sulphur	L. T.	1,565	1,590	33,585	21·12	4,630	4,704	101,212
41	Zinc-white	Sh. T.	39,663	35,982	3,331,692	92·04	44,568	40,432	3,788,180
42	Zinc Ore, exported	„	28,220	25,601	725,944	28·36	37,920	34,401	1,149,612
	Other products, unspecified	..	..	..	141,063,263	..	..	..	165,040,973
	Total non-metallic	..	..	..	615,754,305	..	..	..	755,680,991
	Metallic.								
43	Aluminium	Lbs.	6,500,000	2,948,381	2,112,500	0·72	7,150,000	3,243,219	2,288,000
44	Antimony	„	2,500,000	1,137	241,250	212·18	3,100,000	1,406	286,750
45	Copper	„	581,319,091	263,685	100,916,994	382·72	685,576,802	279,225	100,154,345
46	Gold	Ozs.	3,391,196	105,471	70,096,021	664·60	3,805,455	118,362	78,658,755
47	Iron, pig	L. T.	13,400,735	13,615,350	234,725,754	17·24	13,914,596	14,137,230	238,078,737
48	Iridium	Ozs.	5·6	..	165	..	8	..	240
49	Lead	Sh. T.	217,085	196,938	19,407,399	98·55	251,781	228,414	22,005,659
50	Nickel	Lbs.	22,500	10,205·9	8,156	0·80	20,000	9,072	7,800
51	Platinum	Ozs.	Nil.	Nil.	Nil.	Nil.	173	5·4	3,113
52	Quicksilver	Flasks	28,879	993	1,155,160	1163·20	32,315	1,121	1,474,583
53	Silver	Ozs.	57,126,834	1,776,829	34,036,168	19·16	60,478,276	2,881,068	37,085,248
54	Zinc	Sh. T.	129,675	117,644	14,912,625	126·76	122,850	111,449	10,786,230
	Other metals unspecified	..	..	..	18,415,128	..	..	..	18,971,582
	Total metals	..	..	..	496,057,320	..	..	..	509,800,992
	Total non-metals and metals	..	..	..	1,141,811,625	.	..	..	1,265,481,983
	Deduct duplications	..	..	..	92,581,031	..	..	..	108,319,801
	Grand total	..	..	..	1,049,230,594	..	..	..	1,157,162,182

III.—TAR PRODUCTS, PETROLEUM, Etc.

New Oil District in Mexico.

Bd. of Trade J., Dec. 27, 1900, 705.

According to the *Iron Age* (New York), of 6th inst., arrangements have just been concluded at Tampico, Mexico, for the purchase, by a Californian syndicate, of 400,000 acres of prospective oil lands, situated 25 miles west of Tampico, at a cost of over 200,000*l*. The land is said to contain also large deposits of liquid asphaltum.

Oil Shales of the Lothians, Scotland.

Eng. and Mining J., Dec. 29, 1900, 754.

At a recent meeting of the Edinburgh Geological Society, Mr. Henry M. Cadell gave an address, in which he said that, although the mineral oil industry had existed in Scotland for 30 years, the Geological Survey had never published any general account of the rocks of the lower carboniferous system. The correct reading of the geological sections and the construction of the oil shale districts was for several reasons a matter of no small difficulty, and no geologist had up till now been successful in working out the structure by merely examining the surface outcrops and natural sections. It was necessary to compare natural sections with mining information derived from pits and borings all over the district, and even then there still remained many uncertainties and gaps to fill up, and much was still left direction for future geological investigators to accou In the shale districts, several well-marked horiz landmarks existed for the guidance of mining me geologists. The lowest of these was the Burdie Camps, or Queensferry limestone, which was, in the Calder district, 2,400 ft. below the Hurlet or carboni limestone, and above which were to be found all shales hitherto worked, with the exception of the of Pumpherston, which were situated 600 ft. belo landmark. Above this limestone were the barracks an inferior seam, then the Dunnet, 500 ft. higher up, the Binny sandstone, then the Broxburn shale abo sandstone, and the Fells shale above the marls that c the Broxburn seams. The Houston coal, with its dist green and red overlaying marls, formed anothe conspicuous landmark all over the district, and abo marl only one seam of value—the Raeburn shale— be found. Oil shale was now worked for ammonia as oil, and the production of sulphate of ammonia, had a high agricultural value, formed an important of the industry. The lowest seams of shale at Pumph were richest in ammonia; and Mr. Cadell thought it that the shales richest in ammonia would prove to be t which the proportion of animal to plant remains was g while the shales richest in hydrocarbons, such as t Broxburn, probably contained an excess of vegetable

V.—*TEXTILES.*

Artificial Silk Factory in Belgium.

Bd. of Trade J., Dec. 27, 1900, 712.

According to the *Handels Museum*, of the 13th inst., factory for the production of artificial silk has been stablished by a French firm in Soignies, in Belgium. his factory, which is the first of its kind in Belgium, commenced work on the 1st October last. About 40 operatives re employed.

VII.—*ACIDS, ALKALIS, AND SALTS.*

Chemicals Imports of United States in 1900.

Eng. and Mining J., Jan. 5, 1901, 34.

Substance.		Imports.	Re-exports.	Entered for Consumption.	
				1900.	1899.
eaching pow- der.	Lb.	143,000,000	148,250	142,851,750	123,583,061
tash :—					
Chlorate....	Lb.	1,275,000	342,500	932,500	1,478,948
Muriate	,,	96,000,000	279,000	95,721,000	117,219,080
Nitrate	,,	12,090,000	26,500	12,063,500	18,849,853
Other.......	,,	49,750,000	14,500	49,735,500	46,141,086
da :—					
Ash.........	,,	67,000,000	43,250	66,956,750	48,641,284
Caustic	,,	7,800,000	1,025,000	6,775,000	12,330,708
Sal..........	,,	4,600,000	1,200	4,598,800	6,238,772
Nitrate	,,	192,591	3,930	188,661	144,032
Other.......	,,	18,000,000	260,000	17,740,000	26,409,718
lt...........	,,	416,000,000	3,550,000	412,450,000	381,162,816
im- stone.	Long Tons	153,000	415	152,585	142,757
rites	,,	335,000	..	335,000	310,615
aylite	,,	12,500	4	12,496	20,760

e Chlorate of Potash Explosion at St. Helens.

This Journal, Dec. 1900, *p.* 1159.

Erratum.

The report of the proceedings before Mr. Justice Bucknill ntains the following errors :—

1st. Line 36 from bottom :—" The defendants denied that ey manufactured and stored chlorate of potash," &c. This nial was never made, since chlorate of potash has actually en manufactured and stored ever since the Company isted, and for 40 years previously by its predecessors.

2nd. Line 28 from bottom :—Mr. Brock is spoken of as he Manager of the defendants' works," whereas Mr. Brock of course, the Chairman of the United Alkali Co., Ltd.

Sulphate of Ammonia Statistics.

Bradbury and Hirsch, Liverpool.

Production in the United Kingdom during 1900 from all urces :—

	Tons.
Gasworks	138,000
Iron	18,000
Shale	39,000
Coke and carbonising works	15,000
	210,000

Of this production—

	Tons.
England contributed	134,000
Scotland ,,	73,000
Ireland ,,	3,000

The production during the previous five years was :—

—	1899.	1898.	1897.	1896.	1895.
	Tons.	Tons.	Tons.	Tons.	Tons.
works	136,500	130,000	133,000	127,500	119,600
n	18,000	17,700	18,000	16,500	14,600
le	38,500	37,300	37,000	38,000	38,300
e and carbonising works.	15,000	11,500	10,000	9,000	7,000
Total	208,000	196,500	198,000	191,000	179,500

IX.—*CEMENTS, Etc.*

Bricks from Glass-Works Refuse.

U.S. Cons. Reps., Dec. 1900, 456.

Dr. Ormandy, of St. Helen's, has recently discovered a process by which good furnace bricks can be made from glass-works refuse. The refuse consists mainly of spent sand, minute particles of glass, and about 3 per cent. of iron from the various processes, and it has hitherto been considered that the presence of the iron prevented the use of the material for the manufacture of bricks.

Patents have been taken out to protect the process, and a large firm is now putting up an extensive plant for the manufacture of the bricks. It is claimed that the bricks will stand a great amount of heat They are about the colour of silica bricks and can be glazed. Considerable secrecy is observed as to the process.

Concrete in Mines.

Eng. and Mining J., Dec. 29, 1900, 754.

At the collieries of the John Cockerill Company at Scraing, in Belgium, concrete has been extensively used instead of brickwork for lining circular shafts, lining drifts, air-passages, &c. The concrete used has been made entirely from blast furnace slags, those from forge-iron broken to 30 or 50 mm. being used as ballast, while the mortar is made of granulated slags, hydraulic lime in the proportion of 5 to 1 by volume and slag cement. These are incorporated in a mortar-mill, but no addition of water is necessary, as the granulated slag contains enough. Slag cement is made of about 75 per cent. of granulated gray iron slags and 25 per cent. of slacked lime. When the slags are tolerably uniform in character, chemical analysis of the materials is not necessary except when the furnace charges contain magnesia, which should not be present to a greater extent than 3 per cent. The materials required for a cubic metre of concrete are 0·750 cubic metre granulated slag and 0·150 cubic metre hydraulic lime.

Fuller's Earth Production.

Chem. and Druggist, Jan. 12, 1901, 68.

The production of fuller's earth in the United States has increased greatly in the last five years, though recently it has shown a decline, owing to large importations of the English material, which is preferred for filtering cotton-seed and lard oils. The chief source of the material in the United States is Quincy, Florida, though deposits have been found in New York, Colorado, and Utah, as well as one of a promising nature in South Dakota, which furnishes almost an exact duplicate of the English earth. The American product is largely used as a substitute for bone-black in the filtering of mineral oils. As the cotton-seed oil business is growing rapidly, there promises to be a large demand for the English earth, and, naturally, for such of the native material as comes up to the standard.

X.—*METALLURGY.*

Tropenas Process for Steel Castings.

Eng. and Mining J., Dec. 29, 1900, 761.

Since March, 1900, the Sargent Company, at Chicago Heights, has been manufacturing small steel castings by what is known as the Tropenas process. This method was adopted after several years of experience with open hearth and crucible steel plants, and after a careful study of the subject of steel making at home and abroad, where the process is in successful operation in some 40 different plants.

The Tropenas process consists in the use of special converters, in which pig iron and selected scrap, previously melted in a cupola, are subjected to an air blast of 3 to 4 lb. pressure per square inch, directed horizontally across the top of the molten bath. This action generates intense heat by the combustion of the metalloids in the pig iron, and after a period varying from 16 to 20 minutes, depending on the quality of the charge used, there remains in the converter a bath of nearly pure iron. Addition is made of ferro-manganese, of ferro-silicon, or both, to bring up the silicon, manganese and carbon contents to the specified proportions, when the metal is drawn off into a ladle and poured. The process is very simple and the product very uniform.

The peculiar advantage of the Tropenas process lies in the fact that the resultant metal is better, and consequently more fluid than that produced by any other method, and it is this fact which makes it valuable in the manufacture of small and intricate castings, as it can be poured over the lip of the ladle in as small a stream as desired, and will run through thin sections, producing solid castings free from pin holes and cracks. Any grade of metal is readily produced by varying the additions. It is consequently valuable not only in the production of low carbon steel of the maximum permeability, so much desired in electrical castings, but also in the production of special grades of hard steel for mining machinery parts and other purposes.

HUELVA INDUSTRIES.

Bd. of Trade J., Dec. 27, 1900, 685.

In a report published in the *Moniteur Officiel du Commerce*, of 22nd November last, by M. Prévost, the French Commercial Adviser at Huelva, upon the trade of that district, he calls attention to the recent creation of various companies formed for working copper and manganese mines, which offer little prospect of being of permanent value. Attention is also called in the report to the opportunities for the sale of mining material of all descriptions, and especially of overhead cables for transport purposes, in this district.

Exports.—The quantities of merchandise exported from Huelva during 1899 were as follow:—

	Tons.
Copper pyrites, averaging from 1½ to 3 per cent. of copper	950,000
Iron pyrites, averaging from 45 to 50 per cent. of sulphur	350,000
Carbonate of manganese, averaging from 30 to 35 per cent. of manganese	136,000
Copper matte, containing an average of 30 per cent. of copper	16,000
Copper precipitate, containing an average of 70 per cent. of copper	30,000
Iron ore	25,000
Sulphate of copper	5,000
Lead ore, zinc ore, &c.	5,000
Fruit, cereals, cork, &c.	4,000
Wine	30,000
	1,551,000

Mining.—Besides the pyrites mines, several deposits of carbonate of manganese of low grade containing 30 per cent. to 35 per cent. of mineral, are worked for the most part by native concessionaires; these mines are usually in the form of small pockets or lodes, and will doubtless be exhausted in a comparatively short time.

PLATINUM IN 1900.

Eng. and Mining J., Jan. 5, 1900, 21.

The world's supply of platinum has for several years past ranged between 160,000 and 170,000 troy ounces. In 1900 the total, so far as asertained, was about 165,000 oz., which is somewhat below the demand, so that the metal has commanded high prices throughout the year, its cost gradually approaching that of an equal weight of gold. The uses of the metal are limited by the high prices and could be much extended if the supply could be increased.

Over 90 per cent. of the total comes from the Russian placers, the output of which in 1900 was approximately 153,000 oz. The conditions of production in Russia have not changed materially, though the business is gradually passing into the hands of the combination of Russian mine owners and of Belgian and French refiners, which was formed in 1898. The details of this combination have been kept from the public, and it is hard to obtain definit knowledge about its operations or the exact production.

The only considerable production outside of Russia is i Columbia, in South America. The output of that countr is about 11,500 oz. An increase was promised in 1900, bu the revolution there and the prolonged contest between th Government and the insurgents prevented any extension i mining.

The production in the United States is insignificant; i amounts to about 200 oz. yearly, which is obtained at th San Francisco Mint in parting and refining gold fro certain localities in Trinity, Shasta, and Plumas countie Imports into the United States increased in 1900, the tot for the 10 months ending with October being 6,305 lb indicating a total for the year of about 7,000 lb., or 800 l more than in 1899. A considerable part of the imports i in crude form, the metal being refined here.

A small quantity of platinum is obtained from Britis Columbia, being parted from gold, as in California. Som platinum is known to exist in nickel matte from the Sudbur District in Ontario, but we are not advised of any productio from that source.

New discoveries were reported in 1899, but have not y resulted in the marketing of any quantity of the meta The most promising of these is on the Hootalinqua Riv in the Yukon Territory in Canada. No work has been do on the discovery, which was reported in Algeria two yea ago.

The price of platinum in New York at the close of t year is 18.20 dols. to 18.50 dols. per troy ounce. London, the quotation is 75s. an ounce, or about on a pari with New York. Manufactured into chemical ware or wi the price in New York is 72 c. per grm.

MERCURY IN TEXAS.

Chem. and Druggist, Jan. 19, 1901, 105.

The cinnabar or quicksilver deposits in Brewster Coun Tex., are being developed on an extensive scale. Althou it has been only about a year since any recognition w taken of these deposits, over 1,000 flasks of quicksil were produced up to January 1, 1900. The production f the present year will reach several thousand flasks. T new quicksilver district is located near the Rio Gra border, and is over fifty miles distant from the near railroad-point. Fuel and water are scarce, otherwise t development of the field would be much more rapid tha present.

MERCURY STATISTICS.

Alex. S. Pickering, London.

—	Imports.	Exports.	Price.					
			Highest.			Lowest.		
	Bottles.	Bottles.	£	s.	d.	£	s.	d.
1900	32,725	25,869	9	12	6	9	2	6
1899	51,696	32,239	9	12	6	7	15	0
1898	54,563	34,014	7	15	0	6	16	0
1897	54,734	30,768	7	7	6	6	9	6
1896	47,159	35,211	7	6	0	6	5	6
1895	49,654	36,827	7	8	6	6	7	6
1894	51,251	43,598	6	14	0	5	7	0
1893	52,525	38,022	6	17	0	6	2	0
1892	56,990	50,211	7	13	0	6	1	0
1891	62,771	56,643	9	0	0	7	5	0

Estimated consumption, United Kingdom, 13,000 bot per annum.

XII.—OILS, Etc.

SEAL OIL IN GREENLAND.

Bd. of Trade J., Jan. 3, 1901.

The trade in seal blubber is carried on directly with Greenlanders at the various trading stations and the lying stations in connection therewith, where it is boiled d into oil, in which form it is exported to Denmark. Th the oil is still further refined, and is put upon the mar is light brown and brown seal oil. A third kind of oil is the so-called "three crown oil," *i.e.*, seal oil which has undergone a further boiling and refining process. The seal oil of the Greenland trade is stated to be very well known, and to be everywhere recognised as an excellent product. One thing that always brings it (the so-called "Company Oil") to the front is that it is always produced as an unadulterated article. During the last few years, with a view o safeguard purchasers abroad against imitations, a rule has been in force that, if desired, every cask of seal oil must, on delivery, have the bunghole closed with the seal of he Greenland Company. By this precautionary measure he purchaser has a guarantee that the oil in the cask is eal "Company Oil." About 10,000 casks of seal oil are produced annually, of which about one-fifth is light brown il. Seal oil was formerly sold by auction, but is now sold rivately at prices which are fixed by the administration of he Greenland Company in Copenhagen. The Greenland rade always has been, and is monopolised by the State, and uly Government vessels are allowed to sail in Greenland aters. This is to protect the Greenlander from being eceived by unscrupulous merchants, and from selling more han they can dispense with.

XIII. A.—PIGMENTS, PAINTS, Etc.

Ochre in Germany.

Eng. and Mining J., Dec. 15, 1900, 696.

United States Consul-General Mason writes from Berlin, ov. 9, 1900, that he has received a sample of crude ochre om Texas, which he requested in a previous report. r. Mason adds : "This sample I caused to be divided d distributed among several of the leading consumers of llow ochre in Germany, who, after examination, report nanimously that the tint and quality of the ochre are ike excellent, but that it should be prepared for market being first washed free from sand and other impurities, en dried, pulverized and put up in wooden casks. In is condition it would meet with a ready and extensive le in Germany, where its wholesale value would range om 19·44 dols. to 21·87 dols. per metric ton, including casks, i. f. Hamburg. As above indicated, it will be necessary, order to introduce the new product into this country, that e exporters shall provide for its transportation to a German rt—preferably Hamburg or Bremen—and give a definite ice free on board at one or other of those ports. It is possible for importers in this country to ascertain freights provide charters from a port on the Gulf of Mexico to rmany. That belongs to the exporter, whose product ll in the present case have to compete with French hre, which has for many years controlled the market in rmany."

XIII. C.—INDIA-RUBBER, Etc.

Caoutchouc in the Congo.

Bd. of Trade J., Jan. 3, 1901.

Caoutchouc is the largest item in the export records both the French Congo and the Congo Free State, and the lowing figures show the quantity and value of the export this article during the four years 1896—1899:—

Exports of Caoutchouc.

ears.	From French Congo.		From Congo Free State.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
1896	548	105,000	1,317	263,000
1897	518	99,000	1,662	332,000
1898	578	111,000	2,113	634,000
1899	670	120,000	3,716	1,124,000

Caoutchouc Trade in Hamburg.

Bd. of Trade J., Dec. 27, 1900, 713.

According to the *Dépeche Coloniale* of 13th inst., caoutchouc has a tendency to occupy an increasingly important position on the Hamburg market. The following table shows the quantity and value of caoutchouc imported during the last four years :—

Year.	Quantity.*	Value.
	Tons.	£
1896	7,191	1,253,000
1897	7,576	1,422,000
1898	9,026	2,012,000
1899	11,493	2,343,000

Nearly the whole of the quantity imported is used in Germany ; in 1899 only 6,625 tons were re-exported. The imports of caoutchouc come either direct from the countries of origin (East and West Africa, Madagascar, Brazil, &c.) or from European entrepôts, principally English ports.

Caoutchouc Substitute.

The *India Rubber Trades Journal* says that preparations are being made for the erection of a plant in Monterey, Mexico, for the manufacture of rubber substitute from a native shrub called guayula. It is claimed that the substance can be vulcanised, and is in every way equal to the product of the rubber tree. The shrub grows in unlimited quantity in many of the Central American states, and has been hitherto considered useless.

XV.—MANURES, Etc.

Phosphate Discoveries in Egypt.

Bd. of Trade J., Dec. 27, 1900, 704.

According to a report from the German Consulate in Cairo, published in the *Nachrichten für Handel und Industrie*, discoveries of phosphate deposits have recently been made in Egypt by geologists commissioned by the Government to make exhaustive investigations in consequence of traces of such deposits having been observed.

It appears that, apart from deposits of minor importance, two phosphate deposits of considerable extent and depth have been found, which could be worked without great difficulty, one being situated in the desert, east of Kenah, near the great caravan route leading thence to Kosseir, on the Red Sea, and the other in the Dakleh oasis in the Libyan desert. From both places transport to the Nile Valley, possibly by means of light railways, could be easily effected, especially in the case of Dakleh, which is only 275 kilom. (170 miles) distant, and whence the export of dates on camels is accomplished in seven or eight days' march.

Chemical experts speak somewhat favourably of the phosphate found. So far as samples have yet been analysed, phosphoric acid has been found in quantities corresponding to from 40 to 60 per cent. of phosphate of lime. The German Consul is of opinion that these discoveries may have an important effect on Egyptian agriculture, as on account of their high price, foreign artificial manures have so far been relatively little used in that country, where there was reason to fear that the phosphoric constituents of the soil were being exhausted, and the Government on this account decided about a year ago to admit artificial manures duty free.

Phosphate Rock Production of United States.

Eng. and Mining J., Jan. 5, 1901, 31.

State.	1896.	1897.	1898.	1899.	1900.
Florida	498,400	543,490	546,881	706,677	582,990
Tennessee	49,917	121,251	272,191	462,561	436,000
South Carolina	382,068	333,626	434,273	636,153	562,000
North Carolina	7,418	7 000	2,200	15,000	15,250
All other......	439	2,000	2,100	3,000	3,750
Total { Long Tons }	937,372	1,007,367	1,257,645	1,823,391	1,599,990

NITRATE OF SODA.

W. Montgomery & Co.'s Half-Yearly Report.

OUR earliest trade information regarding nitrate of soda is derived from a circular issued by Mr. Alfred Bourne, in January, 1841, in which Mr. Bourne reviews the business of the previous 10 years, and tells us that imports into England in 1831 amounted to 100 tons, the price at that date being 28s. per cwt. That the imports gradually increased during the decade, reaching 7,200 tons in 1840, with a price of 20s. 6d. per cwt. That the increase was chiefly for agricultural purposes, and also that there were symptoms of demand from Scotland and for transhipment to France.

For the 20 years ending with 1860, progress in consumption was very slow, reaching to 50,000 tons; nearly the whole of which was used in the British Isles. During the next decade these figures had little more than doubled, the quantity being about equally distributed between the United Kingdom and the Continent.

From 1870 to 1875, with remunerative prices for cereals in England, the consumption rapidly rose until in the latter year it reached 165,000 tons in the United Kingdom and 132,000 tons on the Continent. For the next 22 years, until 1897, there was an almost unbroken record of greatly reduced deliveries. It was in the year 1879 that the relative positions of the United Kingdom and Continent began to change as regards consumption, and the latter speedily and irretrievably left the former far behind.

Nitrate of soda has, from time to time, suffered serious mishaps. In 1868 a terrible earthquake and tidal wave overtook and destroyed Iquique, causing great havoc to the nitrate industry, and producing in Europe violent changes in price. In 1877 Peru was again visited with a similar calamity, although not so disastrous. This was followed in 1879 by the outbreak of war between Chili and Peru, which lasted over 12 months, and its effect upon the nitrate shipments was very serious. In the end the whole of the rich nitrate districts which belonged to Peru passed into the possession of Chili. For a few years preceding this war Peru had been expropriating the nitrate fields. When Chili took possession, she adopted the policy of permitting the private owners to work their own deposits, the Government merely imposing an export duty of about 2*l.* 12*s.* 6*d.* per ton, and this system has continued down to the present date.

One consequence of the curtailed shipments, caused by the war between Chili and Peru, was to raise the price in Europe from 13*s.* per cwt. to 19*s.* 6*d.* per cwt., and the following season the European farmer used 30 per cent. less than the previous year.

With a recurrence to more moderate prices and a great stimulus in agriculture on the Continent, especially in the cultivation of beetroot, a vast increase in the consumption of nitrate was noticeable in the decade ending with the year 1890.

The figures during that period for the Continent grew from 113,000 tons to 666,000 tons. In the United Kingdom during the same time, owing to agricultural depression, caused chiefly by the disastrously low price of cereals and the consequently reduced acreage under cultivation, especially of wheat, the consumption fluctuated between about 70,000 tons in 1880 to 120,000 in 1890. From 1890 until to-day, the record of consumption throughout the world is one of almost unbroken advance, slow perhaps, but of such uniform steadiness that there is every reason to believe that it is of a staying character. The following figures will show at a glance the total progress made during the periods to which we have referred:—

Year.	World's Consumption.	Price on 31st December.
	Tons.	Per Cwt. *s.* *d.*
1831	100	28 0
1840	7,200	20 6
1860	50,000	15 0
1870	103,000	15 9
1880	228,000	14 3
1890	885,000	7 7¼
1900	1,324,000	8 6

NITRATE OF SODA.

Shipments, Consumption, Stocks, and Prices for Three Years

—	1898.	1899.	190
	Tons.	Tons.	Ton
Shipments from South American Ports to all parts for the six months ending 31st December	819,000	819,000	86
Shipments from South American Ports for the 12 months ending 31st December	1,260,000	1,373,000	1,421,
Afloat for Europe on 31st December ..	571,000	505,000	573,
Stocks in United Kingdom ports:—	16,000	30,000	38,
Stocks in Continental ports on 31st December	116,000	206,000	186,
Consumption in United Kingdom for the six months ending 31st December	32,000	34,000	13,
Consumption in Continent for the six months ending 31st December	234,000	270,000	235,
Consumption in United Kingdom for the 12 months ending 31st December	132,000	123,000	135,
Consumption in Continent for the 12 months ending 31st December	900,000	1,017,000	991,
Consumption in United States for the 12 months ending 31st December ..	142,000	150,000	175,
Consumption in other Countries for the 12 months ending 31st December	12,000	30,000	21,
Consumption *in the World* for the 12 months ending 31st December	1,186,000	1,330,000	1,324
Visible supply on 31st December (including the quantity afloat for Europe, and Stocks in United Kingdom and Continent)	703,000	741,000	791
Price on 31st December .....per Cwt.	7*s.* 7½*d.*	7*s.* 9*d.*	8*s*

—	1898.	1899.	1900.
	Tons.	Tons.	Tons.
Liverpool..	4,500	6,000	10,000
London....	2,400	1,800	4,000
Out ports..	9,100	22,200	21,000

XVI.—SUGAR.

BEET SUGAR INDUSTRY OF GERMANY.

U.S. Cons. Reps., Dec. 1900, 450.

The official year of the German sugar industry is cal lated from the 1st of August to the 31st of July, and *Reichsanzeiger* has recently published an interesting mary of the production and export of sugar for last with a comparison with preceding years, from which following statement is taken:—

While the consumption of raw beets was somew greater last year, it was considerably less than some for years. There were consumed last year 12,466,432 ton raw beets, while the consumption in the preceding (1899) was 12,150,644 tons. In the year 1897–98, consumption of raw beets was 13,697,892 tons; in 1896- 13,721,601 tons. While in comparison with the preced year the increase was 315,790 tons, or 2·6 per cent., on contrary, the beet consumption in the years 1897–98 an 1896–97 was more than 1,000,000 tons greater than in year now ended. The sugar production was as follows:

Year.	Raw Sugar.	Refined Sugar.	Total in Ra Sugar (includin Crystallise
	Tons.	Tons.	Tons.
1899—1900	1,576,673	1,212,471	1,791,252
1898-99	1,521,716	1,185,922	1,722,420
1897-98	1,664,268	1,207,350	1,844,400
1896-97	1,659,055	1,004,954	1,821,223
1895-96	1,467,437	1,084,395	1,637,057
1894-95	1,692,011	989,862	1,827,971

Accordingly, the raw-sugar production was 54,957 and the refined sugar was 26,549 tons greater last year in the preceding, while the increase in crystallised su which is computed in the last column of raw sugar (parts of crystallised sugar being reckoned as 10 parts sugar), was 68,823 tons, or almost 4 per cent. better than last year. The years 1894-95, 1896-97, and 1897-98 produced certainly considerably greater quantities of raw sugar; but the production in refined sugar was in no former year so great as this season. The total production of raw sugar averaged in the five preceding years 1,770,621 tons; consequently, the production last year exceeded the average by 20,631 tons. For the production of 1 kilo. (2·2046 lb.) of raw sugar, 6·96 kilos. (15·3 lb.) of raw beets were, on the average, necessary last year, while in the year 1898-99, 7·05 kilos. (15·5 lb.) of raw beets were necessary. In the year 1897-98, 7·43 kilos. (16·4 lb.), and in the year 1896-97, 7·53 kilos. (16·6 lb.) were required. The results were more favourable than in any of the previous years, not excepting the unusually warm year 1895-96, during which 7·13 kilos. (15·7 lb.) of beets were required for the production of 1 kilo. of sugar. The Strontium process played an important part in the extraction of sugar. By means of this process, 91½ per cent. of sugar was extracted, as compared with 89 per cent. in the year 1898-99.

In spite of the increase in the production of sugar, the export during the last business year has been less than in the preceding year. There was exported the following quantity:—

Year.	Raw Sugar.	Loaf Sugar.	Total.
	Tons.	Tons.	Tons.
1899-1900	485,935	417,408	924,562
1898-99	499,603	436,785	956,214
1897-98	478,944	478,812	982,869
1896-97	760,657	405,114	1,186,962

According to this, the export of raw sugar decreased about 13,700 tons, and that of loaf sugar 19,000 tons, and he total export, accordingly, decreased 31,700 tons. The igures for the year 1899—1900 include the exports during he five last months of 1899 and the first seven months of 900. The following table shows the export of sugar to he different countries during the last three official years:—

Country.	1899—1900.	1898-99.	1897-98.
	Tons.	Tons.	Tons.
reat Britain	521,981	607,595	628.367
nited States	218,540	188,852	142,434
ritish North America	40,500	51,474	38,474
ree harbour of Hamburg	27,541	9,105	43,292
apan	20,892	16,074	31,326
orway	20,233	17,681	17,328
witzerland	12,654	12,127	12,925
enmark	11,845	13,004	7,358
rtugal	8,262	7,778	6,765
ruguay	7,412	1,056	399
etherlands	6,200	6,801	9,636
weden	5,459	8,569	359
hile	4,024	3,932	5,426
ritish East Indies	2,557	1,135	20,239
ritish Australia	1,793	549	2,628

According to this, the export of sugar to Great Britain as 85,614 tons, or 14·1 per cent. less last year than in the receding. Great Britain received, in the year 1898-99, 3·5 per cent. of the total export of German sugar; in the ar 1899—1900, only 56·6 per cent. On the contrary, the port to the United States increased during last year most 30,000 tons. In the year 1897-98, the United States k 14·5 per cent. of the total German export; in 1898-99, ·7 per cent.; and in 1899—1900, 23·6 per cent. This so much the more remarkable as the increase was during e period in which new tariff rules were prescribed, which creased the duty on sugars exported from premium-ying countries. Consequently an additional duty was posed upon sugar exported from Germany in proportion the premium paid, and thereby the market for raw sugar, well as for sugar exported from countries which paid no emium, was favoured. The export to British North merica decreased during last year because the tariff by hich Canada favours the mother country and its colonies s gone into effect. Also the export to Sweden, Denmark, d the Netherlands has decreased. On the other hand, e export to Japan, British East Indies, and Australia has increased considerably, in comparison with the great falling off in the year 1898-99. The export to Norway has also increased.

BEET-SUGAR INDUSTRY OF FRANCE.

U.S. Cons. Reps., *Dec.* 1900, 452.

"Beet Sugar in France from 1800 to 1900" is the title of a quarto volume of 220 pages and 15 engravings, recently brought out by M. Jules Helot. It is a complete history of the sugar industry in this country, and a review of the legislation and the inventions that have aided or retarded its progress since the first protective decree under Napoleon I. up to the ninety-eighth law enacted during the presidency of the late Félix Faure.

The beginning of the industry in France was really under Napoleon I., in 1810-12, when he established five great schools for study and instruction in "sugar chemistry," and four large imperial sugar mills, exempt from all taxation.

M. Helot follows the discoveries and inventions by which the yield of the beet has been increased from 2 per cent. in 1810 to 12 per cent. in 1900.

There are now in France 340 sugar factories, the average production of which has increased threefold in 18 years. They consume 540,000 lb. of beets every 24 hours. The average daily consumption of Germany is 860,000 lb. Since 1888 the consumption of coal in the sugar mills of France has fallen from 442 lb. to 286 lb. per ton of beets.

The following table gives the product of raw sugar for the countries named:—

Country.	1869-70.	1879-80.	1889-90.	1899—1900.
	Met. Tons.	Met. Tons.	Met Tons.	Met. Tons.
Germany	217,000	415,000	1,261,000	1,790,000
Austria-Hungary	180,000	420,000	799,000	1,200,000
Russia	130,000	300,000	526,000	900,000
France	289,000	478,000	755,000	805,000
Belgium	46,000	75,000	173,000	300,000
Holland	13,000	24,000	56,000	180,000
Other countries.	3,000	8,000	87,000	275,000
Total	878,000	1,720,000	3,657,000	5,450,000

Although France has almost trebled her production in the last 30 years, she has fallen from the first place in 1870 to the fourth place in 1900, and to-day there is a difference of 120 per cent. between her and Germany. In France 255,000 hectares (630,105 acres) are devoted to the cultivation of the beet, against 427,000 hectares (1,055,117 acres) in Germany. The product of beets per hectare in Germany is nearly 30,000 kilos., and in France it is 28,000 kilos. Moreover, in France the yield is 12 per cent., while in Germany it is over 13 per cent.

Since 1896, while there has been a very high protective tariff on sugar—in fact, an increasing tariff—the price has been steadily declining.

STARCH INDUSTRY IN GERMANY.

Bd. of Trade J., *Dec.* 27, 1900, 715.

The German Government have recently collected statistics showing the production in various branches of industry in the Empire, and figures showing the quantity and value of different kinds of starch (exclusive of rice starch) produced in Germany have recently been published in the *Nachrichten für Handel und Industrie*, issued by the German Home Office. Although relating to the business year 1897-98, the figures may be of interest as showing the annual output of this branch of German industry. The

	Quantity.	Value.
	100 Kilos.	Marks.
Potato starch	1,344,578	20,666,820
Wheat „	121,291	4,591,219
Maize „	85,076	2,236,896
Potato sago	4,158	110,734
Starch sugar	71,733	1,719,362
Starch syrup	348,021	8,293,456
"Couleur"	48,113	1,556,593
Dextrin and starch gum	189,585	5,338,069

quantities and value of the principal products of the starch industry are given in the foregoing table.

XVII.—BREWING, WINES, SPIRITS.

Royal Commission on Beer Poisoning.

Standard, Jan. 11, 1901.

We are officially informed that a Royal Commission has been appointed to make investigations respecting the beer-poisoning epidemic.

The Commissioners are Lord Kelvin, Sir W. Hart Dyke, Sir W. S. Church, President of the Royal College of Physicians; Professor T. E. Thorpe, Government Analyst; Mr. H. Cosmo Boosor; and Dr. B. A. Whitelegge, Her Majesty's Chief Inspector of Factories. Dr. G. S. Buchanan, one of the Medical Inspectors of the Local Government Board, is the Secretary to the Commission. The instructions to the Commissioners are—

To ascertain with respect to England and Wales:—

1. The amount of recent exceptional sickness and death attributable to poisoning by arsenic;

2. Whether such exceptional sickness and death have been due to arsenic in beer, or in other articles of food or drink, and, if so,

(*a*) To what extent;

(*b*) By what ingredients, or in what manner, the arsenic was conveyed: and

(*c*) In what way any such ingredients became arsenicated; and,

3. If it is found that exceptional sickness and death have been due to arsenic in beer, or in other articles of food or drink, by what safeguards the introduction of arsenic therein can be prevented

BOARD OF TRADE RETURNS.

Summary of Imports.

Articles.	Year ending 31st Dec.	
	1899.	1900.
	£	£
Metals	28,304,450	33,186,303
Chemicals and dyestuffs	5,768,374	5,559,037
Oils	9,690,576	11,046,595
Raw materials for non-textile industries.	56,777,299	8,277,124
Total value of all imports	485,035,583	523,633,486

Summary of Exports.

Articles.	Year ending 31st Dec.	
	1899.	1900.
	£	£
Metals (other than machinery)	40,307,079	45,422,986
Chemicals and medicines	8,854,813	9,271,510
Miscellaneous articles	34,872,251	36,565,410
Total value of all exports	264,492,211	291,451,306

Imports of Oils for Year ending 31st Dec.

Articles.		Quantities.		Value.	
		1899.	1900.	1899.	1900.
				£	£
Cocoa-nut	Cwt.	458,297	552,743	515,642	667,207
Olive	Tuns	15,939	12,046	553,286	461,084
Palm	Cwt.	945,472	938,350	1,037,265	1,086,555
Petroleum	Gall.	240,147,367	255,852,261	4,574,989	5,574,533
Seed	Tons	46,116	41,225	879,171	1,036,564
Train, &c.	Tuns	20,358	21,324	346,996	389,712
Turpentine	Cwt.	495,808	595,190	809,906	978,943

Imports of Miscellaneous Articles for Year ending 31st Dec.

Articles.		Quantities.		Value.	
		1899.	1900.	1899.	1900.
				£	£
Cement	Tons	..	104,768	..	211,5
China and earthenware.	Cwt.	..	361,371	..	932,07
Drugs	Value £	..	..	1,078,537	1,198,9
Glass:—					
Sheet	Cwt.	1,301,881	1,165,979	672,553	650,2
Plate	„	359,154	316,094	390,828	354,6
Flint	„	..	487,781	..	900,9
Bottles	Gross	1,266,959	1,591,213	727,534	673,4
Other	Cwt.	905,975	343,070	1,617,895	617,1
Glue and gelatin.	„	..	212,063	..	463,8
Leather, unmanufactured.	„	1,354,186	1,408,923	8,582,379	8,792,9
Oil seed cake	Tons	441,934	394,889	2,648,184	2,547,5
Paints and pigments.	Value £	..	..	..	1,349,1
Paper, pasteboard	Cwt.	5,305,399	6,332,573	3,723,094	4,411,5
Scientific instruments.	Value £	..	..	..	648,8
Soap and soap powder.	Cwt.	..	191,214	..	244,3
Zinc manufactures.	„	423,736	434,960	593,930	559,7

Imports of Metals for Year ending 31st Dec.

Articles.		Quantities.		Value.	
		1899.	1900.	1899.	1900
				£	£
Copper:—					
Ore	Tons	125,202	101,153	1,130,528	1,173,0
Regulus	„	82,179	87,720	2,512,572	3,517,2
Unwrought	„	59,550	71,086	4,313,455	5,276,8
Lead, pig and sheet	„	198,377	195,380	2,883,887	3,319,
Pyrites	„	701,174	740,753	1,164,667	1,236,
Quicksilver	Lb.	3,877,184	2,454,438	415,430	297,
Silver ore	Value £	..	..	1,032,590	1,022,
Tin	Cwt.	543,478	662,360	3,298,182	4,359,1
Zinc	Tons	69,949	69,536	1,668,381	1,412,0

Imports of Raw Material for Non-Textile Industries for Year ending 31st Dec.

Articles.		Quantities.		Value.	
		1899.	1900.	1899.	190
				£	£
Bark, Peruvian	Cwt.	33,579	41,108	77,469	92,
Caoutchouc	„	449,651	514,226	5,923,897	6,987,
Gum:—					
Arabic	„	67,926	82,995	168,510	177,
Lac, &c.	„	108,758	113,074	372,587	363
Gutta-percha	„	82,497	126,059	1,005,966	1,085,
Hides, raw:—					
Dry	„	446,725	751,504	1,148,189	1,996,
Wet	„	763,548	634,375	1,639,898	1,467,
Ivory	„	9,939	9,887	404,063	398,
Manure:—					
Bones	Tons	68,915	68,737	313,659	301,
Guano	„	26,911	33,636	140,075	178,
Nitrate of soda	„	140,851	141,155	1,069,771	1,153
Phosphate of lime	„	420,108	355,430	682,940	598,
Paraffin	Cwt.	1,077,003	984,571	1,011,067	1,337
Linen rags	Tons	20,426	16,612	174,801	161
Esparto	„	207,604	200,280	806,354	800
Pulp of wood	„	415,113	488,827	1,989,703	2,633
Rosin	Cwt.	1,708,630	1,802,098	399,656	461
Skins:—					
Goat	No.	..	14,876,710	..	1,113
Sheep	„	..	15,045,195	..	1,00
Tallow and stearin	Cwt.	2,031,137	2,177,991	2,380,033	2,835

IMPORTS OF CHEMICALS AND DYESTUFFS FOR YEAR ENDING 31ST DEC.

Articles.	Quantities.		Value.	
	1899.	1900.	1899.	1900.
			£	£
Alkali .... Cwt.	237,761	322,051	133,878	168,158
Borax .... "	60,566	308,407	30,815	155,409
Brimstone .... "	431,218	450,681	101,615	109,018
Nitrate of potash.. "	248,717	251,928	204,485	214,975
Chemicals, other Value £	..	..	1,464,817	1,498,624
Cutch and gambier. Tons	21,526	19,496	347,025	386,099
Dyes :—				
Alizarin .... Value £	..	..	215,228	186,264
Aniline and other "	..	..	493,569	533,824
Indigo .... Cwt.	58,977	33,518	986,090	542,089
Bark .... "	324,725	293,755	136,971	109,724
Valonia .... Tons	24,335	32,663	281,471	313,656

EXPORTS OF METALS (OTHER THAN MACHINERY) FOR YEAR ENDING 31ST DEC.

Articles.	Quantities.		Value.	
	1899.	1900.	1899.	1900.
			£	£
Brass .... Cwt.	113,920	120,698	562,783	631,525
Copper .... "	997,647	748,627	3,746,880	2,931,793
Lead .... Tons	40,289	36,269	635,997	690,310
Plated wares... Value £	..	..	420,869	460,471
Tin .... Cwt.	93,908	112,462	586,850	763,340
Zinc .... "	132,704	153,402	153,748	166,970

EXPORTS OF DRUGS AND CHEMICALS FOR YEAR ENDING 31ST DEC.

Articles.	Quantities.		Value.	
	1899.	1900.	1899.	1900.
			£	£
lkali .... Cwt.	3,808,800	3,657,154	1,030,871	1,120,862
leaching materials "	1,300,100	1,270,101	321,157	370,784
hemical manures Tons	440,138	400,384	2,427,046	2,411,444
opper sulphate .. "	40,193	42,914	855,225	1,013,594
edicines .... Value £	..	..	1,155,637	1,263,913

EXPORTS OF MISCELLANEOUS ARTICLES FOR YEAR ENDING 31ST DEC.

Articles.	Quantities.		Value.	
	1899.	1900.	1899.	1900.
			£	£
unpowder..... Lb.	7,923,600	7,021,000	180,366	155,857
audles......... "	27,733,300	22,583,100	412,181	397,982
aoutchouc..... Value £	..	..	1,388,805	1,423,413
ement......... Tons	352,358	359,982	690,835	673,062
roducts of coal. Value £	..	..	1,543,942	1,812,174
arthenware ... "	..	..	1,871,531	1,854,147
toneware ...... "	..	..	170,345	184,647
lass :—				
Plate .... Sq. Ft.	1,764,100	2,165,072	100,030	135,426
Flint .... Cwt.	88,401	101,742	216,000	245,038
Bottles .... "	794,650	861,398	377,855	428,965
Other kinds ... "	249,229	225,629	222,463	233,153
eather :—				
Unwrought .... "	157,437	136,458	1,483,114	1,449,537
Wrought ...... Value £	..	..	429,637	481,698
eed oil .... Tons	38,174	42,690	758,657	1,112,660
oorcloth .... Sq. Yds.	26,887,500	27,848,200	1,164,267	1,311,464
ainters' materials Val. £	..	..	1,833,937	2,052,392
aper .... Cwt.	930,014	1,066,818	1,423,924	1,649,188
ags .... Tons	64,893	63,282	341,629	375,682
ap .... Cwt.	932,700	872,610	941,575	929,617

Monthly Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

APPLICATIONS.

23,032. I. C. McClenthen. Improvements in smoke-consuming apparatus. Dec. 17.

23,051. K. E. Markel and J. J. Crosfield. Improvements in or relating to apparatus for separating solid matters from liquids. Dec. 17.

23,052. J. M. Gibson and The Buckley Brick and Tile Company, Ltd. Improvements in packing material for Gay Lussac, Glover, and the like towers. Dec. 17.

23,109. H. de Witt. Improvements in continuous kilns. Complete Specification. Dec. 18.

23,244. L. Kaufmann. Improved process for effecting rapid crystallisation. Complete Specification. Dec. 19.

23,574. E. H. Stein. Improved iron shaft-furnace for burning cement, lime, and the like. Complete Specification. Dec. 24.

23,608. J. E. Bousfield.—From The Snowflake Refrigerator Company, Ltd., South Australia. Improvements in refrigerators. Complete Specification. Dec. 24.

23,754. G. W. Johnson.—From P. Naef, United States. Improvements in means to be employed in absorbing, precipitating, distilling, lixiviating, and generally for subjecting matter to the action of gases or liquids. Dec. 28.

1901.

592. W. P. Grath. Improvements in kilns. Complete Specification. Jan. 9.

654. S. J. Ingram. Improvements in apparatus for charging coal-gas and other retorts. Jan. 10.

765. A. J. Boult.—From A. Laudsiedl, Austria. Improvements in and relating to distilling or condensing apparatus. Jan. 11.

826. D. W. Forbes. A conical carburettor. Jan. 12.

839. W. Reeves. Improvements in filtering apparatus. Jan. 12.

COMPLETE SPECIFICATIONS ACCEPTED.

1899.

25,640. G. N. Vis. Vacuum evaporating apparatus for separating salt from solution, especially from brine. Dec. 31.

1900.

451. F. Pinther. Apparatus for regulating the supply of air to furnaces. Jan. 16.

534. E. G. Behrend. Cooling or refrigerating apparatus. Jan. 16.

2823. J. W. Macfarlane. Weston's centrifugal machines. Dec. 31.

3080. F. Simpson and A. R. T. Woods. Evaporators. Jan. 16.

3748. E. G. Scott. Vacuum evaporators. Dec. 28.

5826. V. E. J. Durafort. Capsules or vessels for containing compressed or liquefied gas. Jan. 9.

5917. H. Schaffstädt. Surface condensers. Dec. 28.

5918. H Schaffstädt. Condensers. Dec. 28.

17,924. S. M. Lillie. Treatment of solutions to precipitate matter contained therein. Dec. 31.

II.—FUEL, GAS, AND LIGHT.

APPLICATIONS.

23,027. C. Carpenter. Improvements relating to the igniting of incandescent gas burners. Complete Specification. Dec. 17.

23,044. P. Naef. Apparatus for recovering products from fuel. Dec. 17.

23,116. S. Chandler, jun., and J. Chandler. Improvements in gas scrubbers and washers. Dec. 18.

23,132. C. S. Snell. Improvements in burners used for incandescent gas lighting. Dec. 18.

23,133. C. S. Snell. Improvements in burners used for incandescent gas lighting. Dec. 18.

23,136. M. E. H. Dennstedt. Improvements relating to the desulphuration of illuminating gas. Dec. 18.

23,222. W. P. Thompson.—From The Firm of S. Zielenziger, Germany. Improvements in incandescent gas lamps. Complete Specification. Dec. 19.

23,236. W. J. R. Sims and A. L. Davis. Improvements in means for extracting roots and foreign matter from peat. Complete Specification. Dec. 19.

23,237. W. J. R. Sims and A. L. Davis. Improvements in processes for treating and drying peat. Complete Specification. Dec. 19.

23,251. A. Scholl. An improved hydraulic gas-compressing apparatus. Complete Specification. Dec. 19.

23,320. W. S. Rock. Improvements in the production of oxide of iron. Dec. 20.

23,346. H. Higgins. Improvements in or relating to the treatment of peat and in apparatus therefor. Dec. 20.

23,605. The Portable Gas Fountain Syndicate Ltd.—From J. Thovert, France. Improvements in incandescent gas burners. Dec. 24.

23,615. J. B. S. MacIlwaine. Improvements in the manufacture of 'acetylene' gas for the purpose of illumination and in the apparatus used in the manufacture of such gas. Dec. 27.

23,642. O. Reitz. Improvements in appliances connected with incandescent gas lighting apparatus. Complete Specification. Dec. 27.

23,662. A. J. Boult.—From Desiderius Turk and The Actien Gesellschaft "Lauchhammer," Germany. Improved process for the production of gases of high caloric value from low-caloric fuel material. Dec. 27.

23,701. A. Rosenberg. Improvements in and connected with self-igniting incandescent gas-lights. Dec. 28.

23,742. C. G. Redfern.—From H. Collins, Belgium. The manufacture of a silicated material for use for fuel or for the production of refractory and other articles. Dec. 28.

23,765. W. Young and S. Glover. See Class B.

23,768. H. Oldham. Improvements in or relating to incandescent gas burners. Dec. 29.

23,813. W. Young, S. Glover, and T. Glover. Improvements in removing and preventing naphthalene deposits and in apparatus therefor. Dec. 31.

23,815. E. W. T. Richmond. An improved Bunsen or atmospheric burner. Dec. 31.

23,849. J. St. Clair Legge. Improvements in vapour incandescent lighting apparatus. Dec. 31.

23,850. A. G. Brookes.—From The Incandescent Gas Light Company, United States. Improvements in or relating to apparatus for so-called incandescent gas lighting. Complete Specification. Dec. 31.

1901.

51. M. Gobler. Improvements in gas producing apparatus. Complete Specification. Jan. 1.

83. J. Bonnet and J. S. Muller. Improvements relating to machines for the manufacture of incandescent gas mantles. Jan. 1.

100. E. J. Duff and The United Alkali Company, Ltd. Improvements in means to be employed in the treatment of producer gases. Jan. 1.

127. F. E. Ross. Improvements in apparatus for th production of combustible gas. Jan. 2.

179. The Atmospheric Gas Company, Ltd., and E Thornton. Improvements in producing mixtures of va porised oil and air for heating, lighting, and motor purposes Jan. 3.

194. J. S. Morriss. Improvements in mantles for in candescent lighting. Jan. 3.

212. T. Machin. Improvements in acetylene generators Jan. 3.

240. J. A. Burgess. Improvements in acetylene ga generators. Jan. 3.

241. J. A. Burgess. Process or method for treating an purifying acetylene gas. Jan. 3.

243. E. Cervenka, J. Bernt, and R. Lehmann. Improve ments in or relating to incandescent burners for liquid fue Jan. 3.

405. G. Daubenspeck and O. H. Smith. Improvemen in and relating to refractory incandescent mantles. Jan.

415. J. A. Ageron, C. E. Baumes, and E. Delcourt. new or improved process and apparatus for producing new kind of gas for illuminating, heating, or motive pu poses. Jan. 7.

478. T. Kautny and R. W. Lotz. Improvements relatin to acetylene gas generators. Complete Specificatio Jan. 8.

571. C. Clamond. An improvement in incandescen mantles. Jan. 9.

572. J. H. Calkins. Improvements in apparatus f generating acetylene gas. Filed Jan. 9. Date applied f June 9, 1900, being date of application in United States.

645. R. Beese. Self-igniting attachment for gas burne Complete Specification. Jan. 10.

697. J. Radcliffe. Improvements in the manufacture gas and in apparatus therefor. Jan. 10.

763. W. Hooker. Improvements in incandescence g burners. Jan. 11.

781. P. Naef. Improvements to be employed in conne tion with the production of gas in gas producers, and i treatment and utilization in internal combustion engin Filed Jan. 11. Date applied for June 14, 1900, being da of application in United States.

798. W. H. Sherburn. Improvements in Bunsen burne Jan. 12.

827. G. Kohl. Improvements in incandescent bodi and in the method of manufacturing same. Complete Sp cification. Jan. 12.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

410. E. J. Duff. Gas producers. Dec. 28.

905. A. Graetz. Blue burners for light carburett hydrogen gas. Jan. 16.

1047. J. West. Charging machine for gas retor Jan. 9.

1336. B. R. Chicken, A. G. Smith, and The Bon-Acc Acetylene Gas Company. Method of purifying acetyle gas, with the necessary apparatus connected therewi Dec. 28.

1959. A. J. Boult.—From E. Fleischer, Germany. P cess for the production of water-gas. Jan. 9.

2005. A. Holstein and A. O. Teschich. Vaporising evaporating device for generating gas from dense hyd carbonic substances for oil, gas, and hot-air motors. Jan.

2063. W. T. Sugg. Apparatus to be used for incand cent gas lighting. Dec. 31.

2855. Sir C. S. Forbes, Bart. Acetylene gas generat Jan. 16.

3631. E. J. Duff. Gas producers. Dec. 28.

3745. A. Messer. Acetylene gas generators. Dec. 31

4134. C. B. Tully. Processes for enriching or car retting coal and other gases for illuminating purposes, appliances connected therewith. Jan. 9.

11,979. M. Graham. Hot coke conveyers. Dec. 28.

14,553. G. C. Dymond.—From The Firm of S. Zeilenger, Germany. Incandescent gas lamps. Jan. 16.

17,025. J. Predmerszky and G. Predmerszky. Acetylene .s generator. Dec. 31.

18,499. F. Deimel. Self gas-lighter. Jan. 16.

18,839. A. J. Boult.—From A. Exbrayat, France. anufacture of coal briquettes and the like, and of agglutiant material for the same. Jan. 16.

19,016. L. D. Railsback. Acetylene gas generator. ec. 31.

19,337. D. McDonald. Acetylene gas-generating apparatus. Jan. 9.

20,947. K. G. Gustafsson. Apparatus for generating etylene gas. Jan. 16.

21,890. W. P. Thompson.—From Boguslaw Jolles and e Firm of Zietz and Brune Gesellschaft mit beschränkter ftung, Germany. Burners for incandescent gas light. n. 9.

21,974. C. A. Bronder. Machinery for discharging gas orts. Jan. 9.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, Etc.

Application.

79. F. Rauch. Improvements in the manufacture of Complete Specification. Jan. 4.

Complete Specifications Accepted.

1900.

08. J. Beveridge and the Linlithgow Oil Co., Ltd. orts for distilling shale and like minerals, and for ling with the burnt or spent shale. Dec. 31.

9,406. S. Fränkel and A. König. Process to render hurished hydrocarbons soluble in water. Jan. 16.

IV.—COLOURING MATTERS and DYES.

Applications.

3,231. The British Oil and Cake Mills, Ltd., and A. G. ss. Improvements in or applicable to the manufacture printing ink. Complete Specification. Dec. 19.

3,338. B. Willcox.—From The Badische Anilin und a Fabrik, Germany. Improvements in the conversion indigo leuco compounds into indigo, and the application eof to colouring textile fibres. Dec. 20.

3,419. R. B. Ransford.—From L. Cassella and Co., many. Improvements in the manufacture of hydroxyd acridines. Dec. 21.

3,548. J. Levinstein, H. Levinstein, and Levinstein, Ltd. rovements in the manufacture of naphthoacridine vatives, and of colouring matters therefrom. Dec. 24.

3,600. A. Allers. Improved method of manufacturing own and dark brown colouring matter. Dec. 24.

3,687. G. W. Johnson.—From C. F. Boehringer and hne, Germany. Improvements in the manufacture of henylmethane colouring matters. Complete Specification. . 27.

3,858. H. J. Haddan.—From A. S. Ramage, United es. A new or improved process of obtaining colour stance from ferrous liquors. Complete Specification. . 31.

3,859. H. J. Haddan.—From A. S. Ramage, United tes. *See* Class VII.

3,887. J. Y. Johnson.—From The Badische Anilin und a Fabrik, Germany. Improvements in or connected 1 the manufacture and production of naphthalene comnds and their employment in dyeing and printing. . 31.

23,902. F. Kehrmann. Manufacture of colouring matters of the thiazine series and of intermediate products therefor. Dec. 31.

1901.

271. A. Zimmermann.—From The Chemische Fabrik auf Actien vorm. E. Schering, Germany. The manufacture of ortho-oxycarbonic acids. Jan. 4.

295. A. G. Green, R. J. Lévy, and The Clayton Aniline Company, Ltd. Improvements in the manufacture and production of colouring matters of the thiazol series. Jan. 4.

330. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of a black colouring matter directly dyeing cotton. Jan. 5.

392. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of a blue-grey dyestuff for cotton. Jan. 7.

751. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of a dyestuff from 1:5 dinitronaphthalene. Jan. 11.

Complete Specifications Accepted.

1900.

530. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. *See* Class XX.

1094. O. Imray.—From The Farbwerke vormals Meister, Lucius und Bruning, Germany. Manufacture of hydrogenised oxybenzylamine and hydrogenised benzylamine bases, and transformation of the latter into hydrogenised cylic aldehydes or terpenaldehydes. Dec. 31.

1760. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of transformation products of coal-tar colours. Dec. 28.

2683. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of new azo-dyestuffs for cotton. Dec. 28.

2772. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of a violet-black azo-dyestuff for wool. Jan. 16.

2784. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of azo-colouring matter, and of lakes from azo-colouring matters. Jan. 16.

3208. R. B. Ransford.—From L. Cassella and Co., of Frankfort, Germany. Production of dyestuffs deriving from $\beta_1\beta_2$ amidonaptholdisulpho acid. Dec. 28.

3615. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of new azo-colouring matters and of new intermediate products for the production of such colouring matters. Dec. 28.

3673. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of new tri-azo colouring matters. Dec. 28.

4175. G. W. Johnson.—From C. F. Boehringer und Soehne, Germany. Production of amines from the corresponding nitro compounds. Jan. 9.

4792. A. G. Green, A. Meyenberg, and The Clayton Aniline Company, Ltd. Preparation of intermediate products for colouring matters. Dec. 31.

5122. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Berlin, Germany. Manufacture of new organic bromo compounds. Jan. 16.

5123. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Berlin, Germany. Manufacture of new organic iodo compounds. Jan. 16.

13,664. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of new intermediate products of new azo-colouring matters, their use in dyeing and treatment of the fibre. Jan. 9.

20,864. O. Imray.—From The Basle Chemical Works, Switzerland. Manufacture of aromatic sulphinic acids. Dec. 31.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Applications.

23,157. C. F. Topham. Improvements in apparatus for use in the production of textile fibres or filaments from solutions of cellulose or of other material from which fibres or filaments can be formed. Dec. 18.

23,636. G. Mitchell. Improvements in the treatment of cellulose. Dec. 27.

23,722. H. H. Lake.—From National Package Company, United States. Improvements relating to the manufacture of fibrous compositions. Complete Specification. Dec. 28.

1901.

273. W. A. E. Crombie. A process for the manufacture of artificial threads or fibres. Jan. 4.

Complete Specifications Accepted.

1900.

2157. L. Schreiner. Machine for use in connection with mercerising and similarly treating yarn in hanks under tension. Jan. 9.

10,438. A. J. Boult.—From F. Wislicki, Belgium. Treatment of wool and other animal or vegetable fibrous materials. Dec. 31.

11,055. E. Maertens. Machines for washing, rinsing, or chemically treating wool and other animal fibres. Dec. 28.

11,426. A. Goldzweig. Process and apparatus for purifying fibrous materials from grease, mineral oil, and other impurities. Dec. 31.

21,397. F. Simons. Mercerising or silk finishing cotton. Jan. 16.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, and BLEACHING.

Applications.

23,110. A. J. Boult.—From A. Gagedois, France. Improvements in or relating to the bleaching of vegetable fibres and fabrics. Dec. 18.

23,100. W. Mather. Improvements in apparatus for bleaching, dyeing, and otherwise treating fabrics. Complete Specification. Dec. 21.

23,401. W. Mather. Improvements in bleaching and dyeing, and in apparatus therefor. Complete Specification. Dec. 21.

23,663. P. Schirp. Improvements in apparatus for dyeing, washing, and bleaching textile materials. Complete Specification. Dec. 27.

1901.

228. C. Rigamonti and G. Tagliani. Improvements in kiers for bleaching cotton fabrics. Complete Specification. Jan. 3.

838. R. B. Ransford.—From L. Cassella and Co., Germany. Improvements in dyeing mixed fabrics. Jan. 12.

Complete Specifications Accepted.

1900.

379. O. Hoffmann. Process for producing repetitions of long suites of colours upon threads. Dec. 28.

509. J. Major and T. J. Wood. Apparatus for dyeing, bleaching, or otherwise treating cops of spun yarn. Dec. 28.

3288. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik. Discharging of dyed textile fabrics. Jan. 16.

5066. H. Hadfield. Process and apparatus for bleaching textile fabrics. Jan. 16.

5409. C. L. Jackson and E. W. Hunt. Method of and means for scouring, bleaching, dyeing, mercerising, or otherwise treating piece goods in the open state. Jan. 9.

14,229. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Production of discharge effects on indigo-dyed silk and woollen goods. Dec. 28.

VII.—ACIDS, ALKALIS, and SALTS.

Applications.

23,207. W. Eschweiler and H. C. Woltereck. Pr of producing hydrocyanic acid and cyanides. Dec. 19.

23,493. U. Alvisi. Improved process for chlorin natural or artificial sulphides by means of free chl Filed Dec. 22. Date applied for, June 11, 1900, being of application in Italy.

23,678. W. P. Thompson.—From G. Flick, Gern Improvements in the manufacture of nitrites. Com Specification. Dec. 27.

23,781. E. W. Engels. Improved process for the duction of carbonic oxide. Complete Specification. De

23,811. J. G. Lorrain.—From G. Thomson, U States. Imrovements in or connected with the treat of liquids containing copper and the like. Dec. 29.

23,859. H. J. Haddan.—From A. S. Ramage, U States. Process of obtaining ferro-ferric oxide. Com Specification. Dec. 31.

1901.

121. R. Hodgson and A. Scroxton. A new or impr invention for the manufacture of broad or common s steam or the like. Jan. 2.

184. F. M. Spence, D. D. Spence, H. Spence, and T. Craig. Improvements in and connected with the facture of sodium bichromate. Complete Specific. Jan. 3.

230. A. Cerasoli. Improvements in or relating t production of carbon dioxide. Jan. 3.

276. G. M. Vis. Improvements in the purificati brine. Jan. 4.

284. H. A. Frasch. Improved nickel salt, and proc making same. Complete Specification. Jan. 4.

524. J. W. Woodall and F. Windham. Improve in or relating to carbide of calcium. Jan. 8.

601. P. L. Martin. Improvements relating to the facture of anhydrous caustic baryta. Jan. 9.

754. R. Wolffenstein. Improvements in the manufa of peroxide preparations. Jan. 11.

Complete Specifications Accepted.

1899.

25,077. P. Pressneck. Manufacture of acetic Dec. 28.

1900.

1763. J. Imray.—From E. Bronnert, M. Frémery J. Urban, Germany. Manufacture of cuprammonia tion. Dec. 28.

2089. G. E. Davis and A. R. Davis. Manufactu chloride of zinc and chloride carbonate of lead from sulphide ores containing lead and zinc. Dec. 28.

2146. J. Dewrance and J. H. Paul, of the A Chemical Company. Means applicable for use in desulphurisation of sulphuretted hydrogen. Jan. 9.

19,432. H. J. Haddan.—From H. Wartenberg and Miller, United States. Art of manufacturing carbon. 31.

20,144. L. Kaufmann. Crystallisation of salts. 28.

VIII.—GLASS, POTTERY, and ENAMELS.

Applications.

23,520. S. Hill. Improvements in the manufactu glass bottles by machinery, and apparatus therefor. De

23,577. C. H. Thompson and J. Wilkinson. Imp manufacture of glass plates suitable for facing wall other like purposes. Dec. 24.

23,579. W. F. Stiel. Improvements in and relati compressing moulds for manufacturing glass or e facing plates. Complete Specification. Dec. 24.

23,580. W. F. Stiel. Improvements in glass or enamel cing plates, and process of manufacturing same. Comete Specification. Dec. 21.

23,652. G. V. Jameson, R. W. Papineau, and R. T. ollis. A glaze or varnish for protecting the polish of etallic and other surfaces. Dec. 27.

23,879. G. von dem Borne and W. von Debschütz. Improvements in the manufacture of polychrome ornamented azed or similar ceramic ware. Complete Specification. ec. 31.

1901.

210. R. B. Ransford.—From Société Parisienne de éramique, France. Improvements in ornamenting ceramic re. Complete Specification. Jan. 3.

419. C. Billington and J. Newton. Novel or improved pliance or instrument for use in decorating ceramic ware. n. 8.

581. C. H. Thompson and J. Wilkinson. Improved nufacture of glass plates suitable for facing walls and her like purposes. Jan. 8.

579. F. M. David. An improvement in the manufacture window glass. Jan. 9.

628. A. Gosling. Improvements in the production of lti-coloured slabs or tiles. Jan. 10.

643. R. J. Friswell and The British Uralite Company, l. Improvements in the manufacture of refractory or mi-refractory materials. Jan. 10.

Complete Specifications Accepted.

1900.

338. C. Czerny and C. Schlimp. Kilns for firing ceramic re and the like. Jan. 16.

3611. J. H. Storey and W. E. McCalla. Manufacture plates or tablets of glass, metal, earthenware, porcelain, l like articles of similar substances for various purposes, l having a surface capable of adhering to plaster or nent. Dec. 28.

X.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Applications.

23,010. C. Krause and A. Beddies. A process for the regnation of wood and fibrous substances. Complete ecification. Dec. 17.

23,368. T. Bradley. Improvements in the manufacture coloured bricks, terra cotta blocks, tiles, and the like. c. 21.

3,375. J. Fielding. Improvements in apparatus for king concrete flags or blocks. Dec. 21.

23,572. H. C. Webb and A. A. Webb. Improvements in production of inlaid ornamental tiles, bricks, blocks, bs, and such like formed or plastic or mouldable subnces, such as clay, and in the manufacture of certain ds of such tiles, bricks, and slabs without inlays. c. 24.

3,574. E. H. Stein. *See* Class I.

3,718. W. W. Hewitt. An improvement in cement ns and drying chambers. Dec. 28.

3,734. W. P. Thompson.—From P. J. Moran, United tes. Improvements in street paving. Dec. 28.

3,851. C. Diesler. Improvements in the manufacture cement. Dec. 31.

1901.

7. A. G. Brookes. From C. Hörisch, Germany. A or improved process for hardening artificial stone or like. Jan. 8.

51. L. A. Garchey. Improvements in the manufacture glass stone and in articles made therefrom. Jan. 10.

01. J. S. Rigby. An improved kiln for the manufacture Portland cement or lime. Jan. 12.

Complete Specifications Accepted.

1900.

791. H. Schutholz. Process for the production of artificial stones. Jan. 16.

2740. A. W. Green. Construction of fireproof floors and roofs. Dec. 22.

3262. H. H. Lake.—From American Wood Fire-Proofing Co., Ltd., United States. Treatment of wood and other combustible substances to render them fireproof, and for other purposes. Dec. 28.

21,913. A. Clemens. Presses for manufacturing facing bricks. Jan. 9.

22,015. O. Imray.—From C. F. Buente, United States. Fire-proof floors. Jan. 9.

X.—METALLURGY, MINING, Etc.

Applications.

22,997. J. Bedford. Improved method or process for annealing self-hard steel. Dec. 17.

23,046. The Société Internationale des Usines et Fonderies d'Aluminium (Société Anonyme). A process for uniting aluminium and steel or iron. Complete Specification. Filed Dec. 17. Date applied for June 20, 1900, being date of application in Belgium.

23,303. E. H. Hopkins. Improvements in the distillation of zinc and other volatile metals. Dec. 20.

23,315. A. Reynolds. Improvements in converters. Dec. 20.

23,320. W. S. Rock. *See* Class II.

23,350. S. Cowper-Coles. Improvements in vanadium alloys. Dec. 21.

23,403. G. Huth.—From F. Pich, Germany. An improved flux for brazing. Complete Specification. Dec. 21.

23,418. The Mining Machinery Improvement Company, Ltd., and A. A. Lockwood. Improvements in extracting copper and other metals from ores. Dec. 21.

23,476. W. B. Middleton. An improvement in the treatment of zinc ores. Dec. 22.

23,477. A. J. Boult.—From E. C. Pohlé and S. Croasdale, United States. Improvements in processes for the reduction of refractory ores. Complete Specification. Dec. 22.

23,522. R. B. Ransford.—From L. W. Gans, Germany. Improvements in the manufacture of metal foil or leaf. Dec. 22.

23,652. G. V. Jameson, R. W. Papineau, and R. T. Hollis *See* Class VIII.

23,600. M. Seligsohn. A method or process of treating ores. Complete Specification. Dec. 27.

23,725. H. L. Herrenschmidt. Improvements in the treatment of nickel ores. Dec. 28.

23,803. J. E. Jasset and A. E. Cinqualbre. An improved process for depositing nickel and other metals upon metallic surfaces. Dec. 29.

1901.

12. S. E. Page.—From R. W. Davies and H. W. Hartman, United States. Improvements in and relating to apparatus for casting metal and other substances suitable for casting, especially casting iron into pigs. Complete Specification. Jan. 1.

318. D. Laird. An improved furnace for smelting ore for the recovery of metals. Jan. 5.

331. J. C. Butterfield. Improvements in or relating to obtaining antimony and separating gold from antimony ores. Jan. 5.

332. J. C. Butterfield. Improvements in or relating to the treatment of complex ores. Jan. 5.

374. J. Nicholas. Improvements in the recovery of metals from ores and other material, and in the plant employed therein. Jan. 7.

430. R. Langhans. Improved process of metallising with precious metals. Jan. 8.

470. W. B. Middleton. An improvement in the treatment of zinciferous lead fumes (known as "sludge") and other zinc products as produced by the Ellershausen process. Jan. 8.

493. H. M. Taquet. Improvements relating to the treatment of zinc ores. Jan. 8.

510. W. J. Foster. An improved method of keeping cool the tuyeres of blast and like furnaces and forges, and of heating the air or blast used. Jan. 8.

778. W. S. Lockhart and The Automatic Gem and Gold-Separator Syndicate, Ltd. An improved apparatus for the concentration of ores, substances held in slimes, and the like. Jan. 11.

788. W. W. Slater and J. Galloway. Improvements in apparatus for the economical treatment of auriferous matters. Jan. 12.

Complete Specifications Accepted.

1900.

817. A. W. Tangye. Process of and apparatus for oxidising or roasting ores containing metallic sulphides, and for the production of gases suitable for the manufacture of sulphuric acid. Jan. 16.

1221. O. Imray.—From W. H. Rogers and J. A. Beaver, United States. Manufacture of tin-plate and apparatus therefor. Dec. 28.

1810. R. C. Baker. Obtainment of hardening and toughening compounds for alloying with steel and other metals. Jan. 16.

2089. G. E. Davis and A. R. Davis. *See* Class VII.

3421. A. James. Apparatus for precipitating gold and silver from their solutions. Dec. 28.

13,260. O. Imray.—From J. S. Hey, United States. Manufacture of tool steel and of tools therefrom. Jan. 9.

18,425. J. P. Roe. Process of puddling iron. Dec. 28.

19,863. R. W. James.—From J. H. Robertson, J. B. Campbell, and D. R. Case, United States. Process for coating fibrous material with metal. Jan. 16.

20,142. H. H. Lake.—From A. G. Betts, United States. Coating of aluminium or its alloys. Dec. 28.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

Applications.

23,106. C. A. Allison.—From The Waterbury Battery Company, United States. Improvements in galvanic batteries. Complete Specification. Dec. 18.

23,107. C. A. Allison.—From The Waterbury Battery Company, United States. Improvements in galvanic batteries. Complete Specification. Dec. 18.

23,309. The British Power Traction and Lighting Company, Ltd., and G. J. Gibbs. Improvements in electrical accumulators. Dec. 20.

23,310. The British Power Traction and Lighting Company, Ltd., and G. J. Gibbs. Improvements in electrical accumulators. Dec. 20.

23,314. J. MacTear. Improvements in electrolytic apparatus for production of chlorine and alkali. Dec. 20.

23,408. A. Pouteaux and A. Wolff. Improvements relating to electric accumulators. Dec. 21.

23,413. G. E. Vaughan.—From H. Koegel, Germany. Improvements in or connected with the electro-deposition of metals or metallic alloys. Dec. 21.

23,543. W. E. Ayrton and A. W. Fithian. Improvements in plates for secondary or storage cells. Dec. 24.

23,647. H. C. Harrison and J. Day. Improvements in the electrolytic deposition of metals. Dec. 27.

23,729. Baron H. F. d'Arnoult. Improvements relating to secondary batteries. Filed Dec. 28. Date applied for June 22, 1900, being date of application in France.

23,743. E. Tiquet. Improvements in battery cells. Complete Specification. Dec. 28.

1901.

56. H. C. Harrison. Improvements in the electro deposition of metals. Jan. 1.

294. M. M. Bair. Improvements relating to galv cells or batteries. Jan. 4.

393. P. A. Newton.—From The National Electro Company, United States. Improvements in electro and apparatus therefor. Complete Specification. Jan

441. O. Lauckner.—From A. Vogelsang, Gern Improvements in the electrolytic bleaching of cotton other textile materials and in apparatus therefor. Jan

469. O. Behrend. Improvements in or connected electrical batteries or accumulators. Jan. 8.

484. H. H. Lake.—From Globe Electric Comp United States. Improvements relating to secon electric batteries. Complete Specification. Jan. 8.

612. R. Kennedy. Improvements in the manufactu sulphate of ammonia from furnace gases and the lil electrolysis. Jan. 10.

624. M. Sutherland and E. Marcuson. Improven in or relating to electric storage batteries. Jan. 10.

Complete Specifications Accepted.

1899.

22,830. S. Robinson.—From S. R. V. Robinson, U States. Primary batteries. Dec. 28.

1900.

2543. S. W. Maquay. Primary batteries. Dec. 31.

3524. W. P. Thompson.—From H. Becker, Fr Features for the anodes in electrolytic apparatus. Ja

12,702. A. A. Riasse and J. J. A. Sengeisen. A mulators. Dec. 28.

20,960. T. A. Edison. Reversible galvanic cells o called storage batteries. Jan. 16.

21,216. P. M. Justice.—From The International Acl Graphite Company, United States. Method of graphit electrodes. Jan. 16.

XII.—FATS, OILS, AND SOAP.

Applications.

23,804. A. Klumpp. Improvements in the manuf of soap. Complete Specification. Dec. 29.

1901.

117. C. Weygang. Improvements in the treatme oils and fats suitable for soap making. Jan. 2.

160. W. H. Power. Improvements in the manuf of soaps. Jan. 2.

759. W. F. Haywood. Improvements in means or ratus to be employed in the manufacture of soap. Ja

Complete Specifications Accepted.

1900.

1155. V. Camiz and A. Gobba. Apparatus for reco oil. Jan. 9.

3363. P. Magnier, P. A. Brangier, and C. Tissier. cess for saponifying fatty substances and converting acid into solid fatty acid. Jan. 16.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, Etc.

Applications.

23,603. A. J. Boult.—From P. C. Ralli, H. Maye L. Toch, United States. Improved compound to be as a substitute for gutta-percha. Complete Specific Dec. 24.

23,909. T. H. L. Bake. Oxidised lead comp Dec. 31.

1901.

50. C. O. Weber and A. Cairns. Improvements in npounded india-rubber. Jan. 1.

424. M. E. Melsom and G. H. Gritlin. Improvements or relating to the treatment of waste or scrap material nufactured from rubber and textile fabric or the like for laiming the rubber therefrom. Jan. 8.

Complete Specifications Accepted.

1900.

16,827. H. Lesser. Refined linseed-oil putty. Jan. 16.

7,475. C. A. R. Steenstrup. Manufacture of substances ilar to india-rubber. Dec. 31.

XIV.—TANNING, LEATHER, GLUE, and SIZE.

Application.

3,250. J. Wezel. Improvements in the preparation of abstitute for animal glue. Complete Specification. . 19.

Complete Specifications Accepted.

1900.

209. G. A. Clowes. Manufacture and treatment of her. Dec. 28.

,306. C. Schill and C. Seilacher. Apparatus for ting glue, gelatin, and the like. Jan. 9.

,141. M. Dietrich and A. Langer. Production of blood men. Dec. 28.

,167. R. Haddan.—From E. R. Edson, United States. ess of and apparatus for making gelatin. Dec. 31.

XV.—AGRICULTURE and MANURES.

Application.

1901.

4. R. Hartleb. A method for producing cultures of eroids of micro-organisms of the leguminosæ and the anent forms of such bacteroids and for inoculating s and soils with micro-organisms. Complete Specifica- Jan. 10.

Complete Specification Accepted.

1900.

9,574. J. Hughes. Basic superphosphate. Jan. 16.

XVI.—SUGARS, STARCHES, and GUMS, Etc.

Applications.

,156. J. Robin-Langlois. Improvements in and relating e refining of sugar. Dec. 18.

,415. W. P. Thompson.—From H. C. P. Geerligs and . Hamakers, Java. Improvements in the process of acting sugar from beetroot-cane sugar, sorghum, and plants. Dec. 21.

,508. J. C. F. Lafeuille. Improvements in apparatus he moulding and centrifugal treatment of sugar. 22.

Complete Specification Accepted.

1900.

04. C. Steffen. Process of utilising the vapours of ry plants, especially sugar factories. Jan. 16.

XVII.—BREWING, WINES, SPIRITS, Etc.

Applications.

,198. H. McPhail. Improvements in and relating to reatment of pot-ales, wash liquors, sewage, and other ous waste or bye-products. Dec. 19.

634. E. S. Beaven. Improvements in the process of g malt, hops, and other substances, and apparatus for. Dec. 27.

1901.

10. J. H. Brodrick. Improvements in compounds and processes for making home-made wines. Jan. 1.

377. A. Méyer. Improvements in vessels for mashing and fermenting purposes. Jan. 7.

735. J. Heaton. Improved sparger. Complete Specification. Jan. 11.

742. O. E. Nycander. Improvements in or connected with the manufacture of distillers' yeast. Jan. 11.

Complete Specification Accepted.

1899.

25,418. M. P. Hatschek. Manufacture of bakers' yeast. Dec. 28.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

Applications.

A.—Foods.

23,377. P. Mongiraud and H. Labranche. New or improved apparatus for the sterilisation and aseptic transfer or storage of milk. Dec. 21.

23,893. R. Hengstenberg. Improvements in the preservation and sterilisation of food products and other substances of all kinds. Complete Specification. Dec. 31.

1901.

647. A. Sauer. Process for producing a milk preservative affording a rich milk similar to mother's milk. Complete Specification. Jan. 10.

755. S. Székely and E. Kovács. An improved process for the separation of milk into casein and whey. Complete Specification. Jan. 11.

B.—Sanitation.

23,198. H. McPhail. *See* Class XVII.

23,412. D. Cameron, F. J. Commin, and A. J. Martin. Improvements in apparatus for purifying sewage and other liquids. Dec. 21.

23,765. W. Young and S. Glover. Improvements in methods and apparatus for the treatment of coal, town refuse, and similar substances, in producing heating gases therefrom, also by-products when desirable. Dec. 29.

1901.

30. G. D. Wild. Improvements in means or apparatus for use in the treatment of sewage and like liquid refuse. Jan. 1.

497. R. Orchard and C. E. Fox. Improvements in and relating to the purification or sterilisation of water. Jan. 8.

517. F. Candy. Improvements in the treatment of sewage and other polluted liquids, and in apparatus for use in connection therewith. Jan. 8.

607. C. N. Russell. Improved treatment and utilisation of house refuse. Jan. 9.

C.—Disinfectants.

1901.

508. A. Strandh. An improved disinfectant compound known as "Lettubrin." Jan. 8.

Complete Specifications Accepted.

B.—Sanitation.

1900.

3036. E. Springborn. Precipitation of sewage. Jan. 16.

5607. G. Green. Apparatus for filtering and purifying water. Jan. 16.

17,071. J. F. Lester and L. A. Dean. Furnaces for burning garbage, night-soil, and other refuse material. Dec. 28.

C.—Disinfectants.

19,569. R. P. Kuhn. Formaldehyde generators. Jan. 16.

XIX.—PAPER, PASTEBOARD, Etc.

Applications.

23,379. D. N. Bertram and S. Milne. Improvements in and relating to strainers for treating pulp. Dec. 21.

23,636. G. Mitchell. *See* Class V.

23,716. R. W. Barker.—From H. G. Stripe, United States. Improvements in bordering note paper. Dec. 28.

1901.

249. F. Billing. Improvements in connection with the manufacture of paper. Jan. 4.

528. W. H. Caldwell. Improvements in the manufacture of paper pulp. Jan. 8.

536. L. Joseph. A supplementary process for the manufacture of waterproof and airtight paper impervious to fat and with glazed surface. Jan. 8.

630. L. H. A. von Giese. Process of and means for rendering non transparent or opaque paper temporarily transparent. Complete Specification. Jan. 10.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

Applications.

23,419. R. B. Ransford.—From L. Cassella and Co., Germany. *See* Class IV.

23,507. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of neutral soluble silver compounds. Dec. 22.

23,727. C. Moureu. Manufacture of useful products from heptine and octine. Dec. 28.

1901.

274. A. Zimmermann.—From The Chemische Fabrik auf Actien vormals E. Schering, Germany. The manufacture of ortho-oxycarbonic acids. Jan. 4.

526. G. W. Johnson.—From C. F. Boehringer und Soehne, Germany. Improvements in the manufacture or production of homologues of xanthin. Complete Specification. Jan. 8.

Complete Specification Accepted.

1900.

530. H. E. Newton.—From Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of chloro-carbonic ethers, and compounds therefrom. Dec. 28.

XXII.—EXPLOSIVES, MATCHES, Etc.

Applications.

23,064. J. Ramsden and W. R. Hirst. Improvem in matches. Dec. 17.

23,252. P. M. Justice.—From The International Sm less Powder and Dynamite Company, United States. provements in smokeless powder in the process of m facturing the same and in apparatus therefor. Com Specification. Dec. 19.

23,414. J. von Romocki.—From W. Tettei, Germ Improvements in the manufacture of lucifer matc Dec. 21.

1901.

201. S. B. Earle. Improvements in or relating explosives or explosive compounds. Jan. 3.

Complete Specifications Accepted.

1899.

23,853. F. A. Ludlow. Fog signals. Dec. 31.

1900.

214. A. C. Girard. Improvements in or relating to manufacture of explosives. Jan. 9.

1323. F. Bale. Manufacture and production of mat and in the substances and processes employed the Dec. 28.

XXIII.—ANALYTICAL CHEMISTRY.

Application.

23,737. J. Waring. Process of gaging high va Filed Dec. 28. Date applied for June 4, 1900, being of application in United States.

Complete Specifications Accepted.

1900.

618. J. Y. Johnson.—From The Chemische F vormals Goldenberg, Geromont and Co., Germany. M facture or production of materials with platinum sur for use as contact substance in chemical opera Jan. 16.

4114. A. Denaeyer. Process for chemically agglom ing powdered materials. Jan. 9.

PATENT UNCLASSIFIABLE.

Complete Specification Accepted.

1900.

4676. M. Otto. Product obtained by the solutic ozone in petroleum. Jan. 9.

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THE JOURNAL

OF THE

Society of Chemical Industry.

A MONTHLY RECORD

FOR ALL INTERESTED IN CHEMICAL MANUFACTURES.

o. 2.—Vol. XX.] FEBRUARY 28, 1901. [Non-Members 30/- per annum; Members 21/- per Set of extra or back numbers; Single Copies (Members only) 2/6, all prepaid.

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SESSION 1900—1901.

Wednesday, March 27th, 1901:—
Dr. J. T. Conroy. "The Rate of Dissolution of Iron in Hydrochloric Acid."
Dr. J. T. Conroy and others. "The Action of Reducing Gases on Sulphocyanides."
Wednesday, April 24th, 1901.—Discussion on the Storage and Transport of Chemicals.

London Section.

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SESSION 1900—1901.

Monday, March 4th, 1901.—Discussion on the Occurrence and Detection of Arsenic in Manufactured Products.

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SESSION 1900—1901.

Tuesday, March 5th, 1901:—
Dr. Wm. Frew. "The Endowment of Technical Research."
Dr. Wm. Frew. "The Valuation of Barleys for Brewing Distilling."

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NOTICES.

Annual General Meeting.

The Annual General Meeting will be held in Glasgow, on ednesday, July 24th, and following days. Full particulars ll appear in a subsequent issue.

Changes of Address.

When notifying new addresses, members are requested to ite them distinctly, and state whether they are temporary permanent. Multiplication of addresses is also to be oided as tending to create confusion. When sending bscriptions, the use of the form attached to the application lps in the verification of addresses, on which the safe livery of the Journal depends.

Candidates for Election.

In the Journal for October 1900 will be found a Nominan Form and Prospectus for the use of those members o have a candidate for election to propose. Please keep r use in case of need.

Authors of communications read before the Society, or y of its Local Sections, are requested to take notice that der Rule 43 of the Bye-laws the Society has the right of iority of publication for three months of all such papers. fringement of this Bye-law renders papers liable to be jected by the Publication Committee, or ordered to be stracted for the Journal, in which case no reprints can furnished to the author.

IST OF MEMBERS ELECTED 22nd FEBRUARY 1901.

xby, G. L., c/o Electric Storage Battery Co., 19th Street and Allegheny Avenue, Philadelphia, Pa., U.S.A., Chemical Engineer.

ewer, Dr. C. E., Wake Forest, N.C., U.S.A., Professor of Chemistry.

mp, J. M., c/o Carnegie Steel Co., Duquesne, Pa., U.S.A., Chemist.

amberlain, G. E., c/o Glucose Sugar Refining Co., Rockford, Ill., U.S.A., Chemist.

lley, Bernard G., c/o American Smelting and Refining Co., Argentine, Kansas, U.S.A., Assayer and Chemist.

iehl, Oscar C., c/o Parke, Davis, and Co., Detroit, Mich., U.S.A., Chemist (Biological Department).

ldy, W. Clifton, c/o American Beet Sugar Co., Norfolk, Neb., U.S.A., Chemist.

nerson, Dr. W. H., Georgia School of Technology, Atlanta, Ga., U.S.A., Professor of Chemistry.

gen, Dr. Peter J., 41, John Street, New York City, U.S.A., Physician and Chemist.

rrester, Arthur, Highfield House, Steven Street, Stretford, Manchester, Chemist.

ance, G. Herbert, Water Lane Dyeworks, Bradford, Yorks, Dyer.

llivan, Frank B., 56, Prospect Place, Brooklyn, N.Y., U.S.A., Chemist.

lpin, Harry T., 1014, Sixth Avenue, New York City, U.S.A., Chemist.

ss, Jas. Kelly, 717, Spruce Street, Philadelphia, Pa., U.S.A., Dyer.

mmell, G. H., 4, Lindsay Place, George IV. Bridge, Edinburgh, Analytical Chemist.

Gent, Percy W., 55, Gower Street, London, W.C., Analytical Chemist.

Goodchild, J. Herbert, St. John del Rey Mining Co., Villa Nova de Lima, Minas, Brazil, Assayer.

Hardcastle, G. Fred., 9, Newtown Street, Leicester, Teacher of Science and Technology.

Highley, Arnold, 20, Spotland Road, Rochdale, Chemist.

Hodgson, H. McA., 51, Holly Bank, Blackford Brow, Whitefield, Manchester, Chemist and Colourist.

Hollick, Herbert, c/o General Chemical Co., Camden, N.J., U.S.A., Works Manager.

Isakovics, Alois von, 449, East 121st Street, New York City, U.S.A., Manufacturing Chemist.

Jackson, W. B., Glengowan Printworks, Caldercruix, N.B., Chemist.

Kauder, Dr. E., c/o Merck and Co., University Place, New York City, U.S.A., Chemist.

Lawrence, Alf., 527, Collins Street, Melbourne, Vic., Australia, Editor of Australian Leather Journal.

Lindsay, Robt. D., Bushy Printworks, near Glasgow, Chemist.

Lippincott, Warren B., c/o American Smelting and Refining Co., Argentine, Kansas, U.S.A., Chemist.

McEwen, Duncan C., 3, Armadale Place, Greenock, N.B., Metallurgical Chemist.

McFarlane, Walter, Sunnyside, Mansewood, Pollokshaws, Glasgow, Printworks Manager.

Mathew, W. E. B. de Vere, 13, Orlando Road, Clapham Common, S.W., Analytical Chemist.

Neale, Percy R., 13, Priory Place, Doncaster, Yorks, Chemical Manufacturer.

Odling, Francis J., Box 314, G.P.O., Melbourne, Vic., Australia, Mining Engineer.

Page, Ralph H., 169, McDougall Avenue, Detroit, Mich., U.S.A., Chemist (Solvay Co.).

Roberts, H. E. U., 9, St. James' Street, Bath, Science Demonstrator.

Rust, Robt. R., c/o Somerset Chemical Co., Bound Brook, N.J., U.S.A., Chemist.

Schneider, Edw. J., c/o Union Carbide Co., Niagara Falls, N.Y., U.S.A., Chemist.

Schultze, Wm., 102, Academy Street, Jersey City Heights, N.J., U.S.A., Chemist.

Seymour, Harold W., The Cascades, Bonsall, Matlock Bath, Engineer (Coke and By-Products).

Sinnatt, Frank S., Glenside, Church Lane, Moston, Manchester, Demonstrator of Chemistry.

Skertchley, Sydney A. R., 27, Rutland Park, Willesden Green, N.W., Mining Engineer.

Smith, J. Cruickshank, 30, Davenport Road, Catford, S.E., Technical Chemist.

Smith, H. Sutcliffe, Edward Ripley and Son, Ltd., Bowling Dyeworks, Bradford, Managing Director.

Stevenson, M. R., Morrison and Cass Paper Co., Tyrone, Blair Co., Pa., U.S.A., Chemist.

Taussig, Emil, 26, East 59th Street, New York City, U.S.A., President (West Disinfecting Co.).

Taylor, John, Grosvenor Museum, Chester, Science Master.

Waite, C. Nelson, Cellulose Products Co., 24, Binford Street, Boston, Mass., U.S.A., Chemist.

Walsh, Lionel O. P., c/o Burt, Boulton, and Haywood, Ltd., Prince Regent's Wharf, Silvertown, E., Chemist.

Whitton, Jas. T., c/o Nobel's Explosives Co., Ltd., Ardeer, Stevenston, N.B., Chemist.

Wilkins, Albert D., 8, Sprague Avenue, Bellevue P.O. Sta., Allegheny, Pa., U.S.A., Chemist.

Worden, Edw. C., Celluloid Zapon Co., Milburn, N.J., U.S.A., Analytical Chemist.

Yardley, Frank, c/o Henry Jutson and Sons, Liverpool Street, Birmingham, Chemical Manufacturer.

MEMBERS OMITTED FROM LIST.

1898. Eastick, S. Philip, 25, Woodville Road, Ealing, W., Chemical Engineer.

1900. Watkins, Norman, Box 767, Honolulu, Hawaiian Islands, Chemist.

CHANGES OF ADDRESS.

Alpers, Wm. C., 45–47, West 31st Street (*not* 36th Street), New York City, U.S.A.

Atkinson, J. W., l/o Santa Maria; Betteravia, Cal., U.S.A.

Baekeland, Dr. L., l/o Nepera Park; Snug Rock, North Broadway, Yonkers, N.Y., U.S.A.

Beaver, C. J.; Journals to Fern Bank, Marsland Road, Sale, Cheshire.

Bibby, Jno., l/o Aintree; c/o J. Bibby and Sons, Formby Street, Liverpool.

Bowtell, N. E., l/o Hollow Way; 144, Greenway Road, Runcorn.

Burkhardt, Dr. A., l/o Antwerp; c/o Burkhardt and Co., Pforzheim, Germany.

Clowes, G. A., l/o Suffolk; Woodleigh, Arundel Road, Eastbourne.

Cosby, C. D., l/o Norway; Radford House, Home Park Road, Saltash, Cornwall.

Edwards, H. W., l/o Keswick; c/o Southern Smelting Co., Oakdale, Ga., U.S.A.

French, Alf., l/o Holloway; 34, Jewry Street, Aldgate, E.C.

Grandage, H., l/o Bradford; Royd House, Brighouse, near Leeds.

Gray, Dr. Thos.; all communications to c/o J. T. Tannahill, 44, West George Street, Glasgow.

Guttmann, O.; all communications to 12, Mark Lane, London, E.C., Consulting Chemical Engineer, M. Inst. C.E.

Haddock, A. G.; Journals to Lynwood House, Norman Road, Runcorn.

Halstead, Jno. E., l/o Bradford; 7, Bath Street, Elland, Yorks.

Hennin, Alphonse, l/o United States; Portoferraio, Elba, Italy.

Hersey, Milton L., l/o St. Sacrament Street; 146, St. James' Street, Montreal, Canada.

Jenks, R. L., l/o Imperial Institute; 89, Bartholomew Close, London, E.C.

Kerr, Saml. T.; Journals to 516, North Delaware Avenue, Philadelphia, Pa., U.S.A.

Lamb, O. R., l/o Carmine Street; 356, West 22nd Street, New York City, U.S.A.

Lamborn, L. Ll., l/o West 19th Street; 108, Fulton Street, New York City, U.S.A.

Lomas, T., l/o Selborne Place; 3, Selborne Villas, Minehead, *via* Taunton.

Lord, J. Ll., l/o Rawtenstall; 23, Park View, Elton, Bury, Lancashire.

Lowe, Jas. S., l/o Mauritius; c/o T. and W. A. McLaren, 29, Queen Street, Edinburgh.

Oliver, W. Letts, l/o 12th Street; Vernon Street, Oakland, Cal., U.S.A.

Peckham, S. F., l/o Brooklyn; Room 104, 280, Broadway, New York City, U.S.A.

Pinto-Leite, A., l/o Lisbon; c/o W. R. Hardwick, 13, Batavia Buildings, Hackins Hey, Liverpool.

Pollitt, R. B., l/o Cape Town; De Beers Explosives Works, Somerset West, C.C., South Africa.

Propach, C.; Journals to 189, East Kinzie Street, Chicago, Ill., U.S.A.

Raegener, L. C., l/o 250; 141, Broadway, New York City, U.S.A.

Ripley, H., l/o Bradford; Donabate, Cheltenham.

Robertson, And. J., l/o South 21st Street; Williamsburg Avenue, Richmond, Va., U.S.A.

Roller, H. C.; Journals to P.O. Box 66, Roselle, N.J U.S.A.

Sanderson, Jno., l/o United States; 4, Lancaster R Belsize Park, N.W.

Schniewind, Dr. F., l/o Wall Street; 277, Broadway, Ne York City, U.S.A.

Shepherd, R. des F., l/o Handforth; 6, Coltman Stre Hull.

Shishkoff, W. A., l/o Ekaterinburg; retain Journals unt further notice.

Smithson, S., l/o Dewsbury; Bright's Cottage, Heckmon wike, Yorks.

Statham, N., l/o Present; Credito Industrial Gijones, G Spain.

Steuart, D. R.; all communications to Osborne Cottag Broxburn, West Lothian, N.B.

Symes, Dr. W. H., Christchurch, N.Z.; retain Journ until further notice.

Taylor, Walter, l/o Heywood; 20, Canning Street, Bu Lancashire.

Terry, Hubert L., l/o 14; 3, Herbert Street, Moss S Manchester.

Thomsen, A. L., l/o New York; 33, South Holliday Stre Baltimore, Md., U.S.A.

Uhlig, C. E., l/o 46; 48, Barclay Street, New York Ci U.S.A.

Whitaker, H. L., l/o Tweed River; Harwood Islan Clarence River, N.S.W.

Wrampelmeier, T. J., l/o Appraisers' Building; 222, Sanso Street, San Francisco, Cal., U.S.A.

Wyld, Jno., l/o North Avenue; The Avenue, Lidgett Pa Roundhay, Leeds.

Yoshitake, E., l/o Leeds; c/o Japanese Legation, Kr prinzen-Ufer 30, Berlin, N.W.

CHANGE OF ADDRESS REQUIRED.

Grime, J.; l/o Rosebank Cottage, Busby, near Glasgow.

Deaths.

France, H. C. D., 8, Vicarage Road, Edgbaston, Birmi ham. Feb. 13.

Parsons, C. Chauncey, 43, Sedgwick Street, Brooklyn, N U.S.A. Jan. 16.

Liverpool Section.

Meeting held at University College, Liverpool, on Wednesday, January 30th, 1901.

MR. C. LONGUET HIGGINS IN THE CHAIR.

THE DECOMPOSITION OF CHLORIDES BY IGNITION WITH ORGANIC MATTER.

BY HERBERT E. DAVIES, M.A., B.SC.

It is a well-established fact that there is a loss of chlo when organic matter containing chlorides is ignited, in consequence the estimation of chlorides in such thi as plant-products, animal excreta, &c., is not an matter, and the results obtained are generally looked u with suspicion. From time to time processes have b suggested with the object of preventing this loss, but, shall show, they are not very satisfactory, and in cases they do not take into account the conditions u which the loss occurs. So far as I can find, there been no systematic investigation into the subject, an light has been thrown upon the amount of the loss u varying conditions and with various substances, so I encouraged to lay before you the results obtained in a se of experiments made in the hope of obtaining some reli information.

My attention was drawn to the matter in the following way. Cases occur from time to time in which it is of onsiderable commercial importance to decide whether ubstances in a ship's cargo have been damaged by sea-water or fresh water, and in such cases the presence of odium chloride in excess of that normally present in the ubstance in question is very conclusive evidence of sea-water damage, and the amount of chlorine present is herefore the first point to receive attention. Sometimes it s possible to wash the substance with distilled water and stimate the chlorine directly in the washings, and compare with that obtained by washing the same substance in the ndamaged state. But obviously this is not possible in e case of such things as sugar, flour, molasses, &c., and n these cases we are compelled to ignite the substance ith all possible care, and estimate the chlorine in the ash. n spite of every precaution the results are sometimes so nexpected, taking into account the evidence obtained by orking on other lines, that after a series of such cases I ecided to investigate a little more fully.

For the first series of experiments sugar was chosen as e organic matter to be used, because in the form of wdered lump sugar it is a very pure substance, constant composition and practically free from chlorides; that hich was used containing not more than 0·001 per cent. aCl. Throughout the experiments grain weights were ed, because, having started with 100 grains of organic atter as a convenient quantity, I continued to use the me weights throughout.

In each case 100 grains of sugar were taken, and the lt to be added was dissolved in 25 c.c. of water so as to ing the salt and sugar into intimate association. The mix-re was evaporated to dryness on a sand bath in a large atinum dish, and ignited in a muffle at the lowest possible d heat—an operation taking about 20 minutes. A small antity of carbon generally remains unburnt under these nditions, but after extracting with water the remaining rbon readily burns, and the ash can again be extracted, ough it has been found by experience that all the loride is removed by the first extraction. The chlorine then estimated volumetrically in the usual way with a ndard $AgNO_3$ solution and potassium chromate.

Experiments were first made to find whether any of the t is lost when heated by itself, so various quantities re dissolved in 25 c.c. of water, evaporated to dryness, d heated in a muffle for 20 minutes, the chlorine en being estimated, with the following results (all in ains):—

Cl taken	0·05	0·1	0·2	0·4
Cl found	0·048 0·05	0·1	0·19	0·4

Then a series was made using 100 grains of sugar with following quantities of NaCl:—

Cl taken	0·05	0·1	0·2	0·4	0·5
Cl found	0·008 0·004 0·006	0·008 0·009 0·008	0·028 0·030	0·182 0·187 0·189	0·23
Cl taken	0·6	0·8	1	1·5	2
Cl found	0·35	0·51	0·71 0·76	1·13	1·65

Other substances were then used instead of sugar, the t being added, as before, dissolved in 25 c.c. of water. t 100 grains of Swedish filter paper were taken, the sh of which contained only a trace of chlorine, for which wance was made.

aCl taken	0·4	0·6
aCl found	0·21	0·42

Potato starch was also used, correction being made for trace of chlorine found in the ash.

l taken	0·4	0·4
Cl found	0·17	0·15

As all these substances are somewhat similar, experiments were made using cinchonine as the organic matter. This gave only a trace of ash free from chlorine. 100 grains of cinchonine were used.

NaCl taken	0·1	0·5
NaCl found	0·005	0·12

The loss is somewhat greater than with the other substances.

Before leaving this part of the subject a few experiments were made to find whether the proportion of organic matter present has much influence on the loss, so 50 grains of sugar were taken instead of 100, with the following results:—

NaCl taken	0·1	0·5
NaCl found	0·01	0·28 0·26

Showing that the loss depends rather on the absolute amount of salt present than on the relative amount of salt and organic matter.

Experiments were next made to find whether other chlorides are decomposed to the same extent. First, barium chloride was used with 100 grains of sugar, and gave as follows:—

Chlorine taken...............	0·15	0·25	0·5
Chlorine found	0·05	0·16	0·38

This is rather a smaller loss than with a quantity of NaCl containing the same amount of chlorine.

Calcium chloride was next used. Solutions of calcium chloride were made up and the amount of chlorine estimated. On evaporating 25 c.c. to dryness and igniting, it was found that there is always a slight loss of chlorine, as might be expected; but with the same solution the loss appears to be constant, and the figure found after thus igniting was taken as representing the amount of chlorine used. When these solutions were added to 100 grains of sugar and ignited in the usual way, it was found that there is an enormous loss of chlorine.

Chlorine taken...............	0·12	0·17	3·62
Chlorine found	0·005	0·006	1·91

Solutions of magnesium chloride were prepared containing, in 25 c.c., 0·1 grain of chlorine and 0·5 grain of chlorine. As might be expected, the chlorine was practically all lost when the solution was evaporated to dryness and ignited, the quantities found being respectively 0·002 and 0·009, and on igniting with sugar a similar result was obtained.

Having thus shown that chlorine is lost, whatever the base in combination with it may be, experiments were made to determine whether the chloride as a whole is volatilised or whether there is a decomposition, the chlorine going off, leaving the base. If the latter be true, there will be an increase of alkalinity in the case of sodium chloride corresponding to the loss of chlorine. Various quantities of NaCl were ignited with 100 grains of sugar, and the alkalinity of the residue determined with decinormal acid and methyl orange.

NaCl taken	0·05	0·1	0·5	1·0
Alkalinity as Na_2O	0·018	0·046	0·133	0·167
Corresponding to NaCl......	0·024	0·062	0·176	0·224
NaCl found..	0·006	0·008	0·23	0·73
NaCl calculated from alkalinity + NaCl actually found.	0·03	0·07	0·41	0·95

This shows that probably all the loss falls on the acid radicle, and that no base is lost.

As mentioned above, various methods have been suggested to prevent this loss of chlorine. One of these directs that the substance be treated with an equal volume of 20 per cent. solution of calcium nitrate, and, after drying, gently incinerated. On trying this, it is found that generally the mass burns with explosive violence, scattering the material about, and in any case the chlorine is still largely lost. Other methods proceed on the assumption that the loss occurs while the carbonaceous mass first formed is being burned off, and direct you to first gently incinerate the mass, and then treat it in various ways—for example, with alcoholic solution of alkali—before burning off the carbon. This method was also tried and found useless, and investigation showed that the loss occurs during the initial and not at all during the final stage of ignition. To prove this, 100 grains of sugar were heated alone in the muffle until it ceased to give off inflammable gas, and only a copious mass of carbon remained. This was crushed, and 25 c.c. of NaCl solution added, evaporated to dryness, and again heated in the muffle until the carbon was burnt. In no case was there any appreciable loss of chlorine, as is shown by the following results :—

NaCl taken	0·1	0·5
NaCl found	0·09	0·45

It now remained to find some satisfactory method of preventing the loss. The opinion to which I had come during the course of the work is that under the influence of steam and oxygen at a high temperature, hydrochloric acid is formed; so experiments were made of drying and igniting the mixture in an atmosphere devoid of oxygen; but the method was troublesome, and not very successful, so I tried whether adding carbonate of soda in solution, so as to bring it into intimate association with every part of the mass, would retain the hydrochloric acid. This method seems so simple and obvious that I feel sure it must have been tried before, but there is no mention of it in any of the books I have consulted. The quantity of Na_2CO_3 required to give the best results was first determined by treating 100 grains of sugar with 0·5 grain of NaCl in solution, and, after adding various quantities of Na_2CO_3, drying and igniting in the usual way. The results obtained were :—

NaCl taken	0·5	..	..	..
Na_2CO_3 added	1·0	2·0	5·0	10·0
NaCl found	0·38	0·44	0·48	0·47

This showed that the addition of 5 per cent. of Na_2CO_3 is all that is required; and in another experiment, using 0·1 grain of salt, exactly 0·1 grain was found after ignition.

The method therefore seems to be all that can be desired, but it was subjected to a very stringent test before I was satisfied, because I thought that if it will retain the chlorine of magnesium chloride it will answer under any circumstances. Two solutions of magnesium chloride were prepared in which the chlorine in 25 c.c. was found to be 0·11 grain and 0·46 grain respectively. The usual experiment was made with 100 grains of sugar and 25 c.c. of the solution, with the addition of 5 grains of Na_2CO_3. The results obtained were :—

Chlorine taken	0·11	0·46
Chlorine found	0·11	0·45

Many other experiments have been made, with equally satisfactory results. The following may be instanced because it shows incidentally how the method affects the determination of the chlorine naturally present in an organic substance.

A good sample of rice was taken, and in every case 100 grains were ignited. First it was ignited by itself, and the chlorine determined in the ash. Then 0·5 NaCl (containing 0·303 Cl) was added to the rice, and the chlorine determined after ignition. Then the rice was ignited after the addition of 5 grains Na_2CO_3 in solution, and finally the rice with 0·5 grain NaCl and 5 grains Na_2CO_3 wa ignited. The results obtained were :—

——	Chlorine present.	Chlorine found.
100 rice	..	0·006
100 rice + 0·5 NaCl	0·309	0·066
100 rice + 5Na_2CO_3	..	0·033
100 rice + 0·5 NaCl + 5Na_2CO_3	0·336	0·324

It will be agreed that these results are very satisfactory.

To sum up, therefore, the following results seem to b fairly well established:—

(1) When any organic matter containing chlorine i ignited, there is a loss of chlorine.

(2) The percentage of loss is greatest with small quantitie of chlorides, and decreases regularly as the amount o chlorides increases.

(3) The loss occurs during the early stages of ignitio and does not occur during the combustion of the carbon.

(4) The loss can be altogether prevented by addin before ignition, a solution containing Na_2CO_3 equivalent t 5 per cent. by weight of the organic matter.

Newcastle Section.

Meeting held at the Durham College of Science, on Thursday, January 31st, 1901.

MR. N. H. MARTIN IN THE CHAIR.

The Chairman pointed out that by the death of Lor Armstrong the Section had lost one of its oldest member he having been an original member of the "Newcast Chemical Society," and having joined the Society Chemical Industry when the two societies amalgamate in 1883. The following resolution was unanimous adopted:—"That this Section desires to place on reco its sense of the loss which it has sustained in the dea of Lord Armstrong, who was one of the original membe of the 'Newcastle Chemical Society,' and who, during h long life, used his splendid talents to benefit his nati city, and to promote the welfare and success of the vario local societies with which he was connected."

DU PONT'S NITROMETER.

BY G. LUNGE.

At the October meeting of the New York Section of t Society of Chemical Industry (see this Journal, Novemb 1900, 982), Mr. J. R. Pitman gives a description of t methods for testing nitric and mixed acids, containi nothing but elementary matter. Just to cite one instanc the author issues a warning against measuring the aci instead of weighing them, because the pipette and fla may be inaccurately graduated, and slight errors may occ in reading—as if a chemist who needs such and simil instructions would not be liable to other mistakes wh weighing the acid—a proceeding which, by the way, have prescribed in all my own publications on th subject!

The remainder of the paper is equally devoid of a interest or novelty for anybody acquainted with the metho hitherto in use—in particular with the descriptions giv in my various publications, which I have every reason f believing to be known on the other side of the ocean, a to which Mr. Pitman himself makes reference. I shou not trouble myself or the Society with any remarks this, if the author had not devoted a great part of his pap to "Du Pont's modification of Lunge's nitrometer," as much more accurate and rapidly working instrument th my own—to which statement I must take decided exceptic If anybody chooses to call it a "modification" when usi a bulb of 250 c.c. instead of 150 c.c., or a slightly differe kind of stand, he has a right to do so for his priv ratification. But it is hardly fair, on the strength of such nd other equally unimportant changes, to proclaim himself efore the world as the inventor of a new instrument to hich a new name must be attached, while another man ad conceived all and every one of the original ideas in- orporated in that apparatus, and had elaborated it into he shape in which hundreds of chemists are using it very day.

From Mr. Pitman's description nobody would guess that Du Pont's five-part nitrometer" (as opposed to "Lunge's wo-part nitrometer") is to all intents and purposes abso- itely identical with the instrument described by myself in 890 as "gasvolumeter," and gradually improved in various ays, all of them duly published in the "Berliner Berichte," the "Journal of the Society of Chemical Industry," in e "Alkalimakers' Handbook," and in every other place here chemists might look for them. There are differences a few details, none of which is an improvement or in ny way essential. The assertion that by these "modifica- ons" the instrument admits of more accurate and rapid ork, is as unfounded as it is unintelligible, as was pointed at by Mr. Willcox in the discussion on Pitman's paper. uch an assertion can be made only when making the tirely inadmissible comparison between a "five-part" and "two-part" instrument, both of which, as is well known, o constructed by myself. I have pointed out that the d two-part instrument, which for many purposes still tains its usefulness, is much less adapted for the analysis nitrates, of nitrocellulose, of nitric acid, and other cases here large quantities of nitric oxide are given off, and I vented the five-part instrument for that very reason, so at Mr. Du Pont has come many years too late for this. east of all can he be credited with the greater accuracy id speed aimed at and attained by me, and that by the entical means.

I must claim a short space to notice the various modifications" introduced by Mr. Du Pont. By en- rging the burette and generating vessel from 150 to 10 c.c., he enables us to increase the weight of the mple in the ratio of 3:5. But this involves employing wider graduated tube; in fact, in his instrument this ntains 400 divisions (4 per cent. nitrogen divided in 100), against 500 divisions in the ordinary gasvolumeter 0 c.c. in 1/100), thus giving to the latter an advantage 20 per cent. in the accuracy of reading. I had taken re, when constructing my instrument, to go to the ex- eme limit of capacity compatible with a handy length of e tube, and I have thus attained the limit of accuracy reading. Du Pont has overshot the mark; for nothing gained by enlarging the capacity, if you must enlarge e width of the burette, as you are compelled to do.

Exactly the same thing has happened to him when aduating the tube directly for percentages of nitrogen, hich principle is not even his invention, but mine. By ing so between the limits of 10 and 14 per cent., a action of a minute is saved in the case of nitrocellulose, hich is again lost by the necessity of weighing out a nstant quantity for analysis; and in every other case, tably that for which Pitman recommends Du Pont's strument, the calculation becomes decidedly more com- icated than when graduating in c.c. I, for my part, when st describing my instrument, pointed out and practically plied the division in other parts than c.c. for special ses; for instance, the estimation of nitrogen in elementary alysis of organic bodies, the determination of vapour nsities, for calcimeters, &c.; and the division adopted by u Pont would be merely a special case of this sort, but the present case it is decidedly not advisable, since all ose who use the nitrometer for nitrocellulose require it ually for the analysis of nitric acid. I had also at that ne forestalled Du Pont's "universal tube."

In another point Du Pont and Pitman are decidedly not to date. They still use my original arrangement of aling off the compensating tube at the top, instead of osing it by a vertical tap sealed by a special mercury cup. or many years past I have abandoned the old method for e latter, which furnishes an absolutely certain seal for y length of time, combined with the facility of readjusting c tube when anything has happened to disturb it.

A further modification consists in providing the generating bulb with a tap at the bottom, in order to facilitate the shaking. I had certainly not overlooked this obvious device, but I discarded it because I found that my students managed the shaking quite as well without it, while they sometimes had accidents with the plug coming out by the violence of the movement. There is not much in it one way or another.

Lastly, the stand adopted by Du Pont, without being less simple or expensive than that constructed by me as the result of great practical experience, does not offer the various advantages secured by the latter.

This exhausts the differences between Du Pont's instrument and my gasvolumeter. All of them are unessential to the principle or to the working of the apparatus; none of them is an improvement, and it is impossible to see where the features come in which are supposed to render the former four times as accurate and four times as rapid as my gasvolumeter. Those, certainly, who do not happen to know that instrument, in spite of its being described in so many places, would, by the communication of Mr. Pitman, most probably be drawn to the conclusion that Mr. Du Pont had invented the "five-part instrument," which dates many years before Mr. Du Pont affixed his name to an apparatus containing every essential feature of mine, and differing from it only in a few paltry details, none of which constitutes an improvement.

I have in vain sought for any other feature of novelty in Mr. Pitman's paper, which contains nothing previously unknown to any student of chemistry, and I must give up as hopeless the task of discovering what is the use of such papers to the chemical world.

DISCUSSION.

Mr. F. A. WILLCOX said that in the analysis of nitric and mixed acids, provided the weighings were made with equal care with each instrument, the rapidity and accuracy in the Du Pont instrument could only be increased by the use of the volumeter, and in the analysis of nitrates, guncotton, &c., the weighing of one gramme exactly, and reading in $\frac{1}{100}$ per cent., must be assumed to be a more rapid and more accurate operation than weighing from a weighing bottle and reading to $\frac{1}{10}$ c.c. and calculating the result.

Whether it was more rapid or more accurate to weigh off one gramme than to weigh from a bottle depended upon the accuracy to which the gramme must be weighed in order to enable the result to be fixed accurately to 0·01 per cent. nitrogen.

Taking the case of pure potassium nitrate of 13·88 per cent. nitrogen, the weighing of one gramme must be accurate to 0·0005 grm. in order to allow of the measuring burette to be read to 0·01 per cent. nitrogen; that was to say, an error of 0·0005 grm. would not affect the result in the second place of decimals, but an error of 0·001 grm. would.

In the case of the two-tube Lunge nitrometer 0·60 grm. was usually weighed from a weighing bottle, but not exactly, and the weighings must be accurate to 0·0004 grm. in order to read the result accurately to 0·01 per cent.

There was no difficulty in accomplishing this in a weighing bottle, but it was questionable whether such a bulky and dusty substance as guncotton could be weighed in quantities of 1 grm. accurately to 0·0005 grm., and such a weighing must take considerable time—a source of error, since this substance rapidly absorbed moisture when in the dry state.

Mr. Pitman had stated that erratic results were given by the two-tube Lunge nitrometer, and also that estimations of nitrogen in both instruments were affected by the use of pure sulphuric acid. His own experience did not bear this out, and since the two-tube Lunge instrument was used by practically all explosive manufacturers in Great Britain, it might be presumed that they also had not had any such experiences.

The results in the case of guncotton appeared to be affected by the method of transferring the substance to the cup, and by the method of solution. Below were given the percentages of nitrogen found in the same sample of guncotton, the instrument used being the two-tube Lunge nitrometer; the methods of introducing the substance into the nitrometer being different.

Method I.—0·5 grm. weighed on a rough balance, transferred to a weighing bottle, and then weighed accurately from the bottle directly into the cup, dissolved there in pure sulphuric acid, and washed into the nitrometer.

Method II.—1·50 grm. weighed on a rough balance, transferred to a weighed bottle, sulphuric acid added, and whole weighed; when solution was complete, about one-third weighed into the cup and washed in with pure sulphuric acid.

	Method I.		Method II.
	Nitrogen. Per Cent.		Nitrogen. Per Cent.
	12·98		13·15
	12·98		13·14
	13·07		13·20
	13·07		13·18
	13·11		13·26
	13·02		13·14
Mean ...	13·04	Mean ...	13·16
G.D.	0·13	G.D.	0·06

These estimations were made by Mr. C. R. Borland, in the laboratory of the American E.C. and Schultze Gunpowder Company, Oakland, N.J., during the summer of 1900, and on days when the temperature varied very considerably owing to the prevalence of tropical heat and thunderstorms.

The first method gave both lower and more erratic results than the second, and this would be expected on account of the unavoidable loss in transferring guncotton directly from a weighing bottle to the cup of the nitrometer; but all the results pointed to the fact that even under adverse climatic conditions the two-tube Lunge nitrometer gave results as accurate and regular as could be expected or desired, when they considered that there were errors such as the solubility of the nitric oxide gas in the sulphuric acid, &c., which were attached to the use of the mercury nitrometer, and possibly would not justify them in reading to such accuracy as 0·01 per cent.

To overcome the difficulty which the use of pure sulphuric acid introduced, Mr. Pitman recommended the use of a good grade of commercially pure sulphuric acid, which might contain traces of nitric and nitrous acid as impurities. This appeared to be a very bad suggestion when they were told that these impurities sometimes produced a difference of 1·0 per cent. in the nitrogen estimation. However, a method of standardising was described which they were told entirely compensated any error due to such impurity. It was interesting to consider whether this method of standardising really compensated any error due to such impurity.

Take the cases of (1) the estimation of nitrogen in pure potassium nitrate, using an acid which made a difference of 1·0 per cent. nitrogen; (2) the estimation of nitrogen in a nitrocellulose of 11·0 per cent. nitrogen, using the same acid—

Using 1 grm. substance, every 16·1 c.c. gas = 1·0 per cent. nitrogen.

1 grm. KNO_3, 13·88 per cent. N yields..	222·1 c.c. gas at N.T.P.
Impure acid yields..........................	16·1 " "
Total gas	238·2 c.c.
1 grm., 11·0 per cent. nitrogen nitrocellulose yields......................	176·6 c.c. gas at N.T.P.
Impure acid yields	16·1 " "
Total gas....................	192·1 c.c.

The standardising simply amounted to the statement that 238·2 c.c. gas represented 13·88 per cent. nitrogen (the reduction of the volume to 222·1 c.c.; the 13·88 per cent. mark did not affect the question), and other volumes would be in proportion; therefore the percentage of nitrogen in the nitrocellulose would be—

$$\frac{192·1}{238·2} \times 13·88 = 11·19 \text{ per cent.}$$

If they considered the volumeter, let them assume, for th sake of argument, that the gas was reduced from 238·2 c.c to 222·1 c.c., the 13·88 per cent. mark at normal temperature; then the air in the volumeter would be under pressure $p_o \times \frac{238·2}{222·1}$ when the mark is made.

If the gas from the nitrocellulose were measured at th same temperature, it would be under a pressure o $p_o \times \frac{238·2}{222·1}$; therefore its volume will be—

$$\frac{192·1 \times 222·1}{238·2} \text{ c.c.,}$$

and the percentage of nitrogen—

$$\frac{192·1 \times 222·1}{238·2} \times \frac{1}{222·1} \times \frac{13·88}{1} = 11·19 \text{ per cent.}$$

Consequently it appeared that the method of standardisin did not get over the difficulty, but led us to erroneou results.

From Prof. Lunge's paper and the above consideration it appeared, then, that the so-called Du Pont modification c the Lunge nitrometer was merely the Lunge nitromete fitted with the volumeter, that it was not more accurat than the Lunge two-tube nitrometer, and that the claim o superior rapidity had not been sustained.

Mr. Collins drew attention to a paper by Dr. Gros mann, in the November 1899 number of this Journal, i which the errors of chemical manipulation were dealt wit and went on to say that chemists who used every refin ment in the determination of the atomic weight of nitroge admitted an error of, say, 4 per 1,000, whilst chemists wh sacrificed some refinements to speed in technical analysis t the same element attempted to discuss errors as small t 5 per 10,000.

Mr. C. E. Stuart exhibited a collection of nitrometer of various types and different patterns lent by Messr Brady and Martin, and Messrs. Mawson and Swan, an pointed out that to appreciate Dr. Lunge's remarks it wa only necessary to compare his instrument with that c Du Pont, when it would be seen that there was no essenti difference.

After giving a short review of the development of tl nitrometer he showed Lunge's "Volumeter" (this Journa 1890, 547—549), the essential idea of which was to sa time and trouble by doing away with corrections f temperature and pressure.

New York Section.

Meeting held on Friday, December 21st, 1900.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

POWDER EXPLOSION AT INDIAN HEAD, MARYLAND.

BY F. KNIFFEN.

On the night of October 24th, at about 10 o'clock, tl storage magazine at the naval proving ground, containi about 45,000 lb. of powder of various kinds, explode The effect was spectacular in the extreme. Persons in position to observe saw a brilliant cloud shoot skyward to height of four or five hundred feet; it was sprinkle throughout with burning powder grains, which looked lil myriads of stars. In a few moments the brilliancy w obscured by a dense smoke, which enveloped everythi for half a mile around, and filled the buildings in tl immediate vicinity, even penetrating into closed room The sound was heard for ten miles in the direction of tl wind. The reflection of the light was seen for a somewh greater distance. The effect of the shock may be inferr from the condition of the nearest buildings. Of the three small buildings, located in the same ravine whi contained the magazine, and therefore in direct ran of flying *débris*, were set on fire and burned. To wh extent they were wrecked by the explosion itself, as om the fire, cannot be determined. Another brick ilding in the ravine, about 300 feet from the magazine, d the end facing the magazine partially crushed in. A achine shop, located in the ravine, but not quite so rectly in range, lost all of its doors and windows. The velling-houses had been carefully located on a flat, evated tract, across one end of which ran the valley ntaining the magazine and other buildings for the storage explosives. Thus the brow of the hill formed a natural otection for them against shock proceeding from the lley. The damage sustained by them was trifling. The use occupied by the writer, which was about 200 yards om magazine, was a typical example: panes in six of the ndows were broken, two doors facing the magazine were own in, and some of the plastering was loosened, though ne fell from the walls. The buildings of the smokeless wder factory, which is entirely distinct from the proving ound, and located a mile away, suffered to the extent of ew broken window panes.

The force of the explosion seems to have proceeded ong three radial lines about equidistant from each other. ees along these lines were blackened and torn, while ners only a few feet away were not injured. No person s in the vicinity of the magazine at the time of the currence, and no one was injured.

The small buildings just referred to as having been rued, were of brick, with wooden platforms. They ntained, chiefly, shells, cartridge cases, and photographic paratus. As the loaded shells were heated by the rning woodwork to the ignition point of the combustibles ntained in them, each burst. How much of the nolition of these small buildings was due to the explosion the magazine, and how much to the subsequent bursting the shells, it is impossible to say.

The explosion was as unsatisfactory from a scientific, it was from an economic, standpoint. Like a total ipse of the sun, such a phenomenon is of rare occurrence, l the possibilities for the acquirement of scientific owledge would be correspondingly valuable. But in case of the Indian Head explosion there were too ny variable quantities. We do not know what powder ploded, we do not know how much of it exploded, and we not know why it exploded. The 45,000 lb. of powder ntained in the magazine may be divided into 30,000 lb. smokeless, 10,000 lb. of the old-style black powder, l 5,000 lb. of brown cocoa powder. The greater part the smokeless was of the modern variety, made from re nitrocellulose only, though there was a small antity which contained metallic nitrates. In which of se varieties did the trouble originate? The ignition, by means, of any variety would have been sufficient to the remainder. Direct evidence is, of course, entirely king, and in the realm of conjecture there is room for number of opinions.

The properties of black and brown powders, and the ation of those properties to spontaneous combustion, ve been studied for years; but smokeless powder, ecially that variety used in the U.S. Navy, is a aparatively new arrival in the field. While it has od the stability tests to which it has been subjected, s not yet old enough to have stood the test of long rage. Had the contents of this magazine been entirely okeless powder, some light might have been shed upon extremely important point, *viz.*, its stability; but the sence of other varieties of powder prevent the drawing any conclusion. That any considerable portion of the okeless powder detonated is hardly conceivable. The onation of any such large amount of nitrocellulose in form would have wrecked every building in the ghbourhood. Moreover, the greater part of the okeless powder was scattered around the ground in ery direction for a distance of a quarter of a mile. The ins were only slightly burned, the flame having been inguished by their rapid projection through the air. e tons have been picked up and boxed. Some quantity every size of smokeless powder which was in the lding, except that in the form of strips or flakes, having hickness of less than 0·018 inch, has been recovered urned.

The spontaneous decomposition of some of the nitrocellulose powders, with generation of sufficient heat to fire the whole mass, is, to be sure, among the possibilities. But it is extremely improbable. The powders on hand, with two exceptions, had easily passed the stability test with potassium iodide and starch. (Two small sample lots, however, which had been sent to the proving ground for trial, had failed to meet the full requirements of the stability test; but they were not regarded as in any sense dangerous, and the poorer of the two has since been heated at 100° C. for 40 hours without showing any appearance of decomposition.)

The black and cocoa powders were, as far as can be ascertained, normal in every respect. Only a small amount of the cocoa was burned, large quantities having been found scattered among the grains of smokeless strewn over the ground. The 10,000 lb. of black powder were entirely consumed. No trace of it has been found.

Discussion.

Dr. C. H. Volney complained that the paper furnished no data which would enable the meeting to get at the facts, and he regretted the absence of the author, who might have given them the necessary information for a discussion. Without plans and descriptions of the magazine, and details as to the storage and condition of the different powders that exploded, it was impossible to fully discuss the causes of the explosion.

He had had long experience in storing powders, but had always considered it bad to store in the same magazine different kinds of powder. This case exemplified the evil of such a practice. He considered black powder more dangerous than so-called "smokeless powders," which, like all colloidal nitrocellulose powders, even those with high percentages of nitroglycerin, were so indifferent to shock, percussion, and heat that the idea of their explosion from such external causes might be dismissed.

This lack of sensitiveness to concussion and heat which smokeless powders exhibited might be inferred from experiences which he had had with such powder containing high percentages of nitroglycerin. Several tons of such powder were tried for use in blasting, and proved perfectly inactive in bore holes, even by using 30 and 40 grain fulminate caps. Only after adding larger quantities of free, *viz.*, unabsorbed, nitroglycerin could such powder be made available for blasting purposes, as otherwise it could not be brought to explosion by any practical means.

Mr. Jno. R. Pitman said that the following instance would show the unlikelihood of guncotton powders having detonated:—At the Laflin and Rand Powder Works, in August 1900, a service magazine, containing about 3,000 lb. of dry guncotton, exploded; the guncotton was stored in wooden boxes, with loose wood covers, weighing about 8 lb.; each box held a charge of 50 lb. The weather was very hot; temperature in magazine at 3 p.m. was 102° F. The explosion occurred at 9 o'clock in the evening; cause doubtful, but might have been due to defects in the window glass. The stability of this cotton was beyond question. Tested by standard method at 65·5° C., the KI starch test papers showed no trace after 60 minutes. There was no detonation; only a portion of the guncotton exploded, the balance being thrown out and afterwards burned. The building was wrecked, but many of the boxes were found uninjured, except that they were slightly scorched on the inside.

On August 27th, about one week later, during a very severe electrical storm, a guncotton dry-house was struck by lightning, and 3,000 lb. of guncotton exploded. There was no detonation; the guncotton, placed on zinc trays as usual, exploded and wrecked the building. The lightning was unusually heavy. With a colloidal guncotton, in the form of powder, there was less, if any, liability to detonate.

During the autumn it was necessary to destroy 2,900 lb. of a pyrocellulose cannon powder. This was placed in a heap about 15 ft. in diameter and about 4 ft. high, and fired by a train of powder. Although this burned fiercely, the flame being considerably over a hundred feet high, there was not the slightest indication of an explosion, not even of the individual grains. Considering the mass and the great heat, this would indicate that unless confined, as in the chamber of a gun, there was no tendency to explode.

He could confirm Dr. Volney's remarks as to the difficulty of detonating nitroglycerin powders. Captain Aspinwall and himself had often tried to detonate powders containing high percentages of nitroglycerin, using strong caps with 33 grains of fulminate of mercury, and had been unsuccessful. Sir Andrew Noble never succeeded in detonating cordite, which contained 58·0 per cent. of nitroglycerin.

Dr. R. C. Schüpphaus entirely agreed with Dr. Volney in regard to the storing of black and smokeless powder in the same magazine. In the early days of smokeless military powder in the United States it was one of their great points to call attention to the decreased danger in storing. As far as deterioration in storage was concerned, he had little fear if the nitrocellulose and powder were properly made. During the last 17 years he had made nitrocellulose for every conceivable purpose, and knew that nitrocellulose could be made of sufficient stability, chemical and physical, for all practical purposes. This presupposed the employment of suitable raw materials and intelligent treatment. No chemical compound was made for all eternity, and organic preparations less than any others.

Meeting held on Friday, January 25th, 1901.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

Before proceeding to the business of the evening it was resolved "That the New York Section sincerely sympathises with the parent Society in its national bereavement in the death of the Queen," and the Secretary was instructed to send a message to London by cable, conveying this resolution to the Council.

The attention of the meeting having been called to the death of their late fellow-member, Major Charles Chauncey Parsons, it was resolved "That the New York Section of the Society of Chemical Industry, having learned with deep regret of the death of their late fellow-member, Charles Chauncey Parsons, a committee be appointed to express our deep sympathy with his family in this bereavement, and that this resolution appear in full upon the minutes of this meeting; also that a suitable obituary notice be published in our Journal."

Nottingham Section.

Meeting held on Wednesday, December 19th, 1900.

PROF. F. STANLEY KIPPING, F.R.S., IN THE CHAIR.

INTERNATIONAL ASSOCIATION METHOD OF TANNIN DETERMINATION.

BY H. R. PROCTER.

(*Abstract.*)

In order to overcome the difficulty of obtaining a clear filtrate from the hide-powder filter in the analysis of such materials as quebracho extract, F. A. Blockey proposes to dilute such solutions so that they contain approximately 0·4 grm. "tannin" per 100 c.c., instead of making a solution containing 0·7 grm. total soluble.

An average sample of oakwood extract contains 42 per cent. of "total soluble," which includes 26 per cent. of "tannin." Hence a weight of such an extract which will give 0·7 grm. of "total soluble" per 100 c.c. will give 0·4 grm. of "tannin" per 100 c.c., but a quebracho extract in the quantity yielding 0·7 grm. of "total soluble," on evaporation would yield no less than 0·6 grm. "tannins," or one and a half times as much as the oakwo extract.

The results given in the following table were obtained fr a pasty quebracho extract. They are expressed in p centages, and show the differences found when such extract is analysed by the I.A.L.T.C. method and by t method now proposed, which differs from the other in th the solution of the extract is made of such a strength th 100 c.c. of it shall contain, as nearly as possible, 0·4 gr of "tannins," instead of the weight of "total solubl being recognised as the basis, as at the present time.

—	Strength of Solution based on Amount of	
	"Total soluble" (13 grms. per litre).	"Tannins" (9 grms. per litr
Total solids	52·1	52·1
Total soluble matter	47·3	51·3
Insoluble	4·8	0·8

—	Tannin.	Non-tannin.	Tannin.	Non tanni
Hide-filter:				
Hide-powder "Oct"	43·5	3·8	47·5	3·8
"No. 3"	42·5	4·8	46·6	4·7
"Freiberg"	44·6	2·7	48·5	2·8
Palmer:				
"Oct"	40·8	6·5	45·4	5·9
"No. 3"	36·6	10·7	43·0	8·3
"Freiberg"	39·1	8·2	44·7	6·6

The most noticeable feature about these results is fact that all the "insoluble" which has gone into soluti is returned as "tannins," thus confirming the suggestion Mr. A. B. Searle, as the result of his experiments in quit different direction, that the matter returned as "insolubl is reported under a wrong heading, and that it ha tanning value equal in every respect to that returned un the head of tannins.

(Note.—Mr. Blockey's suggestion has been adopted the International Association of Leather Trades Chemi at their Paris conference last year, and they now dir that solutions for analysis should contain not more th 0·45 and not less than 0·35 grm. of "tanning matter" 100 c.c.—H. R. P.)

Obituary.

CHAS. CHAUNCEY PARSONS.

MEMBER OF THE SOCIETY OF CHEMICAL INDUSTR

Chas. Chauncey Parsons was a son of Theophil Parsons, Dean of Harvard Law School, and was bo June 18, 1840. He graduated from Harvard Universi with honours, in 1860, and from the Harvard Law Scho in 1862 entered the Army, a few days after graduatio as Second Lieutenant, and in 1864 was promoted a Captaincy, in 1865 becoming Major of the Fif Massachusetts Cavalry.

Mr. Parsons was a born chemist, and was one of t first to engage in the refining of petroleum, becomi superintendent of oil works in Boston immediately aft leaving the Army. He subsequently became a man facturer of sulphate of ammonia in St. Louis and Ne York, and in 1880 he was engaged as secretary a general manager of the Columbia Chemical Works Brooklyn—a position he filled at the time of his deat He was a member of the American Chemical Societ and served on the Committee on Patent Legislation that Society.

Mr. C. C. Parsons died suddenly of heart failure, Hampstead, N.Y., Jan. 16, 1901.

STEVENSON MACADAM, Ph.D., F.R.S.E.

Lecturer on Chemistry at the Surgeons' Hall, Edinburgh; Member of the Society of Chemical Industry and of the Publication Commitee of its Journal.

tevenson Macadam was the son of a Glasgow magisrate, and one of four brothers, three of whom adopted ie profession of chemistry. He was born in Glasgow 1829, and received his early training, under his rother John, at the Mechanics' Institute in Glasgow, nd later on proceeded to Edinburgh, there becoming sistant to the late Dr. George Wilson on the appointent of his brother John, Dr. Wilson's assistant, as rst professor of chemistry in the University of lelbourne. In 1855 he instituted a course of lectures pharmaceutical students in the rooms of the North ritish branch of the Pharmaceutical Society. Dr. acadam was subsequently appointed lecturer in iemistry to the Edinburgh School of Medicine, first at ie School of Arts, and afterwards at Surgeons' Hall, here he continued to lecture till the end of last summer ssion, thus completing a period of fifty years as a cturer. As lecturer and teacher he is said to have en very successful, and to have attracted large classes; also conducted a large consulting business, and took rticular interest in the technical applications of emistry. He was a prominent member of the Royal ottish Society of Arts from 1854, and President from 62 to 1864. In this connection he was brought into ntact with the late Prince Consort, of whom he had any pleasant memories. In early life he graduated as Ph.D. of the University of Giessen. He was an iginal member of this Society, as well as of the Institute Chemistry.

Dr. Macadam died at the age of 72, of blood poisoning, n. 24, at his residence, Brighton Crescent, Portobello, B.

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I.—PLANT, APPARATUS, AND MACHINERY.

PATENTS.

Scale in Steam Boilers; Improved Composition for the Removal of ——. T. Rümler, Ducherow, Germany. Eng. Pat. 25,427, Dec. 22, 1899.

The claim is for a composition for preventing the formation of boiler scale, consisting of 152 parts of quartz powder, 57 parts of calcined soda, and 50 parts of potash, mixed together with an equal quantity by weight of water, and evaporated down to 33 per cent. This liquid is to be added to the feed water when the boiler is being filled, and again 14 days before it is put out of use. It is stated that when this composition is used, the separated boiler scale will lie at the boiler bottom as mud, easy to be withdrawn by a scoop or rake.—E. S.

Calcareous Matters from Metal Surfaces [*Boiler Scale*]; *Compositions for Removing* ——. S. Metcalf, Preston, Lancaster. Eng. Pat. 4219, March 6, 1900.

The composition is prepared by mixing hydrochloric acid, 50 parts; gelatinous matter, preferably animal, 40 parts; and creosote, 10 parts. The mixture is applied by a brush to the boiler or other metallic surface to be cleansed, and after some time is washed or brushed off.—E. S.

Lime, Cement, Dolomite, or the like; Furnaces for the Treatment of ——. E. Gobbe, Jumet, Belgium. Eng. Pat. 552, Jan. 9, 1900.

The object of the inventor is to remove the carbon dioxide, formed by the combustion of the fuel or the heating of the material under treatment, as soon as formed, so as to prevent its being converted into carbon monoxide by further contact with fuel. The upper part of the furnace is divided into a series of cells by vertical walls containing flues to carry off the gaseous products from the baking zone below; while the layers of fuel and material to be treated lie in these cells they become heated by contact with the hot walls of the cells, which in turn are heated by the gases carried off from the baking zone; the baking zone (only 2 to 3 metres long) has its walls provided with vertical ribs to reduce the contact surface to prevent "scaffolding." The cooling zone below this and immediately over the grates is supplied with cold air in excess of that required by the baking zone, the excess being carried off by special flues in the walls of the furnace.—J. W. H.

Evaporators; Vacuum ——. E. G. Scott, London. Eng. Pat. 3748, Feb. 26, 1900.

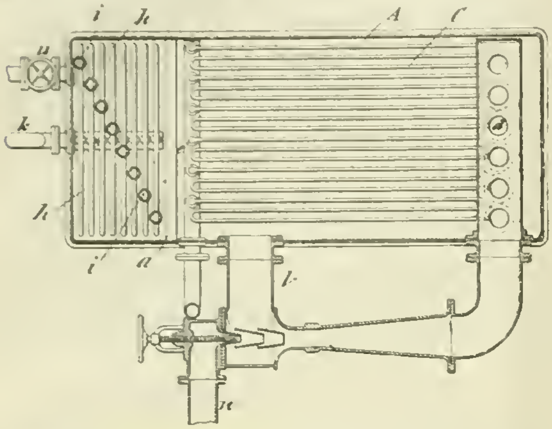
The vacuum evaporating pan is provided with a movable plate or valve, which may be in the form of a float valve, mounted on suitable guides, &c., and normally uncovering the vapour outlet, but adapted to rise and close the said outlet when the contents rise to the top of the pan. When the valve closes the outlet, it is held in that position by the vacuum, thus placing the pan out of operation until the necessary attention has been given to it.—R. A.

Liquids; Apparatus for Cooling and Concentrating ——. H. Schaffstädt, Giessen, Germany. Eng. Pat. 5916, March 29, 1900.

The apparatus consists essentially of a series of arms spirally arranged on a revoluble vertical spindle. The liquid under treatment drops downward from arm to arm, and is acted on by the air which passes upwards between the arms. The spindle may be rotated by the liquid, by delivering the latter on to a series of suitable blades or vanes at the top of the spindle. The arms and vanes act as a kind of ventilator to increase the upward air current, whilst the vanes serve also to distribute the liquid on to the arms.—R. A.

Still [*Water*]; *Improved* ——. S. Bessonoff, St. Petersburg, Russia. Eng. Pat. 21,734, Nov. 30, 1900.

The accompanying figure is a sectional plan of the still, the section being taken near the top of the apparatus. The reservoir A is divided into two compartments by the partition a, which extends nearly to the top of the reservoir. The larger compartment contains the heating battery C, each element of which is made of parallel metal plates, riveted together, bent or folded twice longitudinally, and connected at the ends to the pipes d, e. The elements, h, of the condensing battery in the smaller compartment are similarly formed, opening below into the delivery pipe, k, and terminating above in pipes, i, which have funnel-shaped mouths directed towards the heating compartment. The water to be evaporated is delivered through the pipe u, rises through the condensing compartment, in which it condenses the steam received from the heating compartment through the pipes i, and then passes through apertures in the partition a into the heating compartment. The steam supplied to the heater C through the pipe n passes through the steam injector shown. By the action of the injector, a portion of the steam generated in the heating compartment is withdrawn through the pipe l, compressed, and carried, with the steam supplied by the pipe n, through the heater. The water formed by the steam condensed in the heater passes up through an external pipe, and is discharged into the pipes i, or it may be withdrawn directly from the external pipe through a cock provided for that purpose.—R. A.



Filter-Press; Improved ——. W. Sommer, Bavaria, Germany. Eng. Pat. 19,224, Oct. 26, 1900.

The filter-press has only one main inlet and outlet channel, x, y, which extends over the whole surface of the filtering frames, b, and the intervening grating, c, containing the connecting channels, d, the main channel, x, y, formi reservoirs for the inflowing and outflowing liquid, and maintaining a uniform pressure. The connecting channe d, between the main channel and the filtering chambe are arranged near to one another on their respective gratin c, and are alternately connected to the inlet x and outlet y, so that the liquid completely and uniformly cov the whole surface of the filter, and flows through chambers without any counter current.—R. A.

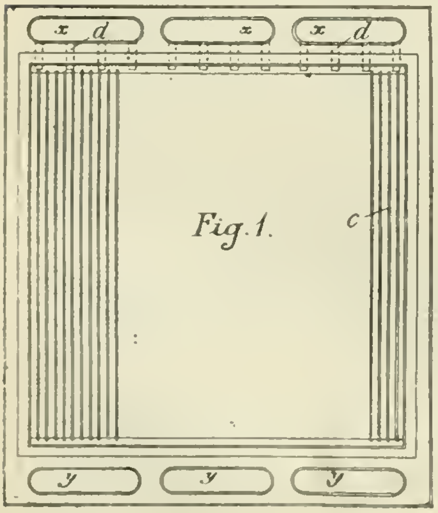


Fig. 1.

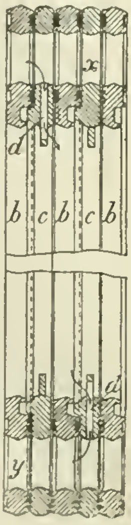


Fig. 2.

II.—FUEL, GAS, AND LIGHT.

"*Mond*" *Gas.* Ironmonger, Feb. 16, 1901, 296.

Some interesting particulars relating to "Mond" gas the process of producing it were given on Feb. 9, to members of the Staffordshire Iron and Steel Institute Mr. A. Rollason, of Nottingham. By the new process, said, a ton of ordinary slack is made to yield 110,000 160,000 cubic feet of gas, applicable to all classes of f nace work, eminently suitable for gas engines also, a yielding the ammonia equivalent to 90 lb. of sulphate ammonia. The gas obtained per ton of fuel is of grea heating and explosive power, if calculated on the percent of combustible matter contained in the fuel used, than t from any other gas-producer. It is free from tar, was quite free from solid particles, soot and dust, and a contains less sulphur than ordinary producer-gas. It cooled to a sufficiently low temperature to admit of its bei sent through pipes for long distances without inconvenie from condensation products. It is especially valuable heating operations in which the flame comes in direct c tact with the products to be heated, such as glass, chi glazed earthenware, &c. In the manufacture of op hearth steel it not only effects a great saving, but produ also a better material, because it contains less sulphur t ordinary gas. In the manufacture of iron and steel it eminently suitable for heating iron piles and steel ingots mill-furnaces, annealing castings, plates, sheets, and w firing forging-furnaces, heating and welding boiler pla and tubes. It is available in the foundry for core mould drying, and in chemical works for firing evaporat and other furnaces, roasting ores, and drying. A plant the manufacture of this gas, with recovery of the sulph has been in use for some years at the works of Brun Mond, and Co. (Ltd.), gasifying on an average 200 t of slack per day, the gas made being used in their furna and for the production of power in gas-engines. Up to present time this plant has gasified over 600,000 tons slack, and other large plants are now being erected and work in different parts of this country, on the Contin and in the United States.

The process of manufacture is as follows :—Comm bituminous slack, brought by railway-waggons into works, is mechanically handled by elevators and creep and deposited into hoppers above the producers. Fr these it is fed in charges of 8 to 10 cwt. at a time into producer "bell," where the first heating of the slack ta place, and the products of distillation pass downwards i the hot zone of fuel, before joining the bulk of the leaving the producer. This destroys the tar and conv it into a fixed gas, and also prepares the slack for descent into the body of the producer, where it is ac upon by an air-blast saturated with steam at 185° and is superheated before coming into contact with fuel. Unlike other producers, the quantity of ste introduced into the blast is relatively very large, amounts to $2\frac{1}{2}$ tons for every ton of fuel gasified, of wh however, nearly 40 per cent. is recovered and returned the producer over and over again. This large quantity steam keeps down the working temperature of the prod within such limits as to prevent the formation of clin or the destruction of the ammonia, yet permits the to be so thoroughly burned that good ashes obtained. Half a ton of steam is decomposed in producer for every ton of fuel burnt, yielding thereby hydrogen to the extent of 29 per cent. by volum the final gas. The hot gas and undecomposed st

ing the producer first pass through a tabular regene-
r in the opposite direction to the incoming blast.
exchange of heat takes place, and the blast is still
her heated by passing down the annular space between
two shells of the producer on its way to the fire-grate.
n the hot products from the producer are further passed
ugh a "washer," which is a large rectangular wrought-
chamber with side lutes, and they meet a water spray
wn up by the revolving dashers, which have blades
nming up the surface of the water contained in the
her. The intimate contact thus secured causes the
m and gas to be cooled down to about 194° F., and by
formation of more steam, tending to saturate the gas
water vapour at this temperature, the bulk of the
sible heat is converted into the latent form. Then
sing upwards through a lead-lined tower, filled with tiles
resent a large surface, the gas produced meets a down-
d flow of acid liquor, circulated by pumps, containing
hate of ammonia with about 4 per cent. excess of free
huric acid. Combination of the ammonia of the gas
the free acid takes place, giving still more sulphate of
nonia, so that to make the process continuous some
hate liquor is constantly withdrawn from circulation
evaporated to yield solid sulphate of ammonia, and
e free acid is constantly added to the liquor circulated
ugh the tower. The gas, being now freed from its
nonia, is conducted into a gas-cooling tower, where it
ts a downward flow of cold water, which further cools
cleans the gas before it passes to the main. The
ing of the gas with its burden of steam, results in the
lensation of the steam, and the raising of the tem-
ature of the cooling water, so that the latter leaves the
r as hot water, and is utilised in a third tower, called
"air-heating tower," through which the air blast from
blower is directed. Here the contact of hot water and
air gives hot air, saturated with vapour at 163° F., and
water. By this method of utilising the heat of the gas
the producer, nearly one ton of steam is added to the
lucer blast for every ton of fuel gasified, and this
ical exchange of heat is always going on, and forms
of the distinctive features in the economy of the plant.
ill be understood that the hot water from the gas-cooling
r is circulated through the air-heating tower, and being
ed thereby is again pumped up to the top of the gas-
ing tower. Both towers are filled with tiles to give
surfaces of contact, and the circulating water acts as
heat-carrying agent between the hot gas and the cold

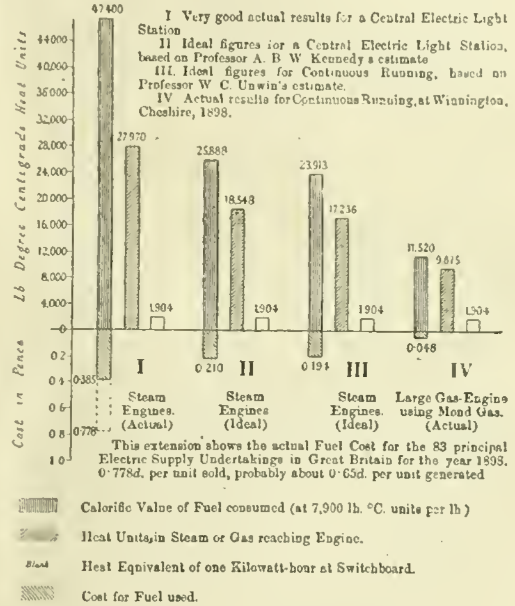
The charging of fresh fuel into the top of the pro-
r and the withdrawal of the ashes from the bottom in
way interfere with the continuous steady work of the
lucer. Moreover, the large volume of steam employed,
as a most perfect regulator in keeping the quality of
gas uniform.

entral Station Installations.—For a central station the
t should be in units of a convenient size, each being
plete in itself, with producers and regenerators, blowers,
ps, washers, acid tower, with pump and tanks, gas-
ing and air-heating towers, steam and air mains, steam-
ng plant (which should consist of gas-fired automatically
lated boilers), and sulphate plant, one of the producers
one washer to be spare ones. A diagram accompanied
paper showing a unit of this size, consisting of six
t. producers, each capable of gasifying 20 to 24 tons of
k per day. This complete plant is arranged for con-
ous working night and day, and will make gas of
tically the same composition. The quantity made may
from 50,000 to 750,000 cb. ft. per hour according to
demand. Each unit of this size will correspond to the
city of one main, and will not require a gasholder for
age purposes. In the Mond producer the make of gas
be controlled automatically in the most perfect manner,
but the gas made and supplied to the distributing main
ways equal to that consumed. A Mond producer will
ond at once to a sudden increase in the demand for
: the speed of the air-blower furnishing the blast to the
lucer can be controlled by the pressure of the gas in the
ply mains, and any fluctuation is automatically balanced
s to keep the supply pressure constant. The limits
n which a Mond producer will make good gas are said
to be surprising, and a producer can be shut down and left with fire in for over a week, and still be ready to start again at short notice.

Mond Gas, and its Application to Gas Engines. H. A. Humphrey. Paper read before the Inst. Mech. Eng. J. Gas Lighting, 1900, **76**, [1962], 1509—1513.

The author discusses the question of the use of power-gas and large gas engines as a factor in the solution of the problem of the production of cheap power, special reference being made to the application, in this direction, of the Mond gas-producing plant. The question is considered under the following headings:—(1) The possibility of using cheap fuel, and of recovering its ammonia. (2) The greater economy of gas engines as compared with steam engines. (3) The simplicity and reliability of gas engines. (4) The superiority of gas-producers over steam boilers. (5) Costs.

Under the first heading the author gives a description of the Mond process for the manufacture of gas from cheap fuel, with recovery of the ammonia (see this Journal, 1889, 505—510; 1894, 938; 1896, 529, 613; 1897, 522; 1898, 34, 1032).



The greater economy of gas engines and Mond producers, as compared with steam engines and boilers, is shown in the accompanying diagram. The economy is effected in three directions:—(*a*) The fuel for generating Mond gas is cheaper than the fuel used at central stations for producing steam. (*b*) For a given expenditure of heat, the calorific value of the Mond gas from the producer is greater than the calorific value of the steam from the boiler. (*c*) The gas engine utilises the heat it receives much more efficiently than the steam engine. It is shown that the actual results obtained with Mond gas and gas engines are superior, not only to the actual, but also to the ideal figures for central stations using steam-driven plant.

Results obtained in actual practice are given showing the reliability of the gas engine. Thus, Mond gas used in a 60 nominal horse-power gas engine, direct-coupled to a Siemens dynamo, gave, during two years, an average thermal efficiency of 25·1 per cent., calculated on the indicated horse-power and the calorific value of the gas used. The consumption of coal fed into the producer averaged 1·05 lb. per indicated horse-power hour, and the consumption of oil about 0·0235*d*. per unit. The average indicated horse-power was 114·7, and the effective horse-power, 88·8.

It has been shown in the United States that gas engines, coupled to alternators, are suitable for running in parallel for the generation of two-phase currents, and the author states that an alternative method would be to work all the gas dynamos on direct current, and use this current to run motor alternators.

Amongst the chief advantages of gas-producers over steam boilers, are:—(1) Gas under a slight pressure is much easier to handle than high-pressure steam, and there are no losses due to condensation. (2) With gas producers, the "stand-by" losses are reduced to a minimum. The author states that another important point is that a Mond producer will respond at once to a sudden increase in demand for gas; indeed, the speed of the air-blower furnishing the blast to the producers can be controlled by the pressure of gas in the supply mains, and any fluctuation automatically balanced so as to keep the supply pressure constant.

The author concludes by giving a detailed estimate of the cost for a 20,000 effective horse-power central station gas-engine plant worked with Mond producer gas. The cost of fuel, oil, labour, repairs, and maintenance, ranges from 0·082*d*. to 0·241*d*. per unit sold, according to the load factor and the price of coal, whilst, it is stated, the combination of Mond producers, recovery plant, gas engines, and dynamos, compares favourably, as regards capital outlay, with the best class of steam-driven plant, when the boiler-house, chimney, slack-handling plant, foundations, and erection, are included in the cost of steam dynamos, boilers, condensers, and auxiliary machinery.—A. S.

Blast-Furnace Gases; Use of ——, in Gas Engines. J. W. Richards. J. Franklin Inst. **140**, [6], 1900, 415—430.

The author briefly reviews the evolution of the gas engine from the original single horse-power, using illuminating gas, to the large 700 horse-power engine of the Cockerill Company, Seraing, Belgium, constructed to burn blast-furnace gas. Their previous 200 horse-power engine (this Journal, 1898, 765, 926) has now been steadily at work for over two years, driving a dynamo, without any wearing out of the parts, the inside of the cylinder showing only a very thin brown skin, which does not affect the efficiency. The present 700 horse-power gas engine is constructed with a blowing cylinder, so that the one engine supplies the blast to one end of the furnace, and is worked by the exit gases from the other. This engine was described, with the results of the first six months' working, to the Iron and Steel Institute in May 1900. The diameter of the gas cylinder is 51 ins., the length of stroke 55 ins., and the speed 80 revolutions per minute normal. The pressure of blast with 84 revolutions was 7·75 lb. per sq. in., which could be increased to 12 lb. The effective horse-power developed in the blast cylinder was 561 to 725. The gas consumed was 2·86 cb. m. per effective horse-power hour, or 2·33 cb. m. per indicated. The distribution of the heat energy of the gas was approximately 30 per cent. converted into work in the cylinder, 50 per cent. carried away by the cooling water, and 20 per cent. in the escaping gases.

After enumerating the actual plants in Europe, the author states that not a single instance of the application of the improvements to American blast-furnace practice can be cited. To bring out the great saving of power under the varying conditions of locality and working, he calculates the minimum, average, and maximum surplus of power which might be obtained by replacing the boiler and steam-engine plant by a gas engine. The results show a surplus of 1,090 horse-power per 100 tons of pig iron daily, in the case where the conditions would be most unfavourable for the generation of power from the gases. With about the average type of furnace, the surplus would be 4,490 horse-power, whilst with a small older type, it would be about 7,290 horse-power. These results are supported by calculations of the power raised by steam boilers and engines with three different efficiencies—3, 6, and 12 per cent. Taking the 6 per cent. case, which is about the efficiency of the furnace in good practice with low fuel consumption, the surplus power works out to a minus quantity in the first instance just given of unfavourable conditions, and to 430 and 1,230 horse-power respectively, as compared with the figures given for the average t and the small older type of furnaces. The contrast is s greater, of course, with the 3 per cent. efficiency, whicl that of the average small blast-furnace steam plant.

Obviously, with such a low efficiency under boilers, s with an efficiency of 20 to 30 per cent. in the gas engi there must be great economy in the latter, and an insta is cited showing that the gases from the production of tons of pig iron daily would, with an efficiency of 2·5 cent. through boilers and engines, yield 2,300 horse-pow whereas in the gas engine, with 20 per cent. efficiency, horse-power developed would be 18,400, or a surplus about 16,000 horse-power available for other purposes. is estimated that in one works with three blast-furnaces Pennsylvania, the saving in the coal bill alone would b least 150,000 dollars in one year by the utilisation of waste gases in a gas engine, the outlay for which would 500,000 dollars.—A. W.

Calcium Carbide; Manufacture of ——. J. B. C. K shaw. Electrician, 1900, **46**, [5], 164—165; [7], 24 246; and [8], 267—268.

The author has brought together all the available infor tion relating to the efficiency and yield of carbide furna

I. *Calculations of the Theoretical Yield of Carl Furnaces.*—Nine estimates are given, and these, redu to a comparable form, are given in Table I.

TABLE I.

Kilowatt Hours theoretically necessary to produce 1 *me ton* (2,204 *lb.*) *of Calcium Carbide containing* 80 *cent. of Carbide.*

Authority.	Reference.	Kilow Hour
Sieber	This Journal, 1898, 564..............	1,523
Addicks	Mineral Industry, 6, —	1,911
Bredel	American Gaslight Journ. 1895, 261 .	1,960
Wolff..........	Zeits. für angew. Chem. 1898, 919....	2,043
Pictet	Le Carbide, 1896, 28	2,640
Haber	"Elektrochemie," Chapter X........	2,670
Gin............	L'Eclairage Electrique, 1899, May 6th	3,069
Lewes	Acetylene, 1900, 301	3,290
Allen	Electrical Review, 1900, Jan. 5th....	3,293

II. *Experimental and Estimated Yields of Carbid* The various yields, reduced to a common form, are gi in Table II.

TABLE II.

Kilowatt Hours necessary to produce 1 *metric ton* (2, *lb.*) *of Calcium Carbide containing* 80 *per cent Carbide. Experimental and Estimated Figures.*

Authority.	Reference.	Kilow Hour
Lewes	Journ. Gas Lighting, 1897, Nov......	4,10
Korda	Rev. de Chim. Indust. 7, 341	4,38
Houston and Kennelly.	Chem. Trade J. 18, 385	4,39
Bullier........	L'Eclairage Electrique, 1896, April 4th.	4,47
Liebetanz.....	Zeits. fur angew. Chem. 1899, July ..	4,80
Wolff.........	" " 1898, 919.... (This Journal, 1899, 818, 1004.)	5,11
?	Engineer	6,51

III. *Actual Yields of Carbide.*—The yields, again duced to a common form, are contained in Table (Compare this Journal, 1900, 330 and 813.)

The author then gives some particulars regarding t types of furnace, *viz.*, the Deutsche Gold und Silber Sche Anstalt furnace; the Willson furnace, as used at Foy and the Gin and Leleux furnace. In conclusion, he p out that the highest yields found amongst the fig

Table III.

lowatt Hours necessary to produce 1 metric ton (2,204 lb.) of Calcium Carbide containing 80 per cent. of Carbide. Actual Figures.

uthority.	Reference.	Kilowatt Hours.
....	Electrician, 1896, April 17th.........	3,576
es	Acetylene, 1900, 302	3,788
ler	Electrician, 1900, Sept. 29th..........	3,871
son	Zeits. fur Elektrochem. 1900, Feb. ...	4,104
en.........	Electrician, 1899, Jan.	4,105
hers......	Zeits. fur Elektrochem. 1899, Oct. 5th	4,157
er	L'Eclairage Electrique, 1899, May 6th	4,291
es	Journ. Acetylene Gas Lighting, 1899, July.	4,351
er	"Elektrochemie," 408	4,470
ard.......	L'Ind. Electrochimique, 1899, Dec. ..	4,920
lat	Stahl u. Eisen, 18, 727	5,066
son.......	Zeits. fur Elektrochem. 1900, Feb. ..	5,616
er	"Elektrochemie," 408	5,960

ing under examination have been obtained in furnaces king on the intermittent system, with movable hexths, in which the carbide produced is allowed to cool. adoption of another form of furnace and of the conous system of working at Foyers, for the sake of a ng in the cost of labour, does not detract from the ectness of this conclusion. Where electrical power is loped at a very low cost, and manual labour is costly, ay be wise to expend more kilowatt hours per ton of ide produced, in order to obtain a reduction in the es bill.

e continuous type of furnace, from which the carbide pped at intervals, is therefore being adopted in localities re power is cheap and labour dear; while the interent form is in use where the opposite conditions obtain. npare this Journal, 1900, 330 and 813.)—J. S.

ium Carbide Mass for Acetylene Manufacture; reparation of ——. Desq and Francou. Rev. Prod. him. **3**, [18], 277.

thousand parts, by weight, of commercial melasses heated at 110° C. to remove water, and, after cooling 1 to 95°—100° C., are mixed, by brisk stirring, with parts of powdered potassium bichromate. When nass has become of a decided bottle-green colour, a ure of sodium carbonate, 200 parts, and litharge, 200 s, is stirred in, the temperature being kept at 85°—90°. n the paste is fluid, viscous, and homogeneous, it ves an addition of calcium carbide in small fragments ut ⅓ in. diameter) previously soaked in a mixture of fied petroleum, 600; spirit of turpentine, 400; and phor, 10 parts. The whole is kept well stirred at 65°— C. until thoroughly mixed, and is then placed in moulds d to 50° C., where it is pressed and cooled, the blocks g finally wrapped in paper steeped in paraffin, &c. To ase their resistance to moisture, the blocks, on leaving moulds, may be soaked in a cold solution of albumin.

—C. S.

ylene Flame; Temperature of the ——. E. L. Nichols. ys. Rev. 1900, **10**, 234—252. Proc. Inst. Civil Eng. 00, **142**, [4], 78.

ELY different numbers have been hitherto given for the eratures at different points of an acetylene flame; Le Chatelier gave 2,100°—2,420° C., Lewes found a mum temperature of 1,517° C., whilst the values ned by Smithells were intermediate between these two. e author's experiments, thermo-electric couples, com- l of platinum and platinum-rhodium (10 per cent.) , varying in thickness from 0·01996 to 0·00821 cm., used, and the mode of preparing them is described. rder to observe the acetylene flame, and to measure listance between its median plane and the thermo- nt, a magnified image was produced on the ground of a micro-camera, the plane of the flame being ged parallel to the axis of the camera. The thermoon was placed at a distance of 6 mm. from the median plane, and the temperature taken by balancing the potentiometer, the couple then being gradually brought to the middle of the flame, and the temperature at each new position determined. With each of the four thermocouples used, the temperature was found to increase gradually at first, but at a distance of about 0·4 cm. from the middle, the curve suddenly becomes steep, so that this distance probably measures the thickness of the layer of non-luminous gas surrounding the well-defined luminous layer, which has a thickness of about 0·065 cm. Before this luminous layer was reached, the temperature curve showed signs of approaching a maximum, the thicker junctions (0·01996 and 0·01598 cm.), however, being coated with carbon, and considerably cooled when coming into contact with the luminous zone. The thinner thermocouples gave temperature curves lying above those of the thicker ones; they gave no deposit of carbon, but were melted in the middle portion of the flame, one of them after passing the median plane, and the other before that plane was reached. The temperatures at various parts of the flame for a thermo-junction of negligible cross-section was estimated by extrapolation; in this way the temperature at the middle of the flame was found to be 1,900° C., whilst at 1 mm. from the middle, the value was 1,920° C. Similar experiments with a luminous coal-gas flame, and a candle flame, showed the highest temperatures to be 1,780° C., and 1,670° C. respectively. The author shows that the fact that a thin platinum wire—prepared by Wollaston's method of silver-plating it, then repeatedly drawing through a die to diminish its thickness, and finally dissolving away the silver—can be melted in a candle flame, is due to the presence of impurities in the wire, in consequence of which it melts at 1,674° C., whilst pure platinum melts at 1,775° C. The temperatures given above are based on an arbitrary scale, in which the melting point of platinum is taken as 1,775° C., and that of gold as 1,070° C.—A. S.

Hydrogen obtained by the Electrical Decomposition of Water; Lighting with ——. J. für Gasbeleucht. **43**, [51], 971.

Hydrogen, compressed in steel cylinders to 150 atmospheres, has been proposed by O. Schmidt for lighting purposes, by means of Auer mantles. He states that he can obtain by the electrolytic decomposition of water 1 cb.m. of hydrogen, compressed to 150 atmospheres, for an expenditure of 6·25 kilowatt-hours; and that 1 kilowatt-hour thereby gives a lighting value of 80 Hefner-hours; whereas, if expended on the production of carbide, the acetylene obtained therefrom would have a lighting value of only 51 Hefner-hours. The latter, however, is too low an estimate, and 80 Hefner-hours would be more nearly correct in this case also. The expenses for materials for carbide manufacture might turn the balance in favour of the hydrogen, in cases where distance did not make the cost of transport of the steel cylinders excessive. Near the source of power electric lighting must be cheaper than either acetylene or hydrogen lighting, but it seems likely that hydrogen might prove the cheaper means of providing small lights in a zone which is too far from the source of power for electric lighting to be cheap, and too near it for the transport costs to give carbide (acetylene) the advantage.—J. A. B.

Peat; Analysis of ——. H. Borntrӓger.

See under XXIII., *page* 159.

PATENTS.

Fuel, Liquid, to Burners; Means or Apparatus for Supplying ——. Sir W. G. Armstrong, Whitworth, and Co., Ltd., and E. L. Orde, Newcastle-on-Tyne. Eng. Pat. 236, Jan. 4, 1900.

The necessary constituents for combustion are heated before reaching the burner, *i.e.*, the oil is forced through a filter into a heating coil or vessel situated in a suitably heated position (*e.g.*, in the smoke box or furnace of a steam boiler), the oil being heated at constant volume to prevent decomposition and deposits of carbon; the steam is superheated in a coil or vessel, the air is also heated in a similar manner, and the three heated constituents are conveyed to the burner by pipes.—C. S.

Water Gas; Process for the Production of ——. A. J. Boult, London. From E. Fleischer, Dresden-Strehlen. Eng. Pat. 1959, Jan. 31, 1900.

The process is an improvement on the process described in Dellwik's Eng. Pat. 29,863, 1896 (this Journal, 1897, 431), in which carbonic acid is generated during the blast period, and in which short blast periods alternate with long gas-producing periods. This method of working is applied in this patent to treating bituminous fuel in twin generators. The gas produced in one generator causes distillation of the fuel in the same generator, and the whole amount of gas produced passes through the other generator.—R. S.

Gas Producers. E. J. Duff, Liverpool. Eng. Pat. 410, Jan. 8, 1900.

The gas producer has inclined gratings at opposite sides of the lower portion of the casing, leaving a central space between the gratings, through which the ashes fall to a water-sealed trough. Air, or a mixture of air and steam, for combustion or gasification is admitted to the space beneath one inclined grating. The gases given off from the top of the bituminous fuel used are admitted beneath the other grating, a communicating pipe being used. By this arrangement the condensable gases from the fuel are caused to pass through the hotter regions of the fuel bed, whereby they become fixed and freed from condensable matters. The gas outlet is arranged on one side of the producer at about half the height of the fuel bed.—R. S.

Gas Producers. E. J. Duff, Liverpool. Eng. Pat. 3631, Feb 24, 1900.

The improvements consist in providing gas producers, which have a water-sealed ash trough and an air-receiving chamber, with a casting or casing extending right across the producer above the air chamber. This casting is provided with sloping or inclined unperforated sides, forming a kind of ridge across the furnace, beneath the lower edges of which the air is admitted to the furnace near the normal level of the water in the trough.—R. S.

Burners; Hydrocarbon ——, *for Use in any kind of Furnace.* C. A. Rosier, Levallois Peret, France. Eng. Pat. 9802, May 28, 1900.

The burner consists of a horizontal tube, closed at one end, and divided along its whole length into two chambers by a partition, the only communication between them being by an opening near the closed end of the tube. The hydrocarbon is fed to the lower chamber and vaporised by applying heat from below, the vapour then traversing the upper chamber into a collector which is bent back upon itself and terminates in a burner nozzle, the flame from which enters the furnace through a funnel-shaped pipe, through which it draws the air necessary for producing smokeless combustion. A series of these burners and tubes may be mounted in a fire-box, in which case the tubes will take the place of fire-bars. It is claimed that no part of this apparatus becomes red-hot while in work.—C. S.

Liquids [Fuel] for Lighting and Heating Purposes, and Products for Producing the same. J. Boual and C. Fietz, Paris. Eng. Pat. 17,181, Sept. 27, 1900.

The inventors claim a liquid, adapted to be burnt through the medium of a wick, for lighting and heating purposes, "which consists of a solution, in water or other suitable solvent, of a mixture of metallic oxides such as those of lithium, strontium, titanium, erbium, cerium, and the like, with sulphur and alcohol." The proportions recommended are lithium oxide, 290 parts; strontium oxide, 200 (or cerium oxide, 20); and titanium oxide, 20 parts; melted separately at at least 90° C., then mixed and cooled to 10° or 20° C., 200 parts of sulphur being next stirred in by degrees, followed by 290 parts of alcohol, at 90° C. The product is dissolved in water to form a 0·2—0·3 per cent. solution.—C. S.

Carbon Dioxide; Means for Indicating and Recording th Amount of ——, *in the Products of Combustion fron Boiler and other Furnaces.* C. Ericsson, Stockholm Sweden. Eng. Pat. 17,527, Oct. 3, 1900.

Indications and records as to the firing of a boiler o other furnace are obtained by using apparatus consisting c two gas meters, a carbonic acid-absorbing vessel, and differential mechanism provided with an indicator. portion of the products of combustion passes continuousl through one meter, then through the absorption apparatu and finally through the second meter. The differenc between the volumes of gas measured by the two mete indicates the percentage of carbonic acid in the gases. Th registering apparatus records this by a curve or diagram. —R. S.

Sulphuretted Hydrogen; Improved Means applicable fo Use in the Desulphurisation of ——. J. Dewranc Southwark, Surrey, and J. H. Paul, Charlton, Ken Eng. Pat. 2146, Feb. 2, 1900.

Sawdust or the like is saturated with solution of a ferr salt, such as the sulphate or chloride, and is treated wi ammonia, so that ferric hydroxide may be deposit throughout upon the material, from which the soluble sal are then washed out. The mixture thus obtained is us in a purifier to absorb the hydrogen sulphide from coal-ga or other sulphuretted gas, water and ferrous sulphide bei formed. The spent material is revivified by moistening a exposure to the air for some days. Ferrous sulphate chloride may be substituted for the ferric salt in the pr cess, but in that case the impregnated sawdust, after t treatment with ammonia and washing, must be exposed the air or otherwise oxidised before use.—E. S.

Coal- and other Gases for Illuminating Purposes, a Appliances connected therewith; Processes for Enri ing or Carburetting ——. C. B. Tolly, Sligo. E Pat. 4134, March 5, 1900.

The enriching oil is pumped into a reservoir at the bott of the carburetter, and is thence raised by the same pu and sprayed over a mass of absorbent material in the up part of the apparatus. The gas to be carburetted is int duced through a transverse pipe, provided with orifices one end and fitted with a valve, and connected with perforated vertical pipe, so that the gas either ascen through the absorbent mass, and escapes, enriched, do the vertical pipe and through the other end of the tra verse pipe, or *vice versâ*, according to which end of latter is used as the feed pipe. Suitable means are provi for gauging the quantity of enriching oil in the reserv observing the action of the pump, and making the wh apparatus self-contained.—C. S.

Acetylene Gas; Method of Purifying ——, *with the nec sary Apparatus connected therewith.* B. R. Chicken A. G. Smith, both of Aberdeen. Eng. Pat. 1336, J 22, 1900.

The acetylene is passed through a washer, with an incli baffle-plate, containing dilute acid, which is intended remove ammonia from it; then through an oxidising age such as chloride of lime, which may be mixed with por material, and is intended to remove phosphuretted hydro and sulphuretted hydrogen; and finally through a de drating agent, such as unslaked lime. The chloride lime may contain some free lime, with the object of abs ing any nitrogen chloride which may be formed thro ammonia which has escaped absorption in the washer. —J. A.

Acetylene Gas Generators. A. Messer, Höchst-on-Main, Germany. Eng. Pat. 3745, Feb. 26, 1900.

A covered generating tank containing water has pas through its top a pipe, through which is introduced a ve with perforated base containing carbide. The vess guided at one side in such a manner that when it rea the lower end of the pipe, which is submerged, it tips a matically, and the perforated base, through which the w eaches the carbide, is projected laterally so that the gas volved does not escape up the pipe by which the vessel is ntroduced.—J. A. B.

cetylene Apparatus. J. Brunschwyler and E. Pärli, both of Biel, Switzerland. Eng. Pat. 14,751, Aug. 17, 1900.

A closed generating vessel has arranged in its top a harging shaft which can be closed by two slide valves, hich may be operated from outside, so that carbide can be rst introduced on a dry slide valve, from which it is discharged into the generating vessel only after the top of the haft has been closed. A valve at the base of the generating essel, by which the muddy water can be discharged, is eighted to open at a slight rise in pressure, and so constitutes a safety valve.—J. A. B.

cetylene Gas Generator. J. Predmerszkÿ and G. Predmerszkÿ, both of Buda-Pesth. Eng. Pat. 17,025, Sept. 25, 1900.

HE bell of a gasholder, when it has descended nearly to lowest position, operates a balanced pipe so that water discharged from an annular reservoir on the top of the sholder tank into a receptacle which, when full, tips the ater into a shoot which leads to a carbide holder. A pawl d ratchet disc direct the water from the receptacle to each several carbide holders in turn, and give a record of the mber exhausted at any time. Some modifications of the paratus are also described.—J. A. B.

Acetylene Gas Generators. E. L. H. Chauvin, Paris. Eng. Pat. 18,353, Oct. 15, 1900.

RBIDE stored in the inclined pigeon-holes of a distributing vice is discharged in predetermined quantities into an lined and recurved shoot in a generating tank containing ter, by mechanism operated by the movements of the holder into which the gas generated passes. A level icator is provided.—J. A. B.

etylene Gas Apparatus. C. Walser and T. Cartier, both of Zürich. Eng. Pat. 18,502, Oct. 17, 1900.

RBIDE in a generating vessel is supplied with water from istern through a pipe which traverses a receiver and is vided with a three-way tap, permitting the escape of in the event of excessive pressure in the generating sel forcing back the water through the pipe and receiver. —J. A. B.

tylene Gas Generator. L. D. Railsback, Indianapolis, U.S.A. Eng. Pat. 19,016, Oct. 24, 1900.

CRBIDE is fed into the upper end of a holder situated in a erating chamber, which extends downwards into a water k, closed at top, by means of a suitable charging mber with closure.—J. A. B.

tylene Gas Generating Apparatus. D. McDonald, arraville, Victoria. Eng. Pat. 19,337, Oct. 29, 1900.

RBIDE holders are introduced into or removed from a erator, through a door in its base provided with a ef valve. The gas evolved passes into a water-displacet gasholder, from which water is supplied to the erator as required. The gas reaches the service pipe ugh a bell on the top of the gasholder, having a valvetrolled inlet pipe.—J. A. B.

ntles of Incandescent Lamps, and for the Covers of yres for Wheels of Bicycles, Carriages, Motors, and her Vehicles; Manufacture of Fabric for ——. D. E. adclyffe, London. Eng. Pat. 3323, Feb. 20, 1900.

fibres of Urtica or Bœhmeria (China Grass) are pred, combed, spun and woven, either into mantles for ndescent lamps, or, more coarsely, into a fabric suitable covering pneumatic tyres.—C. M.

bon [Electric Light Carbons]; Manufacture of ——. . J. Haddan, London. From H. Wartenberg and A. M. iller, Chicago, U.S.A. Eng. Pat. 19,432, Oct. 30, 1900.

the production of this carbon, wood or other fibre is oughly impregnated with the following mixture :— 13½ oz. of water, 2 oz. of sulphuric acid, 6 oz. of saccharine matter, such as white syrup, 1 oz. of tartaric acid, and 1 oz. of carbonate of ammonia. The material is then dried and subjected to a high temperature whilst packed or imbedded in graphite.—D. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Fir Wood; Dry Distillation of ——. Irminger. Ingeniren, Copenhagen, 1899, 311—317. Proc. Inst. Civil Eng. 1900, **142**, [4], 49.

The author has tested fir, spruce, birch, beech, and oak wood in the model retorts and other apparatus used for testing coal in the gasworks; of the fir, wood which had been cut four years, fresh-cut wood, green brushwood, brushwood of a year's growth, and young and old cones were examined. The mode of conducting the tests is described, together with the apparatus employed; and the results are tabulated in two sets, according to the limit of temperature reached in the burning being about 600° C. (1,100° F.) in the course of two hours, or about 700° C. (1,300° F.) in the course of only one hour. The total weight of the products of distillation—gas, pyroligneous acid or wood-vinegar, tar, and charcoal—was within 4 per cent. of the weight of the wood charged into the retorts. With the higher temperature, the gas was more abundant and possessed a higher calorific power, but its specific gravity was lower, owing to the smaller proportion of carbon dioxide present. The amount of pyroligneous acid was about the same with both temperatures. The amount of tar was rather less with the higher temperature, except from the green brushwood, the cones, and the spruce; the amount of charcoal was considerably less. It is apparent, therefore, that the distillation should be effected at a low temperature, not above a dark-red heat, and this temperature should be attained slowly. Brushwood and cones can be utilised with advantage, except as regards their resulting charcoal, which is worthless. It is better, especially when tar is the chief product aimed at, to use wood which has been longer prepared for burning, since the formation of resin is constantly going on, and even continues in the stumps after the trees have been felled. In the distillates from fir, an appreciable quantity of turpentine was only obtained from particularly resinous wood, yielding a large amount of tar of lower specific gravity than the pyroligneous acid or wood-vinegar. The turpentine obtained, boils at about 180° C. (356° F.), but a considerable amount distils over at a lower temperature. Only traces of wood spirit are found in the distillates from fir; it is recovered only from leafy trees, particularly oak and beech. The yield of wood vinegar is highest, both in quantity and in strength, from oak, beech, and birch, particularly from the two last named. The crude gas evolved cannot be used direct as an illuminant, but can be used for lighting in conjunction with a Welsbach incandescent mantle; in this manner a light of about 36 candle-power is obtained with a consumption of 3 cb. ft. of gas per hour. If 1,000 lb. of the fir wood be introduced into a red-hot retort (at about 1,100° C. or 2,000° F.), there is obtained 7,600 cb. ft. of gas, having a calorific power of 460 thermal units (lb.-Fahr.) per cb. ft., but with this high yield of gas, the amounts of the other by-products are smaller. Experiments with a defective condensation apparatus showed that, in order to satisfactorily recover the distillates, sufficient condensing water should be used to cool them to about 20°—30° C. (68°—86° F.). A considerable economy can be effected by utilising the heating effect of the crude gas from the condenser for heating the wood-burning kilns.—A. S.

Charcoal; Half-Carbonised ——. C. Blacher. Chem. Ind. **23**, [23], 508—511.

Statements occur, in text-books by Bersch and others dealing with the distillation of wood, to the effect that carbonisation at low temperatures (about 270° C.) gives as high a yield of acetic acid as carbonisation at the customary higher temperatures, at which the black charcoal yielded amounts to only about half the amount of the half-burnt charcoal obtained at the low temperature. As the latter product forms a good fuel for many purposes, the author endeavoured to learn if the advantages which its manufacture should have, according to these statements, were anywhere realised in practice. He failed to find any practical confirmation of the statements, and therefore proceeded to investigate the matter. His first experiments, made with a large iron retort, were inconclusive, largely owing to the difficulty of maintaining uniform low temperatures, and he therefore made further researches in the laboratory with a vertical wrought-iron retort of $1\frac{1}{5}$ litres capacity, plunged in a bath of molten lead and tin. In this he carbonised, at temperatures ranging from 250° to 310°, pieces of fir, pine, and birch, of the shape and size of matches. The temperature in each trial was reached in two hours, and then maintained constant for two to three hours, when the retort was allowed to cool. The results showed that the maximum yield of acetic acid was attained below 300° C., though nearly up to that temperature the yield increased, while the residual wood (half-burnt charcoal) burnt with flame. Tar was formed only above that temperature, and most freely about 340°—350° C. The charcoal which remained after the tar had been driven off was ordinary black charcoal burning without flame. The half-burnt charcoal was friable, unless made at so low a temperature (below 260°), that only one-third to one-half the maximum yield of acetic acid was produced.

These results indicate that it should be feasible in practice, either to produce good firm half-burnt charcoal and about one-third the maximum yield of acetic acid by carbonising at a maximum temperature of 260°, or to produce a more friable residue, which, however, would be a very suitable fuel for many purposes, and about 80 per cent. of the maximum yield of acetic acid by carbonising below 300°. In either case, however, but especially in the first, great difficulty would be experienced in preventing the temperature from exceeding the limit, while the plant would necessarily be very costly and would need close supervision. It might prove most satisfactory to carbonise in a current of heated gas or steam, but the recovery of methyl alcohol would be rendered more troublesome by the consequent dilution of the products. It should, however, be remembered that wood-tar is often the most valuable product in charcoal manufacture, and as it is not obtained when half-burnt charcoal is produced, the prospects of the latter manufacture becoming remunerative are somewhat remote. On the whole, it would seem that the text-book statements concerning the production of half-burnt charcoal are far too optimistic.—J. A. B.

Waste Products [Naphthenic Acids] of the Mineral Oil Industry; Utilising ——. F. Ulzer. Zeits. angew. Chem. 1900, [50], 1273.

Wischin, in an article bearing upon this subject (see this Journal, 1900, 727), quoted the statement of Lidow (J. russ. phys. Ges. 1898, 221), that the naphthene acids from petroleum refining, when submitted to a treatment similar to that for the preparation of Turkey-red oil from fatty oils, yielded a product which gave very satisfactory results when subjected to dyeing tests. The author has made comparative dyeing tests with the proposed substitute, and with the best Turkey-red oil from castor oil, and finds that the results obtained with the former are not nearly so good as with the genuine Turkey-red oil.

With regard to the applicability of the naphthenic acids to the manufacture of soap, the author finds that, even with the pure acids, the soaps produced have a persistent, unpleasant odour.—A. S.

PATENTS.

Shale and like Minerals; Retorts for Distilling ——, *and for dealing with the Burnt or Spent Shale.* J. Beveridge, Linlithgow. Eng. Pat. 408, Jan. 8, 1900.

The construction of the retort so as to save fuel and labour in working is the subject of the first part, and the second part refers to a mechanical arrangement for intermittently discharging the spent shale from the bottom of the retort by means of a series of drawing shovels, one for eac retort. The retort is made longer than usual, and is con posed of four sections, the first or top section consisting a large iron hopper and redistillation chamber, where quantity of shale can be stored above the gas-outlet pip leading to the gas main, so that spent shale can be draw from the bottom of the retort, and the hopper filled up, may be found convenient, without any loss of gas throu the shale sinking below the outlet pipes; the second secti consisting of an iron chamber fastened to the hopper, which the oil is distilled from the shale; the third secti consisting of a fire-brick chamber, in which the ammon is taken from the shale, and the bottom section consisting a fire-brick chamber, in which the spent shale is allowed cool before it reaches the bottom outlet.—D. B.

Wood, Wood-refuse, Peat, or the like; Method of Ch ring ——, *and Apparatus therefor.* W. A. G. v Heidenstam, Skönvik, Sweden. Eng. Pat. 2292, Feb. 1900.

The usual method of charring wood consists in pressi the raw material into briquettes of suitable dimensions, a heating in a retort under simultaneous compression effec by means of a plunger, which, during the entire operati presses on the material with a constant pressure so as give the density required to the charcoal. Owing to fact that the charring material is in contact with the wa of the retort, which latter, on account of the friction, abs a portion of the pressure, charred rods are obtained wh are not uniform in density, but of a density decreasing w the distance of the plunger. This difficulty is overco by the present invention, according to which the mate is introduced into the retort without coming into cont with the walls. To avoid bending or fracture the mate is divided into sections, and placed on special plates or d loosely slipped on to one or more guides attached to plunger, and passing through the retort and apertures the end of the latter. The charging and emptying is quic performed by the aid of the guides referred to, and a m hood covering the whole, either while charring and cool or only while cooling, so that the incandescent charco not brought in contact with the air until after cooling.
—D. I

Petroleum; Product obtained by the Solution of Ozon ——. M. Otto, Neuilly-sur-Seine, France. Eng. 4676, March 12, 1900.

The product in question is obtained by causing a cur of ozone or ozonised air to pass into petroleum at 15° C. may serve as an agent for the destruction of the para of vines and other plants, for bleaching and disinfec purposes, for the treatment of certain skin diseases, an forth.—D. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigo Fermentation. M. W. Beijerinck. Bot. Zeit. 1 [2], 188. Pharm. J. 1900, **65**, [1591], 723.

The substance from which Indigo is directly formed found to be not identical in all indigo plants. In "indican plants" (*Indigofera sp., Polygonum tincto Phajus grandiflorus*), the original substance is indica glucoside of indoxyl; whilst in the "indoxyl plants (*I tinctoria*), it is indoxyl itself. In all cases the Ind formed, directly or indirectly, by the oxidation of ind In the indican plants the indican is found in the colo protoplasm, whilst the indican enzyme is located i chloroplasts. The indican is either decomposed b enzyme, or is split up directly, without the interventi an enzyme, through the activity of the protoplasm.—A

Hydrosulphurous Acid; Application of the Red Action of ——. P. Goldberger. Oesterr. Chem. **3**, 470. Chem. Centr. 1900, **2**, [19], 1014.

By the aid of nascent hydrosulphurous acid, that the introduction of zinc dust into a bisulphite sol taining the substance to be reduced, a satisfactory re- tion of nitro compounds containing acid or basic groups be effected. The reaction fails with neutral nitro ıpounds, as mono- and dinitrobenzene. 5 grms. of p-nitro- nol dissolved in a little alcohol, then mixed with 48 or per cent. bisulphite solution, the mixture treated with dust, made alkaline with soda, filtered, evaporated, and tralised with acetic acid, gave 2·8 grms., equal to per cent. of the theoretical amount of p-amidophenol. similar manner, the author obtained 77 per cent. and per cent. of the theoretical amounts of p-phenylene- nine and anthranilic acid, respectively, from p-nitraniline o-nitrobenzoic acid.—A. S.

Vitrous Acid on α- and β-Naphthol ; Action of ——. J. Schmidt. Ber. **33**, [17], 3244—3246.

EN nitrous acid (obtained from nitric acid and arsenious) is passed into an ice-cold solution of 10 grms. of phthol in 100 c.c. of ether for about 20 minutes, a dark- ow precipitate weighing about 8 grms., separates out. consists of dinitro-α-naphthol, and crystallises from hot roform in transparent yellow prisms melting at 135° C. In a similar manner, β-naphthol gives about the same yield of dinitro-β-naphthol, which, after recrystallisation from chloroform, melts at 195° C.—T. A. L.

Sulphonic Acids ; Separation of ——, *by Distillation in Vacuo.* F. Krafft and W. Wilke. Ber. **33**, [17], 3207—3209.

It has already been shown (Ber. **25**, 2255) that many sulphonic esters will distil without decomposition under diminished pressure. For example, α- and β-naphthalene sulphonic methyl esters boil at 214° and 224° C., respectively, under 15 mm. pressure. On working with a Torricellian vacuum, even more unstable substances can be easily rectified. Thus, with a vacuum at which the cathode light appears, α-naphthalene sulphonic ethyl ester boils, without decomposition, at 131° C., the vapour column being about 65 mm., whilst the isomeric β-ester, under similar conditions, boils at 134° C. The following table gives the melting and boiling points of certain sulphonic acids and their derivatives, compared with some corresponding carboxylic acids :—

Sulphonic Acids.	Melting Point.	Boiling Point, 0 mm.	Height of Column of Vapour.	Carboxylic Acids.	Melting Point.	Boiling Point, 760 mm.
	° C.	° C.	Mm.		° C.	° C.
ene sulphonic acid...........	66	135	90	Benzoic acid...............	121	250
uene sulphonic acid	85	147	65	p-Toluic acid	180	274
ene sulphonic acid	48	149	55	1.4.3 Isoxylylic acid	132	268
orobenzene sulphonic acid...	68	148	60	p-Chlorobenzoic acid.......	240	..
mobenzene sulphonic acid...	103	155	60	p-Bromobenzoic acid.......	251	..

e differences between the aromatic sulphonic and xylic acids correspond with those between sulphuric carbonic anhydride. The former is hygroscopic, un- , and not very volatile, whilst carbonic anhydride not combine readily with water, is very stable, and is le. When these radicles are combined with hydro- ns they form, on the one hand, sulphonic acids, are hygroscopic, readily soluble in water, and only *in vacuo*, whilst the carboxylic acids are sparingly le, but comparatively volatile.—T. A. L.

narine ; New Formation of ——. Br. Pawlewski. Ber. **33**, [17], 3164.

dition to the many chemical and electrolytic reactions e production of Canarine by the oxidation of sulpho- (thiocyanic) acid, it is now found that persulphuric can also be employed. A solution of ammonium sulphocyanate (thiocyanate) is treated with ammonium persulphate, when a yellow, flocculent precipitate separates. The reaction is as follows :—

$$3CN.SH + O = C_3N_3S_3H + H_2O.$$

The precipitate, after filtering off and washing with hot water, is pure Canarine, $C_3HN_3S_3$, but the yield is rather small. A skein of wool alternately impregnated with ammonium persulphate and immersed in ammonium sulphocyanate solution several times, becomes dyed with Canarine, the strength of the fibre remaining apparently unimpaired.

—T. A. L.

Anilines ; Reactions of Substituted ——. O. de Coninck. Comptes Rend. **131**, [23], 945—946.

The following reactions are given by alcoholic solutions of the bases with solutions of salts of copper, nickel, and cobalt :—

——	Methylaniline.	Dimethylaniline.	Ethylaniline.	Diethylaniline.
copper chloride ..	Bluish opalescence, darkening gradually. In time, slight bluish-white precipitate. Fleeting white fluorescence.	Bluish opalescence. In time, slight green precipitate.	Bluish opalescence; bluish-white fluorescence. In time, slight green precipitate.	Bluish-white opalescence, then slight green precipitate.
ıtrated copper ride.	Turbidity, then greenish precipitate. Bluish-white fluorescence. Gradual change through grey, violet-grey, dark violet, to (after 12 days) carmine.	Bright green precipitate. The liquid gradually becomes turbid.	Abundant greenish-white precipitate.	Abundant green precipitate.
copper sulphate..	No opalescence or fluorescence. Bluish-white precipitate.	Thick, flocculent, bluish-white precipitate.	Abundant bluish-white precipitate; flocculent.	Bluish opalescence. Then slight blue precipitate.
ıtrated copper hate.	Immediate green coloration. Then abundant green precipitate.	Immediate precipitate, abundant, bright blue.	Immediate greenish-white precipitate. Liquid slowly turns greenish-yellow.	Bright bluo precipitate, fairly abundant.
copper acetate ...	Colorations : rose, dark rose, amber, dark amber, dark brown. Then dark brown precipitate.	Bluish tint, turning to lilac.	Brown coloration after a time.	Bluish opalescence. Then slight bluish precipitate.

——	Methylaniline.	Dimethylaniline.	Ethylaniline.	Diethylaniline.
Concentrated copper acetate.	Immediate emerald-green coloration, rapidly darkening to black. Then slight black precipitate.	Turbidity. Then green precipitate, which dissolves in strong alcohol to a bright blue liquid, becoming bright green, afterwards dark green.	Emerald-green coloration. Then bright green precipitate, soluble in strong alcohol. The solution, after 4 hours, turns dark green, and deposits the same precipitate.	Turbidity. Afterwa slight green precipitat
Dilute cobalt chloride...	No coloration. In time, precipitate of cobalt hydroxide.	..	..	..
Concentrated cobalt chloride.	Violet-carmine coloration. After 4½ hours, turbidity, and deepening of the tint.	..	..	..
Dilute nickel chloride ..	Gradual turbidity, but no precipitate, even after a long time.	..	..	..
Concentrated nickel chloride.	After 6 hours, extremely slight green precipitate. Afterwards colour changes to dirty green, then to very dark brown.	..	..	..

—J. T.

Triphenylchloromethane ——. M. Gomberg. Ber. **33**, [17], 3144—3149.

The statement in text-books of organic chemistry, that carbon tetrachloride reacts with benzene and aluminium chloride to form triphenylmethane, is incorrect. The chief product of the reaction is triphenylchloromethane, which can be obtained with a yield of 70—90 per cent. of the theory. The aluminium chloride was obtained by passing chlorine over about 50 grms. of aluminium shavings in a tube connected with an iron receiver. The tube is heated at the end nearest the receiver, and the rapid current of gas attacks the cold metal and causes it to glow. The reaction takes about 1½ hours, and gives 190—200 grms. of aluminium chloride, or about 80 per cent. of the theoretical amount. For the preparation of the triphenylchloromethane $(C_6H_5)_3CCl$, it is essential that the carbon tetrachloride and benzene be carefully dried over calcium chloride and fractionated. About 1 part by weight of carbon tetrachloride and 3·5 parts of benzene are mixed in a round flask, connected with an upright condenser, and 1·25 parts of aluminium chloride in quantities of 10 grms. at a time are gradually added. A violent reaction takes place, and subsequently the mixture is heated for an hour on the water-bath. After cooling, the melt is poured in a thin stream on to ice, kept cool by a freezing mixture. Benzene is added from time to time, in order to keep the triphenylchloromethane in solution. The two layers are then separated, and the benzene solution is washed rapidly, once with very dilute hydrochloric acid and once with water. It is then dried with calcium chloride and evaporated on the water-bath, when about half the total yield of triphenylchloromethane separates in a pure state. The filtrate is evaporated *in vacuo*, and mixed with ether, which precipitates a fresh quantity of the chloro compound. A further quantity can be obtained by repeating this treatment. The last mother liquors contain triphenylcarbinol, but in no instance has any triphenylmethane been isolated. The yield of pure chloro compound amounts to 70—85 per cent. of the theory, and taking into account the carbinol obtained, the total yield amounts to 90—95 per cent. of the theoretical. The product melts at 108°—112° C., and if required quite pure, can be crystallised from benzene or precipitated from a concentrated benzene solution by ether.—T. A. L.

Triphenylmethane Dyestuffs; Absorption Spectra of Aqueous Solutions of ——. C. Camichel. Comptes Rend. **131**, [24], 1001—1002.

The author states that the conclusion of Lemoult (this Journal, 1901, 33) had been arrived at, as the result of an investigation of eight members of the series of i phenols, by Bayrac and himself in 1896. He points that the absorption band in the case of the indopheno much sharper than in the case of the triphenylmeth derivatives; so much so, that the ethereal solution of indophenol forms an excellent monochromatic screen.

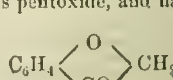
—J. T.

Rosaniline Base. H. Weil. Ber. **33**, [17], 3141—31
(See this Journal, 1901, 34.)

The author, in a previous paper (Ber. **29**, 2677; Journal, 1897, 131), has already shown that the " rosaniline base " obtained by v. Georgievics by precipit cold dilute Magenta solution with the calculated amou soda lye is nothing else than ordinary rosaniline coloured with Magenta, which is precipitated uncha He now gives further analytical data in support of and points out also that it is doubtful whether there is constitutional difference between freshly precipitated ordinary rosaniline base, although according to v. Georgie the former dissolves to an orange and the latter to a c less solution in organic solvents. This apparent diffe is evidently due to the greater solubility of the fr precipitated base. A further statement of v. Georgi (Monatsh. **21**, 407; this Journal, 1901, 34), that the mation of triaminotriphenylcarbinol neutralises the sod is hardly in accordance with the behaviour of this pound. If the carbinol were such a strong acid, rosa base could not exist in a colourless state, since it wo once be converted into rosaniline rosanilate. The a further seeks to confirm his previous statement that ro line carbonate reacts with salt, forming rosaniline h chloride and sodium carbonate. A rosaniline carb solution is stated to be almost decolorised by addin and the solution, when concentrated at a low tempe (below 50° C.), in a current of carbonic acid gas, gi blue reaction on red litmus paper.—T. A. L.

Cumaranone (Ketocumarane) and its Homologues Phenoxyacetic Acids; Synthesis of ——. R. St and F. Bartsch. Ber. **33**, [17], 3175—3181.

Amongst the compounds which may be conside oxygen analogues of indigo derivatives the cu has especial interest on account of the ease with w reacts. It is obtainable from phenoxyacetic acid action of phosphorus pentoxide, and has the constitu



$$C_6H_4\left\langle\begin{matrix}O\\CO\end{matrix}\right\rangle CH_2,$$

es a semicarbazone melting at 231° C., and an oxime lting at 159° C. The product reacts with salicylaldehyde l with *p*-hydroxybenzaldehyde, giving oxybenzalcuranones which are yellow to brown mordant dyestuffs no technical value. In the preparation of cumaranone, eddish-brown dyestuff is obtained as a by-product. Its mation is probably due to a condensation between two naranone molecules, the reaction being possibly similar that which takes place in the production of Indigo Red m indoxyl and isatin. Homologues of cumaranone are o obtainable from *o*-, *m*-, and *p*-cresoxy-acetic acids, and m *as-m*-xylene-oxyacetic acid.—T. A. L.

azobenzene on Phenol ; Action of ——, and Synthesis f o-Hydroxyazobenzene. E. Bamberger. Ber. **33**, [17], 188—3192.

e orange-red acid of the formula $C_{12}H_{10}N_2O$, obtained ler certain conditions from nitrosobenzene and mentioned previous note (Ber. **33**, 1939 ; this Journal, 1900, 728), been identified as *o*-hydroxyazobenzene. The same prot is formed, together with *p*-hydroxyazobenzene as the f product, when diazobenzene is combined with phenol, only to about 1 per cent. of the aniline employed. t the substance has the constitution assigned to it is ved, not only by its giving on reduction, *o*-aminophenol aniline, but also by its synthesis from nitrosobenzene *o*-anisidine. This reaction produces *o*-methoxy-azozene, which on hydrolysis yields *o*-hydroxyazobenzene. the preparation from diazotised aniline and phenol, the droxyazobenzene is separated from its isomeride by m distillation when the *p*-compound remains behind. product is finally purified by means of its tobaccon copper salt, which, when decomposed with dilute rochloric acid, yields *o*-hydroxyazobenzene melting at C. In a similar manner *p*-diazotoluene, when combined phenol, yields a very small amount of o-hydroxyylazo-*p*-toluene, together with the *p*-isomeride which e chief product. The *o*-compound crystallises from ng alcohol in silky golden-yellow plates, melts at 100° and is sparingly soluble in water. It can be separated the *p*-compound by its volatility with steam and by tment with acetate of copper, when it gives a sparingly ble salt. On reduction with zinc dust and boiling r in presence of ammonium chloride it yields *o*-aminool and *p* toluidine.—T. A. L.

oxybenzene ; Transformation of ——. E. Bamberger. Ber. **33**, [17], 3192—3193.

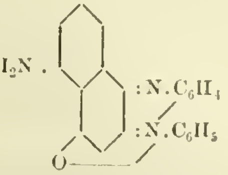
XYBENZENE, according to Wallach and Belli (Ber. **13**, ; *v.* also **14**, 2617), is converted by the action of warm entrated sulphuric acid into *p*-hydroxyazobenzene. repeating the experiment, the author finds that this uct is accompanied by a small quantity of the isomeric mpound, which can be isolated by reason of its greater ility with steam and the insolubility of its copper salt ld alcohol. This latter, when decomposed with hydroic acid, yields orange-red needles of the dyestuff ing at 83° C. Only 0·15 grm. of *o*-hydroxyazobenzene l be isolated from 25 grms. of azoxybenzene.

rosindulines and 5-Acetamino-β-naphthoquinone ——. Kehrmann and A. Denk. Ber. **33**, [17], 3295—3300.

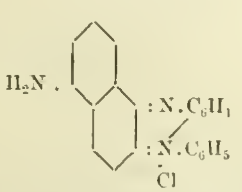
the action of acetic anhydride at the ordinary temture on 1.3′-aminonaphthol it is converted into the sponding acetaminonaphthol, which reacts with nitrous yielding a quinone oxime. This on reduction gives .2-aminoacetamino naphthol, which on oxidation yields .2-acetamino-β-naphthoquinone, the fifth of the six ble derivatives of this formula. The product readily enses with *o* - aminodiphenylamine hydrochloride ing as chief product the acetyl derivative of Isorosine No. 12 (*vide infra*), the isomeric compound, forming t 5 per cent. of the total yield, being identical with the l derivative of the violet-blue Isorosinduline No. 9 . **32**, 2631 ; this Journal, 1899, 1116).—T. A. L.

Isorosinduline No. 9 ; *Constitution of ——.* F. Kehrmann and G. Steiner. Ber. **33**, [17], 3280—3284.

THE 4′.2.1 1-aminohydroxynaphthoquinone obtained from naphthopicric acid (2.4.4′.1-trinitronaphthol) condenses with *o*-aminodiphenylamine, yielding aminorosindone of the formula—



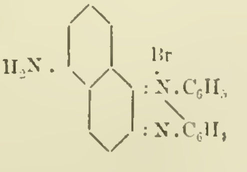
The same compound in the form of its "acetyl derivative" is obtained by the action of cold alcoholic soda lye on the blue Isorosinduline No. 9 already described (Ber. **32**, 2627 ; this Journal, 1899, 1116), from which it follows that Isorosinduline No. 9 has the formula—



A further proof of its constitution lies in the fact (*vide supra*) that it can be obtained by condensing 4′-acetamino-β-naphthoquinone with phenyl-*o*-phenylene diamine.—T. A. L.

Isorosinduline ; 12th Isomeride of ——. F. Kehrmann and G. Steiner. Ber. **33**, [17], 3276—3279.

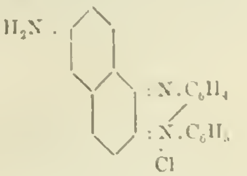
WHEN phenylisonaphthophenazonium nitrate is treated with concentrated nitric acid, it yields two mononitro derivatives, one of which, on reduction, gives Isorosinduline No. 10 (Ber. **33**, 1543 ; this Journal, 1900, 654). The other, which is only obtained in admixture with the first, and not in a pure state, gives on reduction a new Isorosinduline, which is the twelfth known isomeride. The mother-liquors of both nitro compounds appear to contain a third isomeride, since on reduction there is formed a small quantity of a greenish-yellow dyestuff, which does not correspond with any of the Isorosindulines hitherto known. The mixture of nitro products is repeatedly extracted with alcohol, and the alcoholic solutions are precipitated with ether. The precipitate consists chiefly of the nitro compound, which on reduction yields the new Isorosinduline. The product is reduced with stannous chloride and hydrochloric acid, and the tin double salt is oxidised in alcoholic solution with ferric chloride. The precipitate is dissolved in water, treated with sodium acetate, and finally with sodium bromide. The bromide No. 10 is more soluble than the bromide of the new isomeride, and can be removed by dissolving the mixture in a small quantity of hot water, and adding a saturated solution of sodium bromide, when steely, almost black prisms of the bromide of the new Isorosinduline separate out. These are filtered from the yellowish-green mother-liquor, and dissolve to a bluish-green solution, which is again treated with sodium bromide. The new Isorosinduline bromide No. 12 has the formula—



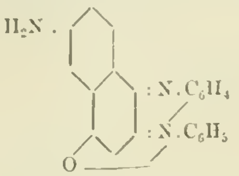
is sparingly soluble in cold, readily soluble in hot water and alcohol. It dissolves to a brownish-red solution in sulphuric acid, which turns orange-yellow on dilution, and dirty greenish-blue on neutralisation. The product can also be obtained by condensing 4′-acetamino-β-naphthoquinone with phenyl-*o*-phenylene diamine (*vide supra*).—T. A. L.

Rosinduline No. 13. F. Kehrmann and M. Silberstein.
Ber. **33**, [17], 3300—3307.

The authors describe the method they employ for obtaining the Isorosinduline No. 13 of the formula—



When 4.3′.1.2-anilino-acetamino-β-naphthoquinone is condensed with phenyl-*o*-phenylene diamine, the chief product is 8-acetaminophenylrosinduline. This, on heating under pressure with dilute sulphuric acid, yields 8-aminorosindone—



the acetyl derivative of which is converted, by the action of dimethylsulphate in nitrobenzene solution, into 6-methoxy-8-acetaminophenylnaphthophenazonium. On treatment with alcoholic ammonia, this yields 8-acetaminorosinduline, from which the amino group can be removed by means of the diazo reaction, and the acetyl group subsequently by hydrolysis.—T. A. L.

Thionine Dyestuffs ——. F. Kehrmann and W. Schaposchnikoff.
Ber. **33**, [17], 3291—3295.

It has been shown in Ger. Pat. 96,859 of 1897 that ammonia, fatty, and aromatic bases react readily with so-called imidothiodiphenylimide, or, according to more modern nomenclature (Ber. **32**, 2601; this Journal, 1899, 1115), 3-aminophenazthionium, which is to be considered as the parent substance of dyestuffs of the Thionine and Methylene Blue series. The substitution takes place in the non-substituted benzene ring para to the azine nitrogen. This reaction has been made use of for the preparation of some hitherto unknown substituted Thionines, and it is found that the introduction of a single phenyl group into the amino group has the same colorimetric effect as methyl groups. For instance, Phenylthionine (that is, phenylated Lauth's Violet) does not differ materially in shade from Methylene Blue; it is, however, a weak base, the salts of which are readily decomposed by ammonia, though not by water. The thionine derivatives are obtained by grinding together aminophenazthionium chloride with the corresponding amine, —*o*-toluidine, for example, giving *o*-tolylthionine (3-amino-3′-*o*-toluinophenazthionium), whilst dimethylamine yields dimethylthionine, identical with Gentianine. The aqueous and alcoholic solutions of this dyestuff are decomposed by alkalis and ammonia, the latter forming dimethylamine and thionine, and the former dimethylthionolin and finally thionol.—T. A. L.

Indigo; The Physical Condition of Two Commercial Preparations of Synthetical ——. A. Binz and F. Rung.
Färber Zeit. 1900, **11**, [23], 355 and 372—375.

The synthetical Indigo manufactured by the Badische Anilin und Soda Fabrik, in both the paste and powder forms, is reduced by sodium hydrosulphite (hyposulphite) at the same rate as the product manufactured by the Hoechst Farbwerke. By lime and zinc powder, however, the Indigo powder of the former is reduced faster than the similar product of the latter concern. Many experiments were made upon this point, the results varying; but in most of them, especially when the vats were heated, the result was as stated (compare Ullmann, this Journal, 1900, 526). The difference is due to the Indigo powder of the Hoechst Farbwerke being more crystalline than that of the Badische Anilin und Soda Fabrik. This was proved b the result of an experiment made with a small quantity the latter product which had been crystallised from phthal anhydride, and with the former product in the extreme divided state in which it is obtained when it is precipitat from a vat, the latter preparation being much the mo readily reducible. The Indigo paste of the Badische Anil und Soda Fabrik is acted on by lime and zinc powder mu more easily than either of the powder products.—E. B.

Luteolin: Synthesis of ——. S. v. Kostanecki, Rozycki, and J. Tambor.
Ber. 1900, **33**, 3410—34
(See also this Journal, 1900, 41; 1896, 444.)

After the synthesis of chrysin (this Journal, 1899, 100 parallel experiments were made with a view to the synthe of luteolin. Phloracetophenone trimethyl ether and pi ronylic ethyl ester were heated in xylene solution w sodium on the oil-bath for 10—12 hours; the resul β-diketone, $(CH_3O)_3C_6H_2.CO.CH_2.CO.C_6H_3O_2:CH_2$, d not yield a product, by the action of hydriodic acid, fr which the expected 1.3.3′.4′-tetrahydroxyflavone can isolated. Veratric ethyl ester was then melted with phl acetophenone trimethyl ether, and granulated sodium int duced. After heating for 1—2 hours on an oil-bath (b at 120° C.) the diketone was isolated. It showed reactions of 2.4.6.3′.4′-pentamethoxybenzoylacetop none. The finely powdered diketone was boiled w hydriodic acid (1·96 sp. gr.) for a long time, the pro poured into sodium bisulphite solution, and the precipi recrystallised from absolute alcohol. It then had properties of luteolin, but was not quite pure. It was p fied by conversion into tetra-acetyl-luteolin, which crys lised in fine white needles melting at 222°—224° (Perkin found 213°—215° C. for the compound of lute from weld, and Vongerichten 220°—222° for lute from parsley.) Luteolin was obtained from the ac compound by boiling with hydriodic acid. When air-d the formula was $C_{15}H_{10}O_6 + H_2O$; it melted at 327° C. all respects it was identical with natural luteolin.—A. C

Tecomin: A Colouring Matter derived from "Bign tecoma." T. H. Lee.
Proc. Chem. Soc. **17**, [231],

The new colouring matter is a yellow crystalline subst soluble in alcohol with an orange colour, insoluble or slightly soluble in water; the solution becomes ros with alkalis and clear yellow with acids; 2 c.c. N/100 a or acid causes the colour change; it is not affected by but the strong mineral acids, but the presence of or acids renders the end reaction indistinct. The wood tains a reddish-brown resin, soluble in alcohol, from wh is difficult to free the tecomin; also a deep brown co ing matter which dissolves in aqueous alkalis ar precipitated by acids. It is used locally as a dye for c and as a stain for wood.

London Purple; Composition and Analysis of —
J. K. Haywood.

See under XXIII., *page* 157.

Nitro Compounds; Electrolytic Reduction of —
A. Rohde.

See under XI. A., *page* 132.

Benzidine; Electrolytic Reduction of ——. W. I

See under XI. A., *page* 133.

PATENTS.

Indigo Paste; The Production of ——. J. Y. Jo London. From The Badische Anilin und Soda Ludwigshafen-on-Rhine, Germany.
Eng. Pa Jan. 15, 1900. (Second Edition.)

In preparing Indigo in the condition of paste, it is to be difficult, with pure Indigo—for example, synthe refined natural Indigo—to obtain a paste containing f to 40 per cent. of Indigotin, which is sufficiently liqu which does not, on standing, deposit any sediment tendency of pure Indigo to form a froth when it is with water, is also troublesome.

To overcome these difficulties a small quantity of certain thickening agents, namely "bone glue, skin glue, fish glue, silk gum, albumin, casein, gluten, gelatin, gum solution, starch, dextrin, and the like," is added to the paste, which should be neutral or alkaline. For example, a solution of 1 part of gum in 1,000 parts of water is added, along with 2·3 parts of caustic soda-lye (14 per cent. of NaOH), to 400 parts of Indigo powder, and the whole is ground. The Indigo soon becomes moist, and in a short time is converted into a smooth paste, which is brought to the desired strength by the addition of water.—E. B.

Azo Colouring Matters [Red, Brown, Blue-Black] therefrom, the Use of these Dyes in Dyeing, and their Treatment on the Fibre; Manufacture and Production of New ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 13,664, July 30, 1900.

Certain aromatic amines, when treated with sulphites, yield sulphurous acid esters of phenols, and, similarly, certain diamines under the same treatment are converted into sulphurous acid esters of aminophenolic compounds. These products, by the action of nitrous acid, yield diazo compounds, which will combine with suitable components to form new azo dyestuffs characterised by possessing a sulphurous acid phenolic ester group. The presence of this group renders the dyestuff more soluble in water than the corresponding products obtained from the aminophenolic compound itself; and, moreover, since the sulphurous acid residue can be split off after dyeing, the dyed fabric is then faster to milling and to soap. The agent most satisfactory for this purpose is cupric acetate, which appears to split off not only the sulphurous acid group, but also to cause the formation of a lake or some other change. The formation of these esters is referred to in Eng. Pat. 1387 of 1900 this Journal, 1901, 36). The following is a typical example of the formation of a dyestuff. Dissolve 223 grms. of 1.1′-aminonaphthol sulphurous acid ester in 5 litres of water, cool with ice, add 250 grms. of hydrochloric acid (32 per cent. HCl), and run in 71 grms. of sodium nitrite 98 per cent. $NaNO_2$) dissolved in water. Run this diazo solution into a neutral solution of 261 grms. of the sodium salt of 1.1′.4-aminonaphthol sulphonic acid, and, when the formation of the azo dyestuff is complete, add sodium carbonate to form the sodium salt and sufficient water to give solution. After adding about 250 grms. of sodium bicarbonate, run in the diazo solution, prepared in the usual manner from 93 grms. of aniline, and salt out the diazo dyestuff in the cold, filter-press, wash with dilute brine, and dry at about 50 C. The dyestuff dissolves to a bluish-violet solution, and gives bluish-black shades on wool from an acid bath. On treating the dyed goods with copper acetate, the shade is changed to a reddish-brown of increased fastness to washing.—T. A. L.

Coal-Tar Colours; Manufacture of Transformation Products of ——. O. Imray, London. From The Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 1760, Jan. 27, 1900.

Aromatic bases containing one or more divalent groups —$NH.CH_2$— or —$NR.CH_2$— (R being an alkyl group) linked on both sides to benzene or to one of its homologues, react on a number of coal-tar dyestuffs containing primary or secondary amino or hydroxyl groups. Such bases are -aminobenzylaniline, *p*-aminobenzylaniline, their homologues and nitrogen alkylated derivatives; anhydro-*p*-aminobenzylalcohol and anhydro-*p*-amino-*m*-tolyl alcohol; and, further, the products obtained by reacting with mineral acids on anhydroformaldehyde aniline and its homologues, by the reaction of molecular proportions of formaldehyde and a primary or secondary aniline base in sulphuric or hydrochloric acid solution. The bases of this last group are generally considered as aminobenzyl alcohols or their anhydrides. The actions of the different bases are of various kinds. For instance, the basic dyestuffs, soluble in water, of the di- and triaminotriphenylmethane, safranine, and rhodamine groups are converted into new products, also soluble in water, but differing greatly in shade from the original dyestuffs. Thus, diaminotriphenyl carbinol (Benzal or Döbner's Violet) yields blue to bluish-green dyestuffs, whilst Magenta gives a violet, and Safranine and Rhodamine 6 G form reddish-violet dyestuffs. With dyestuffs of the fluoresceïn group, and with the so-called Congo colours, the transformation of the shade is more or less important, but the new products possess valuable properties compared with the original dyestuffs. They are, for instance, rendered insoluble, or nearly so, in water, and are also less sensitive to acids. The method consists in treating the dyestuffs with an aqueous solution of a salt (hydrochloride, sulphate, &c.) of one of the bases at a moderately elevated temperature. This operation may also be performed on the fibre. The specification contains a long table showing the change in shade and other properties of a number of dyestuffs after treatment according to the method described.—T. A. L.

Azo-Dyestuffs [Red, Violet] for Cotton; Manufacture or Production of New ——. H. E. Newton, London. From The Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 2683, Feb. 10, 1900.

Dyestuffs for unmordanted cotton are obtained by combining diazo-α- or diazo-β-naphthalene with 2.4′.2′-aminonaphthol sulphonic acid, or with 2.4′.1.2′-aminonaphthol disulphonic acid. Furthermore by combining diazo compounds with certain derivatives of these acids having the general formula $C_{10}H_4.NHR.OH.SO_3H.X$, where R represents an alkyl or acidyl radicle such as CH_3, C_2H_5, C_6H_5, $CH_2C_6H_5$, COC_6H_5, $COCH_3$, CH_2CO_2H, or the like and X, is hydrogen atom or a sulphonic acid group. Moreover, secondary diazo dyestuffs containing these aminonaphthol sulphonic acids in the centre position will also dye unmordanted cotton. These products may be obtained either by diazotising the monazo dyestuffs produced by combining diazo compounds with the aminonaphthol sulphonic acids in an alkaline solution, and coupling the diazo-azo compounds thus obtained with dyestuff components, or else by first diazotising the aminonaphthol sulphonic acids, combining the resulting diazo compounds with an azo dyestuff component, and finally combining the monazo dyestuffs thus obtained with diazo compounds. For instance, the dyestuff prepared from 9·3 kilos. of aniline, diazotised and combined in an alkaline solution with 23 9 kilos. of 2.4.2′-aminonaphthol sulphonic acid is rediazotised in the usual manner with 7 kilos. of sodium nitrite and hydrochloric acid, the resulting diazo compound being stirred into a solution of 23·9 kilos. of the same acid made alkaline with sodium carbonate. When the reaction is finished the dyestuff formed is salted out, filter-pressed, and dried. It gives clear reddish-violet shades on unmordanted cotton, fast to light.—T. A. L.

Azo Colouring Matters [Yellow, Red, Violet] and of New Intermediate Products for the Production of such Colouring Matters; Manufacture or Production of New ——. H. E. Newton, London. From The Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 3615, Feb. 23, 1900.

The new materials are urea or thiourea derivatives of the general formula $XC:(NHR)_2$, where X is either oxygen or sulphur, and R is a radicle of a naphthol or naphthol derivative. The urea derivatives are obtained by reacting with phosgene ($COCl_2$), in presence of a condensing agent, on such aminonaphthols, aminonaphthol sulphonic or carboxylic acids, or the like, as do not contain the amino and the hydroxyl group either in the ortho or the peri position. The corresponding thiourea derivatives can be produced by reacting in an analogous manner with thiophosgene ($CSCl_2$), or by the action of carbon bisulphide on a neutral or alkaline solution of the aminonaphthol compounds. The products obtained will react with one (in a slightly acid solution) or with two (in an alkaline solution) molecular proportions of a diazo compound, yielding new azo dyestuffs which dye unmordanted cotton. The following is an example of the method employed:— 23·9 kilos. of 2.4′.2′-aminonaphthol sulphonic acid and 24 kilos. of sodium carbonate are dissolved in 150 to 200 litres of water, and treated with about 11·5 to 12 kilos. of thiophosgene, with constant agitation. When no more

aminonaphthol sulphonic acid can be detected, the melt is acidulated with hydrochloric acid, and the new thicurea derivative is salted out. It is purified by redissolving it in water and again salting out. The pure sodium salt of the thiocarboxyldioxydinaphthylamine disulphonic acid crystallises from brine in white leaflets, soluble in cold, and readily soluble in hot water. For the preparation of a dyestuff, a solution of 52 kilos. of this product in water, with an excess of sodium carbonate, is mixed, with continuous stirring, with the diazo solution prepared from 21·4 kilos. of *p*-toluidine. After agitating for several hours, the mass is heated to 80° C., and the dyestuff is salted out, filter-pressed, and dried. It dyes unmordanted cotton bright red shades similar to Benzopurpurin 4 B.
—T. A. L.

Trisazo Colouring Matters [*Blue*]; *Manufacture or Production of New* ——. H. E. Newton, London. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 3673, Feb. 24, 1900.

The process consists in combining a diazo derivative with one molecular proportion of α naphthylamine 3′- or 2′-sulphonic acid (Cleve acid) rediazotising the resulting amino-azo compound, combining with a second molecular proportion of a Cleve acid, again diazotising, and combining the diazodisazo dyestuff with 2.4′.2′-aminonaphthol sulphonic acid, or with alkyl, alphyl, or acidyl derivatives thereof. When the first or last components themselves confer sufficient solubility on the finished product, as, for example, with aminosulphosalicylic acid, sulphanilic acid, or the glycine derivative of 2.4′.2′-aminonaphthol sulphonic acid, it is then possible to dispense with the employment of Cleve's acid, and α-naphthylamine may be used instead. The dyestuffs obtained according to this specification give blue shades on unmordanted cotton, which are distinguished for their fastness to light. The following is a typical example. The diazo solution, prepared in the ordinary manner from 15 kilos. of acetyl-*p*-phenylene diamine, 7 kilos. of sodium nitrite, and a suitable quantity of hydrochloric acid is run into an aqueous solution of 25 kilos. of the sodium salt of 1.2′-naphthylamine sulphonic acid and an excess of sodium acetate. After the conversion of the dyestuff so formed into the sodium salt by the addition of dilute soda lye or of sodium carbonate, the product is rediazotised with 7·5 kilos. of sodium nitrite and hydrochloric acid. The diazotisation is complete after stirring for several hours, and the diazo compound produced is combined in the usual way with 25 kilos. of the sodium salt of 1.2′-naphthylamine sulphonic acid, the whole being stirred for several hours, until the formation of the disazo dyestuff is complete. This product is then salted out. It is subsequently mixed with water and 7·25 kilos. of sodium nitrite, and carefully acidulated in the cold with hydrochloric acid, with constant agitation. The diazo compound formed is then added to a solution of 24 kilos. of 2.4′.2′-aminonaphthol sulphonic acid together with an excess of sodium carbonate. After salting out, the trisazo dyestuff so produced is filtered off, and, in order to split off the acetyl group, it is mixed with hot water and with about 60—70 kilos. of sodium hydroxide, and boiled for a short time. Finally, the alkali is neutralised with hydrochloric acid, and the new trisazo dyestuff produced is salted out, filter-pressed, dried, and powdered. It dyes unmordanted cotton clear blue shades which are fast to light.—T. A. L.

Dyestuffs [*Brown*] *deriving from* 2.2′-*Aminonaphthol-disulpho Acid*; *Production of* ——. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 3208, Feb. 17, 1900.

The aminonaphthol sulphonic acid R can be readily converted into a disulphonic acid, and, after diazotisation, combines with amines and phenols, yielding easily soluble azo dyestuffs, which, by the aid of chromates, can be fixed fast to milling. For instance, 32 kilos. of 2.2′-aminonaphthol disulphonic acid, 23 kilos. of soda-lye (40° B.), and 7 kilos. of sodium nitrite are dissolved in about 200 litres of water, cooled to 0° C., and allowed to run into 53 kilos. of hydrochloric acid (21° B.), and 200 kilos. of ice. In about 30 minutes the diazosulphonic acid formed is added to a solution of 11 kilos. of *m*-phenylene diamine and 42 kilos. of sodium acetate. When the reaction is complete the whole is made alkaline with sodium carbonate, heated to 60° C., and the dyestuff finally salted out. It gives brownish-orange shades on wool from an acid bath, changed by the action of chromates to a full dark-brown, perf ly fast to milling and very fast to light.—T. A. L.

Amines from the Corresponding Nitro Compounds; Production of ——. G. W. Johnson, London. From C. F Boehringer und Soehne, Waldhof, Mannheim, Germany Eng. Pat. 4175, March 5, 1900.

The patentees find that aromatic and fatty nitro compound can be readily reduced, by means of an electric current, t the corresponding amines if suspended or dissolved i aqueous or dilute alcoholic hydrochloric acid, employing t a tin cathode. In place of tin, an indifferent cathod (platinum, lead, carbon, or nickel) may be employed if t small quantity of a tin salt be added to the cathode electrolyte. The following is the method given for the preparatio of aniline:—The electrolytic cell, divided into an anod and a cathode compartment, is provided with an anod composed of some indifferent material in sulphuric acid The cathode compartment contains a mixture of 15 volumes of alcohol, 50 volumes of fuming hydrochlori acid, and 25 volumes of nitrobenzene, or else 25 volume of nitrobenzene, 50 volumes of water, and 50 volumes o fuming hydrochloric acid, and is provided with a ti cathode, a stirrer, and a cooling jacket. A current o 1,800 ampères per square metre density is passed throug the cell, and reduction proceeds very vigorously and withou evolution of hydrogen, until the reduction is complet when a regular current of hydrogen is given off. Th cathode liquid is then filtered from the tin sponge an evaporated, yielding aniline hydrochloride in almost theo retical yield. If a nickel wire netting cathode be used i place of the tin, it is necessary to add 2 parts by weigh of stannous chloride to the cathode liquid, consisting c 12 volumes of nitrobenzene, 75 kilos. or fuming hydro chloric acid, and 50 volumes of water, the current density i this case being 1,000 ampères per square metre.—T. A. L.

Colouring Matters; Preparation of Intermediate Produc for the Production of ——. A. G. Green, A. Meyenber and The Clayton Aniline Co., Ltd., Manchester. En Pat. 4792, March 13, 1900.

The present invention relates to the production of mon and dithiosulphonic acids ($RS.SO_3H$) of aromatic mo amines or *m*-diamines by the action of sulphurous acid o the disulphides. These latter are usually readily obtain by the action of sulphur on the amines at not too high temperature. In order to convert them into the thi sulphonic acids it is unnecessary to isolate them, as t whole reaction product may be treated directly in a suitab solvent with a current of sulphurous acid gas. F example, the moderate action of sulphur (3 atomic pr portions) on aniline (2 molecular proportions) yields chief product aniline *o*-disulphide—

$$H_2N.C_6H_4.S.S.C_6H_4.NH_2$$

(Hofmann, Ber. **12**, 2363), of which 100 kilos. of t hydrochloride are stirred to a paste with 300 to 500 litr of water and saturated cold with sulphurous acid. Aft standing some time the solution is heated to boiling, wi continued stirring, the gas still being passed through, a is then filtered, when, on cooling, aniline *o*-thiosulpho acid separates in long colourless needles. On boiling t product in alkaline or acid solution, it gives off sulphuro acid, reproducing the original disulphide. When trea with nitrous acid it yields a diazo sulphide, C_6H_4N (Jacobsen, Ber. **21**, 2304), which is incapable of combini with phenols. This property distinguishes it from t aniline *p*-thiosulphonic acid (obtained from aniline *p*-dis phide, Hofmann, Ber. **27**, 2413), the diazo compound which will combine. The patentees have also obtai thiosulphonic acids by the action of sulphurous acid dimethyl- and diethyl-aniline disulphide, and on the ac uble and acid-insoluble amorphous products formed by action of sulphur on *m*-phenylene and on 1.2.4-tolylene umine.—T. A. L.

omatic Sulphinic Acids; Manufacture of ——. O. Imray, London. From The Basle Chemical Works, Basle, Switzerland. Eng. Pat. 20,864, Nov. 19, 1900.

is specification describes a method for obtaining sulinic acids from sulphazides (Eng. Pat. 12,872 of 1900; below), and an improved method for obtaining sulphinic ds without the use of copper salts (Eng. Pat. 12,871 of 00; this Journal, 1900, 893). The patentees find that sulphazides are readily converted into sulphinic acids by atment with an alcoholic solution of sulphurous acid in sence of a little copper salt. For instance, 10·7 kilos. o-toluidine are diazotised in 30 kilos. of alcohol and kilos. of hydrochloric acid (30 per cent. HCl) with ilos. of sodium nitrite in 15 litres of water. The diazo ition is then mixed at 5°—10° C. with 35 kilos. of sodium lphite solution (34 per cent.) and 30 kilos. of an alcoic solution of sulphurous acid (35 per cent. SO_2), with stant agitation, the mixture being allowed to stand lly for a few hours at 15°—20° C., until the evolution of ogen has almost ceased and the sulphazide has sepad. An aqueous solution of 2·5 kilos. of copper sulphate 0 litres of water is then added, and the stirring is coned until the sulphazide has dissolved and nitrogen is no ger evolved. The mixture is then heated to 40°—50° C., tralised with sodium carbonate, the alcohol distilled off, the sulphinic acid precipitated with hydrochloric acid. patentees also find that aromatic sulphinic acids can be luced without the use of copper salts if the diazo salts first combined with primary or secondary amines to a diazo-amino compounds, and then treated with an holic solution of sulphurous anhydride. For example, ilos. of diazo-aminobenzene are mixed with 30 kilos. 10 per cent. alcoholic solution of sulphurous anhydride, temperature being kept at about 30° C., and allowed ly to rise to about 60° C. When the evolution of ogen has ceased, the mixture is neutralised with sodium onate solution, the alcohol is distilled off, the oily layer parated from the aqueous solution, and the sulphinic is isolated from the latter.—T. A. L.

V-TEXTILES: COTTON, WOOL, SILK, Etc.

ulose; Method of Dissolving ——, *by Means of mmonia and Copper.* — Thiele. Rev. Prod. Chim. [21], 325.

rox wool is mercerised by means of caustic soda, and, being carefully drained of all excess of that reagent, ened out and immersed in an ammoniacal solution of ie oxide, which is said to dissolve it almost immediately he ordinary temperature, whereas ordinary cellulose s several days to dissolve in Schweizer's reagent.

—C. S.

PATENTS.

rammonia Solution; Manufacture of ——. J. Imray, ondon. From E. Bronnert, Niedermorschweiler, Alsace; Fremery and J. Urban, both of Dremmen, Regiergsbezirk Aachen, Germany. Eng. Pat. 1763, Jan. , 1900.

PER strips are covered with ammonia solution of about 14 per cent. in a tall cylinder cooled externally, and compressed air is blown through, care being taken that temperature does not rise above 5° C. The solution ined contains from 4 to 5 per cent. of copper; but at a er temperature than that of its production, copper oxide precipitates, leaving in solution from 2 to 2·5 cent. of copper.—E. S.

ls and Textile Materials; Process for Cleaning, Degreasing, or Scouring and Bleaching ——. A. Bourin, aris, and F. Aymerie, Ivry, France. Eng. Pat. 2070, b. 1, 1900.

NE is used in this process as the bleaching and degreasgent. Wool, either raw, opened, or woven, is placed in a chamber communicating with one where the ozone is produced. The wool chamber is exhausted, and the ozone, freshly made, is led into it, and produces the desired effect.

—C. M.

Wool and other Animal or Vegetable Fibrous Materials [Removal of Fat]; Treatment of ——. A. J. Boult, London. From F. Wislicki, Tubize, Belgium. Eng. Pat. 10,438, June 7, 1900.

WOOL or other material is digested with a volatile solvent, such as benzene, in an air-tight cylinder. After the necessary time, the benzene is forced out by forcing in sulphurous acid gas from a reservoir of the liquefied gas. A slight carbonisation takes place.

This operation is repeated until the whole of the fatty matters are dissolved.

The wool is then treated either with hot or cold water, to dissolve out any alkaline sulphites that may have formed.

—C. M.

Wool and other Animal Fibres; Machines for Washing, Rinsing, or Chemically Treating ——. E. Maertens, Providence, Rhode Island, U.S.A. Eng. Pat. 11,055, June 18, 1900.

A MACHINE in which wool is made to pass through several troughs situated one above the other, passing from one to another by means of chutes. The washing fluid is also kept circulating by means of a centrifugal pump, and arrangements are made so that the dirty washing fluid can be drained off, and the wool, while still traversing the machine, washed with clean water from a high-pressure main.—C. M.

Wool and other Animal Fibres; The Art of Cleaning, with Volatile Solvents ——. E. Maertens, Providence, Rhode Island, U.S.A. Eng. Pat. 20,066, Nov. 7, 1900.

WOOL is treated in a closed digester with any suitable volatile solvent, either once or as many times as may be necessary. The solvent is drained off, a vacuum is produced in the digester, and then gaseous fluid admitted to remove any remaining solvent.

The solvent and water extracts are separated as completely as possible. The wool-fat is extracted from the volatile solvent, and the potash and any other salts from the aqueous extract.—C. M.

Fibrous Materials, from Grease, Mineral Oil, and other Impurities; Process and Apparatus for Purifying ——. A. Goldzweig, Lodz, Russia. Eng. Pat. 11,426, June 23, 1900.

FIBROUS material is placed in an hermetically sealed vessel and heated at 100° C. until the pressure rises. When this is the case the fibres are compressed with a hydraulic ram, which squeezes out the melted grease. This grease is heated for two hours at 130° to 150° C., and continually stirred. It is then allowed to settle and the thin oil on the top separated from the greasy soap beneath. The latter is mixed with 5 per cent. of lime, diluted to a pulpy mass, and boiled for three hours. It is then separated, washed with water, and treated with 1 per cent. hydrochloric acid. The purified grease is then emulsified with 3 per cent. ammonia soda. The fibre, from which the greasy matters have been expressed or partially expressed, is then washed well with this emulsion until quite free from grease.—C. M.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, AND BLEACHING.

Rabbits Fur [Hat Making]; Dyeing Mixtures of ——. Deutsch. Färber-Zeit. Deutsch. Hutmach. Zeit. **32**, [3], 1.

THE shade to be dyed depends largely on the process of mordanting to which the fur has been subjected. For white-mordanted goods, the following shades are recommended:— *Light grey:* Patent Cyanol extra, 0·02 per cent.; orchil substitute N (powder), 0·04 per cent. *Greenish grey:* Cyanol extra, 0·03 per cent.; Naphthol Yellow, 0·03 per cent. *Light Beige:* Cyanol extra, 0·03 per cent.; Orange extra, 0·03 per cent. *Yellow Beaver:* Cyanol extra, 0·02 per cent.; Orange extra, 0·03 per cent. *Red Beaver:* Cyanol extra, 0·03 per cent.; Orange extra 0·05 per cent. *Pea green:* Cyanol extra, 0·4 per cent.; Indian Yellow G, 0·8 per cent. *Light blue:* Cyanol extra, 0·2 per cent. *Tegethoff Blue:* Cyanol extra, 5 per cent. *Blue:* Cyanol extra, 3 per cent.; Fast Blue G G, 2·4 per cent. *Cardinal:* Ponceau Red, 4 per cent.

For yellow-mordanted goods, the following shades, being fuller and covering better, are more adapted:—

Mode shade: Cyanol extra, 0·3 per cent.; Orange extra, 0·6 per cent. *Nutria:* Cyanol extra, 0·7 per cent.; Orange extra, 0·7 per cent.; Orchil substitute N (powder), 0·1 per cent. *Fawn:* Cyanol extra, 0·6 per cent.; Orange extra, 0·1 per cent. *Brown:* Cyanol extra, 0·14 per cent.; Orange extra, 0·2 per cent. *Moss Green:* Cyanol extra, 3 per cent.; Tropæoline O, 3 per cent.; Orchil substitute N (powder), ½ per cent. *Dark Green:* Cyanol extra, 4 per cent.; Indian Yellow G, 2 per cent. *Russian Green:* Cyanol extra, 6 per cent.; Indian Yellow G, 2 per cent.; Patent Anthracite Black B, 1 per cent. *Bordeaux:* Cyanol extra, 0·5 per cent.; Orange extra 0·4 per cent.; Azo Red A, 0·4 per cent. *Black:* Naphthylamine Black 4 B, 10—14 per cent.; Indian Yellow G, 1·5—2·5 per cent.

For colours, the goods after being well steeped in hot water, are entered in a bath—preferably cold, or not exceeding 40° C.—containing 10 to 15 per cent. of sodium sulphate. Here they are worked for about 20 minutes, the temperature being then slowly raised to boiling point. After half an hour, 4—6 per cent. of sulphuric acid (previously diluted), is added, and boiling is continued till the bath is completely exhausted. For black, the bath is prepared in the same way, acid being added as required. Light-weight goods should be chromed in advance with 1½—2 per cent. of potassium bichromate for half an hour, since this preserves their strength; but excessive boiling should be avoided.—C. S.

Leather; Dyeing, Staining and Finishing of ——. M. C. Lamb. Leather Trades Rev. **33**, [769], 959. (See this Journal, 1901, 41.)

Dyeing and Finishing of Shoe Calf.—After the preliminary operations of sorting, soaking, shaving, scouring, &c., described in this Journal, 1901, 41, the skins should be drummed for two or three hours in a good sumac liquor, then washed in tepid water to remove any adhering sumac, and carefully set out on the grain. They are then dyed either in tray or paddle, the temperature of the dye-bath being kept as near 45° C. as possible during the operation. From three quarters of an hour to an hour is generally found sufficient time for the dyeing operation in order to get the full depth of shade. Either acid or basic dyestuffs are used; the former are to be preferred owing to their not showing up the defects of the grain so much as the latter.

After dyeing, the skins are well washed in cold water, hung over a trestle to drain, then set out on the flesh side, and oiled over with linseed or cod oil on the flesh. The goods are now laid in pile, flesh to flesh, over-night, and are then hung up until sufficiently dry for setting out. When set out, they are dried out. If the colour of the dyed skin is not as full as desired, it may be topped over, after dyeing, by brushing on the grain side of the skin a ½ per cent. solution of the dyestuff used.

Finishing.—Every finisher has his own recipe, but, with modifications to suit individual requirements, the following will be found useful; 2 oz. of gelatin are dissolved in 2½ galls. of water, 3 oz. of linseed, together with 16 oz. of carnauba wax and 12 oz. of white curd soap are added, and the whole boiled for two or three hours, with occasional stirring during the boiling until the wax has dissolved; the mixture is strained through muslin, and allowed to cool. The skins are given one coat of the above finish after setting out. When dry the goods are given a second coat. They may then be put on one side for a few minutes, and afterwards polished with a flannel.

Other mixtures may be used for seasoning calf, such as mixtures of gelatin and Iceland moss, linseed mucilage and starch, gum tragacanth, blood albumin, and milk. After seasoning, the skins are dried out, rolled on the grain if a bright finish is required, or they may be glassed on the table by hand, lightly perched to soften, and brushed over on the grain with a soft brush.—J. G. P.

Waste Products [Naphthenic Acids] of the Mineral Industry; Utilising ——. F. Ulzer. Zeits. ang Chem. 1900, [50], 1273.

See under III., *page* 112.

Milk; Coagulation of ——, *Spontaneously and by Ren Lactic Acid Ferment, and Rennet Ferment.* T. Boko

See under XVIII. A., *page* 144.

Bleaching Apparatus; Electric ——, *of Haas and Oe* F. Oettel.

See under XI. A., *page* 130.

PATENTS.

Piece Goods in the Open State; Scouring, Bleach Dyeing, Mercerising, or otherwise Treating ——. C Jackson and E. W. Hunt, Bolton. Eng. Pat. 5 March 22, 1900.

The object of this invention is more effectually than hith to scour, dye, &c. in the open state, certain tissues, suc

Fig. 1.

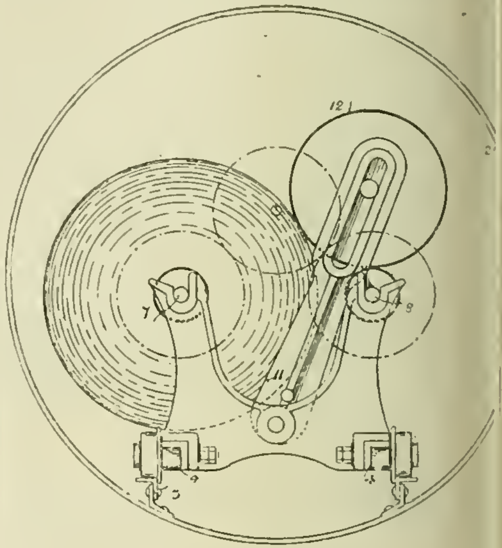
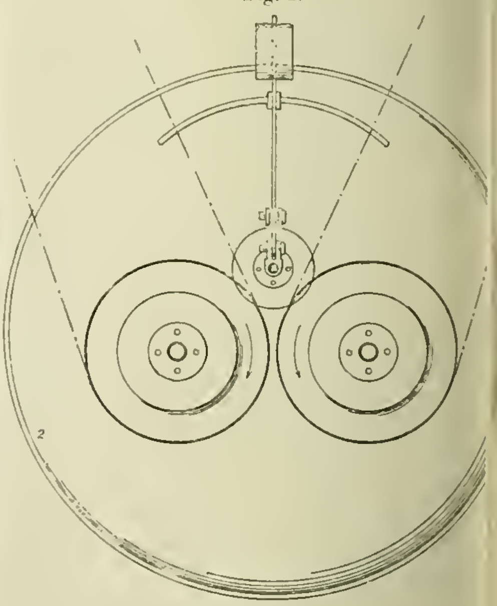


Fig. 2.



Bleaching Kier.

rills, sateens, and velvets, which tend to crease and to curl : the selvedges during such treatment.

The tissue to be treated is wound upon a batching roller, or 8 (see figure), carried by a frame, 4, running upon ils, 3, inside and out of kier, 2. A large perforated drum, 2, is mounted between the rollers in such a manner as to main in contact with the tissue as it passes from one ller to the other.

To use the apparatus, the frame containing a roll of ssue on one of the rollers is placed inside the kier, the oor of which is then closed. The kier is charged with the ouring or other liquor, which is, if desired, heated by eam, and circulated by means of a pump, external pipe, d internal spreader plate. The tissue is wound backards and forwards from one roller to the other, the rection of its course being changed either automatically the mechanism shown in the figure or by hand.—E. B.

olours upon Threads; Producing Repetitions of Long Suites of ——. O. Hoffmann, Neugersdorf, Germany. Eng. Pat. 379, Jan. 6, 1900.

METHOD of colouring yarns in the form of hanks. These e dyed various colours in different parts. According to e manner of winding the yarns into hanks, before these e dyed, the colours are caused to succeed one another gularly or more or less irregularly throughout the length the threads.—E. B.

yeing, Bleaching, or otherwise Treating Cops of Spun Yarn; Apparatus for ——. J. Major and T. J. Wood, Eccles. Eng. Pat. 509, Jan. 9, 1900.

HE capacity of the cop-dyeing machine, which forms the bject of Eng. Pat. 25,525 of 1898 (this Journal, 1898, 22) is doubled, with little addition to the size and cost of e apparatus, by modifying the construction of the relving spindles, &c. in this apparatus, and making each indle carry two cops, one below the other, in place of one ly as previously.—E. B.

ischarge Effects on Indigo-Dyed Silk and Woollen Goods. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine. Eng. Pat. 14,229, Aug. 8, 1900.

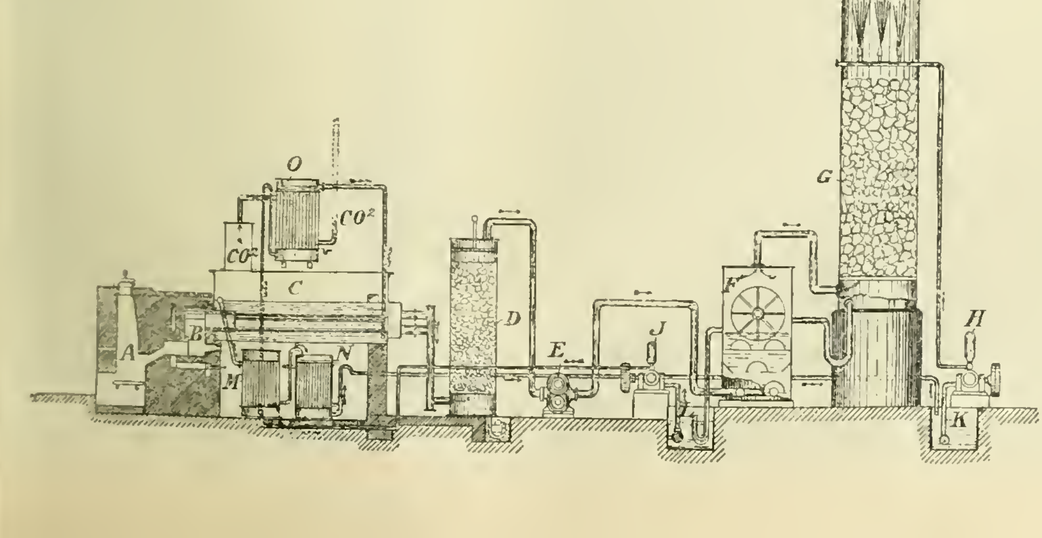
ITHERTO the white discharge effects upon Indigo-dyed oollen tissues, obtained by printing these with an alkali romate discharging mixture and passing through a bath sulphuric and oxalic acids, have been imperfect, and lour discharges do not appear to have been attempted on Indigo-dyed fabrics composed of either wool or silk. ccording to the present invention, satisfactory white scharges upon Indigo-dyed woollen tissues and excellent lour discharges upon similarly dyed woollen and silk ssues are produced by treating the tissues in the manner described in Eng. Pat. 2689 of 1900 (this Journal, 1901, 41), namely, by printing with an alkali chromate discharging mixture, steaming for five minutes, passing through a bath of sulphuric and oxalic acids, and then clearing with sulphurous acid, hydrogen peroxide, or potassium percarbonate, afterwards washing and drying. The colour discharges are produced by adding suitable dyestuffs to the thickened solution of alkali chromate; for instance:— Induline Scarlet, Azoflavins 3 G extra and 3 R, "Rhodamine extra," Methylene Blues BGN and B. A white discharge is obtained upon Indigo-dyed wool with a mixture of 350 parts of gum tragacanth paste (6 per cent.), 400 parts of gum solution (1 : 1), 125 parts of water, 300 parts of sodium bichromate. After steaming, the tissue is passed for about 20 seconds into a bath containing 50 grms. of sulphuric acid and the same quantity of oxalic acid per litre, at a temperature of 55°—57° C. Then it is left for several hours in a bleaching bath composed, for example, of 500 parts of hydrogen peroxide solution (2—3 per cent. of H_2O_2), 500 parts of water, and 15 parts of ammonia solution (20 per cent. of NH_3). A mixture of 300 parts of gum tragacanth paste, 300 parts of gum solution, 610 parts of water, 300 parts of sodium bichromate, and 60 parts of Induline Scarlet, gives a red discharge by the same method.—E. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Carbon Dioxide Manufacture. E. Schmatolla. Zeits. angew. Chem. 1900, 1284—1288.

CARBON dioxide is largely manufactured in Germany, though over-production has lowered prices to an almost unremunerative figure. The South German and Rhenish production is chiefly from natural sources, while the North German works use artificial means, especially the burning of coke and the heating of limestone or magnesite. The percentage of carbon dioxide in the gases from a good coke burner almost reaches the theoretical (20·8); and by passing the hot gases through kilns containing limestone or magnesite, this can be increased to about 28 per cent. The gas is almost always purified by absorbing the carbon dioxide from the washed gases by potash ley of about 1·14 sp. gr., and decomposing the bicarbonate formed, by heating to 100° C. The carbon dioxide is given off mixed with only water vapour, which is separated by cooling, and the gas is then liquefied by means of appropriate machinery.

The figure gives a diagrammatic view of a suitable plant for working the process. Coke is burnt in the generator A, and the combustion is completed by admitting hot air to the products as they pass into the combustion chamber B. The carbon monoxide, and more especially the hydrogen sulphide, are thus completely oxidised; the gases passing



out of the chamber contain about 18 per cent. of carbon dioxide. The hot gases then pass through a number of tubes contained in the vessel C, so that their heat is utilised in decomposing the bicarbonate liquor which is pumped into this vessel. Leaving the heater they pass through one or more wash-towers D containing limestone over which water trickles; here they are freed from dust and from sulphur dioxide. E is a blower or fan, which sucks the gases through the furnace and drives them through the absorbing apparatus. F is a rectangular vessel filled with potash ley to a height dependent on the power of the blower, and provided with a number of semi-circular baffle-plates, arranged, as shown in section, so that the gas accumulates under them successively, and thus remains exposed for a considerable time under the pressure of the column of fluid, to a large surface of liquid; an agitator at the surface throws the liquid into the upper portion of the vessel, and thus further helps the absorption. From F the gases pass into the tower G, where the absorption is as far as possible completed, and then leave the apparatus. The circulation of the potash ley may be looked on as starting from the tank K, whence it is pumped by H, through the Korting's jets, into the upper part of G, which is thus filled with fine spray. The siphon at the bottom of the tower delivers the partially saturated ley into F, which it leaves, practically saturated, by the overflow siphon, and accumulates in the tank L. From this it is driven by the pump J through the tubular vessels M and O, where it undergoes a preliminary heating (to about 60° and 90° C. respectively), into the heater C, where its temperature is raised to 100° C., and where the bicarbonate is completely decomposed. The hot "poor ley" passes, as shown, from O into M, where it gives up some of its heat to the saturated ley passing in the opposite direction through the tubes, and which it leaves at about 45° C., to pass through the similar vessel N, where it is further cooled by water, and back to the tank K. The hot carbon dioxide and steam pass out from C through O, where their surplus heat is used in heating the in-coming saturated ley, to a cooler, and ultimately to a gas-holder, from which the carbon dioxide is drawn as required for compression.

The points on which stress is laid are: (1) The mode of combustion by generator and subsidiary combustion chamber; (2) The arrangement for absorption, by which this is rendered as nearly complete as practicable, while yet requiring a minimum of expenditure on power for agitating, or on renewal of moving parts; and (3) The utilisation of as much as possible of the heat of combustion, both in the tubular vessels M and O, where the hot "poor ley" and the hot gases respectively warm the in-coming saturated ley, and in the heater C, where, by an arrangement of horizontal baffle-plates, the liquor is made to traverse the vessel backwards and forwards as it rises to the top, while the hot gases are similarly carried backwards and forwards in the opposite direction through the arrangement of tubes.—J. T. D.

Carbon Dioxide; Examination of Commercial Liquid ——. A. Lange. Chem. Ind. 1900, **23**, [24], 530—541.

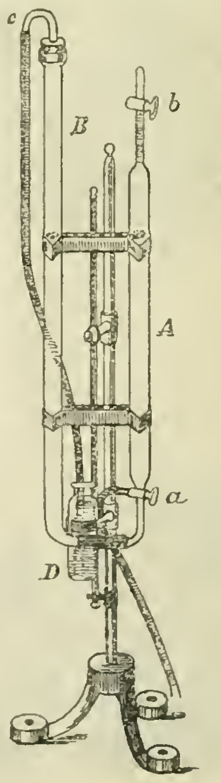
To determine the amount of air, *i.e.*, gases not dissolved by caustic potash, contained in commercial carbon dioxide, both gaseous and liquid, the author used a modified form of Winkler's burette shown in the illustration, which largely explains itself. The tube A has a volume of 100 c.c. between the taps *a* and *b*, the narrow portion containing about 5 c.c. and being graduated in 1/20 c.c., whilst the bottle D holds about 250 c.c. *a* is a three-way tap which allows the tube A to be filled either with potash solution from the other limb B, or with carbon dioxide through a rubber tube shown attached. To adjust the apparatus, the stopper with curved tube *c*, is removed from B, and sufficient potash solution (sp. gr. 1·297) is added to more than half fill both limbs when *a* is open; the stopper is then replaced. The column of liquid in A is now blown back by a tube attached to *b* until its level is at the tap *a*, which is then closed. This produces a continuous column of liquid from *a* to the bottle D which is then nearly filled with solution and adjusted on the stand so that the liquid level is in a line with the tap *a*. By this arrangement the potash falls automatically to the tap *a*, whenever *b* is opened after an experiment, and the large amount of it used permits of many successive analyses. To fill the limb A with gaseous carbon dioxide, the valve of the cylinder standing erect, is opened and regulated until a gentle stream of gas escapes; it is then connected to the tap *a* so that gas flows into A and escapes through *b* driving the ai before it. After one minute, *b* is shut off, the leading tube is slipped from *a* so that the sample, being momentarily free to the air assumes the atmospheric pressure, and this tap is then rotated through 90° allowing the ingress of potash. Absorption is accelerated by inclining the tube A and completed by shaking it; the levels in D and A are adjusted by lifting D and the height then read. D is then returned to its original position. By means of a correction table this movement of D may be obviated.

To obtain a sample of liquid carbon dioxide, the cylinder is placed horizontally on a support with its valve pointing upward; by opening it gradually a slow stream of liquid is released. This may be difficult to effect with some valves and a second reducing valve may be required, which mus be carefully washed out with the liquid before the sample is taken.

With this apparatus, under various conditions of temperature and pressure and modes of release, the relation between the amount of air contained in the gas space (i any) of a cylinder and the amount dissolved in the liquid itself was examined, the author's conclusions being a follows:—

(1) Cylinders filled with carbon dioxide in accordance with railway regulations, are entirely full of liquid between the temperatures 22° and 24° C. No precautions in transpor are necessary, because liquid CO_2 admits of great compression and its pressure only very gradually increases wit rising temperature.

(2) There is also no gas space at temperatures abov 22° C. and a sample (gaseous) taken from a standin cylinder represents liquid CO_2. Tests rapidly followin one another, may show suddenly elevated results, owin to the cooling action produced by drawing off the sample whereupon a gas with increase air-content would fill up the ga space so produced.



(3) No separation between a and carbon dioxide occurs i the gas-space of a cylinder, bu the space is filled with a homogeneous mixture. Nothing gained, therefore, by allowi the cylinder to blow off for short time when taking a samp (*cf.* Holste, Zeits. ges. Kohle säureindustrie, 1897, 461).

(4) The air-content of liqu CO_2 in an upright cylinder, at temperature not exceeding 2 C., and filled in the usual ma ner, does not suddenly chan when allowed to blow off, b falls gradually.

(5) The air dissolved in t liquid CO_2 escapes with the g in such a manner that after t blowing off of a part, not alwa the same, of the cylinder's co tents, an air-free residue r mains.

(6) The amount of air prese in the gas-space of a cylind increases with rise of temper ture, but is also greater at 0 than at 15° C.

(7) No definite relation exi between the amount of a present in the gas-space and the liquid carbon dioxide, so th an increased air-content in t gas-space does not necessar

taken a larger amount of air in the liquid. It would em impossible for the air-content of the gas-space to less than twice that of the liquid.

(8) The composition of the gas contained in a cylinder es no important criterion of the amount of air present pure carbon dioxide. The average air-content of liquid)$_2$ is very closely ascertained by estimating the amount air in the liquid. The air-content of the gas-space need ly be determined for the comparison of experiments when very exact determination of the average air-content is sired. In such cases Holste's calculation (*loc. cit.*) and modification must be applied.

(9) Generally speaking, two analyses of the carbon oxide present in the gas-space are sufficient to determine air-content of the gas taken from a cylinder. This -content is practically the arithmetical mean of the two alyses, unless indeed the carbon dioxide, after removal of first sample, is already air-free. For experimental ults and the method of applying Holste's calculation, the ginal paper should be consulted.—R. L. J.

ustic Soda and Chlorine; Manufacture of ——, by the Electrolysis of Sodium Chloride. Cohn and Geisenberger. Rev. Prod. Chim. 3, [18], 277.

dispense with the use of short-lived diaphragms, and separate the sodium hydroxide from the solution of oride, the authors propose to conduct operations in the d, which causes the former compound to solidify and arate out; and they employ an apparatus consisting of a inder to hold the sodium chloride solution, this cylinder ng mounted on an axis so as to be capable of rotation, and ng also immersed in a refrigerator. The electrodes at ich the chlorine is liberated are supported in a cell made stoneware, glass, ebonite, or other insulating material able of resisting the action of chlorine; and another l receives the crystals of sodium hydroxide. The cells y be charged with light liquids inert towards the products med therein. The electrodes, of material able to resist orine, are supported by cross pieces, and the entire aratus is placed in an insulated case.—C. S.

drochloric Acid; Preparation of Chemically Pure ——. — Haen. Rev. Prod. Chim. 3, [21], 325.

E crude acid, freed from arsenic, is introduced by degrees o a bath of boiling sulphuric acid, diluted to such a gree that its boiling-point is only some 10° C. higher n that of hydrochloric acid. The distillation thus proed, is rendered continuous by replacing the vaporised l by more crude acid; and the product is of the same gree of concentration as the original acid. Leaden stills used, and the sulphuric acid-bath is heated by a leaden l containing steam, under a pressure of about three nospheres; the condenser for the distilled acid is of thenware. A still holding half a cb. metre, with four idensing coils, will produce 2,000 kilos. of chemically re acid per 24 hours. The internal surface of the still n becomes covered with a layer of lead chloride, which serves the metal from further corrosion.—C. S.

Iodic Acid; the Preparation of ——. A. Scott and W. Arbuckle. Proc. Chem. Soc. 17$_3$ [231], 2.

E usual method of preparing iodic acid, by gently boiling ine with nitric acid in a flask with a long neck, is tedious en any quantity is required, and liable to great loss of ine unless the source of heat is very carefully regulated. using, first, the ordinary form, and, later, a modified m, of Soxhlet's fat extraction apparatus to contain the line, almost theoretical yields of iodic acid were obtained er a very short treatment with the boiling nitric acid. e liability, however, of the siphon tube to become choked h crystals of iodic acid, led to the abandonment of this e of apparatus. After many trials with various forms apparatus, the authors recommend the use of a roundtomed flask having a ground-in neck carrying two tubes, one of which is sealed a reflux condenser, and through other is fitted a tube by means of which a current of gen is passed through the boiling liquid. With this apparatus, finely powdered iodine boiled with ten times its weight of fuming nitric acid may be completely oxidised in 20—30 minutes.

Chromic Acid; The Electrolytic Regeneration of ——, and the Manufacture of Acid-proof Diaphragms. M. Le Blanc.

See under XI. A., *page* 132.

PATENTS.

Solutions [Sugar, &c.]; Treatment of ——, to Precipitate Matter contained in them. S. M. Lillie. Eng. Pat. 17,924, Oct. 9, 1900.

See under XVI., *page* 140.

Acetic Acid; Manufacture of ——. P. Boessneck, Glauchau, Saxony. Eng. Pat. 25,077, Dec. 18, 1899.

A "CONTINUOUS-column still" is described as the most suitable for a continuous process of producing acetic acid, as is here claimed. A mixture of pyrolignite of lime and hydrochloric acid (preferably) is fed into the still, and superheated steam is used for heating it. The calcium chloride solution flowing off is said to contain only traces of acetic acid.—E. S.

Salt from Solutions; Vacuum Apparatus for Separating ——, especially from Brine. G. N. Vis, Schweizerhalle, near Basle, Switzerland. Eng. Pat. 25,640, Dec. 28, 1899.

AN improvement on Eng. Pat. 16,738, 1899 (this Journal, 1900, 1111), in respect to the pipe descending from each boiler from above the normal level of the brine to the brine reservoir, for the purpose of keeping constant the level of the brine in other boilers of the series whilst the salt is being periodically discharged. It has been found that these "equalising pipes," owing to frequent passages of air through them, are liable to obstruction from incrustations. To prevent this, under the present invention, the pipe is led to dip into a relatively small vessel containing a non-incrusting liquid (such as water, glycerin, oil, mercury, or the like), open to the atmosphere; and near the upper end of the pipe is a still smaller box or cavity, provided with baffle plates, the size and length of the pipe, and the size of the box and lower vessel being so adjusted that the box, at the most, may be filled with liquid to about half its height. A liquid seal is thus constituted. A pipe for periodically supplying the boiler from above the heating system with fresh brine, to remove incrustations, is also shown.—E. S.

Salts; The Crystallisation of ——. L. Kaufmann, Aix-la-Chapelle, Germany. Eng. Pat. 20,144, Nov. 8, 1900.

THE saline solution is passed into a trough supported on a pivot, having a removable tight-fitting cover and a removable end piece provided with a slot for passage of air. The other end, receiving a pipe for admission of an air current or blast, has two apertures, closed during the working by a sliding valve. By means of a rod and lever keyed on to the pivoting axle a steady oscillatory movement is maintained, whereby the liquid is kept in agitation while the air current passes over its surface. When the crystals formed are ready for removal, the trough is tilted by means of one of a pair of oppositely placed levers below, so that the mother-liquor may be run out; by means of the other lever the trough is then inclined the opposite way, and the cover being removed, the crystals are discharged.—E. S.

Sulphuretted Hydrogen; Improved Means applicable for Use in the Desulphurisation of ——. J. Dewrance and J. H. Paul. Eng. Pat. 2146.

See under II., *page* 110.

VIII.—GLASS, POTTERY, ENAMELS.

Kaolin; Levigated ——. F. Ulzer. Mitt. des k. k. Techn. Gewerbe-Museums in Wien, 1900, 10, [9, 10, and 11], 190—191.

THE industrial value of this sample was investigated in the following manner. The kaolin was pure white, save for a few yellow streaks, was of non-adhesive nature, passed almost entirely through a sieve with 1,200 meshes per square metre, and contained 2·95 per cent. of iron oxide. 1 kilo. absorbed 560 grms. of water and formed a plastic mass, portions of which lost 6, 9, and 12 per cent. in volume at the respective temperatures, 950° C., 1,150° C., and 1,270° C. (approx.). Each test-piece was porous, and broke with an earthy fracture, the last being slightly yellow in colour. A porcelain mixture of the composition, kaolin, 340; sand, 360, and felspar, 300 parts by weight, was fired at similar temperatures. At 950° C. and 1,150° C. the tests remained earthy and porous; at 1,270 C. these characteristics were lost, the test assumed a yellow tint and was translucent in its thinnest portions. An alkaline glaze (K_2O, 0·3; CaO, 0·7; Al_2O_3, 0·5; SiO_2, 5·0) was successfully applied at a somewhat higher temperature. This kaolin could be employed in the manufacture of cream-coloured porcelain or fancy articles; also for filling paper. The amount of iron present makes it unsuitable for white porcelain or the preparation of ultramarine.—R. L. J.

Glass; Coloration of ——, *by Iron and Manganese.* Chr. Dralle. Chem. Zeit. 1900, **24**, [103], 1132—1136.

For the purposes of this investigation a glass was prepared from the following materials:—(1) sand, such as is used at Frede for making mirror glass, of the percentage composition, $SiO_2 = 99·786$, $Fe_2O_3 = 0·032$, $Al_2O_3 = 0·103$, $MgO = 0·005$, $CaO = 0·027$; (2) calcspar of the composition, $CaCO_3 = 98·44$, $MgCO_3 = 0·24$, $Fe_2O_3 = 0·09$; (3) pure sodium sulphate, calcined in a leaden pan; (4) pure sodium nitrate; and (5) wood charcoal. A mixture which would result in a trisilicate was first tried, but proved too viscid and otherwise unsuitable. The two following mixtures, one of a strongly oxidising nature, the other strongly reducing, and both yielding the same amount of glass, which, as analysis showed, agreed closely with the dimetasilicate $(NaO.SiO.O.SiO.O)_2Ca$, answered all requirements, and were used throughout the experiments.

Mixture I. (Oxidising).

	Parts.
Sand	685
Calcspar	285
Na_2CO_3	260
$NaNo_3$	65

Mixture II. (Reducing).

Sand	685
Calcspar	285
Na_2SO_4	400
Charcoal	20

318 grm. lots of I. and 350 grms. lots of II., each resulting in about 250 grms. of glass, were fused in fireclay crucibles together with gradually increased quantities of iron, added either as pure crystallised ferrous sulphate or ignited ferric oxide. The crucibles were heated around the edge of a large crucible of bottle glass where the temperature was between 1,550° and 1,650° C., and the fusions poured into a hot iron cylinder.

Two blank experiments showed that the raw materials were not quite as free from iron as supposed; the known amount being insufficient to produce the observed results, it was concluded that a further small quantity dissolved out from the substance of the crucibles.

The results of 23 experiments (including the blanks) are tabulated, and may be summarised as follows:—

i. The characteristic tint due to ferric oxide is yellow-green, that due to ferrous oxide, blue-green.

ii. Mixture I. always produced a ferric-oxide tint and mixture II. a ferrous-oxide tint, no matter which of the two iron compounds was added.

iii. In the formula, 100 parts of glass + x parts of iron, for all values of x up to 0·7 the iron has a greater colouring power in the ferric than in the ferrous condition; *i.e.*, the tint in the case of all experiments made with mixture I. was slightly deeper than the tint in the corresponding experiment with mixture II. When x exceeds 0·7 this relation is reversed.

In consequence of ii., the addition of iron as ferrous sulphate was abandoned in the later experiments, and only ferric oxide was employed. By the addition of 7·8 grms. o iron, both glasses were opaque, so the experiments cease at this point.

The conclusions as to the action of manganese, are n follows:—

Manganese added in quantities from 0·05 to 0·8 pa per 100 of glass has a greater colouring power as peroxid than as suboxide. In quantities from 0·4 to 0·6 the pe oxide produces a violet tint, the suboxide a grey.

When 0·7 to 2·0 parts as MnO_2 are added to mixture I a red colour appears and increases to deep violet; with 3· parts Mn the glass is opaque, and only transparent at th edges. Corresponding amounts of suboxide produce a ti that is first wine-yellow, and lastly amber-yellow, similar t that known in the industry as "gold-yellow."

As more than 3·0 parts of Mn added per 100 c mixture I. gave opaque products, the addition of MnO_2 w continued with mixture II. 4·5 and 5·6 parts of Mn (MnO_2) produced much slag (fused sulphate); this w limited by using sufficient charcoal, and finally a green gla was obtained. To determine the reason of this, two lots c glass, mixture II., were melted; one with 5·8 grms. c pyrolusite, the other with 22·0 grms. of manganou sulphate. Both were amber-yellow with a brownish tint.

It seems apparent that in commercial glass, coloure gold, red-yellow, and brown, or (when iron is also use light and dark greenish yellow to coffee-brown, the mang nese is present as MnO. A small quantity of Mn_2O_3 ma be also present, but any considerable amount renders t glass opaque. Also, the general opinion that the suboxi produces a rose tint is not supported by these experiment in which 0·1—0·3, 0·4—1·0, 1·5—5·0 parts of Mn adde as manganese sulphate give respectively pale green, yello with grey undertone, and amber or gold-yellow coloratio To find the effect of still larger quantities of MnO, a gla was prepared of the composition—

$$\left.\begin{array}{r}5SiO_2\\1B_2O_3\end{array}\right\rangle MnO : Na_2O,$$

in which all the lime was displaced. This was clear bro in colour, transparent in thin pieces, and opaque in thick layers. As there was no reason to suppose that manga oxide could be present, the coloration produced by t suboxide in quantity appears to be brown. In view of results, the author rejects the usual theories on the d colorising of green-tinted (iron) glass by the use manganese, but is unable to offer a substitute.—R. L. J.

PATENTS.

Glass; Manufacture of Sheet ——. P. T. Sievert, Dresd Germany. Eng. Pat. 25,139, Dec. 19, 1899.

In the manufacture of sheet glass the spreading of liquid glass over the casting table is usually carried out means of rollers. The inventor's method consists in givi the table a shaking motion in all directions; moisten fibrous material forms the covering of the table, and cover of non-conducting material may be used to aid in formation of the sheet.—J. W. H.

Glass; Machines for Blowing ——. P. T. Sievert, Dresd Germany. Eng. Pat. 18,449, Oct. 16, 1900.

A machine is claimed in which a sheet of glass is form as described in the preceding abstract. While the sheet glass is still molten, a mould plate is brought down upou when the disengaged steam from the moistened fibr cover of the table, or compressed air or steam suppl through perforations in the table, blows the glass into several moulds of the mould plate, cutters fixed to the ed of the moulds simultaneously separating the articles form the articles are then shaken out of the mould plate annealed.—J. W. H.

Glass; Pressing or Moulding ——. A. Froyck, Swed Eng. Pat. 25,739, Dec. 30, 1899.

The objects are formed by pressing them out of the wa mass of glass against a soft or elastic bedding. Asbe oard. charcoal, and clay are mentioned as suitable materials or the bedding, which may, however, be faced with thin heet metal.—J. W. H.

lass ; Manufacture of Prism ——, and Apparatus for that Purpose. F. L. O. Wadsworth, Alleghany, U.S.A. Eng. Pat. 17,686, Oct. 5, 1900.

HE glass in a plastic condition is first rolled out into a late of suitable thickness, and then pressed by means of ies to form the prismatic ridges. The glass obtained is ree from strain, and may be cut with ordinary glass-cutting ools. Machinery for the manufacture is described.
J. W. H.

lass-Blowing Machines. The Automatic Glass-Blowing Patents Syndicate, Ltd., West Bromwich. From H. J. Colburn, Toledo, U.S.A. Eng. Pat. 16,617, Sept. 18, 1900.

HE moulds in this machine, after removal of the article ade, are rocked about a horizontal spindle into a water-ough for cooling, and returned into position again for rther service. The mould itself can be revolved and opped automatically after a certain number of revolutions ; e blow-pipe and the base of the mould are also capable rotation in a direction opposite to that of the mould.
—J. W. H.

lass-Blowing Machines. The Automatic Glass Blowing Patents Syndicate, Ltd., West Bromwich. From W. E. Bock, Toledo, U.S.A. Eng. Pat. 16,623, Sept. 18, 1900.

HE invention relates to glass-blowing machines, in which e blow-pipes and moulds are carried in a circular path, e operations being performed during the circuit. The oulds are opened and closed during their travel round the achine by an air cylinder, the piston valve of which is tuated by the track on which the moulds (on rollers) ove ; devices are also described for controlling the action the blow-pipes, regulating the air-supply, &c.—J. W. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

lortars ; Tests of ——. T. Behrmann. Rigaer Ind. Zeit. 1900. **26**, 233 ; through Chem. Zeit. Rep. 1900, **24**, [104], 386.

ESULTS are given of measurements of crushing stress rried out at intervals during a period of two years on ortars made from lime, Roman cement, Portland cement, id various mixtures of Roman and Portland cements, the st cubes being kept in the air but out of contact with ater. In all cases a continuous and considerable increase strength took place throughout the whole of the two ears. Similar hardening may well occur in mortars in the terior of structures.—T. H. P.

ortland Cement ——. F. Ulzer. Mitt. des k.k. Techn. Gewerbe Museums in Wien, 1900, **10**, [9, 10, and 11], 189—190.

HE following table shows the composition of a limestone id a marl suitable for the manufacture of Portland cement, id also the (calculated) composition of two cements made erefrom, by burning them together in the proportions: .] 56·12 limestone with 43·87 marl ; [II.] 65·74 limestone ith 52·14 marl :—

—	Limestone.	Marl.	Cement I.	Cement II.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
O_2	4·58	36·75	27·76	23·73
$_2O_3$	3·37	3·41	5·02	5·13
$_2O_3$	1·29	11·42	8·51	7·24
nO	None	A trace	..	..
O	50·86	22·70	57·19	62·71
gO	A trace	1·25	0·81	0·64
kalis	A trace	1·15	0·74	0·59
$_3$	0·04	0·04	0·05	0·02
$_2$	39·96	..	..	..
ss when heated	40·03	23·28	..	..

A Perlmoos Portland cement had the percentage composition :—SiO_2, and part insoluble in HCl, 21·83 ; Fe_2O_3, 2·92 ; Al_2O_3, 7·34 ; CaO, 58·69 ; $CaSO_4$, 4·86 ; MgO, 2·86 ; loss when heated, 1·59.—R. L. J.

Cement Blocks ; Hollow ——, for Building Purposes. Ingeniren, Copenhagen, 1899, 325. Proc. Inst. Civil Eng. 1900, **142**, [4], 65.

HOLLOW blocks of cement instead of bricks have been used for building purposes at various places in Denmark. The cross section of the blocks is either 13½ × 13½ ins. or 9 × 13½ ins., according as they are intended for 13½-in. or 9-in. walls ; they are 29¾ ins. long, and hollow from end to end, with the sides about 2¼ ins. thick, and the top and bottom about 1¾ ins. The mixture of sand and slow-setting cement is rammed dry in moulds in the usual way ; after six weeks' hardening, the blocks are many times stronger than needed for two-storey houses, whilst after a year's hardening, they will bear about 2,000 lb. per sq. in. of the wall's horizontal section. A large block, 13½ × 13½ ins. cross section, weighs 150 lb. Corner stones and other blocks of special shape are moulded separately, and are made with inlaid strip iron. It is claimed that houses built with these blocks are fit for occupation immediately after building, and that the inside of the walls requires neither cleaning nor preparation, but is ready for papering or oil-painting at once.—A. S.

Plaster of Paris ; Determination of Underburnt and Overburnt Portions of ——. L. Périn.

See under XXIII., *page* 156.

PATENTS.

Cement ; Manufacture of ——. J. C. Gostling, J. H. Fraser, and R. Booth, London. Eng. Pat. 22,549, Nov. 11, 1899.

THE slurry from which the cement is made is dried and burnt whilst passing through a short inclined roasting cylinder, the heating flame and hot gases passing in the opposite direction ; the air used for combustion is pre-heated by being made to pass through metal pipes or boxes, which come into direct contact with the recently burnt and cooling cement.—J. W. H.

Stone, Artificial, and Cement for Building, Paving, Railway Sleepers, and other Purposes, &c. ; Manufacture of ——. P. Timofeeff, St. Petersburg. Eng. Pat. 25,734, Dec. 30, 1899.

ROCKS and other materials are powdered and mixed in such proportions that the mass may be fused and cast into blocks for building purposes. The blocks are cemented together with a mixture of quicklime with 5 to 15 per cent. of silicate of lime.—J. W. H.

Stone, Artificial, &c. ; Process for Chemically Agglomerating Powdered Materials for the Manufacture of ——. A. Denaeyer, Brussels. Eng. Pat. 4114, March 3, 1900.

THE powdered rocks or other materials are mixed with colloidal silicate of lime and pressed into blocks.—J. W. H.

Stone Building Blocks ; Manufacture of Artificial ——. G. E. Güssow, Hanover, Germany. Eng. Pat. 13,491, July 26, 1900.

TO a mixture, in about equal proportions, of clay and siliceous sinter, a small amount of asbestos fibre, magnesite, or bauxite, and some finely divided organic matter, such as peat or straw, is added ; after intimate mixture, a small amount of water being used to form a paste, the mass is moulded into blocks and burnt in a brick kiln.—J. W. H.

Sandstones ; Hardening Calcareous ——, by Steam Heating under Pressure. C. Rensing, Lichtenberg, Germany. Eng. Pat. 18,860, Oct. 22, 1900.

FOR bringing about certain chemical reactions for hardening sandstones, &c., air is first forced into the hardening or other vessel until the desired pressure is reached, and steam then admitted ; steam alone is generally used.—J. W. H.

Bricks; Manufacture of Glazed ——. M. F. Solon, Cobridge, Stafford. Eng. Pat. 225, Jan. 4, 1900.

A process is claimed for producing a glazed brick, by first placing a quantity of marl in a die or mould, then adding finely divided clay, subjecting the substances to pressure, and then removing and firing them in a kiln. Glaze is again applied and firing repeated. But the powdered glaze may be applied without removing the marl and clay from the die, all three substances being fired simultaneously.—J. W. H.

Glass, Metal, Earthenware, Porcelain, &c., having a Surface capable of Adhering to Plaster or Cement; Manufacture of Plates or Tablets of ——. J. H. Storey and W. E. McCalla, both of Lancaster. Eng. Pat. 3611, Feb. 23, 1900.

Tablets of glass, metal, or earthenware are provided with a honeycombed surface on the side which is to adhere to plaster or cement, by firing after having applied a coating formed of enamel or similar substance mixed with combustible matter.—J. W. H.

Paving Roads; Composition for ——. C. A. C. Candemberg, Nice, France. Eng. Pat. 1915, Jan. 30, 1900.

Asphalt in fine powder is intimately mixed with a solution of rubber prepared with a volatile solvent, such as petroleum spirit; the mass spread over dry lime, concrete, or cement, and compressed by ramming and rolling, forms an efficient paving.—J. W. H.

Burning Kilns of the kind known as "Dutch" or "Scotch" Kilns; Method of and Means for Utilising the Waste Heat generated in Brick or Tile or the like ——. J. W. Briggs, Barton-upon-Humber. Eng. Pat. 3584, Feb. 23, 1900.

The kilns are so arranged with flues that those recently filled may be heated by hot air derived from those cooling down.—J. W. H.

Fireproof Coating for Walls, Floors, &c. A. Gabrielli, Novara, Italy. Eng. Pat. 15,960, Sept. 7, 1900.

The coating consists of two layers: asbestos, wood, cork, cloth, or similar material, rendered fireproof and perforated with a number of small holes, forming the first layer; a paint, the solid ingredients of which on being heated generate a gas "antagonistic to combustion," is then applied to form the second layer. Calcium and lead carbonates are mentioned as suitable substances. The coating is especially suited for covering the metal flooring and walls of the cabins of ships. —J. W. H.

Wood [Fireproofing] and other Combustible Substances; The Treatment of ——, *to render them Fireproof, and for other Purposes.* H. H. Lake, London. From The American Wood Fireproofing Company, Ltd. Eng. Pat. 3262, Feb. 19, 1900.

A sample of the timber to be fireproofed is first tested to determine the moisture it is capable of absorbing, by heating to about 110° F. in a tank in which a vacuum is maintained, then filling the tank with water, and after a time applying a pressure of from 100 to 150 lb. per. sq. in. If the proportion of water absorbed, should not prove satisfactory, the wood is then steamed. In conducting the actual process, the wood is subjected to a vacuum in the tank, and ammonia is admitted, and "after a time the vacuum is broken by drawing air through the water containing ammonia and having a temperature of about 130° F., thus charging the inrushing air with both moisture and ammonia." The temperature of the tank is then slowly raised to 120°—140° F. at atmospheric pressure, and, when shown by the previous test to be necessary, steam is introduced, and before using the impregnating solution, a vacuum is again made. The impregnating solution contains ammonium sulphate and phosphate, and also, preferably, smaller proportions of sodium borate, phosphate, and sulphate, and free ammonia. A casein solution, made by dissolving in water, casein and borax, is then added, sufficient to cause cloudiness. A small proportion of an oil emulsion, such as a mixture of cotton-seed oil with lard, is preferably al added. The use also of a potash soap is claimed. Wh the solution is introduced, pressure as before described applied for many hours. After drying, the wood is subject in the vacuous tank to the action of formaldehyde gas, whi renders the casein insoluble; or of carbonic acid or oth acid gas, which coagulates the casein, thus "sealing" t salts introduced within the substance of the wood.—E. S.

Wood Fire-proof and Rot-proof; Improved Process a Preparation for Rendering ——. G. F. Lebiod Boulogne-sur-Seine, France. Eng. Pat. 19,515, Oct. 3 1900.

About 6 parts of boric acid, 10 parts of borax, and parts of ammonium sulphate are dissolved in hot water, a the solution is used while hot in any convenient way impregnate the wood which is to be rendered proof agai burning and rot.—E. S.

Furnaces for the Treatment of Lime, Cement, Dolomite, the like ——. E. Gobbe. Eng. Pat. 552.

See under I., *page* 105.

X.—METALLURGY.

Calcium Carbide; Reductions effected by ——. F. Kügelgen. Chem. Zeit. 1900, **24**, [97], 1060—1061.

The author confirms, in the main, the results of Neuma (this Journal, 1901, 46), but points out that calcium carb had already been shown to reduce other metallic compou (this Journal, 1899, 1061; 1900, 475). From his expe ments he concludes that the gas produced is not carb monoxide, as Neumann asserts, but carbon dioxide, and gives the following formula as representing the process the reduction of metallic oxides—

$$5M_2'O + CaC_2 = CaO + 5M_2' + 2CO_2$$

instead of that given by Neumann—

$$3M_2'O + CaC_2 = CaO + 3M_2' + 2CO.$$

He states that the yields of metal obtained, agree with formula, and concludes that Neumann must have used large excess of carbide in his experiments, in which ca carbon monoxide can be detected in addition to carb dioxide in the liberated gases.—C. A. M.

Pig-Iron; Irregular Distribution of Sulphur in — R. Bolling. J. Amer. Chem. Soc. 1900, **22**, 798—799.

To test the distribution of sulphur in cast-iron, 1 samples were collected at intervals from the runner wh a cast was being made, and when 10 lb. had thus be collected the metal was run into a sand mould about a f long. After cooling, the bar was drilled transversely eight points at regular intervals of $1\frac{5}{8}$ in. These sampl taken in succession, commencing at the top of the and proceeding downwards, showed the following p centages of sulphur respectively:—0·036, 0·036, 0·0 0·036, 0·036, 0·032, 0·030, 0·023. It will be seen t the difference between the upper and lower surface amou to 0·013. Hence, to obtain a true representative as for sulphur, the bar should be drilled through from to bottom, and the drillings should then be well mixed. —W. G. M

Iron; Determination of ——, *in Magnetite Ores by Specific Gravity Test.* J. W. Richards. J. Am Chem. Soc. 1900, **22**, 797—798.

In the many cases of ores which are simply mixtures magnetite and quartz, a specific gravity test may be accurate as an analysis. Samples of from 1 to 50 lb. in wei should be tested, according to the nature of the bala available. The results should be accurate to 0·1, and be so to from 0·02 to 0·03 per cent., which is equiva to a maximum error of 1 to 3 per cent. on the iron cont The following table gives the percentage of Fe (an

O_4 and SiO_2) corresponding to various specific gravities, specific gravity of the magnetite and silica used being 5 8 and 2·66 respectively :—

e.	Fe_3O_4.	SiO_2.	Sp. Gr.	Fe.	Fe_3O_4.	SiO_2.	Sp. Gr.
%	%	%	%	%	%	%	%
	0·0	100·0	2·66	37	51·0	49·0	3·54
	1·4	98·6	2·67	38	52·4	47·6	3·57
	2·8	97·2	2·69	39	53·8	46·2	3·60
	4·1	95·9	2·71	40	55·2	44·8	3·64
	5·5	94·5	2·73	41	56·6	43·4	3·67
	6·9	93·1	2·75	42	58·0	42·0	3·70
	8·3	91·7	2·77	43	59·4	40·6	3·74
	9·7	90·3	2·79	44	60·8	39·2	3·77
	11·0	89·0	2·81	45	62·1	37·9	3·81
	12·4	87·6	2·83	46	63·5	36·5	3·85
	13·8	86·2	2·85	47	64·9	35·1	3·89
	15·2	84·8	2·87	48	66·3	33·7	3·93
	16·6	83·4	2·89	49	67·7	32·3	3·97
	18·0	82·0	2·92	50	69·1	30·9	4·01
	19·3	80·7	2·94	51	70·5	29·5	4·05
	20·7	79·3	2·96	52	71·8	28·2	4·09
	22·1	77·9	2·98	53	73·2	26·8	4·13
	23·5	76·5	3·00	54	74·6	25·4	4·17
	24·8	75·2	3·03	55	76·0	24·0	4·22
	26·2	73·8	3·05	56	77·4	22·6	4·26
	27·6	72·4	3·07	57	78·8	21·2	4·31
	29·0	71·0	3·09	58	80·1	19·9	4·36
	30·4	69·6	3·12	59	81·5	18·5	4·41
	31·8	68·2	3·14	60	82·9	17·1	4·46
	33·2	66·8	3·17	61	84·2	15·8	4·51
	34·5	65·5	3·20	62	85·6	14·4	4·56
	35·9	64·1	3·22	63	87·0	13·0	4·61
	37·3	62·7	3·25	64	88·4	11·6	4·66
	38·7	61·3	3·27	65	89·8	10·2	4·72
	40·0	60·0	3·30	66	91·2	8·8	4·78
	41·4	58·6	3·33	67	92·6	7·4	4·84
	42·8	57·2	3·36	68	94·0	6·0	4·90
	44·2	55·8	3·39	69	95·3	4·7	4·96
	45·6	54·4	3·42	70	96·7	3·4	5·02
	47·0	53·0	3·45	71	98·0	2·0	5·09
	48·3	51·7	3·48	72	99·4	0·6	5·16
	49·7	50·3	3·51	72·4	100·0	0·0	5·18

—W. G. M.

and Wrought Iron; Influence of Copper in Reding Corrosion of Soft ——. F. H. Williams. Eng. l Mining J. 1900, **70**, [23], 667.

author refers to a recent communication by H. M· (this Journal, 1900, 905) on the relative corrosion of ght iron, soft steel, and nickel steel, and then describes iments he made as to the influence of copper in ling corrosion. In one set of tests, four samples of were examined: A, an ordinary soft Bessemer steel; and D soft Bessemer steels containing respectively , 0·145, and 0·263 per cent. of copper. In a second tests, there were examined one soft steel and four es of wrought iron, one of which contained 0·393 per of copper. Small pieces of each were cut and filed same dimensions, weighed, and suspended from a , so that all could be dipped simultaneously into water ien left to hang in the air till dry. This treatment peated for about a month, and then, when the oxide d had a tendency to scale off, the pieces were ughly cleaned and again weighed. The following s were obtained :—

Loss from Atmospheric Corrosion.	Loss Per Cent.
. Soft Bessemer steel	1·85
B. „ „ „ 0·078 per cent. Cu	0 89
. „ „ „ 0·145 „ Cu	0·75
. „ „ „ 0·263 „ Cu	0·74
oft Bessemer steel....................................	1·65
Wrought iron, 1	0·76
„ „ 2	0·80
„ „ 3	0·87
„ „ 4 (0·393 per cent. Cu)	0·53

T results appear to indicate a solution of the problem king soft Bessemer steel as capable of resisting ion as wrought iron, and the author states that the uction of the requisite small amount of copper into where it is not already present in sufficient quantity, be easily effected by the use of copper-bearing iron the blast furnace.—A. S.

Alloys of Iron and Nickel. Rudeloff. Verhandl. des Vereins zur Beförderung des Gewerbefleisses, Sitzungsber. 1900, 38. Proc. Inst. Civil Eng. 1900, **142**, [4], 42.

Statements have already been issued by the committee on iron-nickel alloys appointed by the "Verein zur Beförderung des Gewerbefleisses" (see this Journal, 1894, 955; 1896, 905; 1899, 48). It was found that in the preparation of ingots, the best results were obtained by adding 20 grms. of aluminium in the case of alloys rich in iron, and 10 grms. of magnesium with alloys rich in nickel, in both cases, to 20 kilos. of the material.

The present communication deals with the effect of carbon on nickel alloys. The fine-grained structure of iron free from nickel is transformed by the addition of carbon into a radiated crystalline appearance, whilst the addition of 3 per cent. of nickel caused the carbon to separate out in the form of graphite. In a series of tests, the proportion of carbon was kept constant, and the quantity of nickel varied from 0·3 to 60 per cent. With from 0·3 to 0·5 per cent. of carbon, the pure iron showed the lowest, and the 3 per cent. nickel the highest elastic limit and yield point, whilst the tensile strength and shearing strength were greatest for the alloy containing 60 per cent. of nickel. When the amount of carbon was greater than 0·5 per cent. the 3 per cent. nickel alloy was superior in all respects to the 60 per cent. alloy.—A. S.

Tinned-Iron; The Rusting of ——. F. Ulzer. Mitt. des k. k. Techn. Gewerbe-Museums in Wien, 1900, **10**, [9, 10, and 11], 203.

The author's experiments confirm the general view that tinned-iron goods rust owing to the presence of minute crevices in the surface of the iron-plate, which are not effectually sealed by the molten tin in the process of dipping. Oxidation begins at these points, and rusting extends under the tin coating, causing it to separate.—R. L. J.

Gold; Grollet's Method for the Recovery of ——. Griveau. Oesterr. Zeit. Berg-Hütt. **48**, 567. Chem. Centr. 1900, **2**, [24], 1217.

It is stated that by this process, which is being worked at Harfleur, France, the gold can be recovered from ores and by-products, which contain the metal in the free state, or combined with sulphur, arsenic sulphide, antimony sulphide, &c. The method consists in subjecting the material to the simultaneous action of chlorine and bromine, treating the solution of chloride and bromide of gold with sulphur dioxide for the removal of excess of the halogens, and precipitating the gold by sulphuretted hydrogen. As an example it is claimed that one ton of ore treated with 14 kilos. of sulphuric acid, 12 kilos. of chloride of lime, and 0·1 kilo. of bromine, yielded, after four hours' action in a revolving barrel, 86·21 per cent. of gold; after eight hours, 89·66 per cent.; and after 12 hours, 93·11 per cent. of gold.—A. S.

Cyanide Tailings; Treatment of ——. H. M. Crowther. Eng. and Mining J. 1900, **70**, [25], 732.

Tailings from cyanide treatment usually contain too small a quantity of gold to allow of a profitable re-treatment by a chemical process. The author points out, however, that the limited amount of wash water used in the cyanide process does not completely displace the solution in the charge of ore, and thus, in general, the tailings contain at least ¼ lb. of cyanide and a somewhat larger quantity of free alkali—caustic soda or lime—per ton; and, on subsequent exposure to air and sunlight in the dump, it is stated that the cyanide acquires greater activity and effects solution of the gold present, so long as the mass remains alkaline. After sufficient exposure, these dissolved values may be recovered in solution by a simple washing with water. The author made some tests on tailings from the immense dumps at Mercur, Utah, which had been exposed to the weather from three months to one year. The tailings, as they came from the mill, contained about 0·4 lb. of cyanide, 0·6 lb. of caustic soda, and 8 c. per ton in dissolved gold, with a moisture content of 20 per cent., and an average assay value of about 1 dol. in gold. In six tests, the average amount of water present was 13·2 per cent., and of gold, 1·05 dols. per ton. By simply percolating $\frac{1}{2}$ ton of water through each ton of tailings, an average extraction of 53·3 per cent. of the total gold value was obtained.

In order that the chemical condition of the tailings, at the time of placing on the dump, be such that the otherwise waste cyanide contained in them is preserved for the longest possible period, the author recommmends that the final wash-water contain sufficient caustic alkali to leave from one to several pounds of free alkali per ton of tailings in the associated moisture which adheres to them.—A. S.

Silver: Union of ——, with Oxygen. Berthelot. Comptes Rend. 131, [26], 1159–1167.

Silver combines very slowly with oxygen (whether heated with it at atmospheric pressure or with air) at a temperature of 200° C., and the rate of combination increases, as the temperature rises, up to 500°—550° C. The amount of oxide formed, and persisting after cooling, is always very small, and appears to be about the same whether oxygen or air be used; the presence of moisture, or of a substance capable of combining with the silver oxide (such as glass), tends to increase the amount of oxide formed. At the same time, a portion of the silver much greater than that oxidised, suffers disaggregation, and forms a sort of woolly powder, as though there had existed a state of mobile equilibrium, similar to that between a liquid and its vapour in a confined space. That this is not an effect of heat is shown by the fact that no such alteration of the silver occurs when it is heated in nitrogen, carbon dioxide, or water vapour.—J. T. D.

Silver and Hydrogen. Berthelot. Comptes Rend. 131, [26], 1169—1170.

Silver, heated in sealed tubes to 500°—550° C. with hydrogen, undergoes to a slight extent the same sort of change as in oxygen or carbon monoxide. This is possibly due to the formation and decomposition of a hydride—a supposition which would also explain the slight apparent permeability of silver to hydrogen, which certain of the author's experiments have established. The possible formation and decomposition of such compounds has an important bearing on the explanation of many chemical reactions (inflammation of hydrogen gas by platinum, effect of traces of water in determining reactions, &c.), and the author is pursuing his experiments with other metals besides silver.—J. T. D.

Silver and Carbon Monoxide. Berthelot. Comptes Rend. 131, [26], 1167—1169.

When silver is heated in carbon monoxide at 550° C. (and to a less extent at lower temperatures down to 300° C.), it becomes partially converted into a woolly powder, as when heated in oxygen. At the same time small quantities of a black deposit are formed locally, and when the silver is dissolved in acid a flocculent carbonaceous residue is left. Carbon dioxide, corresponding to about 3 per cent. of the original volume of the monoxide, is contained in the gas after the operation. The author suggests that a silver carbonyl is formed and dissociated, furnishing in the first place carbon and silver oxide, the latter of which then reacts with carbon monoxide, forming carbon dioxide and silver.—J. T. D.

Cupreous Pyrites; Extraction of the Copper of ——, by Conversion into Chloride. J. Delplace. Monit. Scient. 1900, [1], 14, 806—808.

The employment of pyrites or other sulphide ores containing recoverable quantities of copper or other valuable metals, has now become a general rule in the manufacture of sulphuric acid. The most convenient method of extracting these metals from the roasted ore is by their conversion into chlorides. This is effected by driving off the sulphuric acid and sulphur trioxide from the ferric and ferrous sulphates, causing the acid products to react with the proper quantity of sodium chloride and liberating hydrochloric acid and chlorine, which then convert the copper or other metals into soluble chlorides, which can be washed away from the oxides of iron. Naturally, this reaction is mainly dependent on the temperature employed. The author has designe furnace which works continuously in a very simple mann The mixture is fed in at the top and falls on to a series shelves; as it travels it reaches a maximum temperature conducting the flames horizontally in a closed space betw the second and third shelf; the gases of combustion then caused to heat the sides of the upper parts of furnace where the conversion into chloride commenc The advantages of this furnace are that the stoking is k constant and there is no necessity to intensify or moder the heat at certain stages; moreover, the mineral is k all the time in a chlorinating atmosphere.—J. F. B.

Pyritic Smelting and Hot Blast. S. E. Bretherton. Eng. and Mining J. 1900, 70, [26], 760.

The author enumerates the advantages of pyritic smelt with hot blast, over ordinary lead smelting, and t discusses the question of the automatic heating of the b by the waste heat of the furnace and furnace produ Most of the inventions in this direction are based on utilisation of the heat escaping from the fumes of furnace, by means of coils of pipes, placed at some dista above the feed floor of the furnace. The author po out, however, that if a furnace be properly fed and oper so as to prevent volatilisation of the precious metals, th should be very little heat above the feed floor. Atten have also been made to utilise the waste heat of the mo slag, but the methods which have been proposed su from the defect that the fumes from the slag are dri back into the furnace again, with the result that an im blast enters the furnace, with a great portion of the oxygen already removed. The author claims that he solved the problem of heating the air blast to a suffic degree to prevent chilling, without any additional cost operation, by means of the Bretherton hot-blast appar (see this Journal, 1900, 51 and 539). It is stated that the most recent arrangement of this apparatus, ther utilised not only the small amount of heat which ca saved practically, above the feed floor, but also the w heat from a large enclosed settler for the matte.—A. S.

Rhodium Alloys. Roessler. Eng. and Mining J. 19 70, [24], 696.

The author states that rhodium appears, in some case have been confused with iridium. Neither of these m forms a real alloy with silver. If 5 mgrms. of rhodium fused with 1 grm. of silver, melted in lead, the reg resulting from cupellation is not bright as with silver dim grey. On dissolving the grain in nitric acid, the film disintegrates and separates from the solution i form of glittering scales, which consist of hexagonal cry of pure rhodium. With larger proportions of rhodium latter is afterwards re-obtained in the amorphous Iridium behaves in a similar manner. Platinum ap to form a compound with silver, and when an alloy taining only a small proportion of platinum is treated nitric acid, some of the platinum passes into solution the excess. Also, the platinum residue is found to become oxidised and soluble in hydrochloric acid. Rho and gold appear to form a true alloy, which dissolv *aqua regia* with a darker colour than gold alone give. The author also prepared alloys of rhodium bismuth, tin, and antimony, by heating the metals for time above their melting points. Bismuth takes maximum of 5 per cent. of rhodium. When the exce bismuth is removed by cold nitric acid, crystals of remain behind, which are themselves soluble in b nitric acid.—A. S.

Crude Zinc; Theory of the Method for removing from ——. E. Heyn. Berg- u. Hüttenm. Zeit. 59, through Chem. Zeit. Rep. 1900, 24, [104], 381.

Zinc and lead, when melted together, form two d layers, the composition of which varies with the te ature. Thus at 600° C. the lower layer contains 1 cent. of zinc and 85 of lead, while in the upper the p tions of zinc and lead are 95 and 5 respectively; temperature falls the two layers approach more and ly to pure lead and pure zinc, until at 420°, which is above the melting point, the upper layer contains only per cent. of lead and the lower only 6·5 per cent. of So that, by allowing zinc containing 4 per cent. of to stand for a time at a temperature of 420° C. it is ible to reduce the proportion of lead to 1·5 per cent., h is the utmost limit of purification by this method. In tice the conditions are rather more complicated owing e presence of iron, which causes the formation of a l layer.—T. H. P.

Solid Solutions of Mixtures of Three Substances.
G. Bruni.

See under XXIV., *page* 160.

eel ; Rapid Determination of Carbon in ——. R. Job
and C. T. Davies.

See under XXIII., *page* 156.

last-Furnace Gases ; Use of ——, *in Gas Engines.*
T. W. Richards.

See under II., *page* 108.

Bismuth ; Volumetric Determination of ——.
G. Frerichs.

See under XXIII., *page* 156.

per : Determination of Oxygen in Commercial ——.
M. Lucas.

See under XXIII., *page* 157.

PATENTS.

: Manufacture of Tool ——, *and the Tools there-n.* O. Imray, London. From J. S. Hay, Homestead, , U.S.A. Eng. Pat. 13,260, July 23, 1900.

claim is for treating self-hardening steel by heating it temperature between 1,050° and 1,150° C., for the se of providing it with greater durability and enabling withstand the heat of cutting as a tool, according to llowing method :—The steel, of approximately the of the tool or projectile, which may contain manganese ungsten or molybdenum or tin, chromium, nickel, &c., ted, with exclusion of air by placing it in a muffle or ug it with lime, &c., to about 1,110° C., for a period ently long to get uniformly heated, and is allowed to r is plunged into an oil bath. It is then tempered, red, and ground.—A. W.

Process of Puddling ——. J. P. Roe, Pottstown, U.S.A. Eng. Pat. 18,425, Oct. 16, 1900.

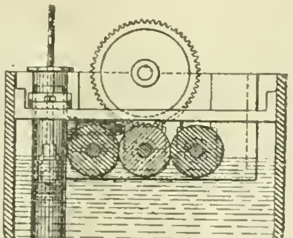
nixed charge of molten cast iron and cinder is made w backwards and forwards in the presence of hot and the flow arrested abruptly before each change of ion until the "iron comes to nature," the operation repeated until the particles of purified iron are "com-d and solidified in a mass." This is accomplished on rth suitably mounted on trunions, with walls, roof, chimney and discharge door at both ends, the whole oscillated by any suitable mechanism. The hot are supplied through the trunions from fire chambers h side.—A. W.

and Silver ; Apparatus for Precipitating ——, *from r Solutions.* A. James, London. Eng. Pat. 3421, b. 21, 1900.

pparatus is an enamelled iron vessel containing a of compartments, each fitted with means of inflow utflow by partition walls and false bottoms, so that lution rises up through the precipitating agent in compartment and overflows down spaces between to the bottom of each in turn. The interior of the may be completely enamelled or only partially so, t the parts which come into contact with the itating metal or agent. (This Journal, 1900, 541.)
—A. W.

Tin Plate ; Manufacture of ——, *and Apparatus therefor.* O. Imray, London. From W. H. Rogers, Wheeling, and J. A. Beaver, Bellefonte, both in U.S.A. Eng. Pat. 1221, Jan. 19, 1900.

(1) In the rolling of the bars into black plate, the combination is claimed of a roughing train and a finishing train of rolls, a heated car for transferring the plates between them, and a heating furnace into which the car is run if necessary, the plates being piled on a bed of coke in the car, to which an air-blast is admitted, whereby they are kept at a cherry-red heat and protected from oxidation. (2) The combination of a finishing train, a carrier to receive the packs, which consists of an endless chain conveyor, and a re-heating furnace, through which the carrier passes with the packs over a body of hot coke. (3) The apparatus for cleaning, oiling, and tinning the plates. The cleaning apparatus consists of a drum horizontally revolving on a central shaft, to which is fixed radial arms with vanes or wings so arranged as to form the interior of the drum into segmental chambers or compartments. The lower half is enclosed in a semi-cylindrical vessel. As the drum slowly revolves, the sheets are fed into the upper compartments, supplied with an abrading powder, so that, by rubbing one over the other with the powder while travelling down and up again, they are cleared of loose scale. The oiling apparatus is of similar construction, but the lower half of the drum dips into oil contained in the outer vessel, the remainder of the scale being hereby rubbed off. The plates are passed from this to a similar rotary tinning apparatus, with suitable gearing for rotation, wherein they rapidly receive their first coating. (4) The process of rolling the plates, pressing the pack of plates by a hydraulic press, and shearing into the right lengths previous to placing in the cleaner. (5) The method of cleaning the plates by rubbing them together with an abrading material, such as magnetic oxide, emery, &c. in the manner described. (6) and (7) In the second and final coatings of tin, the pot of molten tin with rollers arranged side by side within the pot, rubbers above and below in line with their passes, and a spring-supported tray below the rollers for receiving the sheets and lifting them up to the rollers again for withdrawal after they are released from the downward bite. Also, the final grease pot provided with rollers near the top, and with a pump arranged to raise molten tin from under the grease, in the lower part of the pot, and pour it over the rollers, if desired, to remedy any imperfection in a sheet during the greasing operation.



The accompanying drawing illustrates this part of the apparatus. The valves of the pump are ball valves, not affected by molten tin, and the metal is returned to the rollers through the spout indicated.—A. W.

Sulphide Ores containing Lead and Zinc ; Treatment of Mixed ——. G. E. Davis and A. R. Davis, both of Manchester. Eng. Pat. 2089, Feb. 1, 1900.

The following operations are claimed in combination as the process for treating the mixed sulphide ores. Dissolving the ores in hydrochloric acid ; saturating any residual free acid in the liquor therefrom with oxide of zinc ; oxidising any iron therein to the ferric state ; precipitating ferric hydrate with oxide of zinc; precipitating silver from the solution as iodide by the Claudet process; removing the lead by means of oxide of zinc and carbonic acid gas (this Journal, 1901, 47); concentrating the residual solution of chloride of zinc, for use as such, or precipitating the zinc therefrom for use as oxide; the treatment of the residue from the first operation with acid by dissolving out the lead chloride therein with hot water and recovering it as such or as carbonate, extracting the silver with ammonia or thiosulphate of sodium, re-roasting the residue to convert the remaining zinc sulphide into oxide, which is then used for saturating the free acid in the original solution from the first ore treatment; and finally utilising the sulphuretted hydrogen, evolved during the dissolving of the ore, for vitriol making or sulphur recovery by Claus's method.

The modification of this process is also claimed which consists of dissolving about three-fourths of the sulphide of the ore in hydrochloric acid, the lead sulphide being more readily attacked than the zinc, and of roasting the remaining one-fourth into a crude oxide of zinc, which may be used for the purpose of saturating the free acid already mentioned.—A. W.

Sulphide Ores [*Zinc, Lead*]; *Treatment of Complex* ——. H. F. Kirkpatrick-Picard, London. Eng. Pat. 2151, Feb. 2, 1900.

The finely-ground ore is roasted into the form of oxides, with a minimum amount of sulphates, by mixing in a little coal slack at the end of the first roasting; it is then mixed with charcoal or carbonaceous material, together with a binding agent, and the zinc distilled off, the lead being also reduced and left in the residual carbon sponge. The roasted ore may be mixed with a suitable carbonaceous material which will itself coke into coherent masses or into briquettes, to be afterwards treated in a distilling furnace. —A. W.

Aluminium or its Alloys; Coating of ——. H. H. Lake, London. From A. G. Betts, Lansingburgh, U.S.A. Eng. Pat. 20,142, Nov. 8, 1900.

The surface of the aluminium or other metal to be coated is treated with a fused salt of the coating metal, whereby the film of alumina is removed and perfect contact of the metals obtained. The coating may be effected by sprinkling a layer of a dry fusible salt, such as, for instance, cuprous chloride, on the aluminium surface, and heating the whole until the coating is evenly deposited, or by dipping the metal into the fused salt, &c. The coating can be reinforced by the electro-deposition of a further quantity of metal, which becomes firmly adherent. Extra claims are made for a body of aluminium having a finely adherent copper coating chemically deposited as described, and for the same result with a subsequent coating of metal electro-deposited on the first coating.—A. W.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

Water; Electrolysis of ——, *on the Large Scale.* O. Schmidt. Zeits. für Electrochem. 1900, **7**, [20], 295—298.

The author describes an apparatus for the electrolysis of water on the large scale. In appearance the apparatus is very much like a filter-press. It consists of single double-pole iron electrodes arranged in series. Between these are placed sheets of asbestos cloth in order to prevent the two gases from mixing. Rubber solution is applied to the edges of the cloths for insulation and to keep the press tight when screwed up. The electrolyte, consisting of a solution of potassium carbonate (as free as possible from chlorides and sulphates, since these would cause corrosion of the iron) is supplied through a channel at the bottom of the chambers and completely fills them. The gases, oxygen and hydrogen, which are liberated on electrolysis, rise to the top of the chambers, and are carried off through separate channels provided in the top corners of the plates. The evolution of the gases causes a circulation of the electrolyte, and since the apparatus is complete filled with the electrolyte, a collection of the gases in tl chambers and the danger of mixing is thereby avoided.

The E.M.F. required per cell is about 2·5 volts instei of 1·44 according to Thomson's theorem. The ampèr hour yield is nearly 100 per cent., and in practice ea kilowatt-hour produces 168 litres of hydrogen and 84 litr of oxygen. This corresponds to about 54 per cent. of t theoretical yield.

As regards the purity of the gases obtained, the hydrog generally contains about 1 per cent. of oxygen, and t oxygen about 2 per cent. of hydrogen.

If the gases are not for immediate use they are conduct to gas holders, and are then compressed into steel cylinde The power required to compress the gases up to 150 atm spheres is about 5 per cent. of that required for th generation. The weight of the cylinders averages abo 10 kilos. per cubic metre of gas. The question of freig therefore, becomes a serious item when the gases have be sent any distance.

Electrolytic gas is already used in some accumulat works for soldering purposes.

The author is of opinion that hydrogen, if burned in modified form of Welsbach burner, may compete w acetylene as an illuminant. According to his calculatio one normal candle hour costs 0·059 centime in the case acetylene, and 0·025 centime in the case of the hydrog light. The great disadvantage appears to be the wei of the steel cylinders. Compressed hydrogen sufficient produce one normal candle hour weighs about seven or n times as much as the equivalent of calcium carbide.

Originally the author employed hydrogen burners wh worked with hydrogen under very low pressure, and wh consumed a large quantity of the gas. In an impro burner the pressure is half an atmosphere, giving 100 nor candle power for 25 litres of hydrogen per hour. If t is confirmed, the hydrogen light will also compete w Nernst's new incandescent lamp. One kilowatt-hour gi in the case of the Nernst lamp, 666 candle-hours 1·5 watts per candle), and in the case of the electrol hydrogen apparatus, 168 litres of hydrogen correspond to 672 candle-hours.

For ordinary lighting purposes it is improbable that method of lighting will come into general use, but it r with advantage be used in electrolytic works where la quantities of hydrogen are generated.—J. S.

Bleaching Apparatus; Electrical ——, *of Haas Oettel.* F. Oettel. Zeits. für Elektrochem. 1900, [21], 315—320.

Two modifications are described. The first and older f of electrolyser consisted of a rectangular box (mounted trunions for convenience of emptying and cleaning), divi into the required number of cells by means of double- electrodes. All the electrodes, with the exception of terminal negative electrode, are built up of prep carbon plates, which are inserted into vertical slots c the sides of the box. The negative electrode consists lead plate. The size of the electrodes in any apparat so arranged that the current density will be 1,000 amp per square metre. Each of the intermediate electrodes r on a low non-conducting diaphragm, and is also prolo above the level of the electrolyte by a similar diaphrag that the whole of the carbon electrodes are submerge the salt solution. The salt solution, which must be as fr possible from lime, enters the cell at one end of the ele lyser, flows into the second cell through a passage prov near the bottom of the diaphragm separating these two thence into the top of the third cell, and so on.

The second form of electrolyser is constructed a series of cells similar to the above. The box containin the cells, however, is placed inside a larger box, and no p sion is made for the flow of the electrolyte through ea the cells successively. Instead, the electrolyte, whi contained in the larger box, is made to flow into the bo of each cell simultaneously and to overflow at the This is accomplished simply, and without any mecha by making a channel between the bottom of each cell the outside containing box. The hydrogen which is ev in the narrow cells produces the required circulation o lectrolyte. The salt solution in each cell is thus carried pwards, and overflows into the outer chamber, whilst fresh r less highly electrolysed salt solution is drawn in through ie channel at the bottom.

The first of these cells was designed to produce three ubic metres of bleaching liquor in 10 hours, the liquor to ontain 3 grms. of active chlorine per litre. The electric nergy required was 45—50 ampères at 110 volts. Each lo. of bleaching chlorine thus required 7·5—8·3 horse-ower-hours; the density of the salt solution being 4°—6° . In practical working no special cooling is required, the rate of flow of the salt solution through the electrolyser being controlled by means of two thermometers, one placed at the inlet and the other at the outlet.

The second form of electrolyser was designed to meet the demand for a bleaching liquor containing 5, 8, or even 10 grms. of active chlorine per litre. In this case a stronger salt solution is employed, and a cooling system is arranged in the outer chamber containing the bulk of the electrolyte.

The following table gives the results of a test made on the second form of electrolyser in operation at the bleaching works of S. Wolle, in Aue, Saxony:—

Constants of the Electrolyser.

Number of cells	28	Volume of liquor	840 litres.
Current	60 ampères.	Density of liquor	15° B.
Voltage	115 volts.		

Time in Hours.	Temperature, Centigrade.	Current.	Voltage.	Horse-power-Hours.	Active Chlorine.		Percentage Current Yield.	Horse-power-Hours per Kilo. of Active Cl.
					Grms. per Litre.	Total Quantity in Kilos.		
	°							
1	17	61	116	9·6	2·55	2·14	95·0	4·48
2	22	63	116	19·5	4·59	3·85	82·4	5·07
3	23	62	115	29·2	5·90	4·95	72·1	5·90
4	23	61·5	116	38·9	7·41	6·22	68·2	6·26
5	23	62	117	48·8	8·82	7·41	64·8	6·60
6	23	61	117	58·5	10·50	8·82	61·9	6·64
7	23	62	117	68·4	11·22	9·43	59·1	7·25
8	23	61	117	78·1	12·30	10·32	56·7	7·56
9	23	61	117	87·8	13·35	11·21	54·8	7·82
10	23	61	117	97·5	14·31	12·00	52·8	8·11

This table clearly shows that the cost of production of the ive chlorine increases as the concentration of the active lorine rises. In other words, the same quantity of active lorine can be more cheaply produced if a strength of grms. per litre will suffice than if the strength must be reased to 6 or 10 grms. per litre.

The author is unable to give any general figure which uld represent the cost of producing 1 kilo. of bleaching lorine, since the price of salt and electric energy vary siderably in different localities. He points out, however, t the cost of the above plant is 2,500 marks, and that rcely any labour is required.—J. S.

eaching Apparatus; Electrical ——. V. Engelhardt. Zeits. für Elektrochem. 1901, **7**, [27], 390—396.

TTEL (see preceding abstract) compared the above table h a similar one representing a test on a Kellner bleach- apparatus, and stated that, independent of the lower ial cost, the Haas and Oettel electrolyser worked more ciently than the Kellner electrolyser, both as regards rent yield and energy yield, and that the greater con-mption of salt in the Haas and Oettel apparatus was re than balanced by the lower consumption of energy.

The author takes exception to this statement, and maintains t on every point the Kellner apparatus is superior to the Haas and Oettel apparatus, and that the two series of tests are not comparable. The electric energy consumed in an electrolyser depends on the concentration of the salt solution employed, and whilst the concentration in the test of the Haas and Oettel apparatus was 18·65 per cent., that in the Kellner test referred to was only 10 per cent. At the latter concentration more electric energy was required per kilo. of active chlorine, but Oettel's statement that the greater consumption of salt was more than balanced by the lower consumption of energy is entirely misleading.

In order to obtain a bleaching liquor containing approximately 1 per cent. of active chlorine, the cost per kilo. of the active chlorine in the two plants can easily be calculated for different prices of salt and electric energy. For this purpose, it is necessary to select from the tests the figures corresponding to a bleaching liquor containing as nearly as possible one and the same amount of bleaching chlorine. For a 1 per cent. solution the corresponding figures are:—

Haas and Oettel.—18·65 per cent. NaCl; 10·50 grms. Cl per litre and 6·64 h.p.-hours per kilo. Cl.

Kellner.—10 per cent. NaCl; 10·44 grms. Cl per litre, and 9·95 h.p.-hours per kilo. Cl.

If different prices be assumed for salt and electric energy, corresponding to different localities, the cost of 1 kilo. of active chlorine works out as follows:—

——	Haas and Oettel.		Kellner.	
		Pfennige.		Pfennige.
rage prices of salt and energy	18.65 kilos. NaCl at 1.6 pf. 6.64 H.P.H. at 2 pf.	29.84 13.28	10.00 kilos. NaCl at 1.6 pf. 9.95 H.P.H. at 2 pf.	16.00 19.90
	Total	43.12	Total	35.90
pensive salt and expensive energy	18.65 kilos. NaCl at 3 pf. 6.64 H.P.H. at 5 pf.	55.95 33.20	10.00 kilos. NaCl at 3 pf. 9.95 H.P.H. at 5 pf.	30.00 49.75
	Total	89.15	Total	79.75
ap salt and cheap energy	18.65 kilos. NaCl at 1.6 pf. 6.64 H.P.H. at 1 pf.	29.84 6.64	10.00 kilos. NaCl at 1.6 pf. 9.95 H.P.H. at 1 pf.	16.00 9·95
	Total	36.48	Total	29.95
ap salt and expensive energy	18.65 kilos. NaCl at 1.6 pf. 6.64 H.P.H. at 5 pf.	29.84 33.20	10.00 kilos. NaCl at 1.6 pf. 9.95 H,P.H. at 5 pf.	16.00 49.75
	Total	63.04	Total	65.75

In all the instances except the last, the cost of 1 kilo. of active chlorine is cheapest in the case of the Kellner plant. The author points out that in the last instance the prices are abnormal, and that even in this instance the Kellner plant would again work more economically by slightly increasing the concentration of the salt solution, which would at the same time, just as is the case with the Haas and Oettel plant, reduce the amount of electric energy required.

Owing to the fact that the Kellner apparatus works with a current density about ten times as great as in the Haas and Oettel apparatus, the author maintains that for large installations the Kellner apparatus is cheaper than the other, and that even for small plants there is no important difference in the original cost of the plant, although platinum is used in its construction.—J. S.

Chromic Acid: The Electrolytic Regeneration of ——, and the Manufacture of Acid-proof Diaphragms. M. Le Blanc. Zeits. für Elektrochem. 1900, 7, [20], 290—295.

THE author refers to the electrolytic regeneration of chromic acid (this Journal, 1899, 685 and 1124), and points out that the chief difficulty which was encountered, before this process could be worked on a large scale, was the manufacture of large diaphragms capable of resisting the combined action of sulphuric and chromic acids. This has now been accomplished. The diaphragms, after firing, contain about 25 per cent. of Al_2O_3 and 75 per cent. of SiO_2. Up to the present the largest plates which have been made measure 72·5 × 97·5 cm. whilst cylindrical diaphragms measure 75 cm. in length and 31 cm. in internal diameter. The thickness of the diaphragms varies according to the size, but is usually between 4—7 mm. The resistance of these diaphragms is very low. If a divided cell be constructed with a diaphragm 5 mm. in thickness, and with electrodes of the same size as the diaphragm, then it will, when charged with 10 per cent. sulphuric acid at 20° C., cause a drop of only 0·15 volt with a current density of 200 ampères per square metre. No increase of resistance was noted after a diaphragm had been continuously in use for two years.

—J. S.

Lead Persulphate. K. Elbs and F. Fischer. Zeits. für Elektrochem. 1900, 7, [22], 343—347.

A FAIRLY large glass vessel and an earthenware cell suspended in it are filled with pure sulphuric acid of sp. gr. 1·7—1·8. In the outer vessel are placed two bright lead plates to act as anodes, whilst the cathode consists of a spiral of lead tubing placed in the inner pot. A stream of water is passed through the spiral from time to time, in order to prevent the temperature in the outer or anode compartment from rising above 30° C. During the electrolysis the current density should be from 2 to 6 ampères per square decimetre. As a rule a white turbidity of crude lead persulphate, $Pb(SO_4)_2$, appears in the anode compartment, and gradually settles on the bottom, whilst the acid becomes of a pale greenish-yellow colour, due to the presence of dissolved persulphate. When the lead persulphate is being formed properly, the anodes remain perfectly bright, and if brown spots of peroxide appear on them they must be withdrawn, washed with an acidified sodium nitrite solution, rubbed dry with sand, and again replaced. After some hours the porous pot and the electrodes are removed. The anode liquor, together with the deposited mud, are then poured into a bottle and tightly stoppered up. After some days most of the lead persulphate will have settled out on the bottom. Sometimes the walls and the surface are covered with considerable quantities of the salt in a granular form. The current yield averages about 60 per cent. of the theoretical. The salt, dried in the desiccator on porous plates, usually contains 60—85 per cent. of the persulphate, the remainder being lead sulphate. The granular crusts formed on the sides and surface sometimes contain 85—99 per cent. of the persulphate.

Lead persulphate is a white or faintly greenish-yellow powder, apparently crystalline, and slightly soluble in concentrated sulphuric acid or pyro-sulphuric acid, to which it imparts a pale greenish-yellow colour. At 30 C. 100 c.c. of concentrated sulphuric acid dissolve about 0·345 grm. persulphate, together with 0·030 grm. lead sulphate. solution, however, may not contain the persulphate as but the compound $H_2Pb(SO_4)_3$, corresponding to the potassium lead persulphate (potassium plumbisulpl $K_2Pb(SO_4)_3$.

Water instantly decomposes the persulphate into sulp acid and peroxide of lead or its hydrate. Dilute sulp acid also decomposes it, but more slowly. Sulphuric of sp. gr. 1·80 has no action on it at the ordinary tem ture, but at 100° C., oxygen is evolved according t equation $Pb(SO_4)_2 = PbSO_4 + SO_3 + O$.

Concentrated hydrochloric acid dissolves the salt, for a yellow solution containing lead tetrachloride. Ad of potassium or ammonium chloride to this solution duces yellow crystals of potassium or ammonium pl chloride. Glacial acetic acid also acts on the salt, lead acetate.

Lead persulphate is a powerful oxidising agen dissolves in 20 per cent. caustic soda, and is reprecipitat neutralisation as a reddish brown voluminous precip On exposure to the air this precipitate is finally com into peroxide of lead.

The potassium, ammonium, rubidium, and caesium bisulphates (persulphates) have been prepared. The pure yellow salts scarcely soluble in sulphuric ac sp. gr. 1·7, more soluble in stronger acid, and fairly r soluble in fuming acid.

The aniline, dimethylaniline, and diethylaniline pl sulphates have also been prepared.

The existence of lead persulphate may possibly ha important bearing on secondary batteries. If the mass of the plate be not sufficiently porous, or if too a charging current be employed, the specific gravity acid in the interior of the positive plate may exceed When this happens the lead persulphate is stable, an go into solution as if a soluble anode were emp Lead persulphate acts on lead thus :—

$$Pb(SO_4)_2 + Pb = 2PbSO_4;$$

but it also acts on the more dilute acid which gra diffuses towards it, liberating peroxide of lead in a gela condition. The result of these two reactions woul corrosion of the lead framework and a rapid destruc the positive plates.—J. S.

Nitro - Compounds; Electrolytic Reduction of — A. Rohde. Zeits. für Elektrochem. 1900, 7, 32 and 338—341.

Elbs and others (this Journal, 1898, 1137 and described a method for the electrolytic reduction of compounds and some typical examples. The autho the results which he obtained on reducing certain bodies.

I. *m* - Nitro - dimethylaniline gave 93 per cent. theoretical yield of tetramethyl-*m*-diamidoazobenzen further reduction this gave the corresponding hy compound.

II. Dimethyl-*m*-nitro-*o*-toluidine gave 86 per cent. theoretical yield of tetramethyl-*m*-diamido-*p*-azotolue the corresponding hydrazo-compound on further red

III. *m*-Nitro-monomethylaniline gave up to 85 per the theoretical yield of dimethyl-*m*-diamidoazobenze the corresponding hydrazo-compound on further red

IV. *p*-Nitro-dimethylaniline did not yield an a pound. Löb (this Journal, 1899, 486) states that cent. of the azo-compound was obtained from this sul The chief product obtained by the author was *p*-a methylaniline.

V. Benzoyl-*p*-nitro-diphenylamine gave *p*-azoxyb diphenylamine when ammonium acetate was added cathode electrolyte instead of the usual sodium acet when the sodium carbonate solution round the anc replaced by amonium carbonate. At a higher temp in a strongly alcoholic solution benzoyl-*p*-azodiphen was obtained.

VI. *p*-Nitro-diphenylamino gave 70 per cent. theoretical yield of *p*-amidodiphenylamine sulphate of an azo-compound.

VII. *p*-Nitraniline gave 86 per cent. of the theoretical eld of *p*-phenylenediamine, whilst the *o*-compound gave a) per cent. yield of the corresponding o-phenylenediamine.

VIII. α-Nitro-β-naphthyl-ethoxide, reduced in the usual anner gave α-amido-β-naphthyl-ethoxide, whilst when nmonium acetate was substituted for sodium acetate a ompound was obtained which the author considers to be -azoxy-β-naphthyl-ethoxide.—J. S.

enzidine; Electrolytic Production of ——. W. Löb. Zeits. für Elektrochem. 1900, **7**, [20], 300—304; [21], 320—328; and [22], 333—338.

ENZIDINE is best prepared by the electrolysis of an acid lution of azobenzene or azoxybenzene.

Starting from azobenzene the best results were obtained ıder the following conditions:—

Electrolyte { 8 grms. azobenzene.
150 c.c. alcohol.
20 grms. sulphuric acid.

Cathode, nickel-wire gauze, 5 × 10 cm.
Current density, 0·9 ampère per 100 sq. cm.
Ampère hours, 7 (instead of 2·21 theoretically necessary.
Temperature, 23° C.
Platinum anode employed.

The yield was as follows:—

9·9 grms. benzidine sulphate = 80 per cent. of the theoretical.
Traces of unchanged azobenzene.
0·3 grm. aniline.
0·25 grm. diphenyline.

Azobenzene is formed during the electrolysis of an kaline solution of nitrobenzene in alcohol under the nditions given by Elbs (this Journal, 1898, 1137), so that is possible to start from nitrobenzene and electrolyse til the maximum quantity of azobenzene is formed. After idifying this solution with sulphuric acid benzidine sulate may then be obtained as above.

Azoxybenzene may be obtained from nitrobenzene in a nilar manner. The author electrolyses 10 grms. of nitronzene suspended in 80 c.c. of a 2—4 per cent. alkali or kali-salt solution in a divided cell, using a mercury or kel cathode. A platinum anode is employed, the anode mpartment being charged with a dilute solution of sodium lphate. Seven ampère-hours are sufficient for the reducn of above quantity of nitrobenzene, instead of 6·57 eoretically necessary. The oily cathode liquor furnishes oxybenzene corresponding to a 90 per cent. yield.

Benzidine sulphate is obtained from azoxybenzene in the me way as from azobenzene, except that twice as much rrent is required. On electrolysing a solution containing grms. of azoxybenzene, 150 c.c. alcohol, and 20 grms. of ncentrated sulphuric acid, 80—82 per cent. of the theoical yield of benzidine is obtained.

The results are summarised as follows:—

1. During the electrolytic production of benzidine in d solution the velocity of the intramolecular change of intermediate product, hydrazobenzene, can be brought o a definite proportion to the velocity of reduction. It is is possible to ascertain the conditions under which drazobenzene, immediately after its formation and theree in very dilute solution, is converted into benzidine and production of diphenyline reduced to a minimum.

2. In attempting to obtain benzidine by the reduction of robenzene direct in acid solution the yield is very largely ered, owing to the intermediate phases and their products, efly phenylhydroxylamine.

3. Azo- or azoxybenzene must therefore be selected as starting point for the reduction in acid solution. A od yield of both of these substances can be obtained by electrolysis of an alkaline or alkali-salt solution, and s, on further reduction in acid solution, gives about 80 per nt. of the theoretical yield of benzidine.

4. During all these electrolytic operations the best results re obtained by the use of mercury cathodes. Another portant condition for the success of the experiment, ecially as regards the current yield, is the efficiency of stirring arrangement.—J. S.

Caustic Soda and Chlorine; Manufacture of ——, *by the Electrolysis of Sodium Chloride.* Cohn and Greisenberger.

See under VII., *page* 123.

Chloroform; Electrolytic Preparation of ——. Rev. Prod. Chim. **3**, [20], 309.

See under XX., *page* 149.

Calcium Carbide; Manufacture of ——. J. B. C. Kershaw.

See under II., *page* 108.

PATENTS.

Electric Primary and Secondary Batteries. A. de Castro and H. W. Schlomann, Berlin, Germany. Eng. Pat. 3192, Feb. 17, 1900.

To render batteries as light as possible they are mainly composed of suitable material impregnated by a process described in Eng. Pat. 2703, Feb. 10, 1900. The outer receptacle of the battery is formed of sailcloth or other suitable material, impregnated with copper or other active substance to form the negative pole, and there is an inner receptacle made of the same material, and impregnated with zinc or other active substance, which forms the positive pole. Different forms of cell and methods of arranging them are shown.—G. H. R.

Anodes in Electrolytic Apparatus; Impts. in Features for the ——. W. P. Thompson, London. From H. Becker, Paris, France. Eng. Pat. 3524, Feb. 22, 1900.

THE anode container and connecting device comprise a case with perforated non-conducting sides, enclosing the scrap metal to be electrolysed, to which a current is led by means of conductors of suitable form (bars, plates, gratings, or the like), so as to distribute current throughout the scrap metal on which it is intended to act. Current-distributing conductors consisting of metal bars bear other vertical bars which are inserted among the scrap metal, or the conductor may consist of two bars sliding on each other, and bearing other vertical bars which are inserted among the scrap metal, and press it between them.—G. H. R.

Insulating Material; Application of Steatite to Electrical Purposes as an ——. F. de Mare and E. Frémy, Brussels, Belgium. Eng. Pat. 3762, Feb. 27, 1900.

STEATITE may be used to make electrical insulators, the pieces being either formed from the solid, or, when large dimensions are necessary, they may be made in moulds, the steatite being very finely powdered, and brought by a process of compression and baking into a suitable condition for the purpose. An arrangement is claimed for insulating pieces made of steatite, combined for the purpose of protecting by electrical insulation a conductor having to carry a current of very high tension (such as one produced by induction coils) through metallic substances at either high or low pressure. Two pieces of steatite are screwed together like a sheath, within which is placed a tube of thin glass or steatite, to prevent loss by flaws, and to increase in every case the electrical power.—G. H. R.

Amines from the Corresponding Nitro-Compounds; Production of ——. G. W. Johnson, London. Eng. Pat. 4175, March 5, 1900.

See under IV., *page* 118.

(*B.*)—ELECTRO-METALLURGY.

Aluminium as an Electrical Conductor, with New Observations upon the Durability of Aluminium and other Metals under Atmospheric Exposure. J. B. C. Kershaw, Inst. of Elect. Eng. 1901; through Electrician, 1901, **46**, [13], 464—466.

TAKING the relative specific gravities of aluminium and copper as 2·68 and 8·93, the conductivities as 59 and 100, and the prices as 224*l.* and 91*l.* per ton, the relative values of the two metals for conductivity purposes is Al:Cu = 1,000 : 798; but with aluminium at 135*l.* per ton, for which the metal has been sold for large orders in America, the ratio is 1,000 : 1,325; so that aluminium is the cheaper. It is noted that 170*l.* per ton has been quoted for large orders of the wire in this country. Bare aluminium transmission lines have been and are used in many places (named) in America, but in no case is it proposed to use it for insulation-covered conductors. Soldered joints have been made in one or two places, but usually mechanical jointing is relied upon. The author has exposed to the atmosphere two sets of wires, stretched horizontally and separately (2 ft. long) on glass supports in a wooden frame; one of these sets was at St. Helens, the other at Waterloo, near Liverpool. Each set consisted of an aluminium, a galvanised iron, a plain copper, and a tinned copper wire; and was exposed for 10 months (October 1899 to August 1900). At the end of this period the Waterloo set showed the following results:—Aluminium was pitted, especially where water-drops had collected on the under side, and had *gained* 0 to 0·55 per cent. in weight; galvanised iron showed no change in appearance and had *lost* 0·15 per cent. in weight; copper, plain and tinned, had oxidised on the surface, but not corroded; the weight was unaltered.

The St. Helens set were as follows:—Aluminium was badly pitted and very dirty, had gained 0·27 to 0·83 per cent. in weight; galvanised iron was badly corroded with zinc, partly eaten away, had lost 1·4 to 2·1 per cent. in weight; copper, plain or tinned, was quite black, and had lost 1·3 to 1·6 in weight. The conductivity of the aluminium wires fell, in the case of the St. Helens samples, from 51·3 to 46·6, whilst in the Waterloo specimens it was practically unchanged; the tensile strength also had fallen from 13 to 11·15 (St. Helens) and 12·06 (Waterloo) tons per sq. in. It is noteworthy that the original conductivity of the aluminium was said by the vendors to vary in two different wires supplied from 62 to 65, whilst it was actually found to be 51 and 54 per cent. It is therefore probable that the vendors' numbers were based on surmise and not on actual test. As the result of these observations it appears that aluminium is not suitable for overhead wires (especially for trolley lines) in any large town where much coal is burnt, either for domestic or for manufacturing purposes. Even in country districts or in small towns, where all the metals tried appeared to be fairly durable, the slight pitting of the aluminium might prove serious, owing to the opportunity thus afforded for the lodgment of small particles of foreign matter, which in time might lead to the disintegration of the whole.—W. G. M.

Tungsten and Molybdenum Alloys; Production of ——, in the Electric Furnace. C. L. Sargent. J. Amer. Chem. Soc. 1900, **22**, 783—791.

Mixtures of oxides with carbon were heated in scorifier-shaped crucibles of graphite, in some cases lined with magnesia, the voltage used ranging in different experiments between 65 and 100, and the ampèreage between 90 and 190, whilst the duration of the experiment varied between one and five minutes. The proportion of carbon employed, had a greater effect upon the character of the resulting metal than the current conditions adopted had. An attempt was made to decarburise the impure alloy by heating it in magnesia-lined crucibles, but the metal was converted into trioxide, whilst magnesium was volatilised. The conditions of each experiment made, are given, and the analyses and some of the physical characteristics of the alloys produced are quoted. It was not possible by co-reduction of oxides to prepare alloys of tungsten with metals of low boiling-point, as the metal was apparently volatilised before the tungstic oxide was reduced. Bismuth and manganese, each would alloy to some extent with molybdenum, but not with tungsten; copper, on the other hand, alloyed with tungsten, but not with molybdenum; whilst tin would not alloy with either. Cobalt, chromium, and nickel each alloyed with the greatest ease either with tungsten or molybdenum; and the resulting products, in the case of cobalt and nickel, may prove to possess a technical value if prepared in large quantities.—W. G. M.

PATENT.

Electroplating Pins and other Small Objects; Apparat for ——. E. Morrison, Latchford. Eng. Pat. 215 Feb. 2, 1900.

A tube of conducting material in electrical connection wit an external insulated conductor is mounted on the axle a perforated revoluble drum, from which it is insulate and which has a case or guard of non-conducting materi arranged round it so as to prevent its contents, such as pi or the like, from dropping or protruding through the perf rations, and without interfering with the free passage the solution through them. Radiating conducting strips pins for making electrical contact with the articles with the drum are mounted on the tube, so that they or oth parts of the apparatus do not themselves become plated. —G. H. R.

XII.—FATS, OILS, AND SOAP.

Oil of Akee; Notes on the ——. E. M. Holmes. Pharm. J. 1900, **65**, [1590], 691.

The author gives a description of the akee tree, which is native of the coast of Guinea, in West Africa, but h been cultivated for a considerable length of time in t island of Jamaica. The oil is said to be obtained from t arillus of the fruit, that is, the white or cream-colour fleshy substance surrounding the seeds. For a descripti of the characters of the oil, see following abstract.—A. S.

Oil of Akee; Characters of the ——. W. Garsed. Pharm. J. 1900, **65**, [1590], 691.

The sample of oil of akee examined consisted of a yello non-drying, butter-like fat at ordinary temperatures; it h a peculiar odour and an oily, somewhat unpleasant taste.

Akee Oil.

Specific gravity (water at 15·5° C. = 1)	0·857 at 99°—100° C.
Melting point	25°—35° C.
Solidifying point	20° C.
Hehner value	93
Saponification value	194·6
Reichert value	0·9
Hübl's iodine value	49·1
Acid value	20·1

Mixed Fatty Acids.

Specific gravity (water at 15·5° C. = 1)	0·8365 at 99°—100° C.
Melting point	42°—46° C.
Solidifying point	40°—38° C.
Saponification value	207·7
Iodine value	58·4

The mixed fatty acids distil unchanged at 220°—225° under 13 mm. pressure.

The oil-cake, consisting of the pressed seeds, contains 25 per cent. of oil, which can be extracted solvents.—A. S.

Alcohol for the Toilet Soap Industry; Denaturing – R. Hirsch. Chem. Ind. **23**, [23], 511—512.

On Oct. 1, 1900, the use of alcohol, to which 1 part castor oil and 0·4 part of solution of caustic soda been added per 100 parts, was sanctioned [in Germa for use in the manufacture of transparent soaps. concession is undoubtedly of great service to the t soap makers, but it seems doubtful if the denaturing adequate to prevent misuse of the alcohol so treated. second innovation, however, is the following:—Makers perfumes for export, who recover duty on the spirit export, are not allowed to use denatured alcohol in t factories. As, however, with few exceptions, all the man factories where perfumes are made for export are toilet soap factories, it is evident that the new regula places them under a serious disadvantage.—J. A. B.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

'hite Lead; New Process for the Manufacture of ——. R. Hitchcock. Eng. and Mining J. 1900, **70**, [23], 668.

: a new process for the manufacture of white lead, 'ented by J. W. Bailey, and now in operation in Jersey y, U.S.A., metallic lead is melted in a receptacle, vated about 10 ft. above the floor, and is run into a ond, smaller vessel placed over an independent fire, the ject of which is to enable the metal to be maintained at a rly constant temperature. At the bottom of the smaller sel is a short horizontal nozzle about $2\frac{1}{2}$ in. in diameter, minating in a thin plate of steel, which is perforated h about 150 or 200 minute holes, 0·009 to 0·010 in. in meter. The melted lead is forced by the hydrostatic ssure of its own mass through the minute perforations, l, as it falls through the air, becomes immediately dified into fine metallic fibres about 0·01 in. in diameter. e fibrous lead collects on an iron plate, from which it is nsferred to trays, which are made of wood, with slats at bottom, in order to allow of free circulation through m. The trays, when filled with the fibrous lead, are nersed momentarily in an 8 per cent. solution of (No. 26) tic acid, then allowed to drain for a few minutes on inclined platform, and immediately piled in stacks of 15 20 over openings in the floor, through which carbon xide gas enters. The carbon dioxide is used moist, but s important that the humidity should be maintained hin proper limits. The stacks of trays are kept at a form temperature of about 100° F. The corrosion is ed to be nearly uniform throughout each stack, and is nplete in three days, at the end of which period the con- s of the trays are thrown into water, where complete dis- gration takes place. The white lead "cream," which is in a fine and uniform state of subdivision that no grinding ecessary, is passed through a revolving wire screen, partly merged in water, and the pure white lead thoroughly hed and dried. The residual unchanged lead with some te lead attached, which remains on the screen, amounts about 8 per cent. of the lead used, and is in a finely ded condition suitable for the manufacture of lead nte and for other purposes. It is claimed that the te lead is equal in colour and body to the well-known mnitz product, whilst the size of the individual particles ated to be smaller and more uniform than is the case the white lead obtained by the Dutch process.

he total cost of manufacture is less than 5 dols. per ton ry product, whilst by the Dutch process it cannot be than 18 dols.

wo samples of white lead manufactured by the Bailey cess gave the following figures on analysis :—

——	I.	II.
	Per Cent.	Per Cent.
……………………	11·76	11·74
……………………	85·90	85·98
r ……………………	2·34	2·49

—A. S.

(*B.*)—RESINS, VARNISHES.

Resin resembling Shellac; New Brazilian ——. Theuius. Oesterr. Chem. u. Techn. Zeit. **18**, [22], 5.

AMPLE of a new resin, of Brazilian origin, examined he author was found to be of a yellowish-brown (liver) ur, transparent in thin layers (though slightly turbid contained water), and plastic on immersion in boiling r. Broken in the cold, it shows a highly lustrous ure; at 12°—15° C. it bends easily, without breaking; when melted by heat it first froths up, with liberation of vapours, and afterwards fuses to a clear, pale yellow-brown liquid, which resembles shellac on recooling. Cold strong alcohol dissolves it readily, forming a quick-drying solution, which leaves behind a lustrous varnish coating. It therefore appears suitable for replacing shellac and copal, and also as an adjunct to colophony for making sealing-wax. It is insoluble in oil of turpentine and other ethereal oils, even when hot.

At temperatures above melting point, the resin gives off gas and leaves a dense black residue of carbon. On distillation it froths up and yields an acid aqueous distillate, but no ethereal oil, and is finally decomposed into gas and carbon. It is soluble in a boiling solution of borax, the product behaving like a varnish on glass, leather, and wood. The solubility in caustic soda is less considerable, and a portion of the resin is deposited again on cooling.—C. S

PATENTS.

Linoleum or the Like; Manufacture of Coating Material for ——. J. S. Ammundsen and E. A. Rasmussen, Copenhagen. Eng. Pat. 11,526, June 25, 1900.

$36\frac{2}{3}$ parts of resin are melted with $18\frac{1}{3}$ parts of vegetable oil (drying or non-drying), mixed with about 45 parts of casein containing a certain proportion of lime, and incorporated with cork powder or the like. The resulting mass is formed into sheets and dried. The proportion of lime to casein varies from 8 per cent. for a very elastic product to 30 per cent. for a hard one; and either drying or non-drying oils are employed, according to the time available for finishing the material. The advantage claimed is the avoidance of linseed oil, which is expensive, and very slow in hardening. Eng. Pat. 4235, 1899, is referred to.

—F. H. L.

India-Rubber; Manufacture of Substances similar to ——. C. A. R. Steenstrup, Copenhagen. Eng. Pat. 17,475, Oct. 2, 1900.

4 to 8 parts of oil or oil refuse (preferably linseed oil) are melted in an open vessel, with constant agitation, with 1 part of rubber (old rubber cuttings, with or without bits of cloth), and the hot mass is strained or allowed to clarify by subsidence. It is then heated to 350° C. and stirred constantly for 4 to 12 hours, till it coagulates, when the bulk is taken out and cooled. It is suitable for insulating purposes, as a paint for iron, and as an ingredient in linoleum manufacture, &c.—F. H. L.

(*C.*)—INDIA-RUBBER, &c.

Caoutchouc; Togo ——. K. Schumann. Notizbl. d. kgl. botan. Gart. u. Mus. 1900, **3**, 78; through Chem. Zeit. Rep. 1900, **24**, [100], 367.

TOGO-CAOUTCHOUC is probably derived from a species of *Landolphia*, but the point is at present uncertain, owing to lack of material for identification. The natives remove strips of bark 5 cm. long and 2 cm. wide at distances of 40 cm., being careful to leave the cambium ring of the tree unharmed. The sap is collected and sprinkled with lemon juice or with salt water, to hasten its coagulation.—R. L. J.

"Root"-Caoutchouc in the Kunene District ——. Tropenpflanzer, 1900, **10**; through Gummi-Zeit. 1900, **15**, [13], 207—209.

H. BAUM, of the German Kunene-Zambesi Expedition, gives an account of this product in his journal, from which it appears that the Kaffirs of Longa, Quiriri, and Kampuluvé are entirely dependent on it for barter with the Portuguese merchants and other natives, any grain which they cultivate being chiefly used for the manufacture of beer. The plant is found on the large, sandy plains, surrounded by forests, situated on the high lands between the water sheds, and though it may penetrate some distance into the woods, never grows in the immediate vicinity of water. Its distribution is rather wide, occurring from above the mouth of the Lazingua river up to Longa, Quiriri, Kampuluvé, and Kuito, and still further to Kuando. Formerly plentiful at Kutsi and Kubango near Massaca, it has now almost disappeared, but is said to exist in the Cuninghama district. As the stolons are furnished with but little root, they easily perish. The caoutchouc is gathered in the following manner:—The "roots," tied in stout bundles about two metres high, are soaked in water to free the bast and then dried in the sun. They are then cut, one by one, into lengths of 20—40 cm., and the small lumps of gum which exude from the ends, are collected to form the special or light "manga."

The sticks are beaten on a board until the wood is got rid of, and the pieces of bark are further beaten until they gradually form a cake of rubber. Boiling in water and further beating are employed to separate the exhausted bark. This cake is cut into rectangular strips, and these are softened in water and kneaded whilst hot, into round, finger-shaped strands, forty of which constitute a heavy manga. The manga is the unit of quantity and value (the heavy kind merely contains sand and other impurities); it is estimated by spanning with the hand, weighs approximately 1 kilo., and has an exchange value of 8 yards of cloth. A still lighter manga, with fibrous structure and other specific characters, is said to be manufactured from another plant, but it is not often met with.—R. L. J.

India-Rubber on Iron; The Fixing of ——. Gummi-Zeit. 1900, **15**, [13], 205—206.

To ensure the permanent adherence of rubber to any iron surface, the latter must be effectively roughened by hammer and chisel or other means, thoroughly cleansed from oil, grease, and all impurities, and then painted several times with a coat of rubber solution. A layer of hard rubber, also smeared with solution, is placed on this, and soft rubber built thereon to the required extent. The whole is secured by cloth wrappings and placed in the vulcaniser, where an intimate combination ensues between the iron and rubber layers. The wrappings are taken off, and the now solid rubber is trimmed to the desired shape. As any paint on the article is ruined in the heat of the vulcaniser, it should be removed previously.

Some goods cannot be heated in a vulcaniser, a tempered steel band-saw, for instance. These are made as hot as the hand can bear, and the rubber, cut somewhat smaller than the surface to be covered, is cemented on with bone-glue, being stretched meanwhile to the required size. Excess of cement is squeezed out and removed, and the adhesive allowed to set for at least 24 hours.

The use of a hard cement requires special experience.
—R. L. J.

India-Rubber; Caustic Alkaline Bath used in the Manufacture of ——. Gummi-Zeit. **15**, [11], 1900, 177.

In spite of the general use of alkaline baths for the removal of the free sulphur from rubber goods there is very little unanimity amongst manufacturers as to the best manner of their employment, although they appear to be fairly agreed that for economical reasons caustic soda is the best alkali to be used. Various alkaline solvents for sulphur have recently been proposed and enjoyed a passing popularity. Potassium carbonate has been recommended on account of the soft surface it imparts to the goods, but its high price proved objectionable. Caustic potash is used in some French factories together with potassium carbonate. Hancock operated with a strong solution of sodium or potassium sulphate at 200° F. Also common soda crystals are to some extent employed. Opinions differ regarding the strength of caustic soda to use; it is, however, probable that different qualities of rubber goods require solutions of different strengths according to the proportions of resinous or saponifiable matters which they contain.—C. O. W.

India-Rubber for Rubber Shoes. Gummi-Zeit. **15**, [3], 1900, [4], [5], 35, 52, 69.

An entirely uniform blackness of the rubber mixings is essential for the production of good shoes. For this purpose all the mixings contain lamp black or tar. The tar used for this purpose is heated with addition of resin or wax, until the mixture after cooling forms a tough mass. The use of this preparation, however, requires great care, as too great a proportion of it is apt to render the rubber too soft for working or vulcanising. For "mixings" Para rubber, or similar qualities, it is therefore preferal to use neither tar nor lamp black, but litharge, or son similar lead compound.

The foundation of the shoe is the sole, and it should l made of a tough and firm rubber. These soles are roll in calenders in which they are at the same time suitab embossed. For this calendering operation, the mixin should be used very warm so that the sheets are obtain perfectly homogeneous and free from air bubbles. As t sheets leave the calender they are run upon cloth-cover frames the size of which is determined by the size of t cutting tables or machines. Before cutting the soles fro these sheets, the latter are immersed for about 10 minut in boiling water. The shrinking of the rubber is th reduced during vulcanisation to a minimum, and t distortion of the shoe upon the last is obviated. T "sole-mixings" contain comparatively little, but alwa good qualities of rubber, such as Congo, Madagasc Accra strips, Rio sheet, to the amount of about 25 p cent. This quantity can be reduced to 18 per cent. using Ceara or Negro-heads, together with from 8 to per cent. of "recovered rubber." The dark grey colo of the soles is produced by the addition of from 0·5 0·75 per cent. of lamp black, together with from 12 to per cent. of barytes, or lithophone. The quantity of sulph employed should be at least 9 per cent. of the amount india-rubber contained in the mixing.

The uppers are made of much thinner material, rar exceeding 0·02 in. in thickness. The mixing is gener the same for all the qualities of shoes of a factory. T sheets for this purpose are run on an ordinary calend which must, however, be free from vibration, to prev streaks and other irregularities from appearing. Owi to the presence of tar in these mixings, the sheets obtai are very soft and sticky, they can therefore not be rol up, but are cut into two or three yard lengths which deposited upon the already mentioned cloth-covered fram From these sheets the uppers are cut by hand, the parts, until further required, being kept between clo arranged in book fashion. The mixtures for the upp contain not less than 25 per cent. of rubber, gener Ceara twist. Of thickened tar, containing a little resin wax, and sometimes even asphaltum, usually from 3 t per cent. is used, together with about 0·5 per cent. of la black. Of sulphur, 8 per cent. of the amount of rub present is employed. The filling materials in the mix consist altogether of 50 per cent. of either "barytes," lithophone, or zinc-white and chalk, with 10 per cent litharge, and frequently also up to 5 per cent. of iron ox (Venetian Red). Sometimes also magnesium carbo appears to be added.

The insertions ("foxing") between the sole and upp consist of more or less strongly rubber-coated cloth every description. The rubber coating is applied ei with a friction calender, or upon the spreading mach. The mixings employed for this purpose are very ch containing rarely above 10 per cent. of rubber (Camero together with about 15 per cent. of regenerated rubber, 10 per cent. of "black substitute." For colouring purp about 0·25 per cent. of lamp black, 1 per cent. of tar, a 5 per cent. of ground dark waterproof cuttings, and al 12 per cent. of litharge are used. Such a mixing requ about 3 per cent. of sulphur. All the different p representing the "foxing," are cut by machinery.

The shoes being put together from their various p are ready for varnishing. The varnish used for purpose is considered the greatest mystery of a rubber factory, and it is extremely difficult to produce the d black, elastic and non-cracking article required. It con essentially of a linseed-oil lead-soap with additio f turpentine and sulphur. The shoes are varnished w a dilute solution of this preparation in benzene. As a exception scarlet or yellow varnish is used. This con of an india-rubber solution containing the neces quantity of sulphur, to which either vermilion or cadm yellow have been added.

The vulcanisation of the rubber shoes is carried o steam-heated chambers large enough to receive the w of a day's production. The walls of the chamber must be sufficiently thick to reduce the loss of heat by radiation to a minimum, and to allow of the strict maintenance of the required temperature. Owing to the great heat capacity of these large chambers the time required for vulcanisation is not less than 10 hours. The temperature is slowly carried up to 135° C., at which it is maintained for at least two hours. This temperature should not be exceeded owing to the detrimental action of higher degrees of heat both upon the textile portions of the shoes, and upon the brilliancy of the varnish. The progress of the vulcanisation is checked by means of long thermometers and also by withdrawing from time to time one of the shoes through specially provided openings in the stove. Before emptying the hot chamber, the noxious vapours in it are drawn off by means of an exhauster.—C. O. W.

Rubber Industry; Notes on Materials Used in the ——. Gummi-Zeit. 1900, **15**, [13], 206—207. (Compare this Journal, 1899, **18**, [2], 166.)

Casein occurs naturally in the milk of mammals as a soluble alkaline albuminate, and, in the vegetable kingdom, as a constituent of leguminous and other plants. Fresh cows' milk is diluted with four parts of water, acetic acid (0·1 per cent.) is added, and the precipitated casein is washed with water and pressed. The cake is pulverised in water, redissolved with dilute soda-lye, and again precipitated, this process being repeated several times. It is finally washed with ether-alcohol, pressed, dried, and powdered.

Castilloa Caoutchouc, of Central American origin, and now obtained from Nicaragua, West Indies, Honduras, Mexico, Guatemala, Panama, and Peru, is sold in blocks, slabs, and sticky black scraps, and has a medium value usually two-thirds that of the best Para. It is supplied by the *Castilloa Elastica* (*Artocarpaceæ*), which grows wild from South Mexico to Ecuador, and with special vigour in the southern provinces on both Atlantic and Pacific slopes, and possesses various local names, such as Hule (Nicaragua), Ule and Aquoquitl (Mexico), Heve or Jeve (Ecuador), and Caucho (Panama). The tree grows about 20 metres high, has a smooth yellow stem 16—120 cm. thick, is branching and umbellate, and the wood is rather weak. The leaves, 15—20 cm. long, are entire, glossy bright green in colour, hairy on the under surface and fall in the dry season, at which period also the tree is in bloom. The flat, broad fruits, 3—5 cm. wide, ripen in 4—5 months, and consist of small cone-shaped clusters, joined together at the base; they contain flat elliptical seeds, distributed by the agency of monkeys and parrots, which feed on the fleshy fruit coat. *Castilloa tunu* (*tunu* being the native name) is another variety, growing in British Honduras, and yields a kind of balata intermediate in character to caoutchouc and guttapercha. The milk is coagulated by heat, hardens in cold and softens in warm water, so that it can be moulded, but is not elastic. *Castilloa Markhamiana* gives an inferior product. The caoutchouc obtained from genuine *C. elastica* tree varies somewhat according to locality.

Collection of the Juice.—Ring, spiral, or cross-shaped incisions are made in the bark, and the milk collected in vessels. Sometimes the whole stem is sliced lengthwise or even felled, a practice which has greatly reduced the number of trees. 30 years ago one tree in every five was a castilloa, and seven cwt. of caoutchouc could be gathered in a fortnight. Now the "Huleros" must wander long distances to find a suitable specimen. Coagulation of the juice by smoking or drying in the sun is less satisfactory than the use of salt or sodium bicarbonate solutions, mixed with infusions of certain climbing plants (liane and convolvulus).

Castilloa caoutchouc is sold in London, Hamburg, and New York; the Nicaraguan, in slabs weighing 5—10 kilos., and scraps, is the chief variety; one also finds the black viscous kind from Carthagena and large clear pieces from Guayaquil. Inferior brands exude a dark offensive fluid and are very porous.—R. L. J.

India-Rubber Pigments; Cadmium Compounds for ——. Gummi-Zeit. **15**, [8], 1900, 123.

Cadmium sulphide, or cadmium yellow, is an excellent pigment for high-class india-rubber articles. In covering power and brilliancy of shade it is equal, if not superior, to most of the other yellow pigments. For india-rubber articles it is especially valuable on account of its indifference to sulphur compounds, as well as to organic reducing substances, weak acids, and alkalis. It neither affects the elasticity nor the durability of rubber goods, and is even supposed to assist the process of vulcanisation. Commercial Cadmium yellow generally contains traces of zinc sulphate, and low qualities are mostly adulterated with clay, gypsum, or barytes. Addition of tin sulphide scarcely affects the beauty of the colour, and such mixtures may be advantageously employed where the high price of the pure article might be prohibitive.—C. O. W.

Camphor and Camphor Oil. Gummi-Zeit. **15**, [8], 1900, 124.

Camphor is one of the most important materials of the celluloid industry, and is also supposed to be used as a solvent for vulcanised india-rubber waste.

Camphor oil, which forms the by-product of this process, on fractional distillation yields "light" camphor oil of sp. gr. 0·89 to 0·92, and "heavy" camphor oil of sp. gr. 0·96 to 0·97. The latter boils at from 240° to 270° C. Camphor oil is an excellent solvent for resins; it represents chemically a solution of camphor in a terpene, $C_{10}H_{16}$, which, on exposure to the air, or on treatment with dilute nitric acid, is readily oxidised into camphor.—C. O. W.

PATENT.

India-Rubber; Manufacture of Substances similar to ——. C. A. R. Steenstrup. Eng. Pat. 17,475.

See under XIII. B., *page* 135.

XIV.—TANNING, LEATHER, GLUE, SIZE.

Tannase. A. Fernbach. Comptes Rend. **131**, [26], 1214—1215.

Aspergillus niger from nut-galls was cultivated in Raulin's liquid, using, however, tannin in place of the sugar. The product was macerated in water, the maceration concentrated at a low temperature *in vacuo*, the liquid precipitated by alcohol, and the precipitate treated exactly as in Lintner's method for the preparation of amylase. The grey powder thus obtained, when dissolved in water, acts rapidly upon tannin at about 50° C., converting it into gallic acid. The solution of *tannase*, filtered through a Chamberland filter into a sterilised solution of tannin, acts just as effectually, so that we have here a true diastatic action, not a fermentation through the agency of organised cells.—J. T. D.

Tannase; A Diastase Hydrolysing Digallic Acid ——. H. Pottevin. Comptes Rend. **131**, [26], 1215—1217.

By a process precisely similar to that of Fernbach (see preceding abstract), but independently of him, the author has prepared a solution of tannase which hydrolyses tannin. Along with the gallic acid formed there is also, in the case of commercial tannins, a variable amount of glucose; but the author considers these commercial tannins as mixtures, and has obtained, from a purified tannin, gallic acid corresponding to 98·5 per cent. of pure tannin. The fact that tannase also hydrolyses phenyl and methyl salicylates lends support to Schiff's formula, $C_6H_2(OH)_3.CO.O.C_6H_2(OH)_2CO_2H$, for tannin. In nature tannin is often accompanied by gallic acid; no doubt the latter is formed by the action of tannase, which the author has found to exist in sumac leaves, and which, no doubt, occurs in other substances containing tannin.—J. T. D.

Dung-Bate; The Action of ——. J. T. Wood. Wisstechn. Beil. Ledermarkt. 1899—1900, **1**, 43, 49; through Chem. Zeit. Rep. 1900, **24**, [100], 370.

The bateing action of dog's excrement on hide is the effect of a combination of amines (hydrochlorides) and erosive enzymes secreted by actively multiplying bacteria. The latter, which are not liquefying organisms, may be best cultivated in a broth made as follows :—10 grms. of gelatin, 5 grms. of dry lactic acid, and 100 c.c. of water are digested for three hours in a closed vessel on the water-bath ; the liquid, which consists chiefly of glutopeptone lactates, protopeptone and simple nitrogen compounds, is neutralised with sodium carbonate, and potassium phosphate is added. It is then inoculated from a mixed culture, which gives better results than if only one kind of bacterium is present. This forms a perfect artificial bate when the required amino-compounds have been added, and it is only the comparative costliness that hinders its extensive use.

Filtering impairs the value of dog dung as a bate, the finely divided solids appearing to act mechanically as a carrier for the enzymes.—R. L. J.

Erodin ; The Use of ——, in Tanning. H. Becker. Wiss.-techn. Beil. Ledermarkt. 1899—1900, **1**, 39 ; through Chem. Zeit. Rep. 1900, **24**, [100], 370.

Erodin is an artificial bate or puering agent made by cultivating, in a suitable nutrient medium, the active bacteria of dog's dung, its effect being due to the formation of enzymes and the loosening action of organic acid and amino compounds (compare preceding abstract). The hide is rapidly acted on, remains quite white, the grain being smooth and even and the flesh-side dry ; the resulting leather is supple but tough and strong. 10 grms. of the preparation suffice for 1 kilo. of hide.—R. L. J.

Leather Manufacture ; Contribution to the Study of ——. Ch. and Etienne Bruel. Monit. Scient. **15**, [709], Jan. 1901, 29—33.

In a previous article (*ibid.* April 1900, 223) the authors have studied the histology and chemistry of the dermis (corium), the essential part of the skin for the tanner. They now pass to the wet work, consisting of soaking, liming, sweating, unhairing, fleshing, and scudding. The quality and appearance of the finished product depends entirely on these operations. For each kind of leather there is an "optimum" condition in the wet state which will give a maximum absorption of tannin.

The phenomenon of swelling enters into the explanation of every stage of the tanning process. The authors cite Körner's summary (Beiträge z. Kenntniss d. wissenschaftlichen Grundlagen d. Gerberei, 1898-9), in which he considers three types of swelling : 1. Capillary attraction ; 2. Endosmose ; 3. Molecular imbibing.

The last is of the greatest importance in tanning. Körner (see preceding reference) enumerates certain principles governing molecular swelling.

1. A body capable of swelling, when put into water, absorbs a *definite* quantity of the water up to a maximum, which cannot be exceeded. (C. Ludwig.)

2. The maximum of swelling depends upon the chemical composition of the body, on its cohesion and elasticity, and on the temperature and interior pressure of the liquid. (C. Ludwig.)

3. Power of resistance to swelling increases from the exterior to the interior, according to a parabolic law ; *i.e.*, the external layers of the body attain the maximum swelling sooner than the internal portions. (L. Mathiessen and A. Schwarz.)

4. The volume of the swollen body is smaller than its original volume, plus that of the liquid absorbed. (Quincke.)

5. Swelling is accompanied by development of heat. (Duvernoy, E. Wiedemann, and Lüdeking. Wied. Ann. **25**, 1885, 145.)

The production of heat is simply due to the contraction, and not to any chemical phenomenon, such as hydration. (Rodewald, Thermodynamik der Quellung, Zeit. f. Phys. Chem. **24**, 1897, 193.) This explains a fact well known to tanners, *viz.*, that skins swell in cold water and "fall" in warm water. Riecke (Zur Lehre von d. Quellung, Wied. Ann. **53**, 1894, 564) concludes that the degree of swelling, $\frac{m_2}{M}$ (where m_2 = mass of water absorbed, M = mass of the body swollen), in a space filled with aqueous vapour, unsaturated, is a function of the pressure and temperature.

The velocity of swelling (Pascheles) may be expressed by the formula—

$$\frac{dQ}{dt} = (M - Q) K$$

where M = maximum of swelling, Q = amount of swelling in the time t, and K = a constant.

The differential quotient $\frac{dQ}{dt}$ gives the velocity for each moment, and it will be seen that the swelling becomes slower and slower as the maximum is approached. Thus the law of the velocity of swelling is identical with that of the velocity of inversion of cane sugar, itself an application of the law of masses.

For every process of swelling the constant K must be determined experimentally from observation of M, and it may be shown that—

$$K = \frac{1}{t} \log. \frac{M}{M - Q}$$

whence the value of K may be calculated for each series of determinations.

On the manner in which water is held in swollen colloid bodies, Körner (see above) cites three opinions :—

1. The hypothesis that colloids have a structure in the form of a honeycomb. (Bütschli.)

2. The water is absorbed at the surface of colloids in a specially condensed form. (Wilhelmy, Pogg. Ann. **119**, 121, 122.)

3. The water forms with the swollen body a "solid solution." (Nägeli.)

The latter view is the one taken by Procter (this Journal, 1899, 1034 and 1136). In a "solid solution," as in an ordinary solution, for each temperature given, the liquid and the body dissolved are in a state of equilibrium.

In the soaking of salted skins, the salt solution cause a greater swelling than pure water. Phenomena of dissocia tion and osmotic pressure come into play here (see Procte Cantor Lectures, 1899, 19).

In practice a few hours' soaking in running water i enough for fresh skins. For salted skins 3—5 days ar required, according to the length of time the skins have bee salted.

Dry skins require still longer, the problem being t soak them sufficiently without losing skin substance throug putrefaction. Various additions to the soak have bee proposed ; amongst others, sulphurous acid, 1 per 1,000, an borax, 1 per cent. ; the authors prefer caustic soda, 100 grm per 1,000 litres of water. Such a solution hastens the swellin and actually dissolves less skin substance than pure wate "Stocking" or "tumbling" the goods is not to be recom mended. The best plan for salted and dry-salted skins i after two days, in a feeble current of clean water, to dra up the skins, and work them over on a beam, "breakin over" (écraminage). They are then returned to clea running water for 2—3 days, or until properly soake After soaking, the skins are allowed to drain for sever hours, and are then taken to the sweating store or to the li pits. Skins which are insufficiently soaked so as to bri them to their natural supple condition behave badly in t subsequent processes, and hence will never tan.

—J. T. W.

Tan-yard Liquors ; Determining Quickly and Appro mately Tanning Substance in certain ——. A. Palmer. Leather Trades' Rev. **33**, [769], 958.

The following process can only be applied to any liqu containing not more than fifteen-hundredths of a per ce of tanning matter. If the liquor be stronger, it must diluted until of suitable strength. A glass cylinder, 1 in in diameter, and graduated at 12·5, 25·0, 37·5, and 50 c. is the only instrument required.

One such cylinder is filled up to the 12·5 c.c. mark wi the cold tanning liquor to be tested ; distilled water is th added up to the 25 c.c. mark, and clear saturated lin water to 50 c.c. The whole is well shaken and allowed stand, and examined every few minutes. If before lapse of 15 minutes, no precipitate be deposited, the c ents of the cylinder must be thrown away, and a similar est applied to a new liquor made by diluting the above. f this be of correct strength, there will be a separation or recipitate in the cylinder, and by observing the volume of he deposit one can determine with fair approximation the trength of the diluted liquor by comparing it against a quor of known tested strength.

The cylinders used must not be narrower than 1 inch; he lime-water must always be saturated, and the accuracy f the process depends on the practice and skill of the anipulator.

The author has only used this process with the liquor om one tanyard; he therefore does not claim that it would ork similarly with tanning liquors of other composition, ut special experience will be required in each factory.
—J. G. P.

hoe Butts; Currying of Waxed ——. Leather Trades' Rev. **33**, [769], 956.

oon bark-tanned hides are preferable for this purpose, d must be well flayed. They are first rounded, then aked, and brought into condition for shaving. After aving they are stoned and hung up to sammy previous to flatting." They are then scoured, flesh and grain, with ush and slicker, the grain being generally scoured by achine. If after this treatment the colour be not satisctory, the hides may be bleached with warm sumac. hey are then ready for stuffing, which may be done either hand or in the drum. For hand work good results are tained with a stuffing grease made of cod oil and tallow ixed together while warm. After stuffing, the hides are ung up in the stove to dry. When dry they are tallowed the grain with warm tallow, and laid in pile for a few eeks, after which they are ready for finishing and waxing. his process is commenced by freeing the butts from rface grease on both sides, whitening with the slicker, d then cleaning and sizing the grain, after which they are ung up to dry, and are then boarded in three ways. They e now coloured with a composition made of vegetable ack and cod oil, which is applied to the leather with a ush, one brush being used to apply the composition and e other to brush it well in. They are then sized twice th a gelatin size, well glassed, next hung up to dry for an ur or two, re-sized, and smoothed off with a pad on the ft part of the arm. When re-dried, they are re-glassed, d are then "oiled off."—J. G. P.

hrome Liquors; Recovery of Useful Products from Partly Spent ——. Leather Trades' Rev. **33**, [769], 956.

ITH the one-bath chrome process the weak or partly ent liquors are generally thrown away. These, however, equently contain 30 per cent. of the bichromate originally ployed, and the chrome salts may be recovered by the dition of soda ash. The precipitated chromic hydrate is llected on a filter of coarse sacking, and re-used.

In the two-bath system, after chroming the skins, lime ay be added to the spent liquor and the almost insoluble lcium chromate recovered. Treated with a little sulphuric id, the calcium chromate is converted into calcium chromate and gypsum. By treating this with potassium rbonate, calcium carbonate is precipitated, and bichromate potash remains in solution. It is also possible to treat e liquor with lead acetate and recover the lead chromate.

The second bath of the two-bath process is generally of a rength of from 10°—12° B. The partly spent liquor may evaporated to dryness in a small copper, and the residue vered with about one-third of its weight of water. The ssolved portion may be used in the next reducing bath. he residual salts consist chiefly of sodium chloride, hich might be used for salting "green" hides.

In the case of a first bath of a normal constitution, which nsists of bichromate, chrome alum, and hydrochloric acid, is advisable to mix it with the second bath, and then low the liquid to settle; the potassium bichromate is duced, and a solution of chromic hydrate is obtained, hich may be recovered by the help of soda ash.—J. G. P.

Paste-Glue from Bone-Glue; Preparation of ——. H. Borntráger. Oesterr. Chem. Zeit. **3**, 515. Chem. Centr. 1900, **2**, [24], 1218.

Two hundred and fifty grms. of joiners' glue are dissolved in 1,000 grms. of hot water, and a mixture of 10 grms. of barium dioxide, 5 grms. of sulphuric acid (66° B.), and 15 grms. of water added, and the whole heated on the water-bath for about 48 hours at 80° C. A considerable quantity of sulphur dioxide is evolved, and the glue loses its power of gelatinising; it acquires a pleasant odour, and does not become mouldy even after standing for a month exposed to the air. It is strongly adhesive and reacts faintly acid. When dried in the form of thin plates, it greatly resembles gum arabic, and is claimed to be a superior substitute for the latter. 1 kilo. of this paste-glue costs about 25 pf., or a bottle containing 50 c.c. would cost about 1.25 pf.—A. S.

Glue; Determination of the Viscosity of ——. J. Fels. Chem. Zeit. 1901, **25**, [3], 23.

IN extending the application of his viscosity test (this Journal, 1897, **16**, 264) the author has met with a sample of glue which, at the prescribed temperature of 30° C., had a viscosity of 6·24, whereas the highest limit permissible is 4. He therefore recommends that the viscosity test should be made with a 15 per cent. solution at 35°, instead of 30° C., as at the higher temperature all samples tested show viscosities below 4. Moreover, as the time taken in heating the glue and the temperature applied when making the solution (after the material has been soaked well in cold water) affect the ultimate viscosity (the viscosity being lower when the temperature was higher or the time of melting was prolonged), it is now recommended that, after soaking the glue, the 15 per cent. solution should always be heated for 30 minutes to the temperature of boiling water before making the viscosity test.—W. G. M.

Tanning Liquids and Extracts; Determination of Tannin, Gallic Acid, other Organic Acids, and Mineral Acids in ——. F. Jean.

See under XXIII., *page* 159.

Tanning Determination, with Results of Hide Powder Method; Comparison of Volumetric Methods of ——. A. Turnbull.

See under XXIII., *page* 159.

Leather; Dyeing, Staining, and Finishing of ——. M. C. Lamb.

See under VI., *page* 120.

PATENTS.

Leather; Manufacture and Treatment of ——. G. A. Clowse, Needham Market, Suffolk. Eng. Pat. 1809, Jan. 29, 1900.

MANUFACTURE and treatment of leather by a product obtained from brewers', distillers', and vinegar-makers' yeast, and the substitution of such products for such nitrogenous substances as yolk of egg, blood albumin, egg albumin, &c., which are now largely used for filling, swelling, stuffing and dressing of hides. The process may be carried out in the following manner:—

Ordinary thick yeast is placed in suitable vessels and submitted to a temperature, by preference 80° to 100° F., for a sufficient time to reduce the paste to a liquid condition; this operation generally requiring from 8 to 10 hours; if desired, the pressed yeast may be mixed with an equal quantity of boiling water, and allowed to remain in this liquid condition for half an hour. The product is then filtered, and the filtrate neutralised with a suitable alkali, and then, for purposes of transport or convenience, the filtrate may be concentrated, either *in vacuo* or in open pans, to a syrup.

This product, when mixed with suitable oil or fat, is employed in the manufacture and treatment of leather in a similar way and in like proportions to those used when employing the ordinary nitrogenous substances, such as yolk of egg, albumin, &c.—M. C. L.

Gelatin ; Process of and Apparatus for Making ——. E. R. Edson, Ohio, U.S.A. Eng. Pat. 21,467, Nov. 27, 1900.

The primary object of this invention is to obtain isinglass or gelatin from fish scales and other oil-less parts of fish, and to avoid the destruction of the gelatinising property of any of the material undergoing treatment. The material to be treated may be crushed to a finely divided state, and, after cleaning and washing, is treated with pure water at from 180° to 200° F. ; the mass must not be boiled. After sufficient digestion the gelatin solution is drawn off, and filtered from solid matter. This liquid is now allowed to congeal, at a temperature between 33° and 50° F. After some time this sets to a jelly, which may be cut into slices and dried by any well-known process.

There is also described a special apparatus for carrying out the above-described process, for which patent is also claimed.—M. C. L.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Juices ; Influence of the Alkalinity after the Second Saturation on the Solution of Magnesia by ——. K. Andrlik. Zeits. für Zuckerind. in Böhmen, 1900, **25**, [3], 148—152.

It is not advisable to neutralise the alkalinity of the juice in the second saturation to too great an extent, since a low alkalinity causes a large proportion of magnesia to be dissolved in the third defecation. A case is quoted of a sugar factory in which the first vessel of the evaporator became so rapidly incrusted that it had to be cleaned with acid every two or three days. The juice of this factory was brought to an alkalinity of 0·03—0·04 per cent. as CaO after the second saturation, and 0·005—0·01 per cent. after the third saturation. Analysis of the juices showed that the proportion of magnesia in solution increased after each saturation ; the mud from the filter also consisted largely of magnesium carbonate. Hence the conclusion was drawn that the incrustations were due to dissolved magnesia. It appeared that in this particular juice an alkalinity equivalent to 0·035 per cent. of CaO corresponded to a complete precipitation of the free lime, and consequently the most favourable conditions for solution of magnesia existed after the second saturation. The remedy for the incrustations was satisfactorily found by only carrying the second saturation down to an alkalinity equivalent to 0·05—0·06 per cent. CaO. Experiments with sugar solutions fully confirmed the above explanation, for when solutions of raw sugar were heated with a mixture of lime and magnesia, and then saturated to varying extents, it was found that when the saturation was not carried below 0·05 per cent. as CaO no magnesia was dissolved, but that when the alkalinity was less than 0·05 per cent. the proportion of dissolved magnesia steadily increased.—J. F. B.

Sugar Liquors ; Disappearance during Evaporation and Boiling of the Alkalinity of ——. K. Andrlik. Zeits. für Zuckerind. in Böhmen, 1900, **25**, [3], 143—148.

From a study of the composition of the massecuites of two campaigns the author concludes that saturated juices cannot be permanently alkaline if the ratio of the non-volatile inorganic bases (calculated as K_2O), which remain over for the saturation of the amido-acids, to the nitrogen of these acids is below 3·3, since in that case, K_2O : N being as 3·3 : 1, the fixed bases are not even sufficient for the saturation of the amido-acids. In such juices an alkalinity can, at the most, only be due to ammonia, and must disappear either completely or largely during the evaporation. The analyses of the diffusion juices and massecuites of the campaign 1898–99, in which this loss of alkalinity was observed, showed the above ratio as averaging 2·3, and those massecuites which reacted distinctly acid towards phenolpthalein showed a still lower ratio. In the massecuites of the 1899—1900 campaign, in which the alkalinity was preserved during boiling, the ratio above mentioned rose to an average of 3·8.—J. F. B.

Saturation Mud ; Oxalic Acid in ——. K. Andrlik. Zeits. für Zuckerind. in Böhmen, 1900, **25**, [3], 139—142.

The author finds that oxalic acid is present in saturation mud in varying proportions, and can be extracted either by exhaustion with ether after acidification, or by conversion into the solable alkali salt by boiling the mud with an alkali carbonate. The quantity of oxalic acid obtained by the author from the mud of the first saturation varied from 1·07 to 2·56 per cent., with an average of 1·98 per cent. on the dry substance of the mud. As a rule, the quantity of oxalic acid recovered from the mud was the same as that present in the diffusion juice, showing that it is completely precipitated by the process of saturation.

In some cases, however, a larger quantity of oxalic acid was obtained from the mud than was originally present in the juice ; this would seem to indicate that oxalic acid is produced by the action of the lime and heat upon some of the constituents of the juice.

The quantity of oxalic acid in the mud decreases when the latter is kept for some time.—J. F. B.

Glucose ; Method of Producing ——, by the Aid of Mucedinæ. Calmette. Rev. Prod. Chim. **3**, [22], 340.

Crushed maize, or decorticated rice, is mixed with twice its weight of water and 0·5 per cent. of hydrochloric acid, and is heated to 100° C. for the first hour, 110° C. for a second hour, and 120° C. for an hour longer. The consumption of acid may be reduced by adding it by degrees during the operation. The whole of the starch having been converted into dextrose, maltose, and dextrin, the wort is diluted to 25 per cent. strength, and forced by steam pressure into a saccharifying vessel, or "glucogene," where it is treated with sufficient sodium carbonate to reduce the acidity to 25 per cent., expressed as H_2SO_4. It is then sterilised by means of a current of steam for a period of 20 minutes ; the vessel is then at once closed, and compressed sterilised air is admitted, to aërate the wort and force it up into a funnel, which conveys it to an emulsifier Since the latter works continuously, and at a temperatur of 35°—38° C., the conversion of the maltose and dextri into dextrose will be complete in 24 hours when a cultur of *mucedinæ* is used, or 36 hours without. After being agai nearly neutralised with sodium carbonate, the wort is pa through a filter-press, to separate the skin and insolubl matters of the grain, together with the mycelia of the *muce dinæ*. The pale straw-yellow filtrate of dissolved glucos is decolorised with animal charcoal or by electrolysis.
—C. S.

Sugar Factories in Russia ; Purification of Waste Water of ——. J. Slasski.

See under XVIII. B., *page* 146.

PATENTS.

Solutions [Sugar, &c.] ; Treatment of ——, to Precipitat Matter contained in them. S. M. Lillie, Philadelphi U.S.A. Eng. Pat. 17,924, Oct. 9, 1900.

The solutions, especially those of sugar, are heated und pressure in a series of closed vessels ; the pressure is the reduced, in order to develop steam from the heated liquo the steam being utilised for the preliminary heating of fre quantities of the solution. The sugar solution may b passed through a series of vessels in succession, equal number to the number of steam pressures employed, ar subjected to direct contact with steam under successivel increased pressures. Besides the apparatus necessary f carrying out the above treatment, means are claimed f automatically controlling the flow of the solution from tl vessel of highest pressure to the pressure-reducing tan and conducting the steam there developed back to tl apparatus, or other place, where it may be utilised ; also f regulating the action of the pump which circulates tl liquor.—J. F. B.

aste ; An Improved Liquid ——. W. Häckel, A. Heinrich, and C. Gumpricht, Breslau. Eng. Pat. 20,528, Nov. 14, 1900.

composition is claimed, consisting of water-glass (sp. gr. 37), 100 ; borax, 4 ; "natron" (sp. gr. 1·33), 2 ; talc, 2 ; itening, 2 ; boric acid, 2 ; siccative, 2 ; dextrin, 8 ; to be ed for sticking purposes, in substitution for glue, which it said to equal in adhesive properties.—M. C. L.

XVII.—BREWING, WINES, SPIRITS, Etc.

rley ; The Proteolytic Enzyme of Germinating ——. F. Weis. Zeits. physiol. Chem. 1900, **31**, [1 and 2], 79 ; through Woch. für Brau. 1900, **17**, [50], 748—750.

e investigations of the author confirm, on the whole, recent work of Windisch and Schellorn, Fernbach and bert, Petit and Labourasse, on the same subject (see s Journal, 1900, 838 and 916).

The author digested filtered infusions of green malt with utions of wheat gluten, in presence of lactic acid. The antity of gluten digested was determined after two hours, precipitating the unaltered albuminoids with tannic acid, l estimating the nitrogen in the filtrates by Kjeldahl's thod, correcting the results by blank determinations.

The enzyme of barley produces under similar conditions re unprecipitable nitrogenous matter than does pepsin. is pointed out that all quantitative measurements of se digestions are only comparable when the same pre- itant is used ; thus Kjeldahl, using copper sulphate, nd that the action of the malt enzyme was most intense a temperature of 50°—55° C., whilst the author found greatest effect towards the tannic acid precipitant at —48° C. The enzyme acts best in presence of small ntities of weak acids ; with lactic acid the maximum ect was obtained with 5 parts per 1,000. The author ained no action in neutral or alkaline media, using stic soda as a neutralising agent. The nitrogenous tter digested increases with increase of the concentration he gluten solutions up to 3 per cent. With kilned malt author also finds a certain proportionality between the ymatic action and the nitrogenous matter in the extract. e proteolytic enzyme is not destroyed by the evapora- n of the infusions to dryness *in vacuo* at a temperature 30°—50° C. The only essential point of difference ween the author's observations and those of Windisch Schellhorn lies in the fact that Weis considers that the yme is capable of attacking not only dissolved proteids, also undissolved and insoluble proteins.—J. F. B.

ley : Treatment of ——, *with Lime in the Steeping Vater.* Kajmar. Allgem. Zeits. Bierbrau. und Malzfab. 900, [20] ; through Woch. für Brau. 1900, **17**, [51], 62.

prevent the subsequent development of moulds on the minating grain, Windisch recommended the addition of e to the first steeping water. The author prefers to add lime to the second steep water. He considers that the ley, after having been soaked in the first water, is more lily disinfected by the lime, and it is sufficient to leave grain in the lime water for two hours instead of eight rs, as in Windisch's process.

Windisch strongly advises the application of the lime to steep water in the form of clear saturated lime water, not as milk of lime. If added as milk of lime, the ium carbonate adhering to the grain drys up in the and is injurious to the workmen.—J. F. B.

eat-Malt ; Manufacture of ——. B. Rudolph. Woch. für Brau. 1901, **18**, [1], 1—2.

e best malting wheats come from Silesia. They should small-corned, smooth varieties, grown on not too rich il. The author has worked with a wheat of a steely earance, which indicates a high proportion of nitrogen. s kind gives good malt if care be taken to prevent ing.

malting wheat, a steeping space of 0·12 cb. metre, a surface of 1·6 sq. metre, and a kilning surface of 0·9—1 sq. metre are allowed per cwt. of grain. Steeping occupies about 48 hours, or 52 hours in cold weather, changing the water every 9—10 hours and allowing from 36—40 hours' immersion. The addition of a lime and bleaching-powder solution to the last steeping water is beneficial. The germination on the floor should be started, if possible, at 10° C. with a thin "couch." The grain should be turned occasionally until it begins to sprout, that is, for the first two days. The temperature when felting takes place should not exceed 20° C., and must be kept down by loosening if necessary. The grain requires from 4—5 days on the floor ; when the modification is complete, the length of the acrospire, which, in the case of wheat, grows externally, should be three-quarters the length of the corn. Kilning, with a double-floor kiln, takes 24 hours, the final temperature on the lower floor being 85° C., measured in the malt. On the upper floor the malt should be turned once every three hours, to avoid breaking off the shoots, which would prevent the formation of air channels ; on the lower floor it should be turned every hour. The malt must not contain excess of moisture when it arrives at the lower floor, and the aëration must be sufficient, or the malt will readily become brown or "foxy," and its flavour will be spoilt for the preparation of good "Weissbier." The loss of weight during the malting of wheat is estimated at from 23—25 per cent.—J. F. B.

Yeast and Sugars, Various ; Fermentation Experiments with ——. P. Lindner. Woch. für Brau. 1900, **17**, [48—51], 713—716, 733—735, 746—748, and 762—765.

The author has developed his simple method of identification and classification of fermentation organisms by their behaviour towards various sugars and allied carbohydrates (this Journal, 1900, 761). The present paper consists essentially of records of some 3,000 experiments with over 200 organisms and 21 different sugars, including some of the rare and synthetical sugars. The results are classified according to the type of yeast, and are arranged in tabular form. The groups comprise various yeasts and yeast-like fungi (monilia, torula, mucor, and yeast from special beers), schizosaccharomyces, milk-sugar yeasts, mould yeasts, anomalus yeasts, wine, distillery, pressed, top and bottom beer yeasts, wild yeasts, &c.

The most important tests of the commoner yeasts are those which relate to the fermentation or non-fermentation of dextrin, since this largely determines their industrial type. Some species ferment maltose but not cane sugar, a few others ferment raffinose but not cane sugar, whilst others, again, act conversely. Logos yeast ferments raffinose only slightly, cane sugar and melibiose strongly. Several discrepancies occur when these experiments are compared with those of Kalanthar (this Journal, 1899, 60), in the behaviour of some of the species towards polysaccharides. Kalanthar's work was performed with dried yeasts, and the conditions were rather different. Some fungi produce acids which may have a secondary action in the inversion of polysaccharides.

The typical top-fermentation distillery yeast "Race II," ferments dextrin ; but although the distillery yeasts are of the same origin as the pressed yeasts, they are mostly without action upon dextrin, whilst the pressed yeasts nearly all ferment it. This must be due to differences in conditions of growth. Although, as a general rule, melibiose is not fermented by top-fermentation yeasts, this is by no means universal, and there are a few notable exceptions. No sharp line can be drawn between the top and bottom fermentation yeasts in this respect ; melibiase is probably a very readily alterable enzyme ; the test proposed by Bau for detecting the presence of bottom-fermentation yeast in top yeast is, therefore, not infallible. Nearly all the wine yeasts were without action on melibiose ; the author detected at least three different races of Champagne yeast, differing in their behaviour towards the sugars. Porter yeast was found to contain three races, one of which did not ferment dextrin ; some "Weissbier" yeasts fermented dextrin.

The existence of mixed industrial yeasts differing in their action towards dextrin has a bearing in connection with secondary fermentation. The wild yeasts were also resolved into dextrin-fermenting, or Frohberg types and non-fermenting Saaz types. In judging the results of tests of this kind, allowance must be made for the great possibilities of physiological variations. This test is also one for the presence of zymase. "Orange yeast," for instance, contains invertase, but no zymase; it does not ferment any sugar, but if mixed with *S. apiculatus* it enables the latter to ferment cane sugar, which it would not do alone. "Red yeasts" of the torula class often contain no zymase, but they contain enzymes which enable them to assimilate all the sugar in a wort without a trace of fermentation. Some races of "Red yeast," however, do set up fermentation of glucose, fructose, and cane sugar.—J. F. B.

Yeast Moulds; Is the Formation of Enzyme in —— a Characteristic Means of Differentiation? Zeits. für Spiritusind. 1901, **24**, 2.

Dubourg (this Journal, 1899, 288) has shown that yeasts which do not invert or ferment cane sugar become acclimatised when grown in highly nitrogenous media containing 5 per cent. of glucose and 5 per cent. of cane sugar. When the culture medium was washed away, the yeast was able to ferment cane sugar in the absence of glucose. He was also able by similar means of acclimatisation to ferment other sugars which in the ordinary way are not affected by yeast. Lactose, however, was an exception, and *Mucor alternans* could not be induced to ferment any of the sugars unfermentable by it in the ordinary way.

Klöcker has repeated Dubourg's work with three species of yeasts, *S. apiculatus*, a new *saccharomyces* from the stomach of a bee, and *S. marxianus*, and failed to acclimatise the first two mentioned yeasts to cane sugar, whilst *S. Marxianus* could not be induced to ferment maltose. This author concludes that Dubourg's statements (*loc. cit.*) are incorrect; consequently Duclaux's opinion, that the behaviour of the yeasts to the sugars cannot be used as a means of differentiation, being based on Dubourg's work, is not tenable. Klöcker asserts that the enzyme formation of the alcohol fermentation yeasts is one of their most persistent characteristics.—J. L. B.

Malt Worts; Analysis of Saccharified ——. P. Petit. Monit. Scient. 1900, (4), **14**, [708], 797—806.

In the analysis of malt worts, whether by simple acid hydrolysis or by the aid of auxiliary diastatic hydrolysis, the presence of the ready-formed sugars of the malt is a source of trouble. The author determines these sugars by repeated extraction of the malt with boiling alcohol. They consist mainly of saccharose, with smaller proportions of glucose and fructose. In normal malt the fructose exists in much greater quantity than the glucose; maltose is absent. In analysis of the worts, the ready-formed reducing sugars increase the apparent quantity of maltose, and consequently tend to lower the dextrin value; on the other hand, the saccharose is inverted together with the dextrin, and tends to increase the dextrin value. The use of diastase does not afford much assistance, since the diastase of some malts, especially of green or low-kilned malts, inverts saccharose and even maltose to a partial and variable extent. In the analysis of fermented worts (that is, brewery worts) which have been boiled before fermentation, the ordinary method of acid hydrolysis (Elion's method with hydrochloric acid), after correcting for the reducing power of unfermented maltose, generally gives the proportion of dextrin originally present in the wort with sufficient accuracy. The author concludes that the employment of precipitated diastase in the analysis of saccharified worts is not likely to lead to any useful result, on account of the indefinite, variable, and unstable nature of such preparations; the use of cold-water malt infusions is still more unsatisfactory. According to the nature and the age of the diastatic preparations, the products of the action of diastase on the dextrins of starch or malt worts may be either maltose alone, or a mixture of maltose and glucose.

To correct for the presence of the ready-formed sugars, the author first removes the glucose and fructose by a fermentation with *S. apiculatus*. He has previously determined that the saccharose in the wort can be estimated with accuracy by inversion by Clerget's method, provided the quantity present exceeds 0·4 grm. per 100 c.c.; he h also found that after prolonged acid hydrolysis (Elion method), the saccharose present yields 89 per cent. glucose as modified invert sugar. Consequently, the tr maltose having been found by the direct cupric reduci power after fermentation with *S. apiculatus*, the tr dextrin is determined by subtracting from the total gluco equivalent, according to Elion's method, the saccharo × 0·89 and the maltose × 1·05, and multiplying t remainder by 0·9 to obtain the dextrin. This correct dextrin, however, includes all non-reducing carbohydrat other than saccharose, which yield reducing sugars by ac hydrolysis, and consequently includes pentosans, &c. fro the husks. These husk constituents may attain lar proportions if raw grain be employed in mashing. Th presence may be demonstrated by hydrolysing the wo to the maximum limit by the prolonged action of diasta and then fermenting. The unfermentable residue th consists largely, if not entirely, of the non-dextrin carb hydrates derived from the husks. The author proposes, a scheme of analysis for practical purposes, that t "apparent" maltose and dextrin be determined in t ordinary way, not only in the original wort, but also af fermentation for four days at 27° C., with a high-attenuati industrial yeast, always employing the same race of yea When a new batch of malt is taken into use, a fu corrected analysis on the lines indicated above should made, in order to check the "apparent" or "crud results obtained by the ordinary methods.—J. F. B.

Alcohol in Distilleries during 1900; *Causes of Poor tenuations and Deficient Yields of* ——. G. Heinzmann. Zeits. Spiritusind. 1900, **23**, [50], 458—459.

A frequent cause of bad yields in the distillery is t insufficient provision of malting floor-space; consequen the malt is generally used too young; in fact, often af only 6—8 days' germination, whereas 16—18 days on floor should be allowed. If sufficient malting floor-sp cannot be afforded, there should at least be a storage flo to allow of a longer ripening of the malt after it leaves floor. The employment of a longer-germinated malt all the quantity used to be considerably curtailed.

Another point which requires attention is the macerat of the green malt; the malt must be macerated as finely possible, and passed three times through the crusher, oth wise a considerable proportion of the grains will rem behind when the peels of the potatoes are removed, diastase and yeast-nutrient will be lost. The malt-crush machine should be set as closely as possible, in order obtain a fine maceration. The method and time of remov the peels have an effect upon the efficiency of the m Some distillers remove the peels as soon as the potatoes blown out, and at the same time remove a large proport of the malt along with them. Since the removal of peels from the mash only takes about half an hour, it safest to leave them in as long as possible, that is, until end of the cooling process, so as to allow sufficient time the complete exhaustion of the malt grains. The prac of reserving part of the malt, and not adding it to the m until after the peels have been removed, has been emplo with satisfactory results.

In some distilleries the old-fashioned green-malt y mashes, poor in sugar, are still employed instead of con trated mashes which yield stable and vigorous ye Further, some distilleries use bakers' pressed yeast or o unsuitable type, instead of the selected distillery y known as Berlin Race II. It has been said that the l gives frothing fermentations, but if the instructions properly followed these will not occur, especially in concentrated mashes obtainable with this year's pota In the acidification of the seed-yeast mash with l bacteria, mistakes are frequently made; sterilisation 75° C. after acidification is very often omitted; somet the acid mash employed for infecting the next batc sterilised, and consequently almost useless; the acidific is then very slow, and excessive further quantities added. The lactic acid thus introduced destroys diastase too soon, and the attenuations are deficient. infecting acid mash should be taken out before the bu rilised; not more than 1—2 litres should be employed, d it should not be added until saccharification is comete. The author has met with very few cases this year ere the acidity of the fermented mash has been abnorlly high, owing to want of cleanliness.—J. F. B.

er; Nature of the Carbonic Acid in ——. Hantke. Amerik. Bierbrauer, 1900, 563; through Woch. für Brau. 1900, **17**, [52], 782.

ɪᴇ author suggests that gaseous carbonic anhydride is not primary product of fermentation, but that the hydrated d H_2CO_3 is first formed and then dissociates into carbon xide and water. He argues by analogy that since the ion of other enzymes is characterised by hydrolysis, the ation for the splitting up of glucose by zymase ought to vide for the addition of water.

This question may not be of much importance for nary fermentation at the ordinary pressure, but for ondary fermentation under excess pressure, the assump would probably explain the peculiar, gradual, and tinuous evolution of gas which characterises the foaming beer when poured out.

here is evidence to show that hydrated carbonic acid, ch is stable under pressure, reacts with the secondary sphates yielding primary phosphates and bicarbonates; that it forms unstable esters with the alcohols of ndary fermentation, imparting an aroma to the beer, ch disappears after standing in the air; it also probably bines with the amines, and the dissociation of these e combinations contribute to the permanent character of head. According to Hantke, the total of this loosely mbined" carbonic acid should amount to 0·2 per cent., ch is higher than the solubility of carbon dioxide in a ture of water and alcohol of the same strength. It ld appear that the same delicate effects cannot be ined by the mere "gassing" of the beer, and that e are more rationally explained by the combination of ated carbonic acid, produced *in situ*, with the conents of the beer during cellarage.—J. F. B.

asses Distilleries; Continuous Fermentation in ——. . Sorel. Bull. de l'Assoc. Chim. Sucr. Dist. 1900, **18**, and 6], 302—303.

author gives a short sketch of a process for continuous entation, as deduced from certain experiments in the ratory.

a the large scale there would be required a closed -yeast vat of 60 hectolitres, three fermentation vats of hectolitres each, all closed, and an open collecting vat 00 hectolitres. The seed yeast is made up in a sterilised ium and brought into active fermentation. It is then ed into the first fermenting vat, into which diluted sses are fed direct from the boiling pan, after being d in absence of air. The vat is filled in 5 or 6 hours, the liquor is then passed to the second vat, and so until it arrives in the collecting vat with a density of —3° B. Fermentation is complete in 3—5 hours after at is full. When the cycle is started, the last vat is in 20 hours. The temperature in the first vat is kept °—23° C., in the second at 23°—25° C., in the third at -25° C., and in the last at 30°—31° C.

e molasses may be diluted with water or with spent , in which case allowance must be made for the density e same. Nutrients and sterilised air may be supplied tervals to the first fermenting vat when required.

—J. F. B.

Rum; Non-existence of Methyl Alcohol in ——. I. Quantin. J. Pharm. Chim. **12**, [11], 505—507.

ɪɴɢ to redistil 8,500 litres of rum, the author examined refully for methyl alcohol or its derivatives. In the distillation, with a Savalle's column which did not of temperature determinations, the receiver was ged, first, when the distillate ceased to colour rosaniline phite; and second, when the distillate began to darken eating to 100° C., with its own volume of strong sulc acid. The first fraction contained 250 litres; the d 4,500, the whole of the remaining liquid going into hird. The first fraction boiled at 72° C., and must, therefore, have contained any methyl alcohol, aldehyde, formate, or acetate in the rum. Ten litres of this were heated slowly to 50° C. while a slow stream of carbon dioxide was passed through. The vapours coming away below 25° C. were caught in cooled alcohol; the liquid was tested for formaldehyde. The second fraction, up to 35° C., was saponified and redistilled, and the distillate tested for methyl alcohol. The third portion, coming over on further heating to 64°—72° C., was also tested for this alcohol both before and after saponification. The results were in all cases negative. This large-scale examination, then, has confirmed, as far as this particular sample is concerned, Trillat's conclusion that rum contains no methyl derivatives.

—J. T. D.

Malt; Determination of the Available Extract of ——. L. Briant.

See under XXIII., *page* 160.

Beer; Detection of Arsenic in ——. C. Estcourt.

See under XXIII., *page* 158.

Beer, Sugar, &c.; Detection of Arsenic in ——. B. H. Paul and A. J. Cownley.

See under XXIII., *page* 158.

Beer; Detection and Determination of Arsenic in ——. W. Kirkby.

See under XXIII., *page* 158.

Beer; Detection of Arsenic in ——. A. H. Allen.

See under XXIII., *page* 158.

Glucose; Determination of Value of Liquid Commercial ——.

See under XXIII., *page* 160.

Wines; Cause of Error in the Detection of Salicylic Acid in ——. H. Pellet.

See under XXIII., *page* 158.

Wine; Detection of Alum in ——. F. Lopresti.

See under XXIII., *page* 158.

Spirits; Detection of Foreign Colouring Matter in ——. C. A. Crampton and F. D. Simons.

See under XXIII., *page* 158.

PATENTS.

Casks, Milk Churns, and like Receptacles; Treating and Preserving ——. H. C. Williams, London. Eng. Pat. 25,084, Dec. 18, 1899.

Tʜᴇ cask is first pickled with hot, weak, soda or salt solution, in order to remove surface dirt, rinsed out, and allowed to drain. A small quantity of strong ammonia solution having been poured into the cask, air, heated to 150° F., at first, and afterwards to 300° F., is introduced under a pressure of 10 lb. per square inch, the pressure being afterwards raised to 20 lb. During this process the cask is rotated or agitated, and the ammonia and water are forced into the pores of the wood, and through to the outside of the cask. Steam may be used instead of hot air. The pressure having been relieved, an antiseptic is introduced into the cask and the process repeated. Such antiseptic may consist of a mixture of carnauba wax with a little salicylic acid and petroleum, which leaves the interior surface of the cask hard, smooth, and not sticky.—L. A.

Rectification and Distilling Apparatus. C. Crépelle-Fontaine, Le Madeleine-lez-Lille, France. Eng. Pat. 24,846, Dec. 14, 1899.

Tʜᴇ claims relate to a type of apparatus for the continuous rectification of alcohol, comprising "a purifier, provided with a condenser and cooling apparatus, a rectifier proper, provided with condenser and cooling apparatus, between which the purifier is arranged and to which it is connected; a phlegm purifier, provided with condenser and cooling apparatus, and connected to the rectifier; means for controlling the operation of the condensing and cooling apparatus by a suitable flow-controller and a float pressure-controller, acting upon the admission of steam into the rectifier and phlegm purifier, to control the pressure within the apparatus." The form of pressure regulator claimed comprises a receptacle divided into a lower and upper compartment, connected by means of a central tube, a suitable connection between the lower compartment and the apparatus, of which the pressure is to be controlled, a float in the upper compartment, a rod on the float, connected with a lever operating the inlet cock of the steam pipe.—J. F. B.

Yeast; Manufacture of Bakers' ——. M. P. Hatschek, Putney. Eng. Pat. 25,118, Dec. 22, 1899.

Brewers' yeast is washed and suspended in water, heated to 180° F., and afterwards digested at 150°—130° F. for a sufficient time to allow of the diffusion of the cell contents of the yeast through the cell walls, whilst leaving the latter more or less intact; the liquid is then filtered in such a way that the yeast cells pass through into the filtrate. To obtain still better results the yeast, after digesting at the above temperatures, may be heated to the boiling point, or boiled under a pressure of two atmospheres. In this case the yeast cells are burst, and the cell-wall residues are then filtered off through a close filter. The yeast extract prepared in either of the above manners is then mixed with saccharine matter to form a highly nitrogenous wort, in which a suitable seed yeast of the bakers' yeast type may be grown.—J. F. B.

Hopped Wort; Production of a Concentrated ——. H. A. Hobson, London. Eng. Pat. 48, Jan. 1, 1900.

The process consists essentially in first digesting hops in hot water, and then mashing the malt in the hop extract so obtained, straining and concentrating. Since the tannin constituents of the hops have a retarding influence upon the action of the diastase, and since the aromatic principles are more or less volatile during boiling, the following mode of operation is further claimed:—The lupulin of the hops is first removed mechanically; the residue of the hops is then infused with hot water, and the extract digested or boiled with some substance containing albumin, such as spent or fresh malt, in order to fix the tannin. The extract is then used as mashing liquor for preparing the wort, which is strained and concentrated. Shortly before the final degree of concentration is attained, the lupulin previously abstracted is added to the boiling liquor.
—J. F. B.

Distilleries; Treating Waste Products from ——. A. A. Ferguson, Glasgow. Eng. Pat. 356, Jan. 6, 1900.

The process claimed for dealing with the spent wash, or "pot ale" of distilleries, and obtaining therefrom a valuable by-product consists in running the hot wash through filters, where the solid constituents are deposited, and evaporating the liquid portion in vacuum pans to a brown, syrupy fluid. Or else the evaporation may only be carried to such an extent as to cause the deposition of the whole or the greater part of the dissolved solids in the form of a sediment at the bottom of the pan. The clear liquid may be run off, and is stated to be sufficiently pure to be passed into rivers. The sediment, when treated with starch, glucose, dextrin, or the like, forms a gelatinous mass suitable for stiffening or sizing purposes. The brown, syrupy fluid also has a considerable feeding value.—J. F. B.

Beer; Sterilising ——, *in Transport Casks.* E. Berliner and A. Herbert, Berlin. Eng. Pat. 20,656, Nov. 15, 1900.

The beer is sterilised by heating in transport casks of special construction. The cask, which is preferably made of metal, has an opening closed by a valve or tap on to which may be fitted an air vessel, or expansion chamber which takes up the expansion of the beer during the operation of heating The air vessel is brought into connection with the interio of the cask either by turning on the tap or by opening th valve by means of a key passed through an air-tight stuffin box in the top of the globe. When pasteurisation i complete, the beer is cooled and the air vessel removed, afte closing the tap or valve; naturally, air is excluded durin the whole series of operations. The ends of the cylindric transport cask are stiffened by plates bolted together fro end to end, and the socket intended to receive the valve ma be provided with a flange secured to the inside of the cask
—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Milk; Coagulation of ——, *Spontaneously, and by Renn Lactic Acid Ferment, and Rennet Ferment.* T. Bokorn Chem. Zeit. 1901, **25**, [1], 3—4.

The addition of acids or of salts with acid reaction to mi brings about the coagulation of the caseïn, either instant neously or after standing, according to the quantity a nature of the acid added. The coagulating properties rennet have frequently been attributed to the presence lactic acid in the ferment. But the author shows that th cannot be the case; the quantity of acid present in t small proportion of rennet necessary to produce coagulati would not be sufficient. Moreover, the addition of ferme poisons, such as formaldehyde, mercuric chloride, or sodi fluoride, hinders or prevents, according to the quantity, t action of the rennet. The spontaneous coagulation of m is undoubtedly due to lactic acid produced by lactic bacter but the rapidity of the action of rennet (a few minut precludes the explanation of bacterial production of la acid in this case. It is also generally agreed that nature of the coagulates is somewhat different. There c therefore, be no doubt that the coagulating agent pres in rennet is a specific unorganised ferment, probably o proteïd nature.

The author has made a series of comparative experime on the retarding or inhibitive influence of various antisep upon the coagulating powers of lactic acid bacteria an the rennet ferment, at the most favourable temperatur 30° C. The conclusion which follows is, that both ferm are susceptible to the action of the poisons, but that unorganised ferment of rennet is affected to a far degree by the same proportion of antiseptic than organisms. This is specially noticeable in the cas chloroform, a saturated solution of which entirely inh the activity of the bacteria, whilst the coagulation by re is only delayed by about a quarter of an hour.—J. F. B

PATENTS.

Meat and other Extracts; Apparatus for Preparing J. Y. Johnson, London. From The Actien Masch bau-Anstalt vormals Venuleth and Ellenberger, D stadt, Germany. Eng. Pat. 3817, Feb. 27, 1900.

The meat or other substance from which the extract be obtained is placed between two endless cloth apro bands, which travel in an upward zigzag path over rollers. The substance is compressed as it passes ove guide rollers by adjustable pressure rollers mount sliding bearings. The extracting fluid is admitted the band at the top of the apparatus, The extract wh expressed at each pair of rollers runs into a rece which has a partition reaching nearly to the bottom. extract passes under this partition, and runs on to the lower band, and so on. Any fat which is extracted on the surface, and so does not pass under the partitio is run off through a pipe supplied for the purpose. rollers may be hollow, to allow them to be heated. volatile extracting fluids are used, the whole apparatu be enclosed in an air-tight case. Fractional extractio be carried out by admitting the solvent at different and keeping the expressed liquids separate.—W. P.

lood Preparations; Production of ——. Max Dietrich, Friedrichsberg, Germany, and A. Langer, Berlin. Eng. Pat. 19,141, Oct. 25, 1900.

ℍE process claimed is one for the production of a blood bumin, insoluble in water, and containing a large quantity iron. 0·5 to 2 kilos. of calcium oxide, roughly powered, are poured into 100 kilos. of ox blood and stirred up ntil the mixture becomes thick. The mixture is then lowed to stand, when any unused calcium oxide settles out. ie clear material is removed and dried under reduced essure at 60° C., until ready for grinding. The ground eparation is washed with water. Instead of oxide, lcium carbonate, phosphate, &c. may be used in equivalent proportions. The finished product is odourless and steless.—W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

Water; Lead in Potable ——. P. Cables. J. Pharm. Chim. 12, [11], 517—520.

ɴE lead is attacked by waters less readily than alloys, d the ease and rapidity of the attack increase not only h the amount, but also with the number, of the foreign tals. The author's experiments with long lengths m) of lead piping confirm the usual view, that nitrites i the water increase its corrosive action on lead, while st other salts diminish it. Free carbon dioxide, as a vent of lead carbonate, also increases the activity of a er; but the addition of dissolved calcium carbonate, ecially in conjunction with calcium sulphate, greatly ens it. Lead in a water is best detected and its amount ermined by hydrogen sulphide; but care must be en to have enough acid to dissolve any carbonate sent, yet to avoid unnecessary excess, as the coloration duced by a given quantity of lead is considerably ened by even a small amount of acid in excess. In y few cases is lead in water a serious danger; in a nestic supply, filtration, especially if a weekly spoonful nimal charcoal be added to the filter, will usually remove lead, but in the case of public drinking fountains, lead s ought to be avoided altogether, and cast-iron pipes d.—J. T. D.

ter; Need of Uniformity in the Bacterial Analysis of ——. F. Abba. Zeits. für Hyg. 1900, 33, 372. Proc. nst. Civil Eng. 1900, 142, [4], 46.

results of different bacteriological analyses cannot, in y cases, be satisfactorily compared, owing to the rsity in the practice of the various experimenters. The lts cannot be uniform if the temperature at which the ures are carried out, the period of incubation, and the linity or the composition of the gelatin medium, vary. following data, which were proposed by the author for eral acceptance, were discussed at the Como Hygienic gress, and a resolution was passed in favour of uniformity rocedure. For the nutritive gelatin, a substance composed of concentrated bouillon from Liebig's Extract of t, 6 grms.; fish glue (gelatin), 150 grms.; distilled r, 1,000 grms.; is recommended. The addition of peptone, and other similar ingredients is unnecessary. bonate of soda in the proportion of 0·5 per 1,000 is osed for the standard of alkalinity, after the addition fficient alkali to give the characteristic rose tint with er cent. alcoholic phenolphthalein solution. The arch method is not recommended for cultures, but that och, with Fischer's modification of Petri's process. The perature for incubation should, in all cases, be constant —19° C., and the period of incubation should be as onged as possible—15 days is suggested. The number olonies should always be stated as those present in . of water. No investigation of water of unknown n should be undertaken, nor of samples procured by liable observers.—A. S.

er; The Linde and Hess Process for the Removal of on from ——. Gesundheits-Ing. 1900, 105. Proc. st. Civil Eng. 1900, 142, [4], 47.

water is treated in a filtering vessel filled with wood ngs, free from turpentine, and impregnated with oxide of tin. Air is excluded, so that the oxygen required for combination with the iron is apparently derived from the water itself. The hydrated oxide of iron formed, is retained by the shavings, in the form of a brownish-red deposit. The filters are washed out every 12 hours, air and steam being blown through them in a reverse direction, whilst the shavings are changed and cleansed about every two months. The cost of a considerable amount of pumping is saved by this process, as there is no need of mechanical admixture of the water with the atmosphere. In some works at Gladbach, the total cost of the plant was 2,500*l.*, and the annual expense of filtering 165 million gallons of water, for labour, materials, and interest on capital, was 389*l.*—A. S.

Contaminated Waters; Reaction of Sodium p-Benzenesulphonate on Iron Cystinate contained in ——. H. Causse. Comptes Rend. 131, [26], 1220—1222.

Moliné has stated that all acid waters, even distilled water, give a reaction with sodium *p*-benzene sulphonate, and that this reaction is consequently not characteristic of cystine. The author points out that he has all along regarded this reaction as indicating a CSH group, rather than a particular substance, and that certain phenols also give similar though individual tints with the reagent; moreover, it is the iron compound of cystine, not cystine itself, that gives the reaction. Two portions of a water giving the reaction were treated, one with baryta, one with lead acetate; the first, after filtration, gave no reaction, while the second, after filtration and removal of the lead from the filtrate by sodium sulphate, still gave the reaction. If traces of iron be removed from the phenols above mentioned, by precipitation with baryta water, they no longer give the reaction; but the tints are at once brought out by adding minute quantities of ferrous sulphate. Moliné's distilled water no doubt contained traces of cystine compounds of iron.—J. T. D.

Refuse; Disposal of the Berlin House ——. Gesundheits-Ing. 1900, 140. Proc. Inst. Civil Eng. 1900, 142, [4], 47.

The municipal authorities at Berlin have carried out experiments with the Wegener process, in which the ashes and domestic refuse are fused in a species of cupola furnace, but although the results were, upon the whole, satisfactory, it is stated they have decided to discard this system of treatment in favour of the Buda-Pesth plan, according to which, the refuse is first sorted, and the valueless residue alone consumed. It has been shown from previous experiments that Berlin refuse cannot be consumed alone in furnaces of the ordinary kind, owing to its high percentage of ash. It is pointed out that the question is not solely that of the profitable disposal of the refuse, but is intimately connected with sanitary considerations, and it is doubtful whether the sorting system as now practised is free from objections from the hygienic point of view. In Hamburg, where a similar sorting process was employed, this plan has been given up since the cholera epidemic, and the house refuse is now burnt unsorted.

Wegener claims that the cost of treatment by his process can be greatly reduced, by arranging the furnaces in connection with a series of boilers, in which the surplus heat would be utilised. The furnaces will melt 25 tons of refuse per diem, with the addition of 30 per cent. of coal dust, the total amount of clinker produced being 8 per cent. of the whole bulk dealt with.—A. S.

Sewage; Treatment of London ——. F. Clowes. J Soc. of Arts, 1900, 49, [2508], 45—50.

The treatment which the sewage of London at present undergoes is as follows:—The coarser solid matters are screened off, and the sewage is mixed with solutions of lime and sulphate of iron; the precipitate thus produced is then allowed to settle, together with the finer particles in the sewage, by sending the sewage slowly through parallel channels on its way to the river. The screenings are disposed of by being dug into the ground; the settled matter or sludge is sent in tank steamers to be discharged out at sea beyond the river's mouth; and the fairly clear effluent passes constantly into the river at Barking and

Crossness in two streams which jointly deliver over 200 million gallons every 24 hours.

The clarified sewage produced by this treatment contains a large amount of dissolved putrescible matter, which causes no nuisance when there is an ample flow of river water to dilute the effluent and carry it rapidly out to sea; but in warm and dry seasons, the condition of the lower reaches of the river frequently becomes almost offensive, and this state of things is likely to become worse as population increases and the volume of water taken from the river by the water companies becomes greater. Experiments in bacterial purification were therefore commenced in 1893 by Mr. Dibdin, and have been continued by the author with the co-operation of Dr. Houston. The results have been published in the form of reports to the London County Council (see this Journal, 1899, 862 and 1148).

In the process adopted, the sewage was allowed to flow into large tanks, which contained fragments of coke about the size of walnuts. As soon as the level of the liquid had reached the upper surface of the coke-bed, its further inflow was stopped, and it was allowed to remain in contact with the coke surface for 2 to 3 hours. It was then allowed to flow slowly away from the bottom of the coke-bed. After an interval of from 3 to 7 hours, the processes of filling and emptying the coke-bed were repeated with fresh sewage. The coke-bed was at first filled in this way twice in every 24 hours, but later it was filled three or four times in 24 hours.

A considerable purification has been effected by the coke-bed, owing to the agency of the bacteria contained in the sewage itself, the number of bacteria in raw London sewage averaging from about 3,500,000 in February to April to 6,140,000 in May to August. The maintenance of the purifying action is due to the presence of bacteria or their enzymes upon the coke surfaces, and to the adequate aeration of these surfaces by frequently exposing them to the oxygen of the air. That the aeration of even the lowest portions of a deep coke-bed seems to be satisfactory in the above method of working is shown by the fact that the gases present in the interstices of the coke between two fillings with sewage usually contain as much as 75 per cent. of the amount of oxygen contained in the air. Samples of gases drawn from the coke-bed at 13 ft. from the surface, and at varying intervals after drawing off the effluent, gave, on analysis, the following results:—

Date, 1899.	Depth in Feet from Surface of Coke-Bed.	Number of Hours since Effluent was Drawn off.	Oxygen, per Cent., in the Gases.	Carbon Dioxide, per Cent., in the Gases.
Oct. 30	13	2	19·1	0·8
"	13	48	14·2	3·5
"	13	104	18·6	0·2
Nov. 13	13	4	19·0	0·8
"	13	5	19·0	1·0

Raw sewage, screened through coarse gratings, lost practically the whole of its suspended matter by remaining in such a coke-bed for 2—3 hours. The suspended particles of fæcal matter apparently underwent liquefaction by the bacteria, since they did not collect upon the surface of the coke. The sand, grit, and finer mud (road detritus), however, were deposited, and gradually reduced the capacity of the bed. Hair, fibrous matter, woody fibre from the wood pavements, and particles of chaff and straw, mainly derived from the dejecta of horses, were also deposited upon the coke surfaces, and gradually choked the bed. These substances, consisting mainly of cellulose, appear to be acted upon by bacteria with extreme slowness under the above conditions. They arrive, however, in a water-logged condition, and rapidly settle out if the rate of flow of the sewage be reduced. Therefore, in dealing with the sewage of the Metropolis, it seems best to submit the roughly-strained sewage to a somewhat rapid process of sedimentation before passing it on to the coke beds; the small amount of suspended matter which then remains, and the dissolved organic matter, are readily dealt with by the bacteria of the coke-beds, and no choking of the beds occurs.

The effluent which is thus obtained from the coke-beds is entirely free from offensive odour, and remains so, even if kept for a month at summer temperature in closed or open vessels. It is clear, except when a turbidity is produced by fine mud particles washed down by heavy rain. Many pond and river fish have been kept in the constantly renewed effluent for a month, and have been found to be perfectly healthy at the end of that period. Coke-beds, varying in depth from 4 to 6 ft., remove, on the average, 51·3 per cent. of the dissolved matter of the original sewage, which is oxidisable by permanganate, the portion removed evidently being that which would rapidly become offensive and would rapidly lead to a de-aeration of the river water if it were allowed to pass into the river. A coke-bed 13 ft. in depth has proved more efficient, and has for some time produced a purification of 64 per cent., whilst an old bed, 6 ft. in depth, gave a purification of 86 per cent. By passing the effluent from the coke-bed through a second coke-bed, an additional purification of 19·3 per cent. has been effected, making a total purification of 70·6 per cent.

Relative Impurity as Estimated by Permanganate.

—	—	Percentage Purificatio calculated on the Clear Raw Sewage.
Raw sewage deprived of its suspended matter.	3·696	..
Effluent from chemical treatment.	3·070	16·9
Effluent from single bacterial treatment.	1·799	51·3
Effluent from double bacterial treatment.	1·137	69·2
River water (high tide).......	0·550	..
" " (low tide)	0·429	..

The above purification is reckoned on the *dissolved* impurity of the sewage; the suspended impurity is not take into account. No difficulty has been experienced maintaining the bacterial purification.

The bacteriological condition of the effluent correspon in the main with that of the raw sewage. The total numb of bacteria undergoes some reduction in the coke-beds, b the different kinds of bacteria which were present in t sewage are still represented in the effluent (see tl Journal, 1899, 1149). The introduction of such a sewa effluent into the lower Thames is unobjectionable. T river water at the points where the effluent is discharged uniformly muddy; it is always brackish, and frequently s to taste, owing to the presence of tidal sea water. It therefore, not capable of being used for drinking purpos The effluent would certainly cause no deposit upon the ri bed, and would ordinarily tend to render the muddy ri water more clear by mixing with it. No offensive sm would be emitted by the effluent as discharged, a although it would contain more organic matter than river water, the bacteria which it contains would slowly inoffensively remove this organic matter from the efflu after it had been discharged into the river. The efflu would be suitable for the maintenance of healthy fish lif —L. A

Waste Waters of Sugar Factories in Russia; Purificat of ——. J. Slasski. Bull. de l'Assoc. Chim. Sucr. D 1900, **18**, [5 and 6], 303—304.

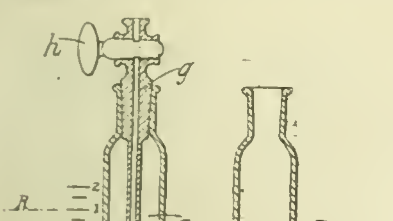
The first attempts to arrive at a general purification of waste waters of sugar factories in Russia date from year 1880. But only in 1894, as the result of a commis of inquiry, was the matter put on a satisfactory basis. waste waters are divided into harmful and non-harm To the former class belong those which contain dissol saccharine matter, &c., and the water used for washing carbonic acid gas. These waters, failing any satisfact chemical process of purification, must be purified in irr tion fields, which must be at the disposal of all s factories. The uncontaminated waters may be dischar into the rivers; the condensing waters must first be co to 25° C., and the beet-washing waters must be clarifie sedimentation.—J. F. B.

PATENTS.

Vater for Steam Generators; Determining the Condition of ——, with respect to the Amount of Chemicals required for Softening it, Apparatus for ——. F. R. K. Erfmann, Rotterdam, Holland. Eng. Pat. 1166, Jan. 18, 1900.

'ne object of the invention is to afford a ready means of etermining the proportion of soda (for instance) that hould be added to the feed-water of boilers in order to often it, so as to prevent the formation of a hard crust n the boiler-plate, the method being usable by ordinary orkmen. "A definite quantity of boiler-water is caused react on a definite quantity of a basic solution of definite rength so that a precipitate is formed. This mixture is tered, and it is then determined how much of the basic lution still remains in the filtered liquid. For this pur- se the base is coloured yellow by Methyl Orange." On utralising the base by an acid, the change of colour dicates the completion of the reaction.

Three flasks, not shown, are used: (1) containing the loured base; (2) the acid; and (3) the water to be sted. The water is poured into the vessel *b* (the cock ing closed) up to the mark A. From flask (1) the basic lution is added up to the mark B. A precipitate forms, d, on opening all the cocks, the liquid flows through the er *i* into the vessel *a* until it touches the end of the pipette. e cock *h* is then closed, and the liquid rises in the pipette ly until it reaches the same level as in vessel *b*. All the cks are now closed, the pipette is removed, and acid is ded from flask (2) until the alkali is neutralised. The ision reached by the liquid shows the quantity of acid



a ed, the equivalent of which in soda is known by previous t ition, and may be read off at once as kilos. of soda to be a ed to each ton of boiler-water. It will be noticed that the c struction of the vessel containing the filter is such as to p vent, by compression of air, overflow of the filter.—E. S.

I Manufacturers; Treatment of Water for ——. . Otto, Neuilly, France. Eng. Pat. 2991, Feb. 14, 1900.

T : water is first sterilised by passing through it a current zone. It is then de-aërated by agitation under reduced p ssure.—L. A.

Refuse Material, Garbage, and Night Soil; Furnaces for Burning ——. J. F. Lester, Atlanta, U.S.A., and L. A. Dean, Rome, U.S.A. Eng. Pat. 17,071, Sept. 25, 1900.

The furnace consists of one combustion chamber or a number of preliminary combustion chambers, each with a series of inter-communicating furnaces below. The refuse is charged into a combustion chamber through an opening in the top, and is delivered through openings in the floor into the furnaces below, the floor of the chamber forming the perforated arched roofs of the furnaces. As the refuse falls, it passes through the path of the escaping products of combustion. At the rear of the combustion chamber is a wall having therein a series of restricted openings. Each vertical series of these openings communicates by a vertical flue with a common horizontal flue arranged beneath the furnace. This latter flue leads the gases towards the end walls, and thence through an opening to a parallel flue running along the centre of the furnace. Within this flue is arranged a coke fire to consume the smoke. The gases then pass to the chimney. The chimney at its lower part is cooled by air channels, and is constructed internally in the form of two truncated cones, so as to assist the draught.—R. S.

(C.)—DISINFECTANTS.

PATENTS.

Antiseptic Preparation for the Destruction of the Microbes of Furuncles, Anthrax, Phlegmons, Abscesses, and other Cutaneous Affections. F. F. Bourdil, Paris. Eng. Pat. 1814, Jan. 24, 1900.

A solution of iodine in acetone.—L. A.

Disinfecting, and Apparatus therefor. E. Fournier, Paris. Eng. Pat. 13,566, July 27, 1900.

The improved method consists in injecting into the air of the chamber any suitable disinfecting vapour, whilst maintaining the air of the chamber at a minimum temperature of 30°—40° C. Complete portable apparatus is described for carrying out the necessary operations, consisting of a stove for heating the air and for vaporising the disinfectant; a fan for agitating and mixing the air and vapour; a door for closing the chamber, which is fixed in place of the ordinary door, and is provided with the necessary openings, connections, and tubes for the apparatus for heating, injecting, and agitating the air, as well as for the reception of a thermometer, and with inspection holes and ventilation orifices; and two injectors, one a spray device for distributing the disinfectant, and the other is constituted by a system of perforated tubes, enclosing non-perforated tubes, for the circulation of heated air, and terminating in a tube extending through the lower part of the door, and a tap for removing the products of condensation.—L. A.

XIX.—PAPER, PASTEBOARD, Etc.

Paper Manufacture; Increased Cost of Wood for ——, and Process for Utilising Cheaper Woods. F. A. Bühler. Papier-Zeit. 1900, **25**, [94], 3526—3527.

The author alludes to the increasing price of wood suitable for the manufacture of sulphite cellulose and calls attention to his process (Eng. Pat. 6651, 1898; this Journal, 1898, 944) for the employment of phenolic tar oils in the preparation of cellulose from wood. It is based on the fact that the phenols are solvents, not only for lignone, but also for resinous bodies, and consequently resinous and knotty woods, branches, and tops unsuitable for the sulphite process, can be employed. Wood can be heated to a much higher temperature without decomposition in presence of phenol than alone, or with other liquids. A temperature of 200° C. is quite safe, decomposition only begins at 230° C. No acetic acid is produced in the process; the dark colour of the cellulose is not due to decomposition, but to colouring matters from the oil, and readily yields to bleaching. Pure phenol gives a white pulp. The time of boiling is 3—4 hours for wood-meal, 5 hours for straw, 8—10 hours for soft trunk-wood, and 10—12 hours for dense, resinous wood; no pressure is required. Experiments on branches and knots showed that the whole of the incrusting matters are dissolved; naturally, the fibres obtained from these are not so long as those of the trunk-wood. By boiling at 5 atmospheres pressure for 60 hours, the whole of the cellulose is dissolved. Experiments showed that the solvent action of the phenols was still preserved when the dilution was 3 parts of phenol to 7 of hydrocarbon; further dilution increased the time required for boiling. Commercial phenolic oils from wood-tar, with 50—60 per cent. of phenols should therefore be perfectly applicable. Iron vessels are considerably attacked by the phenols and copper is the most suitable metal for the pans. The pulp can be pressed to 70 per cent. of dry fibre, the rest of the oil must be extracted, preferably by "crude benzole." On recovering the phenols by distillation, the incrusting matters and resinified oils are obtained as a pitchy mass of high calorific value, equal in weight to the cellulose produced. The yield of cellulose amounts to 48—50 per cent. of the dry weight of the wood. The quantity of oil employed is four times the weight of the wood and the copper boilers are heated by fire or superheated steam. Water and light oils come off first, the heavy oils are condensed and returned; the temperature of boiling is about 150° C. for 10 hours. The cellulose in the unbleached state does not felt very readily, but after bleaching it is equal to sulphite cellulose. This process has not yet been adopted on the large scale, but it should prove of good service in the future, especially for goods which need not be quite white.—J. F. B.

Straw-Paper. Papier Zeit. 1900, **25**, [98], 3679.

There is generally reckoned a loss of 30—35 per cent. of fibre substance from the dry straw to the finished paper. With boards, the loss is rather less because straw boards usually contain 10—15 per cent. of moisture, and straw-paper only 5—7 per cent. Straw-paper should always leave the machine with a certain amount of moisture, in order to preserve its flexibility. The degree of moisture can be regulated by taking care that as the paper leaves the delivery roller of the drying cylinder, it still steams considerably; it should neither cling to nor spring away from the cylinder. It makes a great difference whether the straw is bought at harvest time or some months later; the loss of weight from harvest to Christmas amounts to almost 25 per cent. In making purchases this loss should be taken into account.

Good rye-straw grown on poor sandy soils has a much lower specific gravity than that grown on heavy clay or mixed soils. Differences are caused by variations in the weather at harvest time. The greatest amount of moisture is nearly always found in pressed straw bales, these also often contain moist sweepings, refuse, and sand in the interior of the bale. On opening these bales steaming is often observed; it is caused by fermentation. The driest straw is that which has been stored till Christmas in barns; straw ricks in the open are always rather damp.

So-called "uneven" wheat straw, grown on mixed soils manured with potash, often contains hard knots which are not softened even by severe boiling, and give rough boards which will not take a smooth surface. These straws must be boiled with alkali or, better, with the waste liquors from straw cellulose factories for a long time.—J. F. B.

Linoleum; New Method of Manufacturing ——. Ammundsen, Rasmussen, and Hrün. Rev. Prod. Chim. **3**, [22], 341.

Two parts of resin and one part of a vegetable oil are melted together and 55 parts of this mixture are incorporated with 45 parts of a mixture of lime and casein. When the mass is homogeneous it is mixed with ground cork, the product being spread out in the form of plates and dried. The advantage claimed over ordinary linoleum is that drying is complete in a few days; and owing to the presence of an excess of lime along with the casein, a soap is formed with the oil present, and the linoleum is thereby maintained in a pliable condition. Glycerin has been tried, to prevent the hardening of the casein, but it gave unsatisfactory results, even when used in proportions up to 30 or 40 per cent.—C. S.

Kaolin; Levigated ——. F. Ulzer.
See under VIII., *page* 123.

Camphor and Camphor Oil. Gummi-Zeit. **15**, [8], 124
See under XIII. C., *page* 137.

PATENTS.

Manifold Paper. [*Single or Double "Carbon" Paper* F. W. Weeks, Chicago, U.S.A. Eng. Pat. 9451, M 22, 1900; under Intern. Conv., Oct. 23, 1899.

The ordinary kinds of carbon paper have a soft layer pigment, which is injured when touched, and also soils t hands of the user. To overcome this defect, a mixture equal parts of wax, tallow, and either lampblack or Pruss blue is prepared, melted, and cast into sticks. It is th applied to, and spread uniformly over, the paper by suitab mechanism; and finally the whole is given a firm ha surface by finishing with rapidly rotating wing polishers. —F. H. L.

Drawing Rolls used in Spinning [*Cotton*]; *Coverin suitable for the ——.* W. F. Reid, Addlestone, Surr and "The Velvril Co., Ltd.," London. Eng. Pat. 16 Jan. 25, 1900.

The rolls are covered with tubes, preferably seamless, ma of a mixture of one part of nitro-cellulose with two parts nitro-linoleïn or nitro-ricinoleïn, as described in Eng. P 21,995, 1895; this Journal, 1896, 910. The method preparing the tubes is given in Eng. Pat. 11,209, 1900. —F. H. L

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Rare Earth Group; Separation of the Members of — Verneuil and Wyrouboff. Rev. Scient. **13**, 518—5 616—622. Le Mois Scient. et Ind. **2**, [2], 250—252.

Separation of Members of the Rare Earth Group.— existing methods give defective results, and the aut prefer to treat the calcined oxides with sufficient nitric to form neutral salts with ceroso-ceric oxide and the oxi of lanthanum and didymium present. On boiling solution, the first-named oxide polymerises to a m compound, which may be precipitated as a pure sulp by adding an alkali sulphate, leaving the other ox behind. Thoria, if present, comes down with the ceri but can be extracted by treating the neutral nitrates an excess of hydrogen peroxide.—C. S.

Hydrogen Peroxide; Reduction of Mercury Salts by - A. Kolb. Chem. Zeit. 1901, **25**, [3], 21.

Mercury salts, in the presence of alkali, or in ammon solution, are reduced to the metallic state by hydr peroxide, whilst in neutral or acid solution, they are affected by it, although in neutral solutions, mercuric are reduced to the mercurous condition in the presen a neutral tartrate, such as Rochelle salt. Thus, on war an aqueous solution of mercuric chloride or nitrate, to w a little alkali has been added, with a few drops of a cent. solution of hydrogen peroxide, the yellowish-red cipitate is rapidly reduced to the metallic state. Simi a mercury salt mixed with an ammonium salt and an e of ammonia may remain clear, but on mixing wit hydrogen peroxide, will deposit mercury; but in this the precipitation is not complete, even in the pre of an excess of the peroxide. If, however, a little ta acid, and then an excess of strong ammonia, be add the clear solution, the whole of the mercury can be cipitated as such after warming for half an hour wi peroxide. Neutral mercuric chloride, mixed with Ro salt and warmed with the peroxide, gives a reducti mercurous chloride (not to metallic mercury) in fro 10 minutes. The precipitate of calomel is large-gr and both filters and washes well; the reduction ap moreover, to be quantitative. If the reaction has effected in strong solutions, the liquid deposits crys otassium bitartrate on cooling. Vanino and Treubert (this ournal, 1897, 1013; and 1898, 72) add hydrogen peroxide the end of their process, in which mercuric salts are duced by phosphorous acid, but the peroxide here plays n oxidising part. Mercuric cyanide also, when warmed ith a little potash and hydrogen peroxide, is completely duced in from 15 to 30 minutes. If ammonia be substituted r potash, the reduction is not complete.—W. G. M.

alcium Iodate; Preparation of ——. W. Mackie. Lancet, 1900, [4035], 1867. Chem. and Druggist, Jan. 5, 1901.

n aqueous solution of iodine in potassium iodide is prered of such strength that it will just transmit light rough a depth of 3 ins. A filtered solution of bleaching wder is run into the iodine solution, with occasional rring. If the crystalline precipitate which forms after me time be not perfectly white, a further quantity of tassium iodide solution is added, the mixture stirred, and ain decolorised with the bleaching powder solution. A all quantity of very dilute hydrochloric acid is now added dissolve any calcium carbonate which may have been med, the precipitate is collected on a filter, washed once twice with cold water, and dried on blotting paper or at emperature not much exceeding 100° C. The potassium ide should be kept in excess during the precipitation. The duct corresponds to the formula $Ca(IO_3)_2 + 6H_2O$; it dourless and tasteless and is soluble in about 380 parts water at 11·5° C.; it is said to be a satisfactory subute for iodoform. The salt has been known in Elgin ler the name of "Calcinol."—A. S.

Bismuth: Hydrated Oxide of ——. P. Thibault. J. Pharm. Chim. **12**, [12], 559—561.

e author confirms the previously recorded fact that the rated bismuth oxide obtained by precipitating acid itions of salts of the metal by means of alkali, invariably tains a notable quantity of oxysalt of the acid present, ever the manipulative details of the process may be ed. He finds, however, that by precipitating the oxide n an alkaline medium with an acid, this impurity may avoided; the resulting gelatinous precipitate affords a nular white powder, which, when dried at ordinary peratures over H_2SO_4 responds to the formula $Bi_2O_3H_2O$. grms. of crystalline bismuth nitrate are mixed intimately n 30 grms. of glycerin (sp. gr. 1·264), and 100 grms. of er added gradually with constant agitation. When tion is complete, the liquid is gradually added to excess solution of potash. When all the hydrated oxide has n entered into solution, the excess of alkali is cautiously tralised by the addition of dilute sulphuric acid, until liquid is only faintly alkaline, or at the most, neutral; ess of acid being carefully avoided. The resultant tinous precipitate is washed free from sulphate by notation in the usual manner. From the pure hydrated le thus obtained, the organic salts of bismuth such as gallate, salicylate, benzoate, perfectly free from conination with salts of mineral acids, may be prepared, h is not the case with those prepared from the oxide ined by the usual method of precipitation.—J. O. B.

muth Subnitrate; Commercial ——. F. A. Upsher Smith. Pharm. J. 1900, **65**, [1590], 692—696.

author draws the following conclusions from the lts of his experiments. Commercial English bismuth itrate is uniform in composition as regards Bi_2O_3 but es slightly in acidity and in the proportion of moisture ent. English samples contain less Bi_2O_3 than some rican samples examined by Curtman and Kebler, and are "more basic and slightly more acid" than the formula demands. For purposes of calculation, a nula corresponding to 80 per cent. of Bi_2O_3 should be n instead of the B.P. formula.

he following modifications of the pharmacopœial chars and tests are recommended:—Bismuth subnitrate, aining not less than 80 per cent. of Bi_2O_3, and from to 19·5 per cent. of N_2O_5, should form a heavy, white, orous powder, consisting of minute crystals, with an acid ion to litmus. If 1 grm. be just dissolved in nitric acid, and the liquid mixed with 5 c.c. of an aqueous solution containing 2 grms. of citric acid, and sufficient ammonia to give a decided alkaline reaction, no precipitate or opalescence should be formed on boiling (absence of calcium phosphate). 1 grm. of substance, on ignition at red heat, should leave a residue of from 0·79 to 0·81 grm. (corresponding to 79—81 per cent. of bismuth oxide). If 2 grms. be heated with 5 c.c. of water and 10 c.c. of normal potassium hydroxide solution for half an hour on the water-bath, with occasional stirring, then the liquid filtered, and the residue washed, the filtrate should require from 34·75 to 27·3 c.c. of decinormal hydrochloric acid for neutralisation, with phenolphthalein as indicator (corresponding to 17·5—19·5 per cent. of N_2O_5). Heated at 120° C., the salt should lose from 2 to 3 per cent. of its weight.—A. S.

Chloroform: Electrolytic Preparation of ——. Rev. Prod. Chim. **3**, [20], 309.

A 20 per cent. solution of sodium chloride is heated at 100° C. in a leaden still, and kept stirred by means of carbon spatulas, which, at the same time, serve as anodes for the (5—6 ampère) current. Acetone is introduced into the bottom of the still, and combines with the liberated chlorine to form acetone trichloride, which, in presence of the sodium hydroxide, is decomposed with formation of sodium acetate and chloroform. The latter is conveyed through a condenser, and collected in a suitable receiver. The yield is said to be 180 parts out of 210 theoretically possible. —C. S.

Cacodylic Acid and Cacodylates. W. H. Martindale. Pharm. J. 1900, **65**, [1591], 724.

In the commercial preparation of cacodylic acid, equal parts of potassium acetate and arsenious acid are subjected to dry distillation, yielding Cadet's fluid, which consists of a mixture of cacodyl oxide, $[As(CH_3)_2]_2O$, with some cacodyl, $As_2(CH_3)_4$. This is redistilled in a current of hydrogen, and treated under cold water with mercuric oxide in small quantities at a time. The supernatant liquid containing the cacodylic acid and a small quantity of mercury cacodylate (which is removed by adding a few drops of cacodyl) is decanted off, evaporated to dryness, and the acid extracted by hot alcohol. Cacodylic acid, $AsO(CH_3)_2OH$, is a monobasic acid, reacting acid to phenolphthaleïn and litmus, but neutral to Methyl Orange; it crystallises in the form of anhydrous, colourless, odourless, rhombic prisms, easily soluble in water, but less in alcohol; it is deliquescent, and alters in composition in moist air; melts at 200° C., but rapidly decomposes at higher temperatures. Cacodylic acid should be free from chlorides, sulphates, oxalates, and arsenious or arsenic acid.

Sodium cacodylate, $AsO(CH_3)_2ONa + nH_2O$, forms very deliquescent, prismatic crystals, easily soluble in water and alcohol. It is prepared by exactly neutralising cacodylic acid with sodium hydroxide. The crystals contain varying proportions of water, according to the temperature at which crystallisation took place and the nature of the solvent used. The salt of commerce, which usually contains 2 to 3 mols. of water, should be tested for the impurities mentioned under cacodylic acid. For the determination of sodium cacodylate in the commercial salt, which frequently contains free cacodylic acid, Imbert and Astruc have proposed the following method:—A decinormal solution of the salt is prepared by dissolving 1·6 grms. in 100 c.c. of water. 10 c.c. of this solution are neutralised with decinormal caustic soda in presence of phenolphthaleïn, then a few drops of Methyl Orange added, and the liquid titrated with decinormal acid; the number of c.c. of acid used, multiplied by 10, will give the percentage of pure dry, sodium cacodylate. The author states that the method is satisfactory, except that with samples containing appreciable quantities of free cacodylic acid, the number of c.c. of soda consumed in neutralising this free acid should be deducted from the number of c.c. of acid used.

Other Cacodylates.—Potassium cacodylate is more deliquescent than the sodium salt, and crystallises with 1 mol. of H_2O; the lithium salt is soluble in water and alcohol; the calcium salt has 9 mols. of H_2O; the magnesium salt is soluble, and crystallises with difficulty; the silver salt withstands the action of light when dry, but blackens when moist. The iron salt is of variable composition, in fact the commercial article is said to frequently consist of a mixture of oxides of iron with cacodylic acid. Mercury cacodylate gives prismatic crystals from alcohol; it is soluble in cold water, but the solution is decomposed on heating. Other compounds are guaiacol cacodylate of uncertain composition; alkaloidal cacodylates; and cinnamylcacodylic acid, which is stated to contain a molecule of each of the component acids, and to be crystallisable.—A. S.

Cinchona Alkaloids: Formation of the ——. J. P. Lotsy. Bull. Inst. Bot. Buitenzorg. 1900, **3**. Pharm. J. 1900, **65**, [1590], 689.

The author communicates the results of an investigation as to the place of formation of the alkaloids in *Cinchona succirubra* and *ledgeriana*. He concludes that they are formed in the leaves, whence they pass to the stem, and are there stored up, either in their original form or after transformation into some other alkaloid. The alkaloids are not formed as products of decomposition of proteids, but by direct synthesis, as the results of the action of cinchonic acid on ammonia, or a compound of ammonia, and subsequent condensation.—A. S.

Camphene. F. W. Semmler. Ber. 1900, **33**, [18], 3420—3432.

The transformations from the pinene to the camphene type are of great significance for the constitution of both terpenes.

Pinene dibromide, obtained by the method given by Wallach (Annalen, **264**, 1), was converted into hydrocamphene, $C_{10}H_{18}$, which was identical with the hydrocarbon obtained from artificial camphor, $C_{10}H_{17}Cl$. Bromocamphene, when reduced by sodium and alcohol, yields camphene identical with the original substance. The same camphene dibromide is found in the residue, after the steam distillation of the product of the action of bromine upon camphene, which is obtained by the action of bromine upon camphene dissolved in glacial acetic acid. It crystallises from alcohol, melts at 90° C., and distils undecomposed at 153°—155° C. under 15 mm. pressure. On distillation with quinoline, the above bromocamphene is obtained. The dibromide is unaltered by alcoholic potash; when reduced by sodium and alcohol, the above hydrocamphene, $C_{10}H_{18}$, is formed. Camphene hydrobromide is obtained by the action of hydrobromic acid gas upon camphene dissolved in absolute alcohol. When separated from its solutions by cooling, it forms fine crystals which melt at 133° C. Alcoholic potash at once regenerates camphene, which was also the sole product of the action of sodium and alcohol, though camphene hydrochloride on reduction gives camphene and hydrocamphene.

Camphene Ethyl Ether, $C_{10}H_{17}OC_2H_5$, is obtained by boiling camphene and absolute alcohol with sulphuric acid. It is a fluid oil, boiling at 200° C., and is not decomposed by distillation over sodium. A similar reaction occurs with other pseudo-terpenes, with nopinene and sabinene, but the yield is small; limonene is polymerised almost entirely.

Camphor is obtained in small quantity by the oxidation of isoborneol with potassium bichromate and sulphuric acid. The yield is much greater if the isoborneol be dissolved in glacial acetic acid, and the calculated quantity of powdered permanganate added.—A. C. W.

Santalol; Preparation of ——. Heine and Co. Ger. Pat. 116,815, an addition to Ger. Pat. 110,485, of Jan. 4, 1898. Zeits. angew. Chem. 1901, **14**, [1], 15.

The crude santalol obtained by saponification of sandalwood oil, according to Ger. Pat. 110,485, 1898 (this Journal, 1900, 555), is purified by fractional distillation with superheated steam.—A. S.

Adonidin. N. A. Waljaschko. Farmaz. Westn. 1900, **4**, 551; through Chem. Zeit. Rep. 1900, **24**, [100], 366.

Merck's adonidin, obtained by precipitating an aqueous extract of the plant with tannin, is a brown hygroscopic substance which deliquesces at once in the air to a brownish-yellow turpentine-like mass, with microcrystalline structure and odour of the dried plant. It contains (1) . colourless constituent of bitter taste and peculiar odour which crystallises in needles and dissolves easily in organi solvents, but with difficulty in water; (2) a dark brow substance soluble in alcohol and insoluble in water; (3) similar body easily soluble in water, precipitated by lea hydrate and dissolved with difficulty by alcohol; (4) colourless, bitter principle which crystallises in octahedr dissolves easily in water and very slightly in alcohol; (5 white amorphous adonidin, recognised by its colour reactio with sulphuric acid, bitter taste, and insoluble tanni compound.

Adonidin is almost insoluble in petroleum spirit, ethe toluene, and benzene, somewhat soluble in acetone, chlor form, acetic and amylic ethers, aniline and pyridine, easil soluble in phenol, glacial acetic acid, water, and meth alcohol, and also in the higher alcohols (ethyl, propy isobutyl, and isoamyl) with gradually increasing difficulty.

The commercial sample was repeatedly extracted wi isobutyl alcohol to eliminate substances 3 and 4. Fro the solution the fairly pure substance was precipitated b tannin, recrystallised several times from isobutyl alcoho and evaporated in a vacuous desiccator over calciu chloride. The resulting pure white substance dissolves 120 parts of cold or 90 parts of hot isobutyl alcoh is extremely hygroscopic, deliquesces rapidly, probab owing to the formation of hydrates, and must be recryst lised several times before it recovers this comparative permanent state.

When dried *in vacuo* at 60°—110° C., alcohol ar moisture are lost, and the substance appears to be le hygroscopic. In the purest state it is pale yellow in colou forms a clear solution, and has no definite melting poi but undergoes change at 120°—130° C. The percenta composition is C = 57·97, H = 6·49, ash = 6—7. Adonid does not reduce Fehling's solution, and yields, when deco posed with hydrochloric or sulphuric acid, (1) a wh soluble substance, slightly soluble in alcohol; (2) a ve bitter principle with characteristic odour that crystallises needles and dissolves in ether, chloroform, acetone, a alcohol; (3) a resin easily soluble in alcohol and solul with difficulty in ether or water. This resin is probal formed by the further action of the acid on the precedi substance.—R. L. J.

Peru Balsam in Central America. P. Preuss. D. Phar Ges. Ber. 1900, **10**, 306; through Chem. Zeit. Rep. 19 **24**, [100], 367.

This balsam is exclusively obtained from the small Repul of San Salvador, and derives its name from the fact t during the Spanish occupation, the drug was first taken the seaport town Callao in Peru and thence shipped Europe. The tree that yields it (*Myroxylon Pera* grows, either singly or in small groups, to a height 15—20 metres, and is tapped when the trunk measu 60 cm. in circumference, the juice being collected throu out the year, but chiefly during the dry period f December to April. Rags are employed to soak up balsam, and its flow is increased by the application of When saturated, the rags are squeezed and boiled w water; the bark is removed when the incisions ceas yield, pounded up, and extracted in a similar man The "rag-balsam" is then mixed with that obtained f the bark.—R. L. J.

Ionone from Cyclo-Citral and Acetone; Preparatio ——. Haarmann and Reimer. Ger. Pat. 116,637, 11, 1898. Zeits. angew. Chem. 1901, **14**, [1], 15.

The claim is for the preparation of ionone from c citral and acetone by condensing these substances in pres of an alkaline reagent.—A. S.

Ethereal Oil from "Orchis militaris L." E. Cro Répert. Pharm. 1900, [3], **12**, 529; through Chem. Rep. 1900, **24**, [104], 384.

This oil can be extracted by means of 90 per cent. alc or better, by ether, as in this case the pleasant smell o dry plant is retained. The oil is yellowish, and l pleasant penetrating smell. If the dry plants are dis th water, the oil suffers partial decomposition and loses its aracteristic odour.—T. H. P.

eppermint Oil from Russian and other Sources; Examination of ——. J. Lifschitz. Farmaz. Westn. 1900, 4, 575; through Chem. Zeit. Rep. 1900, **24**, [100], 366.

ttings of black and white peppermint were obtained om Mitcham some years ago for the Botanical Gardens at St. Petersburg. A portion of the white variety was transferred in 1895 to the Ljubens plantations in the Poltava district, and two years later the leaves, flowers, and thin twigs of this crop were distilled for oil. The following table shows the composition and properties of three Russian oils and of six other samples from recognised sources examined in the pharmaceutical laboratory of the university of Kharkoff:—

Description.	Specific Gravity at 17·5° C.	Rotation at 20·5° C. in 100 mm. Tube.	Solidifying Point.	Boiling Point.	Maumené Reaction.	Acid No.	Etherification No.	Saponification No.	Iodine No.
ppermint oil:		° ′	° C.	° C.	°				
White	0·9138	− 21 21	− 12	160	20 5	1·68	48·72	50·4	65·10
Black	0·9098	− 21 29	− 11·5	165·5	20	1·12	49·28	50·4	76·49
gricolla" Co.'s oil, Kiev.	0·9115	− 24 10	− 14	180·5	16·5	1·12	54·88	56·0	79·51
ppermint oil:									
erman	0·9045	− 26 24	− 14·5	183	18·5	0·56	66·64	67·2	61·38
nglish (Mitcham)	0·9024	− 24 11	− 13	198	18	0·56	21·84	22·4	66·64
nglish	0·9109	− 25 20	− 13·5	194	19	1·68	26·32	28·0	46·92
merican (Hotchkiss)	0·9154	− 29 17	− 13	154	17·25	2·24	36·96	39·2	61·84
merican (Fritzsche)	0·9097	− 26 10	− 13	156	18	1·12	21·28	22·4	63·24
apanese	0·9454	− 21 40	below − 20	124	20·5	16·8	28·0	44·8	61·61

Description.	Vols. of Oil and Alcohol (90 per Cent.) respectively, which form a Clear Solution.	Menthol Content.			Menthone Content.
		Fixed.	Free.	Total.	
ppermint oil:		Per Cent.	Per Cent.	Per Cent.	Per Cent.
White	1 : 1·8, cloudy with more alcohol	13·57	43·14	56·71	36·07
Black	1 : 1·8, „ „	13·72	40·63	54·35	39·03
gricolla" Co.'s oil, Kiev.	1 : 1·4, „ „	15·23	40·34	55·62	34·00
ppermint oil:					
erman	1 : 2·3, „ „ weaker	20·12	34·23	54·35	31·84
nglish (Mitcham)	1 : 4·5, more alcohol gives faint opalescence	6·08	46·44	52·52	39·29
nglish	1 : 4·0, „ „ „	7·33	44·14	51·47	37·24
merican (Hotchkiss)	1 : 1·7, cloudy with more alcohol	10·29	47·04	57·33	20·58
merican (Fritzsche)	1 : 1·3, „ „	5·92	50·44	56·36	23·81
apanese	All proportions	7·80	26·72	34·52	49·40

The Japanese oil was evidently deprived of a portion of free menthol. The "Agricolla" was somewhat inferior the English in taste and odour, but superior to the rman. The markedly superior odour of the Russian nples (first three in the list) is in harmony with their gh percentage of combined menthol.—R. L. J.

Osmophorous [Scent-forming] Groups. II. Diazoimides (Triazo-compounds). H. Rupe and K. von Majewski. Ber. 1900, **33**, [18], 3401—3410.

ertain groups impart to the compounds they enter a aracteristic and pleasant odour. These groups are styled osmophorous" by the authors: in particular they are H, O:, CHO, $CO.CH_3$, $O.CH_3$, NO_2, CN, N_3. Certain oups may replace others without altering the character of e odour; thus we have the series $C_6H_5.CHO$, $C_6H_5.NO_2$, $H_5.CN$, $C_6H_5.N_3$. Similarly *p*-nitroguaiacol has a slight, d *p*-cyanoguaiacol a distinct odour of vanilla. In artiial musk the nitro group has been replaced by CN and N_3 without perceptible change of smell.

Derivatives of pyrocatechol methylene ether were prered. Piperonylic nitrile, $CN.C_6H_3O_2:CH_2$ resembles peronal in odour, but has, at the same time, a nitrile smell. iazopyrocatechol methylene ether, $N_3.C_6H_3O_2:CH_2$, has odour similar to piperonal but weaker, at the same time as the anise odour characteristic of the diazo-imide group. As regards the combination of several osmophorus groups, e following observations were made: *p*-triazo-benzoicthyl ester has a strong sweet odour, recalling fruit and ise, whilst *p*-cyanobenzoic methyl ester has a strong, not pleasant odour, very similar to that of the last-named comund, but also characteristic of nitriles, and not far removed om the fruity smell of *p*-bromo- and chlorobenzoic methyl ters. In the *p*-, *m*-, and *o*-triazobenzoic methyl esters there a decrease in smell from *p*- to *o*-. *p*-Triazomethoxybenzene s the strong anise odour typical of diazo-imides, whilst e *o*-compound is similar to *m*- and *o*-triazobenzoic methyl ters. *p*-Triazobenzaldehyde has a strong smell, tolerably easant, recalling anise and anisaldehyde; the correspond- nitrile has a feeble smell.

p-Methoxyacetophenone has a very pleasant odour; Tabara (Ber. **25**, 1308) describes the *o*-compound as an oil of aromatic odour; the *m*-compound was now prepared and found to possess only a very slight smell of acetophenone. *m*-cyanacetophenone is also almost without smell, whilst acetophenone-*m*-carboxylic methyl ester is quite odourless and *m*-triazo-acetophenone is almost odourless. Thus in the derivatives of acetophenone, the *m*-position is the least favourable for osmophorous groups.

Diazo-imides.—The methods for the preparation of diazo-imides through the perbromides and by means of hydroxylamine are not suitable for working on a large scale. Good results were obtained by using potassium hydroxylamine mono- or disulphonate in place of the base itself; the method is, however, restricted to diazo-compounds containing a negative group in the nucleus. The potassium hydroxylamine sulphonate was obtained by the process of Raschig (Annalen, **241**, 183); for use it was dissolved in 40 parts of water by gentle heating. As an example, *p*-nitraniline may be taken: the base was diazotised by means of 4 mols. of hydrochloric acid and 1 mol. of nitrite, a solution of 2½ mols. of the hydroxylamine sulphonate was then added. The diazo-imide separates in a few minutes; the yield is almost quantitative, and the crude product melts at 70° C. instead of 72° C.—A. C. W.

Morphine; Determination of ——, *by Reduction with Silver Nitrate.* C. Reichard.

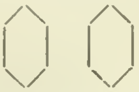
See under XXIII., *page* 160.

PATENTS.

Chlorocarbonic Acid Ethers, and Compounds therefrom; Manufacture or Production of ——. H. E. Newton, London. From The Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 530, Jan. 9, 1900.

These esters may be profitably obtained by allowing phosgene $COCl_2$, perchlormethylformiate $OC(O.CCl_3)Cl$, or hexachlorodimethylcarbonate $OC(O.CCl_3)_2$ to act on alcohols, phenols, or derivatives of bodies containing free hydroxyl groups, in the presence of tertiary bases, such as antipyrine, quinoline, dimethylaniline, and their homologues or analogues (the bases of the pyridine series being excepted). The following are examples:—Chlorocarbonic acid ethylic ester, b. pt. 93° C., is obtained when phosgene (990 parts) is led into a mixture of absolute alcohol (460 parts) and dimethylaniline, (1,210 parts). the last being diluted with an equal volume of pure ether. If other alcohols or tertiary bases are employed, intermediate products may be formed and isolated, which then act upon the alcohol, phenol, &c. Thus chlorocarbonyliedimethylphenylpyrazolone $OC(OC_{11}H_{12}N_2Cl)_2$ is produced as a white crystalline mass, when a solution of phosgene (99 parts) in benzene is added to antipyrine, (376 parts), also dissolved in benzene, and analogous products when other homologues are used. This product may be employed to produce normal propylchlorocarbonic ester C_3H_7OCOCl, if to 475 parts dissolved in benzene, propylic alcohol (60 parts) are added with continuous stirring and careful cooling. Other alcohols, phenols, &c., behave in an analogous manner with other double intermediate compounds.

These complex esters form derivatives with bases of the pyridene series, one molecule of the ester combining with two molecules of the base to form compounds such as—



R.O.N . CO.N.Cl

These products are all characterised by forming, when treated with water, alcohols, or phenols or their homologues, neutral carbonates of the general type $(R.O)_2CO$. If water is used, the same radicle (R) enter the molecule twice, whilst by the use of alcohols and phenols, the carbonate may be of a mixed type, such as $R'O.CO.R''O$, where R′ and R″ are different radicles. For example, $CO(CH_3.O)_2$ results when the double compound (100 parts) prepared from the methyl ester of chlorocarbonic acid is mixed with xylene, water added, and, after removal of pyridine by dilute hydrochloric acid, the xylene solution is fractionated. The dimethyl carbonate so obtained boils at 91° C. On the other hand, if 2,665 parts of the double compound prepared from pyridine and chlorocarbonic acid ethylic ester are mixed with benzene, 1,080 parts of benzylic alcohol in benzene are slowly added, and the product is similarly purified, ethylbenzyl carbonate $OC(OC_2H_5)OC_6H_5.CH_2$ is obtained as an oil which boils at 242°—243° C. and possesses an agreeable odour, resembling that of pears.

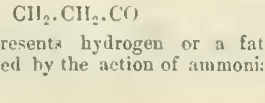
Again, if the double compound obtained by the interaction of pyridine and the chlorocarbonic ester of salol, is mixed with toluene, and a solution of salol in toluene is added, salol carbonate, $OC(O.C_6H_4.CO.OPh)_2$, remains as a solid, after removal of the toluene. It separates as a white crystalline powder from alcohol, melts at 132° C. and gives no coloration with ferric chloride. In this case, if ethylic alcohol is employed instead of salol, the mixed carbonate, salolethyl carbonate, $OC(OC_2H_5)O.C_6H_4.COOC_6H_5$, is produced. This compound forms rhombic prisms, melts at 75° C., and is readily soluble in the usual solvents.

Analogous substances are obtained when other chlorocarboxyl derivatives or other phenolic agents are employed.

—R. L. J.

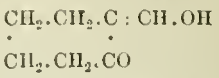
Oxybenzylamine, Hydrogenised, and Hydrogenised Benzylamine Bases, and Transformation of the latter into Hydrogenised Cyclic Aldehydes or Terpenealdehydes; Manufacture of ——. O. Imray, London. From The Farbwerke vormals Meister, Lucius und Brüning, Hoechst a M., Germany. Eng. Pat. 1094, Jan. 17, 1900.

AMINOMETHYLENECYCLOKETONES of the general formula—



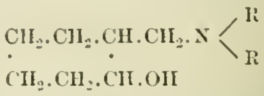
$$\begin{array}{l} CH_2.CH_2.C:CH.N\left\langle\begin{array}{l}R\\R\end{array}\right. \\ \cdot \qquad\qquad \cdot \\ CH_2.CH_2.CO \end{array}$$

(where R represents hydrogen or a fatty or aromatic radicle), obtained by the action of ammonia, or primary or secondary fatty or aromatic amines on formyl- or ox methylenecycloketones of the general type—



$$\begin{array}{l} CH_2.CH_2.C:CH.OH \\ \cdot \qquad\qquad \cdot \\ CH_2.CH_2.CO \end{array}$$

are converted by the action of reducing agents (*e.g.*, sodiu and alcohol) into hydrogenised oxybenzylamines of tl configuration—

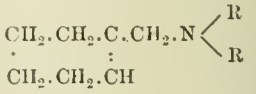


$$\begin{array}{l} CH_2.CH_2.CH.CH_2.N\left\langle\begin{array}{l}R\\R\end{array}\right. \\ \cdot \qquad\qquad \cdot \\ CH_2.CH_2.CH.OH \end{array}$$

Thus anilinomethylenementhone becomes isopropylmethy oxyhexahydrobenzylaniline, ethylamino-methylenementhor forms isopropyl-methyl-oxyhexahydrobenzylethylamic and anilinomethylenedihydroisophorone yields trimethy oxyhexahydrobenzylaniline.

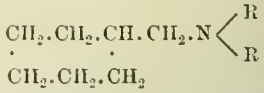
By further reduction or elimination of water, such bas become hydrogenised benzylamine bases of the types—

I.



$$\begin{array}{l} CH_2.CH_2.C.CH_2.N\left\langle\begin{array}{l}R\\R\end{array}\right. \\ \cdot \qquad\qquad : \\ CH_2.CH_2.CH \end{array}$$

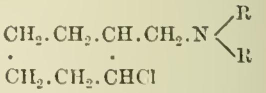
II.



$$\begin{array}{l} CH_2.CH_2.CH.CH_2.N\left\langle\begin{array}{l}R\\R\end{array}\right. \\ \cdot \qquad\qquad \cdot \\ CH_2.CH_2.CH_2 \end{array}$$

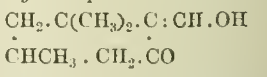
Thus, isopropyl-methyl-oxyhexahydrobenzylaniline giv isopropyl-methyl-tetrahydrobenzylaniline and isopropy methyl-hexahydrobenzylaniline; whilst trimethyl-oxyhex hydrobenzylaniline forms trimethyl-tetrahydrobenzylanili and trimethyl-hexahydrobenzylaniline (*vide infra*).

The elimination of water from hydrogenised oxybenzy amines is best effected when chlorine is first substituted f hydroxyl by the agency of phosphorus pentachloride, the intermediate chlorohydrobenzylamines being of the type—



$$\begin{array}{l} CH_2.CH_2.CH.CH_2.N\left\langle\begin{array}{l}R\\R\end{array}\right. \\ \cdot \qquad\qquad \cdot \\ CH_2.CH_2.CHCl \end{array}$$

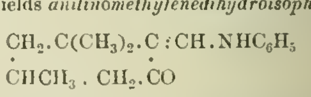
Oxymethylenedihydroisophorone—



$$\begin{array}{l} CH_2.C(CH_3)_2.C:CH.OH \\ \cdot \qquad\qquad\quad \cdot \\ CHCH_3 . CH_2.CO \end{array}$$

is prepared by adding together dihydroisophorone (parts), methyl formate (84 parts), sodium ethylate (48 parts), and ether (300 parts) in a flask fitted with a refl condenser, moderating the action by cooling, as require A solid crystalline mass of the sodium derivative results 15 minutes, which, after standing 12 hours, is treated wi water (500 parts); the ethereal solution is then separat and the aqueous layer extracted with ether. Addition dilute acetic acid separates a still further quantity as yellowish layer, which is taken up with ether, washed a dried. After distilling off the ether, the base remains a yellow oil which boils at 124° C., under 27 mm. pressu without decomposition.

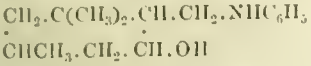
110 parts of this oil dissolved in methyl alcohol (3 parts) and treated with aniline (65 parts) dissolved acetic acid yields *anilinomethylenedihydroisophorone*—



$$\begin{array}{l} CH_2.C(CH_3)_2.C:CH.NHC_6H_5 \\ \cdot \qquad\qquad\quad \cdot \\ CHCH_3 . CH_2.CO \end{array}$$

a yellow crystalline substance soluble in the usual solver This is reduced as follows:—To the thoroughly dry anili base (1 kilo.) dissolved in absolute alcohol (15 kilos.) dri by sodium, 1 kilo. of sodium is gradually added. Wh solution is complete, the alcohol and some dihydroi oronyl, alcohol and aniline are removed by steam-distil-ion. The new base, which remains as a viscous oil, is ritied by conversion to the *hydrochloride* in ethereal ution, excess of HCl gas being avoided.

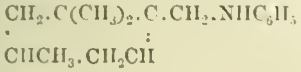
Trimethyl-oxyhexahydrobenzylaniline—



$$\begin{array}{l} CH_2.C(CH_3)_2.CH.CH_2.NHC_6H_5 \\ CHCH_3.CH_2.CH.OH \end{array}$$

tained by neutralising the colourless crystalline hydro-loride crystallises from hot petroleum spirit in needles, lts at 70°—86° C., and boils without decomposition at 4° C., under 15 mm. pressure.

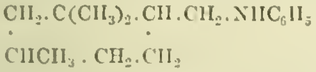
It is converted to the *trimethyl-chlorohexahydrobenzyl-iline* by dissolving the oxybase (610 parts) in benzene 500 parts) and saturating with HCl gas. The solution nains clear, and phosphorus pentachloride (53 parts) is led thereto, the reaction being completed by warming on water-bath. Water and excess of sodium carbonate added, and the benzene solution of the chlorinated e is removed, dried, and distilled *in vacuo* leaving the loro-base as a yellowish oil. This oil (1 part) when ated on the oil-bath with powdered KOH (10 parts) and ohol (5 parts), for 4—5 days, diluted with water and am-distilled, gives *trimethyl-tetrahydrobenzylaniline*—



$$\begin{array}{l} CH_2.C(CH_3)_2.C.CH_2.NHC_6H_5 \\ CHCH_3.CH_2CH \end{array}$$

an odourless oil, which after solution in ether and drying, ls at 187° C. under 19 mm. without decomposition.

The still further reduced base *trimethyl-hexahydrobenzyl-line*—



$$\begin{array}{l} CH_2.C(CH_3)_2.CH.CH_2.NHC_6H_5 \\ CHCH_3.CH_2.CH_2 \end{array}$$

btained from this tetrahydro-base or from the above-ntioned chloro-base by dissolving 1 part of either in elute alcohol (20 parts), heating and adding sodium parts). It is a colourless odourless oil which boils at ° C. (15 mm. pressure) without decomposition.

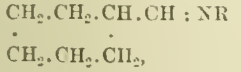
n a similar manner are obtained the three corresponding es derived from each of the following :—

Anilinomethylene-camphor,
Anilinomethylene-menthone,
Aminomethylene-menthone,
Dimethylaminomethylene-menthone,
Ethylaminomethylene-menthone,
Oxymethylenemethylcyclo-hexanone,
Oxymethylene-phenyl-methylcyclo-hexanone,

which all but the first are new substances.

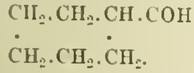
he properties of most are described in the specification.

The above hydrogenised benzylamine bases are oxidised o hydrobenzylidene derivatives of the general type—



$$\begin{array}{l} CH_2.CH_2.CH.CH : NR \\ CH_2.CH_2.CH_2, \end{array}$$

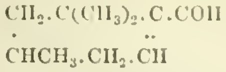
ich, when heated with dilute mineral acids, form the es H_2NR and hydrogenised cyclic aldehydes (terpene ehydes) of the type—



$$\begin{array}{l} CH_2.CH_2.CH.COH \\ CH_2.CH_2.CH_2. \end{array}$$

If R, in the hydrogenised benzylamine base, represents aromatic radicle, acid oxidising agents can be used, and e cyclic aldehyde results at once; if it represents a fatty licle, neutral or alkaline oxidants should be employed. ds being used later to complete the process. The cyclic lehydes obtained in either way are colourless oils, with a ong aromatic odour when concentrated; when dilute, the ver members of the series have the odour of benzaldehyde, higher, a more or less pronounced odour of plants or ssoms.

Trimethyltetrahydrobenzaldehyde—



$$\begin{array}{l} CH_2.C(CH_3)_2.C.COH \\ CHCH_3.CH_2.CH \end{array}$$

is obtained when trimethyltetrahydrobenzylamine (5 parts), water (300 parts), and H_2SO_4 (60 parts) are steam-distilled, a solution of potassium bichromate (45 parts) in dilute sulphuric acid being meanwhile added. The aldehyde distils over as an oil, is extracted with ether, dried, and the ether is then removed. The bisulphite compound, made in the usual manner, is decomposed by cold water containing excess of sodium carbonate, and the freed aldehyde, when separated and dried, appears as a colourless oil, and boils at 90°—91° C. under 18 mm. pressure. It is isomeric with cyclocitral, and has a distinct odour of violets when largely diluted, and of cedar wood in quantity. Two similar aldehydes are also described.

The claim is for the various stages of these processes and for the manufactured products.—R. L. J.

XXI.—PHOTOGRAPHY.

Reducer, Photographic; Potassium Permanganate as a ——. H. Hands. Brit. Jour. Phot. 1900, **17**, [2120], 810.

The behaviour of a solution of potassium permanganate varies with the degree of dilution; a wet negative is reduced evenly with a dilute solution, whilst the same solution applied to a dry negative has an excess of action on the denser parts.—J. W. H.

Reducers; Photographic ——. Lumière and Seyewetz. Brit. Journ. Phot. 1900, **47**, [2120], 805.

Some reducers act uniformly on the image, others attack the most opaque parts to the greatest extent. Ammonium persulphate, hydrogen peroxide, and potassium permanganate are among the latter. The primary action of ammonium persulphate is to produce a double sulphate of ammonium and silver; hydrogen peroxide and potassium permanganate, in a weak sulphuric acid solution, also produce silver sulphate. The peculiar action which reduces the dense parts of the negative more rapidly than the thin is attributed by the authors, to a certain extent, to secondary reducing actions taking place near the surface of the film, owing to the presence of an excess of the reagent. The authors have examined a large number of bodies which might be presumed to behave in a similar fashion, generally, with negative results. They conclude that the number of these substances (the persulphates, hydrogen peroxide, and potassium permanganate) is small, and that they only act in an acid solution.—J. W. H.

Toning and Fixing Bath. R. E. Liesegang. Brit. Jour. Phot. 1900, **47**, [2120], 807.

Thiosinamine may with advantage replace ammonium sulphocyanide in the combined toning and fixing bath; it has little effect on the gelatin film, and, except in hot weather, does not require the addition of alum. 5 to 10 per cent. of a saturated aqueous solution of thiosinamine added to a bath consisting of sodium thiosulphate, 150 grms.; gold chloride, ½ grm.; water, 1 litre; works well. Potassium citrate in saturated solution behaves like alum in hardening gelatin films, and also favours toning; a bath consisting of gold chloride, ½ grm.; sodium thiosulphate, 120 grms.; 50 per cent. solution of potassium citrate, 200 c.c.; water, 1 litre, toned a print to a black in 10 minutes, whilst the same bath without the addition of potassium citrate had but little action in that time.
—J. W. H.

Printing Process; Photographic ——. Brit. Jour. Phot. 1900, **47**, [2121], 820.

The paper is coated with a solution of soft gelatin, 6 parts; ammonium bichromate, 16—20 parts; water, 100 parts; and is then dried in the dark. After exposure in the ordinary way, the paper is washed thoroughly, the last washings being made with water acidulated with 0·1 per cent. of sulphuric acid. Development is carried out with a solution of 1—2 parts of sodium sulphite in 600 parts of water to which is added 1 part of such compounds as *p*-phenylenediamine, *p*-amido-phenol, pyrogallol, &c., substances which are converted into colouring matters by the chromium dioxide of the image.—J. W. H.

Printing Process, New Photographic; Iron ——. Brit. Jour. Phot. 1900, **47**, [2121], 820.

A. and L. Lumière find that iron sucrate is sensitive to light, and has good keeping qualities. Gelatin-coated paper is painted with a solution of the salt (formed by adding in molecular proportion, barium sucrate solution to one of ferric sulphate) dried, exposed in the usual manner, and developed with potassium ferro- or ferricyanide, or other salts.—J. W. H.

Toned Bromide Prints; The Permanence of ——. Joh. Gaedicke. Phot. Alm. 1901, **21**, 37; through Chem. Zeit. Rep. 1900, **24**, [100], 372.

The author considers that the permanence of bromide prints toned by the formation of metallic ferrocyanides, is a matter of considerable doubt. Red and blue tones resulting from the use of uranium nitrate and ferric oxalate respectively, are most to be distrusted. Also, the reduced silver of the print forms insoluble silver ferrocyanide in the ferricyanide bath. This remains in the paper, and experiment shows it to be sensitive to light.—R. L. J.

Palladium Toning. Brit. Jour. Phot. 1900, **47**, [2120], 804.

J. Joé recommends the following formula for toning silver prints with palladium: potassium palladio-chloride, 1 grm.; sodium chloride, 10 grms.; citric acid, 10 grms.; water, 2 litres. After printing, immerse the paper in a bath of common salt and wash thoroughly before toning. A bath to give chocolate brown tones is made by substituting for the sodium chloride an equal weight of ammonium molybdate, and increasing the amount of water to 2½ litres.—J. W. H.

Intensification, Photographic ——. W. Thomas. Brit. Jour. Phot. 1900, **47**, [2121], 827.

When a plate has been underdeveloped, printing density of a temporary character is best obtained by the uranium intensifier. The plate, washed free from the fixing salt, is immersed in a solution of potassium ferricyanide, 1 part; uranium nitrate, 1 part; glacial acetic acid, 10 parts; water 100 parts; until sufficient density is obtained; after removal from the bath, washing is carried out first with dilute acetic acid, and then for a short time with water; if unsatisfactory, a weak solution of ammonia restores the negative to its original condition. Bleaching in a weak hydrochloric acid solution of mercuric chloride, followed by the ferrous oxalate developer, is recommended for permanent work, or a solution of copper sulphate, 1 part; ammonium bromide, 2 parts; water, 40 parts; may be used for the preliminary bleaching, any developer serving to again blacken the image. A method of intensification based on the action of light on bichromated gelatin is often useful. The plate is soaked in a weak solution (3 per cent.) of potassium bichromate, dried in the dark, exposed through the glass for a few minutes to daylight, and, after washing, thoroughly immersed in a solution of a red or yellow dyestuff (which is selectively absorbed by the image), and again dried.

—J. W. H.

Ozotype. G. F. Blackmore. Brit. Jour. Phot. 1900, **47**, [2118], 777.

This process is operated as follows:—For sizing unsized papers, a solution of Lepage's fish-glue, 1 part in 9 parts of water, may be used, two coats being necessary for very absorbent papers; after drying, the sensitising solution may be applied by the aid of a little artificial light; when sensitized and dried, the paper may be kept, if due care be taken, for weeks; printing is carried on until the finest detail is just visible; at this stage the prints, after washing and drying, may be kept indefinitely before "pigmenting." The pigment tissue is applied to the face of the print while immersed in the acetic acid solution warmed to 65°—70° F Three hours after the pigment tissue has been applied development may be carried out with hot water, or th prints may be kept for the opportunity of doing so; befor development the prints are soaked well in cold water, trans ferred to the warm bath (105° F.), and the paper backin of the pigment plaster stripped with uniform action, eithe wholly out of the water, or quite in it; marks appear i this operation is badly done; after development, the print may be hardened in a cold alum bath, washed and dried, o to allow of slight local development, dried first. The pig ment plaster may not adhere evenly to rough papers, an Manly recommends soaking the washed and dried prints in glycerin or sugar solution (glycerin, 1 part; water, 2 parts or loaf sugar, 1 part; water, 4 parts); for Whatman's ho pressed or best cartridge papers, the washed prints may b coated with a solution of fish glue, 2 drachms; glyceri 1 oz; water, 6 oz., and put into the "acetic" bath withou drying; the preliminary sizing may also be omitted.

—J. W. H.

Sensitive Linen, Silk, and other Fabrics; Preparation ——. Zap. imp. russk. techn. obschtsch. 1900, **34**, 106 through Chem. Zeit. Rep. 1900, **24**, [104], 388.

According to H. J. Junk's process, this is carried out follows:—Hot solutions of silver nitrate, potassium bromid containing a small quantity of the iodide, and gelatin a mixed, and the whole added to a cooled solution of arrov root (or starch), the emulsion thus obtained being used f coating the linen, silk, or other fabric. Photographs take on such surfaces can be afterwards painted.—T. H. P.

Lippmann's Colour Process; Sensitisation of Gelatin Plat for ——. R. Neuhauss. Phot. Rundschau, 1900, **14**, 22 and 241; through Chem. Zeit. Rep. 1900, **24**, [104 388.

The author has examined a large number of dyestuffs, whic have been recommended from time to time as sensitisers silver bromide-gelatin, to determine how far they can l used to sensitise the plates used in Lippmann's colo process. He finds that Kinzelberger's Glycin Red combine with Cyanin and Erythrosin gives the best results. Wi this mixture, a nearly perfectly regular band is obtain between the lines C and G, whilst the too powerful lig action from G to N can be remedied by the use of a yello screen. The general sensitiveness, which is very small f Lippmann plates, is not impaired by Glycin Red; it may l increased (1) by employing a preliminary silver nitra bath, which, however, imparts bad keeping properties to t plates; (2) by exposing the plates to the vapours of res before placing them in the mercury chamber.—T. H. P.

PATENT.

Photographic Plates, Films, and the like; Protecti Paint for Preventing Halation. P. Plagwitz a F. Freund, Berlin. Eng. Pat. 3605, Feb. 23, 1900.

This material is a spirit varnish composed of sandara shellac, &c., dissolved "in any suitable kind of ethe tinted with Eosine, Aurantia, and the like, mixed wi the oil of cassia, clove, or aniseed, and incorporated wi some substance insoluble in alcohol, such as potato star gum tragacanth, or gum arabic. The object of the star or gum is to increase the consistency of the compositi and make it easier to remove; the idea of the essential is to increase the optical dispersing and refracting power the coating It is applied to the non-sensitised surface o dry plate or film; and is claimed to prevent the comm defect known as "halation."—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc.

Smokeless Powder; New ——. Bernadou. Rev. Pro Chim. **3**, [22], 341–342.

The author finds that when soluble nitrocellulose immersed in ethylic ether, and exposed to a temperat near to or below the freezing point of water, it passes i solution or forms a colloid jelly and does not afterwa turn to its cellular form. The product may, when dried, used alone or as a binding material for other ingredients the preparation of powder.

The soluble nitrocellulose may be prepared by nitrating drocellulose, or by the hot nitration of ordinary cellulose. —C. S.

ifety Explosive ; Composition of a ——. F. Ulzer. Mitt. des k. k. Techn. Gewerbe-Museums in Wien, 1900, **10**, [9, 10, and 11], 204.

ns preparation bore the name "Wetter-Dynammon" and d the percentage composition:—Ammonium nitrate, ·83 ; potassium nitrate, 1·98 ; charcoal, 3·77 ; moisture, 42. The charcoal grains measured 1–6 μ. and showed structure under the microscope.—R. L. J.

PATENTS.

xplosives ; Manufacture of ——. A. C. Girard, Paris. Eng. Pat. 214, Jan. 3, 1900.

order to thicken oil sufficiently to enable suitable ixtures of oil and chlorate to be used without risk of udation about 10 to 15 per cent. of soap that has been ell dried at 120°—130° C. is stirred into and heated with e oil for two or three hours at 150°—170° C. ; the mixture then filtered from the excess of soap at 105°—115° C. r at some suitable temperature above the melting-point), d, when cold, should have a consistency between that of seline and that of paraffin. The chlorate or other idising agent is incorporated in the solidified oil at 80° C. itrates and nitro-derivatives may be added, but acids or id derivatives must not be used because they cause idity by decomposing the soap. Thus picrates, but not ric acid, may be employed. The following proportions e quoted by way of example:—(*a*) potassium chlorate ammonium perchlorate, 80 ; solidified oil, 20. (*b*) Potassium chlorate, 80 ; solidified oil, 14 ; nitro-naphthalene, (*c*) Potassium perchlorate, 75 ; solidified oil, 16 ; nitrophthalene, 4 ; potassium picrate, 2. (*d*) Potassium lorate, 80 ; solidified oil, 16 ; nitrobenzene, 4 ; potassium rate, 2.—W. G. M.

rplosive Materials ; Building of Sheds for the Manufacture or Storing of ——. G. A. Nahnsen, Hamburg. Eng. Pat. 15,057, Aug. 23, 1900.

order to lessen the distance through which semi-manutured nitroglycerin (or other explosive) is carried, and to minimise the risk in handling it, the sheds used in e different stages of manufacture are now often isolated, t by a considerable open space, but by stout walls mewhat higher than the buildings themselves, and at a ort distance from them. There remains the risk of mage to adjoining sheds by the downward blow, and nsequent vibration of the earth, at the moment of plosion. To lessen this, the sheds are to be built over llars, the shape and capacity of which depends on the antity of explosive to be stored or treated in the sheds, t rarely more than 9 ft. deep. These cellars are preably made with walls sloping somewhat inwards from p to bottom, and with a more or less concave floor. The lls may, with advantage, be double, so that the force of e explosion may be spent in breaking down the inner lls, thus leaving the outer walls sufficiently strong to sist collapse. When very large quantities of explosive e to be handled, the roof of the cellar may be vaulted th a somewhat similar object. The cellar should be led either with a light fine material such as coal ashes infusorial earth, or, better, with water, so that the rce of the explosion may be used up in scattering this aterial instead of in wrecking the cellar. Water is eferred because it serves to extinguish ignited materials hist in flight.—W. G. M.

latches and Striking Compositions, and the Substances and Processes employed therein ; Manufacture and Production of ——. F. Bale, Droitwich. Eng. Pat. 1323, Jan. 22, 1900.

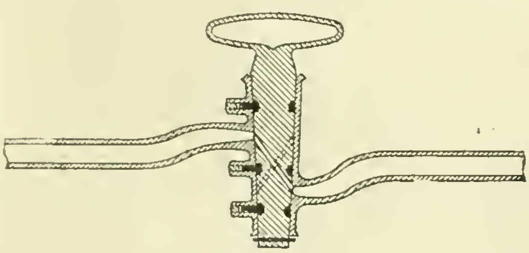
HROMIUM trioxide, or other oxide intermediate between at and the monoxide, is used in the match composition, e dioxide CrO_2 having been found the best for special safety matches. The use of phosphorus may then be dispensed with. A match composition containing potassium chlorate with sulphide of antimony and sulphur (or with sulphur alone) is stirred into a solution of four parts of glue and one of chromic anhydride in 14 parts of water until the right consistency is reached ; and the prepared splints are then, as usual, dipped into the resulting paste. The use of a prepared rubber is recommended ; it may be made either (1) from the aqueous solution of glue and chromic oxide above referred to (or from a weaker one) ; (2) from such a solution to which sulphide of antimony has been added ; or (3) from a solution of glue mixed with sulphide of antimony. It is stated that the glue protects the chromic oxide from deliquescence, so that the match composition remains dry.—W. G. M.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Glass Tap with Universal Mercury Seal. H. Göckel. Zeits. angew. Chem. 1900, [49], 1238—1239.

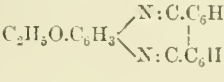
THIS tap, as the figure shows, is furnished with three grooves filled with mercury, which prevent the slightest leakage of air between the tap and the surrounding glass, even when the tap is connected with an evacuated vessel. In the smallest size in which the tap can be made, the length of the glass barrel is 5 cm.—T. H. P.



"*Luteol.*" [*New Indicator.*] P. Glæss and R. Bernard. Monit Scient. 1900, [4], **14**, 809. (See this Journal, 1896, 216.)

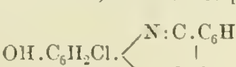
THE authors describe the various operations necessary for the preparation of "luteol," hydroxychlorodiphenyl quinoxaline, which has been described as a very sensitive indicator for alkalimetry.

The starting point for its preparation is phenacetin, $C_2H_5O.C_6H_4.NH.CO.CH_3$. When this is boiled for a very short time with 10—12 per cent. nitric acid, it yields a solution which, on cooling, deposits yellow needles of mono-*o*-nitrophenacetin. This body is then saponified by boiling alcoholic potash, with the production of *o*-nitrophenetidine as ruby-coloured needles melting at 113° C. On reduction with zinc dust in alkaline alcoholic solution, this nitro-compound yields the corresponding diamine, *m*-ethoxy-*o*-phenylenediamine. This base condenses with benzil when the two are heated in alcoholic solution, the condensation product being *m*-ethoxydiphenyl quinoxaline—



$$C_2H_5O.C_6H_3\left\langle\begin{matrix}N:C.C_6H_5\\ |\\ N:C.C_6H_5\end{matrix}\right.$$

When this is heated with phosphorus pentachloride, reaction sets in at a temperature of 70°—90° C., with the entry of an atom of chlorine into the original benzene nucleus, ortho to the ethoxy group. Finally the chloro-compound is saponified by heating with hydrochloric acid in a sealed tube at 180° C. for an hour, and the free phenol, luteol



$$OH.C_6H_2Cl.\left\langle\begin{matrix}N:C.C_6H_5\\ |\\ N:C.C_6H_5\end{matrix}\right.$$

is obtained. Luteol is purified by crystallisation from dilute alcohol until three or four drops of a solution (1:500) on filter paper are coloured distinctly yellow by one drop of decinormal soda and completely decolorised by two drops of decinormal acid.—J. F. B.

INORGANIC CHEMISTRY.—QUALITATIVE.

Nickel in Presence of Cobalt; Detection of ——. P. E. Browning and J. B. Hartwell. Amer. J. Science, 1900, **10**.

A quantity of the substance to be tested, containing not more than 0·1 grm. of the salts of the two elements, is dissolved in about 5 c.c. of water, a few drops of a saturated solution of alum added, any free mineral acid present neutralised with ammonia and the solution made faintly acid with acetic acid. About 0·5 grm. of potassium ferricyanide is then added, and the liquid agitated to effect the solution of the ferricyanide and the complete precipitation of the cobalt and nickel. The nickel is rendered soluble by the addition of about 5 c.c. of strong ammonia, the liquid is filtered, and the filtrate, which should have no reddish colour, is boiled with a piece of sodium or potassium hydroxide about the size of a pea. The presence of nickel is indicated by the formation of a black precipitate; if the quantity of nickel present be very small, only a dark coloration is produced at first.—A. S.

INORGANIC CHEMISTRY.—QUANTITATIVE.

Saltpetre; Determination of Nitrogen in ——. O. Böttcher. J. f. Landw. **48**, 287—289. Chem. Centr. 1900, **2**, [22], 1161.

Von Wissell has stated (this Journal, 1900, 853) that the Möckern method gives low results. The author, however, obtained quite satisfactory numbers in a series of trials. When pure reagents were used, he did not obtain the positive values, varying up to 0·25 c.c., found by von Wissell in blank determinations, and he suspects that such differences point either to defective apparatus or inaccurate work.

Zinc dust can be satisfactorily freed from ammonia by treatment with water, but caustic soda sometimes contains nitrates or nitrites, which can only be removed with difficulty. —A. S.

Saltpetre; Determination of Nitrogen in ——. L. von Wissell. J. f. Landw. **48**, 291. Chem. Centr. 1900, **2**, [22], 1161.

Replying to Böttcher (see preceding abstract), the author remarks that his apparatus gave satisfactory results when used for blank determinations without reducing metal, or by Devarda's method. He believes that he worked according to the prescribed directions, and states that similar results have been obtained by other chemists. The differences obtained in the blank determinations are attributed to the presence in the zinc dust of nitrogen compounds which are not completely removed by treatment with water and dilute sulphuric acid. The author reiterates his opinion that Devarda's method is preferable to the Möckern one.—A. S.

Nitrites; Determination of ——, *either Alone or in Presence of Nitrates.* H. Pellet. Ann. Chim. anal. appl. **5**, 361—365. Chem. Centr. 1900, **2**, [20], 1089.

The author published in 1879, in the Bull. Soc. Ind. du Nord de la France, a method for the determination of nitrates, which, however, has become so little known, that he again describes it. It is based upon the fact that both nitrates and nitrites in hydrochloric acid solution are decomposed by ferrous salts with formation of nitric oxide, whilst in acetic acid solution, nitrites alone are decomposed. —A. S.

Nitrites; Determination of ——, *and their Separation from Nitrates.* L. L. de Koninck. Ann. Chim. anal. appl. **5**, 365—368. Chem. Centr. 1900, **2**, [20], 1089.

The author has examined Pellet's method (see preceding abstract), using the same arrangement of apparatus as is customary for Schloesing's process. Potassium nitrate boiled with 10 per cent. solution of Mohr's salt, gave no the slightest evolution of gas, even after the addition o 10—20 c.c. of glacial acetic acid. The evolution of ga was scarcely perceptible after the addition of 5 c.c. c fuming hydrochloric acid, but in presence of 30—40 c.c of this acid, the decomposition was rapid and complet Nitrites are quickly and completely decomposed by boilin with Mohr's salt; addition of acetic acid accelerates th decomposition. In presence of ammonium chloride, th reaction proceeds according to the equation—

$$NH_4Cl + NaNO_2 = NaCl + 2H_2O + N_2.$$

This, however, makes no difference in the gasometri determination, as the volume of gas evolved remains th same.—A. S.

Plaster of Paris; Determination of Underburnt and Ove burnt Portions of ——. L. Périn. Comptes Rend. 13 [23], 950—952.

The author looks upon plaster of Paris as a mixture of— 1. Active matter, consisting of $CaSO_4.nH_2O$, where *n* ha for different portions of the substance, a varying valu between 0 and 2; for purposes of analytical calculation, is assumed that the average value of *n* is 1. 2. Unburn gypsum, $CaSO_4$ $2H_2O$. 3. Overburnt gypsum, anhydrou $CaSO_4$. 4. Heterogeneous substances, which may l looked on as inert impurities (silica, alumina, ferric oxid &c.), tending to just the same extent as the underburn and overburnt portions, to lower the strength of the s plaster.

The substances under 4 can be determined by th ordinary methods; for the determination of those und 1, 2, and 3, the author uses the following methods:—Th sample is ground in an agate mortar, dried for two hours 60° C., and cooled in the desiccator. About 5 grms. a weighed into a porcelain or platinum basin, excess of wat added, and the surplus water evaporated at 60° C. T increase of weight is the water needed for the formation fr the "active plaster" of $CaSO_4.2H_2O$; if this increase *n* grms., the amount of active plaster present (assumed to $CaSO_4.H_2O$) is $\frac{154}{18}$ *n*, or 8·56 *n*. The sample is now heat to redness, which drives off all the water; suppose the lo of weight to be *m* grms. Of this, 2*n* grms. came from t hydrated active plaster; hence *m*—2*n* grms. came from t unburnt gypsum, and the amount of this unburnt gyps must be $\frac{172}{36}$ $(m - 2n)$ or 4·8 $(m - 2n)$ grms. The to SO_4 in the sample is now determined; from this is su tracted the sum of the amounts corresponding to the act plaster and the unburnt gypsum; the remainder is the amou corresponding to the overburnt $CaSO_4$, the amount of wh is of course $\frac{136}{96}$ or 1·41 times the weight of that remaind

—J. T. D

Steel; Rapid Determination of Carbon in ——. R. and C. T. Davies. J. Amer. Chem. Soc. 1900, **22**, 79 797.

This is a modification of Sargent's recently described proc with continuous heating arrangement, simplified as far possible. A combustion requires 19½ minutes, for the f seven minutes of which, oxygen, and for the remaining ti air is used. Without cooling the furnace, a second boa then introduced, and another combustion effected with fr potash bulbs, and so forth. A full description of arrangement and of the method of using it is given.

—W. G. M

Bismuth; Volumetric Determination of ——. G. Freric Apoth. Zeit. 1900, **15**, 859; through Chem. Zeit. R 1900, **24**, [44], 383.

This method depends on the quantitative reaction wh takes place between freshly precipitated bismuth sulph and silver nitrate with the formation of silver sulphide bismuth nitrate. The freshly precipitated bismuth sulph is vigorously shaken for a short time, with a measu quantity of N/10 silver nitrate solution, the liquid mad with water to a definite volume, and the excess of silver in n aliquot part determined by means of N/10 ammonium ulphocyanide solution, iron-ammonium alum being employed as indicator. 1 c.c. N/10 silver nitrate solution orresponds to 0·00693 grm. bismuth or 0·00773 grm. bismuth oxide.—T. H. P.

Copper ; Determination of Oxygen in Commercial ——. M. Lucas. Bull. Soc. Chim. 23, [24], 900—904.

HE copper is fused with tin in an electric furnace in a urrent of carbon monoxide, and the carbon dioxide formed ollected and weighed.

The carbon monoxide from oxalic acid is collected in cid cuprous chloride solution ; it is then evolved by heating the solution, washed by potash, heated to redness in a porcelain tube, again washed by potash, and collected in a gas-holder of 25 litres capacity ; it is now practically free rom oxygen and carbon dioxide. In the process of nalysis, the gas from the gas-holder is washed by potash nd sulphuric acid and passed over dry potash, through a tube ontaining platinum black, again over dry potash, and finally over sulphuric acid pumice: it then enters the porcelain ombustion tube, which passes through a Charpy's electric urnace, and at the other end of which are the usual potash bulbs and drying tube. The tin is heated in carbon monoxide till its weight is constant. The copper is in the orm of a single block of 10 to 20 grms. weight ; its surfaces re cleaned by the file immediately before weighing. It is weighed in a porcelain boat; enough tin is added to form n alloy of about 20 per cent., and the boat is again ccurately weighed. The boat is placed in the tube, the urrent of gas kept up for a quarter of an hour, the potash ulbs are attached, the furnace is heated, and the tube pushed through so that the boat is in the hot part : the emperature (determined by a Le Chatelier thermocouple) is kept at 900° C. for an hour. Then the bulbs are detached and weighed (after displacement of the carbon monoxide they contain by dry air), and the boat is gradually cooled and finally weighed. From the gain of weight of the potash bulbs, the oxygen can be calculated ; while the loss of weight of the boat represents, besides this xygen, the volatile bodies, such as arsenic and antimony.

Experiments have shown that all the foreign substances xcept silica are reduced—nickel, antimony, lead, iron, zinc, manganese, to the metallic state ; sulphur, phosphorus, rsenic, to sulphide, phosphide, or arsenide of copper. The olatilised substances condense in the cold parts of the ube ; sulphur and nickel may give rise to carbonyl sulphide and nickel carbonyl, but the effects are negligible unless he sulphur rises beyond 0·2, or the nickel beyond 1·0 per ent.

The results agree with those obtained by reduction in hydrogen, or by solution in silver nitrate. The apparatus once set up can be used conveniently for a series of determinations.—J. T. D.

Copper as Oxalate ; Volumetric Determination of ——. C. A. Peters. Eng. and Mining J. 1900, 70, [23], 666.

THE author differs from those chemists who deny the accuracy of Bournemann's method for separating copper from cadmium, by precipitating the copper as oxalate in the presence of nitric acid, filtering hot, and, after ignition, determining the copper by gravimetric methods. He states hat amounts of copper equivalent to at least 0·0128 grm. of the oxide, can be completely precipitated, even in presence of a moderate proportion of strong nitric acid, by the addition of a sufficient quantity of oxalic acid.

Moderate quantities of copper may also be quantitatively determined by precipitation with oxalic acid, and titration of the precipitate by potassium permanganate. Copper can be separated from cadmium, arsenic, iron, and small amounts of tin, when precipitated by oxalic acid in 50 c.c. of solution containing 5 c.c. of strong nitric acid. The method cannot be used for the separation of copper from zinc, bismuth, and antimony ; and it should be noted that the copper is not precipitated completely if the amount present be less than that equivalent to 0·0128 grm. of oxide per 50 c.c. of solution —A. S.

London Purple ; Composition and Analysis of ——. J. K. Haywood. J. Amer. Chem. Soc. 1900, 22, 800—809.

"LONDON purple" consists mainly of calcium arseniate and arsenite, with an organic dye residue. The water, determined by drying at 100° C. for 12 to 15 hours, ranged, in four samples, from 1·87 to 4·07 per cent. Several methods were tried for estimating arsenic ; but the most satisfactory process consisted in dissolving 2 grms. of the sample in dilute hydrochloric acid at 60°—70° C. (20 c.c. HCl + 80 c.c. H_2O) filtering, washing till the filtrate amounted to 300 c.c., drawing off 100 c.c., and adding to it sodium bicarbonate in excess in a 500 c.c. flask, making up to the mark with water, adding a few drops of ether to destroy bubbles, filtering off 250 c.c., adding to this starch, and titrating with standard iodine solution. From this was found the As_2O_3 in 50 c.c. of the original solution. 50 c.c. of the original solution was then heated to 80° C. on the water-bath, and removed for the purpose of adding 50 c.c. of HCl and 3 grms. of KI. After standing for 15 mins. to allow the arsenic acid to be reduced to arsenious acid, with evolution of iodine, decinormal sodium thiosulphate solution was added drop by drop exactly to remove free iodine (a process, difficult at first, owing to the colour of the solution, but becoming easy with practice), the solution was then rendered alkaline with solid sodium carbonate, and then made slightly acid with hydrochloric acid, and finally alkaline with sodium bicarbonate. Titration was then effected as before, with decinormal iodine solution, using starch as the indicator, whereby the total arsenic in the original material was found. In the four samples examined, the percentages of arsenious oxide ranged from 6·4 to 17·3, and of arsenic oxide from 35·5 to 26·5 per cent., the total arsenic, reckoned as As_2O_3, varying between 37 and 40 per cent. Of this, the soluble arsenious oxide (extracted by water) was 2·4, 13·4, 3·9 and 1·4 per cent. (and the soluble arsenic oxide, 15·8, 7·1, 12·5 and 19·5 per cent.) in the four samples respectively. The calcium oxide ranged from 23·5 to 25 per cent., of which from 6·6 to 10·8 per cent. was soluble. Other inorganic matters, chiefly sand, amounted to from 2·5 to 3·5 per cent. Out of the above four samples, and one other, examined, three closely approximated the formulæ $Ca_3(AsO_3)_2$ and $Ca_3(AsO_4)_2$, whilst the other two appeared to consist of compounds in which the amount of lime is less in proportion to the oxides of arsenic than in the above formulæ—as in $CaHAsO_4$ and $Ca_2As_2O_5$.
—W. G. M.

Arsenic ; Determination of ——, *as Ammonio-Magnesium Arsenate.* O. Ducru. Bull. Soc. Chim. 23, [24], 904—910.

THE conversion of precipitated ammonio-magnesium arsenate into magnesium pyroarsenate is inexact ; if the muffle only be employed, the conversion is incomplete and the results are too high, while if the blowpipe be employed to finish the operation, sensible amounts of arsenic are volatilised. On the other hand, the drying of the precipitate to constant weight requires care ; the author has found an ordinary steam oven, where the internal temperature is about 98° C., to be very suitable for the purpose, but about 20 hours' drying is needed.

The author has investigated the solubility of the precipitate in the mother liquor and in the ammoniacal washings (1) by several times dissolving, reprecipitating, washing, drying, and reweighing a known initial amount of the precipitate, noting each time the volumes of the first filtrate and of the wash-waters ; (2) by making several precipitations, and each time determining the arsenic in filtrate and in wash-water by reduction with sulphurous acid, precipitation as sulphide, solution of the washed sulphide in ammonia, evaporation of the solution, and weighing the residue ; (3) by a similar process, omitting the reduction by sulphurous acid. The results show considerable irregularities ; but they indicate that the correction suggested by Fresenius is too low, and the author proposes as the nearest possible approximation, to add to the weight of the dried precipitate, 1 mgrm. for each 50 c.c. of the total volume of filtrate and wash-waters.
—J. T. D.

ORGANIC CHEMISTRY.—QUALITATIVE.

Arsenic in Beer; Detection of ——. W. Kirkby. Chem. and Druggist, 1900, **57**, [1090], 968.

For the detection and determination of traces of arsenic in beer, the following method of working is recommended. The beer should always be concentrated to an extent sufficient to dissipate the sulphites and allied compounds which have been used as preservatives. The author's practice is to acidify, evaporate to dryness on the water bath, and dissolve the residue in distilled water. It is also advisable to boil the concentrated beer with a little sulphurous acid, in order to ensure complete reduction of the arsenic compounds present, but any excess of sulphurous acid must be driven off by boiling; the treatment with sulphurous acid appears, in some cases, to cause the production of a darker stain by the arsenic compounds present. 9 c.c. of the prepared beer (reduced) is diluted with distilled water to 15 c.c. and made up to 20 c.c. with hydrochloric acid (sp. gr. 1·16) free from arsenic. The liquid is equally divided between three similar test-tubes. Another 6 c.c. of the prepared beer, which has not been boiled with sulphurous acid, is diluted with water to 10 c.c., and made up to 13·3 c.c. with hydrochloric acid, and the mixture divided between two test tubes. Four discs of pure white filter paper of close texture are each moistened with one drop of mercuric chloride solution (1 in 20); and one disc with one drop of a solution of lead subacetate; the mercuric test papers are used dry, but the lead-paper in the moist condition. A piece of arsenic-free zinc rod is introduced into each test-tube, the mouths of the tubes loosely stopped with cotton-wool plugs, and two mercuric papers and the lead paper placed as caps on the first three tubes, and two mercuric papers on the others. When the rate of evolution of gas is too slow in any individual tube, it may be accelerated by very gentle warmth. In the absence of arsenic and an excessive quantity of sulphur compounds, the mercuric papers remain unstained, but a brown stain is generally produced on the lead paper. The presence of arsenic in the proportion of 0·01 grain of arsenious acid per gallon will cause the formation in one hour of a faint yellow stain on the mercuric paper. When testing the zinc and reagents, however, the process should be continued for three or four hours. To determine the amount of arsenic present, standard tests should be carried out in an exactly similar manner, with arsenic-free beer (not with water), to which has been added varying known proportions of arsenious acid. It is preferable to prepare fresh standards for each set of experiments, as the colour of the stains is, to a certain extent, affected by light.—A. S.

Arsenic in Beer; Detection of ——. A. H. Allen. Chem. Trade J. 1900, **27**, [710], 522.

The author proposes the following modification of Reinsch's test. Any sulphites present in the solution under examination, are oxidised by means of bromine water before boiling with the copper, and then a small quantity of a solution of cuprous chloride in hydrochloric acid is added to the liquid, to reduce the arsenic to the arsenious condition. In this manner, it is stated that the prejudical influence of sulphites is overcome, and the deposition of the arsenic on the copper occurs promptly and completely.—A. S.

Arsenic in Beer, Sugar, &c.; Detection of ——. B. H. Paul and A. J. Cownley. Pharm. J. 1900, **65**, [1590], 690.

The authors point out that in the detection of very small quantities of arsenic in manufactured articles, apparently positive indications by the Gutzeit test cannot be relied upon, owing to the disturbing influence of certain compounds which may be present, such as sulphurous acid or sulphites. The addition of iodine, and the use of slips of bibulous paper saturated with lead acetate, have been recommended for the elimination of the error due to the presence of sulphur compounds reducible to sulphuretted hydrogen by nascent hydrogen, but the authors consider that the advantage of these contrivances is more imaginary than real.

The Marsh test, also, according to the authors, is unrel able for the detection of very small quantities of arsen in beer. They remark that, operating with one pint of bee this test is incapable of showing the presence of arsenic, if tl proportion be much less than 0·1 grain per gallon.—A. S.

Arsenic in Beer; Detection of ——. C. Estcourt. Che News, 1900, **82**, [2142], 287.

Attention is drawn to the fact that the presence of l sulphites in beer will prevent the detection of small amoun of arsenic by the Marsh test or by the Reinsch test. T presence of organic matter does not appear to have such a pr judicial influence, as on mixing a beer, which had been prov to be absolutely free from arsenic, with a known quantity arsenious acid, it was found that practically the whole of t arsenic could be recovered by the Marsh test. On mixi another portion of the same beer with an amount of arser sufficient to give a large deposit in the heated tube, th adding a small quantity of calcium bisulphite, and submitti the product to the Marsh test, no deposit of arsenic w obtained in the heated tube, but it could be detected means of a porcelain plate held above the flame at the e of the tube.

The author states that the Marsh test will work sat factorily if the beer be subjected to a preliminary treatme For this purpose, not less than 100 c.c. of the sample sho be treated with acid, charred only to intumescence, t residue mixed with water, filtered, and the filtrate evaporat The evaporation of the filtrate is important in order to ex any sulphurous acid which may have been formed by interaction of the sulphuric acid and carbonaceous matter —A. S

Salicylic Acid in Wines; Cause of Error in the Detect of ——. H. Pellet. Bull. de l'Assoc. Chim. Sucr. D 1900, **18**, [5 and 6], 305.

Referring to the note by J. F. da Silva (this Journal, 19 918), in which it is pointed out that the method in use Brazil causes some pure wines to be condemned as contain salicylic acid, the author admits that this may be the ca When Pellet and Grobert worked out the method in questi they were more concerned with the quantitative estimat than with the correct detection of the salicylic acid. author therefore concurs with the proposal to adopt German method (extraction with ether and petroleum spi in the preliminary stages of estimations made by method.—J. F. B.

Wine; Detection of Alum in ——. F. Lopresti. S speriment. agrar. ital. 1900, **33**, 373; through Ch Zeit. Rep. 1900, **24**, [100], 365.

The logwood test for the presence of alum in flour ma applied to wine in the following manner: A meas quantity (50 c.c.) of wine is evaporated to one-third of volume in a porcelain dish, decolorised with animal charc filtered, exactly neutralised, together with the washings dilute caustic alkali (indicator, litmus) and then dilute the original bulk with distilled water. 3 c.c. of this solu are treated with 1 c.c. of alcohol (90—95 per cent.) 5—6 drops of a fresh logwood solution made from 5 g of the wood and 100 c.c. of ordinary alcohol. If alu present, a blue or violet colour is produced; if absent, liquid is orange yellow. Exact neutrality of the prep wine is important; if acid, the blue tint may fail to ap and if alkaline, a blue colour is no proof of the presenc alum. The phosphates naturally present in wine, var in amount from 0·04 to 0·9 grm. per litre, are precipit by alum so that if a positive result is obtained by this the addition of at least 0·19 grm. alum per litre (equiva to 0·04 grm. phosphate) is indicated.—R. L. J.

Spirits; Detection of Foreign Colouring Matter in - C. A. Crampton and F. D. Simons. J. Amer. Chem. 1900, **22**, 810—813.

The method is based upon the insolubility in ether of colouring matter of caramel and prune-juice, the foreign colouring materials known to the authors as l for the artificial colouring of spirits. The colouring ter of oak wood (chiefly flavescin) is soluble in ether. c.c. of the sample are measured at a standard (room) perature, and evaporated nearly to dryness on a water ; the residue is washed into a 50 c.c. glass-stoppered , 25 c.c. of absolute alcohol are added, and the solution, r cooling to standard temperature, is made up to the mark water. 25 c.c. are then, after mixing, transferred to ecial separator, and treated for half an hour (with ing at intervals) with 50 c.c. of ether; the lower layer en made up with water to 25 c.c., and, after shaking and ration, the aqueous portion is drawn off, and its colour nined with the aid of a tintometer. A similar colori- ic reading is taken with the 25 c.c. of the spirit not ed with ether, and the amount of colouring matter acted is thus found by difference. The separator mmended for this test consists of a bulbed pipette of h the lower tube is capillary and is provided with a -cock, whilst the upper tube is extended beyond the uation mark and is then expanded into a wide pear- ed bulb contracted to a neck, and provided with a stopper above. In introducing the water at the end e operation, it is proposed to run it from a cistern at her level through an india-rubber tube joined up to apillary tube below the stop-cock, which is of course ed for the purpose. Two sets of samples known to be cially coloured showed from 36·4 to 51·1 and from 2 per cent. respectively of their colouring matters to *luble.*—W. G. M.

GANIC CHEMISTRY—QUANTITATIVE.

; *Analysis of* ——. H. Bornträger. Zeits. anal. Chem. 1900, **34**, [11], 694—698.

of recent formation is light in colour and of low den- and differs greatly from the dark heavy peat, which ently is many centuries old. Both contain the same ituents, but in very different proportions. For instance, will be in 100 parts dried at 100°.

—	Fibre.	Humic Acid.	Nitrogen.
ht peat..........	95—90	5—10	0·5—1·0
vy peat.........	58—48	40—50	2·0—2·5

e light peat absorbs water freely, heavy peat scarcely . The French methods of analysis do not differentiate en the fibre and the humic acid, and the author thinks portant to determine these constituents separately in where the peat is required in agriculture or for distil- . In an analysis of peat for such purposes, he deter- : (1) Moisture: A finely divided portion is dried at until the weight is constant. The amount ranges from 10 per cent. (2) Mineral wax: The dried peat is cted with anhydrous ether. The amount is between and 1·0 per cent. (3) Nitrogen: By Kjeldahl's d. From 0·5 to 2·5 per cent. is usually present. t half is usually in the form of ammonia, which may timated by boiling a portion of the peat with strong on of caustic soda, and receiving the ammonia evolved ndard acid. (4) Humic acid and fibre: 1 to 2 grms. are extracted by boiling for one hour with 5 grms. of soda 00 grms. of water, and the extracts filtered through a ed filter. The residue, after washing, is dried at 105° C., epresents the fibre. The alkaline filtrate, which contains umic acid, is acidified with hydrochloric acid, boiled ously as long as carbonic acid is evolved, and the c acid is then collected on a weighed filter (or asbestos), which is dried at 105° C. and weighed. (5) Ash: t 1 grm. is incinerated with the aid of ammonium e in an open platinum dish. The amount ranges from 10 per cent. French analyses state the chief consti- s of the ash, *viz.*, insoluble matter, lime, magnesia, h, and phosphoric acid, but the author considers this nation of little value. He refers also to a rapid method he estimation of the humic acid only, previously described by him and also by Tacke (Chem. Zeit. 1896, 223, and 1897, 174). A weighed portion of the peat is boiled with powdered whiting and water, the carbonic acid evolved is determined, and thence the amount of humic acid is found by calculation. The following are results of typical analyses made by the author's method:—

—	Light Peat. Near Hanover.		Heavy Peat. Oldenburg.	
	1.	2.	3.	4.
Water..................	30·0	29·0	20·0	20·0
Ash.....................	3·0	3·1	2·8	3·0
Fibre....................	55·0	54·9	49·0	47·0
Humic acid.............	12·0	13·0	38·0	30·0
Total...........	100·0	100·0	109·8	100·0
Nitrogen, total..........	1·1	1·3	1·8	2·0
" as ammonia ..	0·3	0·4	0·6	0·7

Peat for use as fuel must, of course, be valued according to its calorific power.—J. A. B.

Tanning Liquids and Extracts; Determination of Tannin, Gallic Acid, other Organic Acids, and Mineral Acids in ——. F. Jean. Rev. de Chim. Ind. 1900, **11**, [132], 349—350.

A. Determination of Total Acidity.—This is determined by titration with N or N/20 sodium carbonate solution, turmeric paper being used as indicator. The soluble indicators give bad results in the presence of tannin and gallic acids, with the exception of Trillat's reagent, a sulphonic derivative of dinitrobenzene-azodihydroxynaphthalene.

B. Total Acidity, less Tannin.—A second portion of the original liquid is exactly neutralised with N/10 sodium carbonate solution, and treated with about 15 c.c. of a 2 per cent. solution of albumin. The precipitate is filtered off and washed with hot water, the filtrate heated to the boiling point, after the addition of sufficient N/10 sodium carbonate solution to bring the total amount used to, say, 20 c.c., and the excess of alkali in the boiling liquid titrated with N/10 sulphuric acid, with Trillat's reagent as indicator.

C. Organic and Mineral Acidity, less Tannin and Gallic Acid.—A third portion of the original solution is boiled with a slight excess of zinc oxide, and filtered, and the precipitate washed with hot water. The filtrate is boiled with 20 c.c. of N/10 sodium carbonate solution, the zinc carbonate filtered off, and washed with hot water, and the filtrate brought to the boiling point, and titrated with N/10 sulphuric acid, with turmeric as indicator.

D. Mineral Acidity.—A fourth part of the sample is evaporated to dryness in a platinum basin, with 20 c.c. of N/10 sodium carbonate solution; and the residue calcined, and dissolved in boiling water. The solution is filtered, and the filtrate and washings titrated with N/10 sulphuric acid, with turmeric as indicator. This is the method devised by O. Hehner for the determination of mineral acid in vinegar.

The results, in terms of H_2SO_4, obtained by the author in the analysis of a test mixture of known composition, were very satisfactory.—C. A. M.

Tannin Estimation Results with Hide-powder Method; Comparison of Volumetric Methods ——. A. Turnbull. Paper read before the Paris Conference, 1900. Leather Trades' Rev. **33**, [769], 959.

The Jean method was tested with regard to its reliability in the determination of tannin in tanning materials containing sulphites. The sulphites were removed by titrating in an acid solution with iodine, and the tannin was estimated in the usual way in a solution containing an excess of sodium bicarbonate. It was found that in presence of sulphites, low results for tannin are obtained, and that the greater the amount of sulphites present, the lower the results. Thus a solution of pure tannic acid, which required

9 c.c. of iodine solution, required only 8·6 c.c. when a small quantity of sulphite had been present; a mixed solution of tannic and gallic acids, requiring 11 c.c. of iodine solution, after the addition of much sulphite, required only 8·4 c.c. by titration.

The Jean method appears about equal to the Loewenthal method, but it has the disadvantage that it is only possible to work with very small quantities of the tanning material, and both processes require some experience in manipulation. The results obtained by the Jean method are lower than those obtained by the Loewenthal method, and much below those obtained by the hide-powder method, and there is no constant ratio between the results of the three methods.—J. G. P.

Malt; Determination of the Available Extract of ——. L. Briant. Analyst, 1901, **26**, 2—5.

The author reviews and discusses the methods at present in use for determining the brewers' extract in malts, and then suggests the use of the following modified process:—50 grms. of ground malt are placed in a boiling flask of about 550 c.c. capacity, and to it is added as rapidly as possible a bulk of water at 160° F., which shall be equal in volume to 400 c.c. if measured at 60° F. The measurement of this volume of water is made in a flask graduated at the point occupied at 160° F. by 400 c.c. of water at 60° F. The contents of the flask are thoroughly mixed, the flask loosely corked to prevent evaporation, placed in a water bath maintained at a temperature of 150° F., and allowed to stand for two hours. At the end of this time, the mash is cooled to 60° F., 100 c.c. of water at 60° F. added, shaken, filtered, and the specific gravity taken. In order to obtain the true extract per quarter of 336 lb., the excess gravity over 1,000 is multiplied by the factor 3·51.—J. L. B.

Glucose; Determination of Value of Liquid Commercial ——. H. S. Coupland. Pharm. J. 1900, **65**, [1592], 761.

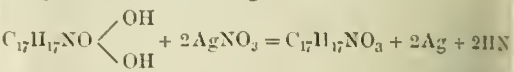
The author suggests that in view of the uncertain composition of liquid commercial glucose, the following tests should be introduced into the Pharmacopœia. It should have a cupric reducing power corresponding to at least 65 per cent. of dextrose; it should give no decided reaction for sulphite when tested with zinc, hydrochloric acid, and lead paper, and no reaction for arsenic when tested in a similar manner with mercuric chloride paper; it should not yield more than 1 per cent. of ash.—A. S.

Albumin; Determination of ——. F. Barnstein. Landw. Vers.-Stat. **54**, 327—336. Chem. Centr. 1900, **2**, [19], 1037.

The author gives the following modification of the method proposed by Ritthausen: 1—2 grms. of the substance are boiled with 50 c.c. of water, or, if starch flour be present, heated for 10 minutes on the water bath, then 25 c.c. of copper sulphate solution (60 grms. per litre) added, and finally, with stirring, 25 c.c. of caustic soda solution (12·5 grms. per litre). The precipitate is filtered off, washed with warm water, and its percentage of nitrogen determined. The advantages of this method over that of Stutzer are that the solutions are stable and readily prepared, the addition of alum solution and potassium phosphate is avoided, and the precipitates, which settle well, can be easily filtered and washed. The results obtained in the examination of fodder materials correspond well with those obtained by Stutzer's method; they are usually slightly higher (on the average, 0·016 per cent. N), this being probably due to the more intimate contact with the material attained by reason of the precipitant being present in solution. Greater differences (up to 0·2 per cent. N.) occur with substances which contain alkaloids or basic nitrogen compounds. Attempts to apply the method to the precipitation of peptones, showed that vegetable and egg albumin, brought into solution by means of gastric juice, were not completely precipitated, but higher results were obtained than by Stutzer's method.—A. S.

Morphine; Determination of ——, *by Reduction* *w* *Silver Nitrate.* C. Reichard. Chem. Zeit. 1900, 2 [97], 1061—1062.

On adding a solution of silver nitrate to a not too dil aqueous solution of a morphine salt (other than those halogen acids) the following reaction occurs—



$$C_{17}H_{17}NO\begin{matrix}\diagup OH\\ \diagdown OH\end{matrix} + 2AgNO_3 = C_{17}H_{17}NO_3 + 2Ag + 2HN$$

The separated silver is collected on a filter, washed w boiling water, rapidly dried at 130°—150° C., ignited, a weighed, together with the ash of the ignited filter, in porcelain crucible.

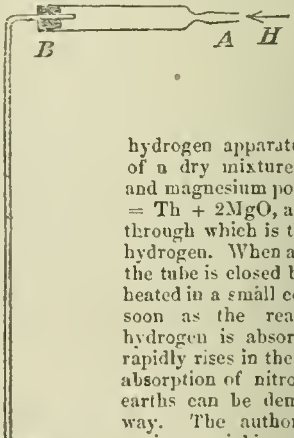
This method is not directly applicable when the morph is in combination with an acid which forms an insolu silver compound, but in certain cases slight modificati can be used. Thus, in the case of morphine hydrochlor the silver may be freed from the silver chloride by wash on the filter with ammonium hydroxide. Similarly in case of hydrobromide a solution of sodium thiosulp may be used, or of potassium iodide in the case of morph hydriodide. Since only a limited number of alkal reduce silver nitrate, this method can often be used a rapid means of determining morphine in the presenc other organic substances. In conclusion the author sh that in practice it is necessary to employ heat to obta complete precipitation of the silver in a short time, gives a series of test analyses in which the results ar close agreement with the theoretical amounts.—C. A. M

XXIV.—SCIENTIFIC & TECHNICAL NOTI

Solid Solutions of Mixtures of Three Substances. G. Br Atti. R. Accad. dei Lincei Roma, **9**, [5], 232— Chem. Centr. 1900, **2**, [23], 1173.

The author discusses, from the standpoint of the p rule, the melting-point curves relating to mixture three components. According as the three component completely or incompletely isomorphous, or give add compounds with one another, or are neither isomorp nor give addition compounds, or two of them belong to of these three types, whilst the third, in relation to the two, may be classed under another type, six types of ter mixtures are discussed and illustrated by curves. A sev case occurs when two constitutents give an addition pound which is isomorphous with the third compo The phenomena in mixtures of three substances a importance in studying the behaviour of ternary alloys —A.

Hydrogen and Nitrogen; Absorption of ——, *by Met* *the Rare Earths. Lecture Experiment.* C. Mati Chem. Zeit. **24**, [97], 10



A tube, A Jena glass, 20 length, is con with a mano tube and wi hydrogen apparatus. From 2 to 3 of a dry mixture of the required and magnesium powder, *e.g.*, ThO_2 = Th + 2MgO, are placed in the through which is then passed a curr hydrogen. When all air has been ex the tube is closed by fusing at A, an heated in a small combustion furnac soon as the reaction commence hydrogen is absorbed, and the m rapidly rises in the manometer tube. absorption of nitrogen by metals o earths can be demonstrated in th way. The author has found th conium, niobium, and vanadium readily combine with nitrogen.

—C. A M.

er Selenides. Fonzes-Diacon. Comptes Rend. **131**, [26], 1206—1208.

ic Selenide, CuSe, is formed by the action of ogen selenide on anhydrous cupric chloride at a temperaof 200 C. or above, as a bluish-black substance, either ning the form of the cupric chloride crystals or partially , according to the temperature.

prous Selenide, Cu_2Se, is formed as an olive-green pitate by passing hydrogen selenide through an acid on of cuprous chloride, or as small dark green crystals ssing hydrogen selenide diluted with hydrogen over lrous cuprous or cupric chloride at a red heat. The compound is formed when cupric selenide is reduced by gen at a red heat, and when copper selenate is heated harcoal.—J. T. D.

bdenum and its Oxides; Action of Water Vapour, and mixed with Hydrogen, on ——. M. Guichard. uptes Rend. **131**, [24], 998—1001.

E hydrogen, at and above 600° C., reduces the oxides of denum to metal, water-vapour oxidises the metal to ie only at and above 700 C. Below 700° C., then, ducing action of hydrogen is not interfered with by ture, with the hydrogen of water vapour. Above ., if a mixture of molybdenum and its dioxide be l in a closed vessel with limited amounts of hydrogen ater vapour, oxidation or reduction will occur till a e ratio, depending on the temperature, is reached en the pressures of the hydrogen and the water r; but if an unlimited supply of hydrogen and vapour in definite proportions be passed over the re of metal and oxide in a tube, then, unless the pro- ns of the gases be those for equilibrium, oxidation or ion should go on till only oxide or metal, as the case be, remains. The author has verified this experily: at a temperature of 800° C., and at a total re of 760 mm., there is complete reduction or on, according as the pressure of water vapour in the e is below or above 350 mm.—J. T. D.

ndes and Ketones; Acidimetry of ——. A. Astruc H. Murco. Comptes Rend. **131**, [23], 943—945.

ny of the behaviour of these substances towards thine A, Phenolphthaleïn, and Poirrier's Blue. *Monles* (formic, acetic, propionic, valeric, benzoic, and c) are neutral to all of these indicators. *Dialdehydes* al only studied) affect the indicators very slowly, but to phenolphthaleïn and Poirrier's Blue as monobasic *Halogen-substituted Aldehydes* (chloral hydrate and ate and bromal) are monobasic to Poirrier's Blue. *lic and Phenolic Aldehydes:* Hydroxybutyric alde- ldol, and the aldoses are neutral to all three indicators; e and parahydroxybenzoic aldehydes, vanillin and nal, are neutral to Helianthine, monobasic to the two. *Monoketones* (acetone, diethylacetone, methyl etone, acetophenone, benzophenone) are without on any of the indicators. *Diketones:* the β-series o function as monobasic acids, though the indicator s when less than a molecule of alkali has been added lecule of the aldehyde; the α series are probably l; the same is the case for the γ-series, as far as they resented by acetonyl-acetone. *Halogen-substituted s:* monochloracetone and monobromacetophenone are to Helianthine, monobasic to the other two. *Ketonic* (pyruvic, levulinic) are exactly monobasic to phealeïn and Poirrier's Blue; but with Helianthine a amount of alkali suffices for the change—less with ic than with pyruvic acid; no doubt because of the ion of the ketonic and carboxylic groups by two roups. These alkalimetric results agree with the ions from heats of neutralisation, where these have etermined.—J. T. D.

yl Sulphate; Injurious Action of ——, on Respira- Organs. Actiengesellschaft für Anilinfabrikation. in. Chem. Ind. 1900, **23**, [24], 559.

TION is called to the dangerous nature of dimethyl e, the vapour of which strongly attacks the mucous ane and respiratory organs. The vapour is tasteless, almost odourless, and apparently has an anæsthetic action, so that much injury may arise before the ill effects become evident. Similar observations by other investigators of this class of compound may well be communicated, in the public interest.—R. L. J.

Lichens, and their Characteristic Constituents. O. Hesse. J. prakt. Chem. 1900, **62**, [21, 22], 430—480. (See also this Journal, 1898, 807; 1901, 77.)

THE lichens were examined by extracting with ether under a reflux condenser, washing the ethereal extract with potassium bicarbonate solution, and concentrating. Thus the extracted matter is divided into the fractions B (acids) and C (indifferent substances). Fraction A comprises the substances which separated from the ether during extraction.

Usnea, from Japanese cinchona bark, consisting of *U. plicata L. Ach.* with a small quantity of *U. barbata (L.)*, was found to contain *d*-usninic, usnaric, and plicatic acids, together with usnarin. On boiling with alcoholic potash or baryta water, usnaric acid yields carbonic acid and a brown amorphous compound. Plicatic acid,—

$$CH_3O.C_{18}H_{31}O_4(CO_2H)_2,$$

forms white leaflets, which melt at 133° C.

Usnea barbata (L.) var. dasypoga (Ach.) Fr. contains *d*-usninic, usnaric, and alectoric acids. Usnaric acid is separated from alectoric acid by means of the action of potassium bicarbonate, potassium alectorate being insoluble in a solution of the reagent.

Alectoria jubata (L.) Ach., var. implexa (Hoffm.), was found by Zopf to contain salazinic acid alone (Annalen, **297**, 295). The author was unable to find this acid, but discovered a new acid—alectoric—which separates in quantity during the extraction. It is a dibasic acid of the formula $C_{28}H_{24}O_{15}$, and melts at 186° C.; on boiling with baryta it is converted into another acid, melting at about 220° C.

Evernia divaricata (L.) Ach.—The author finds divaricatic acid only, in this lichen.

Ramalina cuspidata Nyl. contains a new acid, cuspidatic acid, which is readily soluble in alcohol, acetone, and ether, and melts at 218° C.

Thamnolia vermicularis (Sw.).—From this lichen thamnolic acid, $C_{19}H_{15}O_{10}.OCH_3$, is obtained by extraction with ether and repeated crystallisation from hot acetic acid. When boiled with baryta, barium carbonate is formed, together with thamnolinic acid, $C_{16}H_{20}O_7$, which melts at 163° C.

Stereocaulon coralloides, Fr.—The author finds that fractions A and C consist essentially of atranorin, but fraction B of an unidentified acid, which was not parellic acid.

Stereocaulon alpinum, Laurer, contains atranorin and usnetinic (Zopf's stereocaulic) acid.

Stereocaulon salazinum, Bory.—In this lichen were found atranorin and salazinic acid. The latter crystallises from hot alcohol. Its taste is biting, but not bitter. The acid gives a brick-red coloration with caustic potash.

Cladonia Floerkeana Fr. contains coccellic acid and a small quantity of thamnolic acid. Coccellic acid, $C_{20}H_{22}O_7$, is decomposed by hydriodic acid with the production of rhizoninic acid, $C_{10}H_{12}O_4$, and coccellinic acid, also $C_{10}H_{12}O_4$. Coccellinic acid forms fine white needles which melt at 176°—177° C.; it gives an intense bluish-violet coloration with ferric chloride.

Cladonia fimbriata (L.) Fr. ε-chordalis Ach.—Fraction B contains a single acid, which was found to be protocetraric acid, $C_{30}H_{22}O_{15}$.

Cladonia uncinata (Hoffm.).—From fractions A and B a new acid, uncinatic acid, was obtained; it is a white crystalline powder, melting at 212° C.

Cladonia squamosa (Hoffm.) α-ventricosa (Schaer.).—From fractions A and B, a new acid, squamatic acid, was isolated. It is homologous with uncinatic acid, and contains one methoxyl group. It melts at 215° C. with decomposition.

Parmelia tiliacea (Hoffm.) = Imbricaria tiliacea Körber. The parmelianic acid, found by Zopf (Annalen, **295**, 278) in this lichen, is lecanoric acid.

Parmelia sorediata (Ach.) Th. Fr. contains lecanoric acid.

Parmelia perlata Nyl., from Java, contains considerable quantities of atranorin, but only traces of lecanoric acid.

Parmelia perforata Nyl., from Java, cinchona bark, contains atranorin and small quantities of lecanoric acid. This lichen, when moistened with very weak alkali solution, soon becomes rust-coloured.

Parmelia olivetorum Nyl., also contains atranorin together with a large proportion of lecanoric acid.

Parmelia tinctorum Despreaux, Nyl. contains atranorin and 23·6 per cent. of lecanoric acid.

Parmelia saxatilis var. sulcata and *var. panniformis*, yielded atranorin and protocetraric acid, $C_{30}H_{22}O_{15}$. The fraction B of the latter lichen contains also usnetinic acid, which was extracted by warm acetone. Usnetinic acid, $C_{23}H_{23}O_7.OCH_3$, melts at 192° C. when quite pure.

Parmelia acetabulum (Neck.) Dub. contains atranorin and salazinic acid, as previously found by Zopf.

Umbilicaria pustulata (L.) Hoffm. gives a large yield of gyrophoric acid. It is obtained crystalline from ether or dilute alcohol, melts at 200°—202° C., contains no alkoxyl group, and is optically inactive. The formula is $C_{16}H_{14}O_7$. When boiled with acetic acid it is completely converted into orsellinic acid; when boiled with absolute alcohol it yields orsellinic ester and orsellinic acid.

Placodium saxicolum var. compactum, Körber, yields atranorin and an acid which does not appear to be identical with any hitherto found in the lichens.

Placodium gypsaceum (Sm.) Kbr.—Zopf had found usninic and squamaric acids, the latter of which the author has previously shown to be identical with parellic acid. Lichens obtained from two separate places were now found to yield parellic acid alone, unaccompanied by usninic acid.

Placodium circinatum Pers. Kbr. contains parellic acid.

Blastenia arenaria (Pers.) var. teicholytum Ach.—Atranorin and gyrophoric acid were obtained.

Hämatomma ventosum (L.) Mass.—The author finds *d*-usninic and divaricatic acids, together with smaller quantities of another acid, soluble in ether with difficulty and melting about 190° C. with decomposition.

Lecanora subfusca (L.) Ach., collected from cinchona bark, contains atranorin as the only characteristic constituent.

Aspicilia calcarea (L.) Kbr.—The variety examined most nearly resembled *farinosa*. Fraction C contains colourless crystals, which were extracted by hot alcohol. This substance, aspicilin, after recrystallisation, yields fine white prisms which melt at 178·5° C. The alcoholic solution is neutral, and gives no coloration with ferric chloride; the compound sublimes undecomposed. Fraction B yields erythric acid, $C_{20}H_{22}O_{10}$. Erythric acid is to be regarded as erythrolecanoric acid. This lichen also contains calcium oxalate.

Urceolaria scruposa var. arenaria Schaer., yielded a small quantity of lecanoric acid.

Lecidea grisella, Flörke.—Fraction B consists of gyrophoric acid.

Graphis scripta (L.) Ach. is frequently found on Java cinchona bark. If the bark be placed for some hours in cold water and then exposed to the air, a reddish and then brownish coloration appears on the places where the lichen grew. The lichen contains much salazinic acid, $C_{30}H_{24}O_{16}$ or $C_{28}H_{22}O_{15}$, which contains no alkoxyl groups.

The author enumerates differences in the constituents of certain lichens, due to differences in climate or in the substances upon which they grow. The alleged discovery of emodin in certain lichens by Bachmann rests upon unsatisfactory evidence. The substance examined has only certain reactions in common with emodin.—A. C. W.

PRIZES.

Prize for a Substitute for Benzine.

Bd. of Trade J., Feb. 14, 1901, 418.

The United States Consul at Coburg, in a report dated 12th December last, states that for years a substitute for benzine has been in demand. The objectionable points about benzine are its high inflammability and volatility, the danger of poisoning the atmosphere, &c. This was one of the chief topics of discussion at the Chemical Congress at Hanover in 1899, and last autumn the subject came once more at the meeting at Cassel, when a premium about 50*l*. was offered for an effectual substitute for benzi or for means of rendering it less dangerous.

New Books.

Chemisch-Technisches Repertorium. Uebersichtlic Bericht über die neuesten Erfindungen, Fortschritte Verbesserungen auf dem Gebiete der technischen industriellen Chemie, mit Hinweis auf Maschinen, Appa und Literatur. Herausgegeben von Dr. Emil Jacob 39. Jahrgang. 1900. Erstes Halbjahr. Zweite Hä R. Gaertner's Verlagsbuchhandlung. Hermann Heyfel Schönebergerstr. 26, Berlin, S.W. 1901.

This is the number of the "Repertorium" for the sec half of the first half-year of 1900, and it treats of following subjects of Chemical Technology:—I. Foodst II. Paper. III. Photography. IV. Residues, Man Disinfection and Sanitation. V. Soaps. VI. Explos and Matches. VII. Preparation and Purification Chemicals. VIII. Fine Chemicals, &c. IX. Chem Analysis. X. Apparatus, Machinery, Electro-techno and Thermo-Technology. XI. Appendix, &c. XII. Books. Alphabetical Index of Subject-Matter.

Tables of Colour and Solubility of Simple S Reprinted from "Chemistry for Examinations." Henry W. Hill. Allman and Son, Ltd., 67, New O Street, London. 1900. Price 2*s*. 6*d*.

Tables, strongly backed by cloth, indicating at a gl the solubility, colour, and certain other properties o salts of the principal inorganic acids.

Qualitative Chemical Analysis, Organic and organic. By F. Mollwo Perkin, Ph.D., Head o Chemistry Department, Borough Polytechnic Inst London. Longmans, Green, and Co., 39, Patern Row, London; New York, U.S.A.; and Bombay. Price 3*s*. 6*d*.

This work contains preface, table of contents, and 261 of subject-matter, and the alphabetical index. The are illustrated with nine wood engravings and a col engraving representing the spectra of the metals. In work, besides the usual qualitative separation of the and bases, a second part is devoted to organic quali analysis, and the following sections are embraced h XI. Qualitative "Elementary" Analysis of Carbon pounds. XII Reactions and Separation of Organic and Phenols. XIII. Aldehydes, Alcohols, Acetone Glycerin. XIV. The Sugars. XV. Bases, Glucoside XVI. Alkaloids.

Trade Report.

LEGISLATION; TARIFF CHANGES A CUSTOMS REGULATIONS.

Assessment of Duty on Mercerized and oth Cotton Cloths.

It has been found that the widths of Italian linin mercerised cotton cloths frequently run from $\frac{1}{4}$ in. t and occasionally $1\frac{1}{2}$ in., less in actual measureme stated in the invoices relating to the goods. The re this is said to be that such cottons are measured being coloured, and that this process or the merceri the goods causes the shrinkage referred to. It h sequently been decided that such merchandise and al tissues shall be assessed for duty on the basis, not invoiced, but of the actual, width, as returned appraiser at the port of entry.

Duties on Russian Petroleum.

Petroleum produced in Russia and importe England, there refined and thence imported i United States, is dutiable at a rate equal to t imposed by Russia on petroleum imported in try from the United States. The provisions of para-h 626, Act of July 24th, 1897, apply to the country e the oil is produced, and not to the country of ex-ation. Appeal of Vacuum Oil Company from Collector Customs at Rochester, N.Y.; United States Board of eral Appraisers.

TARIFF VALUATIONS OF CERTAIN GOODS IN BRITISH INDIA.

e Board of Trade have received, through the India e, copy of a Circular (No. XXI. of 1900), issued by Finance and Commerce Department of the Government dia on the 24th ult., fixing the valuations for tariff oses of certain classes of goods.

Indian Valuation Tariff.

Names of Articles.		Tariff Valuation.	Duty.
CHEMICALS, DRUGS, MEDICINES, AND NARCOTICS, AND DYEING AND TANNING MATERIALS.			
		R. a.	
hemical products and preparations—			
Acid, sulphuric	Lb.	0 1½	5 %
Alkali, Indian (sajji-khár)	Cwt.	1 8	„
Alum	„	4 8	„
Arsenic	„	21 8	„
„ China mansil	„	15 0	„
Bicarbonate of soda	„	6 8	„
Copperas, green	„	2 10	„
Explosives, namely, blasting gelatine, dynamite, roburite, tonite, and all other descriptions, including detonators and blasting fuse.	..	*ad val.*	„
Sal ammoniac	Cwt.	28 0	„
Sulphate of copper	„	20 0	„
Sulphur (brimstone), flour	„	6 4	„
„ („), roll	„	6 0	„
„ („), rough	„	5 8	„
All other sorts of chemical products and preparations, including saltpetre and borax.	..	*ad val.*	„
rugs, medicines, and narcotics—			
Aloes, black	Cwt.	20 0	„
„ Socotra	„	25 0	„
Aloe-wood	Lb.	6 0	„
Asafœtida (hing)	Cwt.	65 0	„
„ course (hingra)	„	22 0	„
Atáry, Persian	„	15 0	„
Banslochan (bamboo camphor).	Lb.	0 5	„
Brimstone (amalsára)	Cwt.	35 0	„
Calumba root	„	10 0	„
Camphor, Bhimsaini (barás)	Lb.	50 0	„
„ refined, cake	„	1 11	„
„ crude, in powder	„	1 3	„
Cassia lignea	Cwt.	35 0	„
China root (chobchini), rough.	„	9 0	„
China root (chobchini), scraped.	„	14 0	„
Cubebs	„	22 8	„
Galangal, China	„	9 0	„
Pellitry (akalkára)	„	40 0	„
Peppermint crystals	Lb.	8 0	„
Quinine and other alkaloids of chinchona.	..	..	Free
Salep	Cwt.	125 0	5 %
Senna leaves	„	7 0	„
Storax, liquid (rose mellose)	„	44 0	„
Tobacco, unmanufactured	..	..	Free
„ manufactured	..	*ad val.*	5 %
All other sorts of drugs, medicines, and narcotics, except opium (for which see Schedule III.).	..	„	„
yeing and Tanning Materials—			
Alizarin dye, dry:			
40 per cent.	Lb.	1 5	„
50 „	„	1 9	„
60 „	„	1 13	„
70 „	„	2 1	„
80 „	„	2 5	„
100 „	„	2 14	„
Alizarin dye, moist:			
10 per cent.	„	0 4¾	„
16 „	„	0 7	„
20 „	„	0 8¾	„
Aniline dye, moist (indigo blue).	„	0 6½	„

Indian Valuation Tariff—continued.

No.	Names of Articles.		Tariff Valuation.	Duty.
	Dyeing, &c. Materials—*cont.*		R. a.	
	Aniline dye, dry	Lb.	1 0	5 %
	„ salts	„	*ad val.*	„
	Avar bark	Cwt.	4 12	„
	Buzgand (gulpista)	„	30 0	„
	Cochineal	Lb.	0 12	„
	Gallnuts (myrabolams)	Cwt.	3 0	„
	„ Persian	„	45 0	„
	Madder or manjit	„	9 0	„
	Orchilla weed	„	4 0	„
	Sappan wood and root	„	5 8	„
	Turmeric	„	11 9	„
	All other sorts of dyeing and tanning materials.	..	*ad val.*	„
13	Metals—			
	Lead, ore, galena	Cwt.	14 0	„
	„ pig	„	12 0	„
	„ pipes	„	*ad val.*	„
	„ sheets	Cwt.	14 0	„
	„ „ for tea-chests	„	..	Free
	Quicksilver	Lb.	1 12	5 %
	Tin, block	Cwt.	90 0	„
	„ foil, China	Lb.	0 12	„
	„ other sorts	..	*ad val.*	„
	Zinc or spelter, nails	Cwt.	20 0	„
	„ „ plates and other shapes, soft.	„	20 0	„
	Zinc or spelter, plates and other shapes, hard.	„	15 0	„
	Zinc or spelter, sheet or sheathing.	„	22 0	„
	Zinc or spelter, all other sorts.	..	*ad val.*	„
	All other sorts of metals	..	„	„
	OILS.			
16	Oils—			
	Cajeputi	Quart	1 12	„
	Cassia	Lb.	3 0	„
	Cocoanut	Cwt.	16 0	„
	Linseed	Imp. gall.	2 2	„
	Otto of sorts	Oz.	15 0	„
	Petroleum, including also naphtha and the liquids commonly known by the names of rock oil, Rangoon oil, Burma oil, kerosine, paraffin oil, mineral oil, petroline, gasoline, benzol, benzoline, benzine, and any inflammable liquid which is made from petroleum, coal, schist, shale, peat, or any other bituminous substance, or from any products of petroleum.	Imp. gall.	..	1 anna
	Petroleum, which has its flashing point at or above 200 degrees of Fahrenheit's thermometer, and is proved to the satisfaction of the Customs collector to be intended for use exclusively for the batching of jute or other fibre or for lubricating purposes or fuel.	..	*ad val.*	5 %
	All other sorts of oil, including paraffin wax.	..	..	„
	OTHER ARTICLES, UNMANUFACTURED AND MANUFACTURED.			
24	Building materials, bricks, cement, fireclay, lime.	..	*ad val.*	„
26	Candles, paraffin	Lb.	0 6	„
	„ spermaceti	„	0 7	„
	„ wax	„	1 0	„
	„ all other sorts	..	*ad val.*	„
31	Coal, coke, and patent fuel	..	..	Free
38	Earthenware, china	..	*ad val.*	5 %
40	Fireworks and fulminating powder.	..	„	„
43	Glass and china	133⅓ Lb.	30 0	„
44	Gums, gum-resins, and articles made of gum or gum-resins—			
	Copal	Cwt.	70 0	„
	Cutch and gambier	„	16 0	„
	Gamboge	Lb.	0 15	„
	Gum ammoniac	Cwt.	15 0	„
	„ Arabic	„	24 0	„
	„ bdellium	„	13 0	„
	„ Benjamin, ras	„	25 0	„
	„ „ cowrie	„	80 0	„

Indian Valuation Tariff—continued.

No.	Names of Articles.		Tariff Valuation.	Duty.
			R. a.	
	Gums, &c.—*cont.*			
	Gum bysabol (coarse myrrh)	Cwt.	22 0	5 %
	„ olibanum or frankincense.	..	..	Free
	„ Persian (false)........	Cwt.	10 0	5 %
	„ kino..................	„	10 0	„
	Myrrh......................	„	28 0	„
	Rosin......................	„	1 8	„
	All other sorts of gums, gum-resins, and articles made of gum or gum-resin, including caoutchouc and gutta-percha.	..	*ad val.*	„
46	Hides and skins................	..	„	„
48	Instruments and apparatus.....	..	„	„
52	Leather........................	..	„	„
53	Manures of all kinds...........	..	..	Free.
55	Oilcake........................	..	..	„
56	Oil-cloth and linoleum..........	..	*ad. val.*	5 %
57	Paints, colours, painters' materials, and compositions for application to leather, wood, and metals—			
	Lead, red, dry..............	Cwt.	14 0	„
	„ white, dry..............	„	16 0	„
	Ochre, other than European, all colours................	„	1 8	„
	Paints, composition.........	„	55 0	„
	„ patent driers.......	„	12 0	„
	Turpentine.................	Imp. Gal.	2 6	„
	Verdigris..................	Cwt.	70 0	„
	Vermilion, Canton..........	Box of 90 bundles.	100 0	„
	Zinc, white, dry............	Cwt.	25 0	„
	All other sorts, including glue and putty.............	..	*ad. val.*	„
58	Paper, pasteboard, millboard, and cardboard...............	..	„	„
60	Pitch, tar, and dammer—			
	Bitumen....................	..	„	„
	Dammer.....................	Cwt.	5 0	„
	Pitch, American and European	„	7 0	„
	„ coal.................	„	3 0	„
	Tar, American and European..	„	6 0	„
	„ coal..................	„	3 8	„
	„ mineral...............	..	*ad. val.*	„
63	Pulp of wood, rags.............	..	..	Free.
72	Soap...........................	..	*ad. val.*	5 %
76	Tallow, grease, and stearine.....	Cwt.	20 0	„
78	Textiles not otherwise described.	..	*ad. val.*	„
79	Toilet requisites not otherwise described.	..	„	„

CUSTOMS TARIFF OF VENEZUELA.

See Bd. of Trade J., Jan. 24, 1901, *p.* 222, *and Jan.* 31, 1901, *p.* 277.

CUSTOMS TARIFF OF ECUADOR.

See Bd. of Trade J., Jan. 31, 1901, *p.* 288, *and Feb.* 7, 1901, *p.* 335.

I.—GENERAL.

SAUERBECK'S "INDEX NUMBERS."

Comm. Intelligence, Jan. 26, 1901, 38. (*See also this J.,* 1894, 762A; 1895, 609; and 1896, 755.)

A comparison of prices in 1899 with those of preceding years in that great world's market, London, is made by Prof. A. Sauerbeck, in a publication issued by the Royal Statistical Society. This comparison, according to Prof. Sauerbeck's statement which precedes it, "shows the course of prices of 45 commodities during the last 20 years, as compared with the standard period of 11 years, 1867–77." The statement of values is in the form of "index numbers" in which the average price during the period 1867–77 is taken as 100, and the relative price in the years named, from 1880 to 1899, is based thereon. The 45 articles considered are arranged in six great groups: Vegetable food; animal food; sugar; coffee and tea; minerals; textiles; and sundry materials. In vegetable food, the index number for the year 1880 was 89; for the year 1885, 68, for the year 1890 it was 65; in 1896 it reached its lowest point, 53; and in 1899 averaged for the year, 60. In animal food, the figure for 1880 was 101; for 1885, 88; for 1890, 82; in 1896 again the lowest point, 73; and 1899, 79. Sugar, tea, and coffee stood in 1880 at 88 1890 at 70; and reached their lowest average, 51, in 1 and in 1899 stood at 53, though for coffee and tea, as sh in the discussion accompanying the tables, the 1899 fig were the lowest recorded in the tables. In minerals, index figure in 1880 was 79; in 1885, 66; in 1890, 80 1895 it reached its lowest point, 62; and in 1899 stoo 92, by far the highest point in the 20 years' period, 1880 under consideration. In textiles the index figure for was 81; for 1890, 66; and reached the lowest point in and 1898, when it stood in each year at 51, returnin 1899 to 58 In the list headed "sundry materials," index figure for 1880 was 89; for 1885, 76; for 1890, and reached its lowest point in 1897, when it stood a and in 1899 returned to 65. Taking the grand total of 45 articles considered in the various classes of veget food, animal food, sugar, coffee and tea, minerals, tex and sundries, the index figure for 1880 was 88; for 1 72; for 1890, 72; and in 1896 reached its lowest point, returning in 1899 to 68.

Discussing the table from which the above figures taken, Prof. Sauerbeck says:—

"The index number for all commodities was 68, ag 64 in 1898, or 32 per cent. below the standard p 1867–77, and 14 per cent. below the 10 years 1878–87 3 per cent. above the average of the last 10 years. compared with 1898, the advance amounted to four p (or 6¼ per cent.), while the rise on 1896, the lowest on record, was as much as seven points (or 11½ per ce The rise was smaller than was probably expected by observers, and this is explained by the fact that the av advance for the whole year applied only to materials here principally to minerals; to a smaller extent to tex and to a very slight extent to sundry materials. Ar of food, on the other hand, were in the aggregate lower advantage no doubt to consumers—and were exactly level with 1897, so that the advance obtained in 189 again lost.

"Four articles out of the 45 contained in my t showed records of lowest prices, viz.: Brazil coffee, coarse wool, and the average import price of tea. Ar of food were a little lower, but materials 24 per higher than in December, 1898, while the rise for mat from the lowest point in February, 1895, amounted much as 36 per cent. in the aggregate. Articles of fo the other hand, were only 8½ per cent. above their l record point in July 1896.

"In the course of last year prices of corn rem generally on a low level, the small wheat crop of the of 1897 (283 million quarters) having been followed i by the largest crop on record (358 million quarters), 1899 by another good crop (324 million quarters). and butter were somewhat dearer, the latter being af by the drought in August. Sugar and the common s tea ruled a little higher than in the preceding year t both articles are still on a very low basis, the av import price of all sorts of tea imported having bee lowest on record. Brazil coffee, under the influence large crops in succession, was lower than ever Santos touching 25*s.* per cwt. in September, but imp again to 32*s.* towards the end of the year. Metals ge reached their highest points between July and Octob gave way to some extent later on, while coal ob almost famine prices at the end of the year and e 1900. Iron has not been so high since 1874, but and tin, although very dear, were still higher duri speculation in 1887–88.

"Among the textiles we have to record an adva cotton, in view of a large consumption and lower est of the current crop, but prices during the past yea still very low as compared with former periods. touched the lowest price on record, improved gra and realised a sharp advance in December. Manila experienced great fluctuations in conjunction wit policy of opening and again closing the port the pri 17*l.* sterling per ton at the end of 1897, and ab sterling at the end of last year, probably the highest on record. Merino wool advanced over 60 per ce has not been so high since 1880, while the bulk of vools occupied the lowest level on record for the greater art of the year, improving to some extent towards the nd. Silk was considerably higher.

"The past year will, on the whole, be considered a very rosperous one, and the activity of the manufacturing ndustries in Europe, as well as in America, was greater han at any time since 1871-73."

Chemical Imports of Mexico.

Foreign Office Annual Series, No. 2516, *Jan.* 1901.

The value of the chemical products imported into Mexico n the year 1899 was 455,300*l.*, as against 376,615*l.* in 1898. 'he principal articles in which an increase is most visible re :—

Articles.	Value.	
	1898.	1899.
	£	£
aints and varnishes, including aniline dyes, and extracts from dye-woods.	78,905	101,016
rugs, patent medicines, &c..........	75,414	92,303
ulphate of copper, iron, &c.	48,947	79,005

The greater quantity of articles imported under this head ome from the United States and Germany.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Petroleum Deposit at Beaumont, Texas.

Bd. of Trade J., Feb. 14, 1901, 411.

H.M. Consul at Galveston reports that a petroleum posit of considerable extent has recently been discovered Beaumont, a Texas town lying some 150 miles to the west Galveston, and 25 miles from the coast.

It has long been supposed that considerable deposits of l existed in that vicinity, but it is only within the last few eeks that it has actually been discovered.

The one well which has been sunk up to now is, at present, roducing some 5,000 to 6,000 barrels a day.

The oil, however, is a very low quality, and is only fit for el.

It is understood that arrangements are being made to nstruct a pipe line to Port Arthur, whence the oil will be ipped in tank steamers.

IV.—COLOURING MATTERS, Etc.

The Indigo Industry.

C. Rawson. Calcutta "Englishman"; through Chem. Tr. Journal, Feb. 9, 1901. (*See also this Journal,* 1899, 467—474.)

In order to compete successfully with artificial indigo and digo substitutes, and to put the industry of India once ore upon a firm basis, the cost of production must be nsiderably diminished, or, in other words, a greater yield f plant must be obtained from each acre of land cultivated, s well as a greater amount of colouring matter from every aund of plant put into the vats. This can now undoubtedly e done and at a remunerative cost, but in order to make e industry a success it needs the co-operation of buyers, gents and planters. Many planters are unable to take dvantage of the situation unless they have the assistance f their agents; others fear to put down new manufacturing lant lest buyers should unduly depreciate the value of the digo produced on account of its being made by some rocess out of the ordinary.

It would appear from several letters which have recently een published in English papers, that indigo planters ere doing nothing to retain their position in the field, and ild statements have been made by individuals knowing ttle or nothing about the condition of labour in this ountry, that the whole process of manufacture was most rude and antiquated. As many readers of the *Englishman* are aware, the Behar Indigo Planters' Association has taken the matter in hand, and during the past three years a considerable amount of research work relating to improvements both in the cultivation and manufacture of indigo has been done in the Mozufferpur district, though for obvious reasons little has hitherto been published. Another body, known as the Indigo Improvements Syndicate, has also been working with similar objects in view at Dulsing Serai. Judging from statements made by several correspondents, an erroneous impression has apparently been received and spread that the older association was confining its attention entirely to matters connected with improved methods of manufacture, and that the syndicate was dealing solely with the agricultural part of the problem. One of the great difficulties attending the introduction of an improved process of manufacture is the attitude taken by buyers with respect to the indigo thereby produced. If any compound generally termed a "chemical" is added to the liquid during any stage of the manufacturing operation, the product is named "patent" or "chemical" indigo by the Calcutta buyers, and is looked upon with suspicion. Its quality may be superior, but it rarely, if ever, commands the same price as indigo of a similar character made by the old ordinary process. Sulphuric or hydrochloric acid added to the "liquid" indigo in the boiler unquestionably improves the quality of the product, but it has frequently been stated in Calcutta that indigo which has been so treated was undesirable, and that the acid used would tend to rot the cloth subsequently dyed with it. It is absolutely impossible, however, for such an effect or any other injurious effect to take place. Even without taking special precautions, the acid used in the boiling process is subsequently removed, and does not appear in the finished indigo. But in an extreme case, not at all likely to occur in practice, if, through carelessness, some acid still remained in the dried cake, it would be at once neutralised by the lime or other alkali always present in large quantities in the dye vat. There is certainly some reason for buyers looking with suspicion upon so-called "patent" indigo, because much which has been made in the past has been of inferior quality, but if any doubt exists regarding the value of such indigo the remedy is very simple, *viz.*, analysis. An analysis of the sample will clearly show the quality of the indigo, and put an end to all speculations and diverse opinions. If indigo is to hold its own against artificial dyes it will certainly be necessary to modify the present mode of manufacture, but if buyers throw obstacles in the way by discounting the value of indigo so produced, the position of the planter may not be much improved.

During the past season several factories in Behar have made a certain amount of indigo by what is known as the "blower" process. It consists in oxidising the "liquor" obtained on steeping the plant by forcing air through a number of perforated pipes lying at the bottom of the vat in place of oxidising by the ordinary beating wheel. In this way an increase of from 20 to 25 per cent. of colouring matter is obtained, without the assistance of any chemical compound. The operation may be performed either by means of mechanical air compressors or by steam blowers. In the latter case, the temperature of the liquid is raised slightly, and a small amount of carbonate of lime (naturally always present in the solution) is precipitated with the indigo, thereby reducing the colouring matter in the product by 2 or 3 per cent. By adding a little sulphuric acid to the "mal" in the boiler, however, this is at once removed, and the indigo obtained is of precisely the same quality as that made by the ordinary process. If the amount of acid is increased, the quality of the product is decidedly superior to the ordinary indigo, and the working of subsequent operations is much facilitated. In one respect the indigo thus made is superior to that made by wheel beating, as it contains a slightly greater amount of indirubin.

The quality of the indigo made by the process during the past season should not be taken as an index of the quality which will be produced in future, as many planters, looking upon the operation as being in an experimental stage, unfortunately laid down plant of insufficient power, resulting in the production of indigo of an inferior quality to that which otherwise would have been obtained.

So long as prices remain about equal, value for value, the majority of dyers in Great Britain will continue to use natural indigo, but if the synthetic dye can be supplied at a lower price, one cannot be surprised if they make a change. In the great conflict which has now commenced between the old indigo industry of India and the large dye manufacturing firms of Europe, it behoves planters, agents, and buyers to join forces and pull together for the mutual interests at stake.

THE EXPORT OF INDIGO.

Comm. Intelligence, Feb. 9, 1901.

An Indian Government memorandum recently published gives the exports of indigo of the last five years in cwts., as follows :—

From	1895-96.	1896-97.	1897-98.	1898-99.	1899-1900.
Calcutta	111,714	109,601	71,364	81,779	59,078
Madras	60,706	41,629	47,356	41,203	38,701
Bombay	7,330	8,647	9,631	5,681	6,641
Karachi..........	5,870	8,195	4,690	4,966	5,849

The report gives a very poor return for the exports in the first eight months of the current season. Prices continue low and discouraging.

DYESTUFFS IN EGYPT.

Foreign Office Annual Series, No. 2549, *Jan.* 1901.

Year.	Total Value Imported.	Of which from United Kingdom.
	£	£
1897	260,218	12,230
1898........................	260,603	13,258
1899	246,043	18,056
1900 (first 6 months).........	157,124	..
1899 „ „	131,236	..

In 1899 there was a decrease of nearly 15,000*l.*, chiefly in indigo ; there was an increase in other colours and dyes. During the first half of 1900 there was a marked recovery, the total value imported exceeding by nearly 25,000*l.*, the total for the same period of 1899. There was a slight improvement in indigo, and an increase of nearly 20,000*l.* in other colouring matters. Indigo represents more than two-thirds of the total value of this class of goods.

VII.—ACIDS, ALKALIS, AND SALTS.

GRAPHITE DISCOVERY IN THE GODAVERY DISTRICT OF INDIA.

Comm. Intelligence, Feb. 16, 1901.

A coal company working in the Godavery district has accidentally discovered a large deposit of graphite. The property is to be vigorously worked, and the estimated production is 100 tons a month. A mineralogist from Cornwall is now on his way to India to superintend the working of the property.

SULPHUR INDUSTRY OF SICILY.

Eng. and Mining J., Feb. 9, 1901, 180.

In 1900 the exports of brimstone aggregated 557,668 long tons, as against 479,031 tons in 1899, showing an increase of 78,637 tons, or 14·1 per cent. in the past year. The movement in 1900 is classified by Emil Fog & Sons, of Messina, as follows : United States and Canada, 162,233 tons ; France, 103,647 tons ; Italy, 101,073 tons ; United Kingdom, 23,973 tons ; Germany, 28,702 tons ; Scandinavia, 22,681 tons ; Russia, 22,090 tons ; Austria, 21,594 tons ; Greece and Turkey, 19,647 tons ; Holland, 18,595 tons ; Belgium, 9,721 tons ; Spain, 6,187 tons ; other countries, 6,810 tons. The largest increases in exports, as compared with 1899, were to the United States, Holland, and Scandinavia. Stocks in Sicily on December 31, 1900, were 221,204 long tons, as against 277,098 tons in 1899, and 248,023 tons in 1898.

CHEMICALS AND DRUGS IN EGYPT.

Foreign Office Annual Series, No. 2549, *Jan.* 1901.

Year.	Total Value Imported.	Of which from United Kingdou
	£	£
1897........................	258,517	31,499
1898........................	230,166	35,396
1899........................	274,112	40,288
1900 (first 6 months)	132,847	..
1899 „ „	137,396	..

The falling off in 1898 was caused by a diminution in th importation of common soap. During the first half of 190 there was a falling off of 4,000*l.* in common soap, othe articles showing an increase. British imports in this clas consist chiefly of chemicals and drugs, and are increasing.

Common soap, which is the principal of this categor of imports, is almost entirely imported from Crete. Th import appears, however, to be diminishing owing to th competition of local manufactures.

CHEMICAL WORKS IN BOSNIA.

Foreign Office Annual Series, No. 2552, *Feb.* 1901.

The chemical works at Tuzla are doing very well. The produced in 1899 about 15,000 tons of alkalies and 10,00 tons of other chemical products, and paid a dividend c 12 per cent. The works employ over 400 workmen an the paid-up capital is 93,000*l.*

The "Holzverwerthungs-fabrik," at Teslié, with a capita of 125,000*l.* (3,000,000 kr.), which produces from beech wood methylic alcohol, acetone, pyroligneous acid, acetat of lime, tar, and charcoal, and impregnates sleepers an building timber, is not so far prospering, as it has not ye recovered from the heavy outlay incurred in the recor struction of the machinery, involved by the failure of th process, known as the Bergmann patent, which was at fir employed.

The calcium carbide works at Jaïce, with a capital (250,000*l.* (6,000,000 kr.), also did not thrive in 1899.

VIII.—GLASS, POTTERY, AND ENAMELS.

GLASS AND CHINA IN MEXICO.

Foreign Office Annual Series, No. 2546, *Jan.* 1901.

Glass, china, and earthenware are all articles where a opening could bo easily acquired by the British manufacturer, if he would only assist his agents by stretching point or two in regard to certain special requirements fo this market.

The following example is of quite recent date. merchant of this city required some dinner ware of a certai weight and pattern, and the order was given to representatives of British manufacturers for a quotation. After long time the reply came that as they were not accustome to make that style of ware in the quality required they coul not accept the order, and in consequence the order was se on to France and Germany, where it was executed withou delay.

GLASS IN EGYPT.

U.S. Cons. Reps., Feb. 1901, 254.

All kinds of glassware are at present much in demand i Egypt. In 1898, the imports of glassware (window gla not included) amounted to 1,500,000 francs (289,500 dols. Lamp glass in particular is wanted and is principally imported from Austria and Germany. The increased use gas has caused an augmentation of the sales of all kinds articles for gas lamps. France, Austria, and Germany al furnish large quantities of glassware for electric lamp Goods out of pressed glass—as, for instance, salt and pepp stands, beer mugs, sugar basins, and all kinds of tab glassware of medium quality and prices, spirit and be bottles, and similar articles—are purchased in considerab quantities.

In 1898, the imports of glassware from Austria amount to 570,000 francs (110,010 dols.) and those from Fran to 260,000 francs (50,180 dols.); after these come Germany, Belgium, Great Britain, and Italy.

As regards china, Germany, Austria, and Italy have increased their sales, while France seems to have been doing less business. England and Belgium have also considerably diminished their exports in this line. The French trade included the better-class articles, mostly from Limoges. Italy exports ordinary faïence goods, which are largely in demand on account of low prices.

Would it not be well for our glass manufacturers to cast an eye on Egypt as a likely market for their wares?

X.—METALLURGY.

New Nickel-Ore Works at Newcastle, N.S.W.

According to the *Queensland Government Mining Journal* for December last, arrangements have been completed for the establishment of large nickel-ore smelting nd refining works at Newcastle (New South Wales). An rea of 400 acres has been secured on the Wallsend Coal ompany's property, and the ore to be treated will be rought from New Caledonia by a regular line of steamers. he works will provide employment for a large number f men.

utput of Minerals in Bosnia and the Herzegovina during the Year 1899.

Foreign Office Annual Series, No. 2552, *Feb.* 1901.

Mineral.	Output in 1899.	More or Less than in 1898.	Value.	More or Less than in 1898.
	Tons.	Tons.	£	£
al	303,425	+ 32,242	54,169	+ 6,975
on ore	67,085	+ 8,552	13,972	+ 3,276
pper ore	3,980	+ 195	2,082	+ 120
anganese	5,266	− 54	7,458	− 305
rome ore	196	− 262	653	− 711
on pyrites	430	+ 190	179	+ 79
ey copper	631	+ 93	853	− 302
	Gallons.	Gallons.		
ine	30,537,034	+4,625,698	4,627	+ 701
Total	..	..	83,993	+ 9,833

XII.—OILS, Etc.

Cotton-Seed Oil Production in Mexico.

Chamber of Commerce J., Feb. 1901, 38.

The *Moniteur Officiel du Commerce* says that the annual oduction of cotton-seed oil in Mexico is on an average 500,000 kilos. (3,306,900 lb.) and the quantity consumed 1899 was 14,000,000 kilos. (30,864,400 lb.) In the United ates, as well as in Mexico, the crop was inferior to an erage one. Cotton oil is absolutely indispensable for e manufacture of soap, which explains the endeavours ade to discover a plant the properties of which would be nalogous for producing the said oil. It has been found at the seeds of the castor-oil plant and of the "coyol" ight be cultivated with profit, especially on account of eir hardness and of the fatty oil they supply, and which is rticularly adapted for the manufacture of soap. From e United States there were recently imported some achines for the purpose of extracting the oil from the stor seed which is harvested near Durango, where experiments which have lasted nearly two years have yielded ery satisfactory results. The "coyol" grows abundantly a wild state in the tropical regions; it is a shrub or kind palm, which produces berries containing 80 per cent. of l, of great service for making soap.

oap and Candle Trade in the South of Europe.

Chamber of Commerce J., Feb. 1901, 37.

All manufacturers of soap who desire to dispose of their oductions in Turkey, are urgently advised by *Handels uscum* to employ only olive oil which is perfectly pure. Soaps which contain cotton oil or earthnut oil are not admitted by the Turkish customs officials, particularly at Salonica. The smallest admixture of cotton oil suffices for confiscating a shipment, and the exporter interested may think himself lucky if he succeeds in recovering his merchandise. Some exporters assert even that they had met with such difficulties although olive oil only had been employed in the manufacture; the cause seems to have been that the olive oil had been conveyed in casks which had previously contained cotton oil. The Bulgarian market shuts itself off more and more from the employment of foreign candles and soaps. The German Consul at Varna reports that the tallow and wax candles used there are mostly of native manufacture, only stearine candles being imported from Belgium and the Netherlands. The importation of ready-made soaps is continuously decreasing, as three Varna soap factories almost completely cover the requirements. France, Turkey, Germany, and Greece supply the raw material. Greek soap, which formerly was in great demand, no longer meets with buyers on account of its high price. From a French consular report it appears that at Leghorn English soap controls the market, owing to the abundant advertisements which the English manufacturers publish. In the South of Europe there are seven soap factories. In 1898 the quantity exported was 6,563,112 kilos., and in 1899, 6,847,307 kilos. Medicinal soaps are imported from Germany, and meet a satisfactory sale at firm prices.

XIII. A.—PIGMENTS, PAINTS, Etc.

Paints and Colours in Mexico.

Foreign Office Annual Series, No. 2546, *Jan.* 1901.

Paints and colours are articles that with a little careful management could easily be introduced. The greater quantity of paints and colours are imported from Germany and are nearly all made from aniline dyes; and varnishes are principally of American manufacture. Up to the present this branch of trade has received very little attention from the British manufacturer, and though one or two feeble attempts have been made to introduce them no foothold has been acquired, owing to the lack of experience required to conform to certain local customs and methods of business in this market.

XV.—MANURES.

Phosphate Industry in Christmas Island.

The *Straits Budget* of 22nd December last, in an article on Christmas Island, says that an interesting feature in the development of that place is the vast extent of the phosphate deposits already discovered, and the extension which the existence of these deposits may make to the trade of Singapore. The business of working the deposits and exporting the phosphates really commenced in January, 1900, and, since then, over 30,000 tons of it have been exported to England, Germany, Japan, and Australia. The profit on this has been over 1*l*. a ton, and this rate of profit will increase as the island is further developed and more labour-saving devices can be utilised in the work of quarrying, loading, &c. With the projected improvements it is believed that the output will soon be increased to at least 100,000 tons per annum—producing a profit of considerably over 100,000*l*. The demand for phosphates is in excess of the supply, and it is a demand that is yearly increasing. In the present clearing of only 20 acres, 42 prospect holes have been sunk through the phosphate bed, and these show over 620,000 tons of the product in sight and immediately available. It is also stated that there are over 50 adjacent areas known to be as rich if not richer. Large beds of phosphate of aluminia have also been discovered, and under modern scientific treatment this latter product may yet prove even more valuable than the phosphate of lime.

The phosphates produced are now all exported in the natural state as they come from the ground; but as the scheme advances, the syndicate recently formed to develop the island will erect its own plant for milling the raw stuff, and treating it so as to transform the phosphates into superphosphate, which are the staple form in which phosphates are used as a fertilising agent. The works for this purpose will very possibly, for convenience of trade, be erected in Singapore.

PHOSPHATES IN RUSSIA.

Foreign Office Annual Series, No. 2548, *Jan.* 1901.

Thomas Phosphate.—In 1901 Thomas phosphate will be manufactured in Russia. Slag will be taken at first from the Kertch Metallurgical Iron Works. The port of delivery for South and Central Russia will be Mariupol. The Russian Thomas slag will contain about 20 per cent. of phosphoric acid, instead of the 17 or 18 per cent., which is usually found.

Super-Phosphates. — In competition with the Thomas phosphate, a Russian firm is about to start a large superphosphate works at Schmerinka, utilising the deposits of phosphorites found in the neighbourhood. The sulphuric acid, however, cannot be obtained from nearer than Poland.

XIX.—PAPER, PASTEBOARD, Etc.

PAPER IMPORTS OF MEXICO.

Foreign Office Annual Series, No. 2546, *Jan.* 1901.

There is an increase in the value of the imports of paper during the year 1899. The figures are 407,056*l.*, as against 306,234*l.* in 1898.

The articles in which this increase is most noticeable are cigarette paper, unsized paper, wrapping and writing papers, and wall paper.

The value of cigarette paper, which is classified under a separate heading in the Customs tariff, imported almost entirely from Spain, was 85,619*l.*, or 29,000*l.* over what it represented in 1898, thereby demonstrating that the demand by the tobacco factories was larger than the year before.

The value of unsized paper for printing purposes was 11,000*l.* in excess of what it was in 1898.

Wrapping paper also shows an increase of nearly 10,000*l.* over 1898.

Writing paper, which includes all kinds, whether in packets or in fine cases of stationery, shows an increase in value of over 7,000*l.*

Wall papers also show an increase in value, namely 15,913*l.* against 11,264*l.* in 1898. This increase is due to the larger demand for this article occasioned by the number of new buildings being erected in the various towns throughout the country, as well as in the City of Mexico.

The countries that supply this article in largest quantities are France and Germany. The United Kingdom and the United States do not supply as much, owing to the difference in width and length of the rolls. The workmen here, being accustomed to make their calculation on French-made papers, find it difficult to fall into the way of calculating on papers made in the United Kingdom or the United States, though the manufacturers of the latter country are now making their paper of the same size as the French or German make.

In this article British manufacturers might have a very fair opening, if they would look into the matter, though, of course, they would have to compete with the very low prices at which the French papers are sold. The duties leviable on wall papers are as follows ;—

Description.		Duty.
		Cents.
Ordinary wall paper without gilding, &c..	Per legal kilo. (not gross weight)	10
Finer paper with gilding or velvet........	Per legal kilo.	20
" " silk or other combination	" "	50
Lincrusta Walton is considered as the finer quality of paper, and pays	" "	20

The value of wood pulp imported into Mexico in the year 1899 amounted to 11,413*l.*, as against 11,661*l.* in 1898.

PAPER; HINTS TO EXPORTERS OF ——.

U.S. Cons. Rep., Feb. 1901, 256.

According to a French report, Austria is crushing Frenc competition in Egypt in the sale of cigarette paper, both c account of quality and price. In writing and printing pap also, Austria commands the Egyptian market, Italy an Great Britain alone competing to some extent.

From Durban, Natal, comes a Belgian report, accordi to which cardboard is an import article of some importanc The demand is only for first quality cardboard that wi bend easily without breaking. Special care must be devote to the packing of cardboard. It must be packed betwee wooden boards, wider and longer than the cardboard itsel in order to protect the edges. Belgian cardboard frequent arrives greatly damaged. Imported cardboard is chief used by bookbinders.

Waterproof cardboard is also exported to Natal, only the following dimensions, however: 36 by 18 ins. and fro 4 to 5 mm. (0·1576 to 0·197 in.) thick.

The demand for printing paper seems to be on the increas but only in the better, well-glazed grades. Scotch an German makes are given the preference.

XX.—FINE CHEMICALS, Etc.

DUTY-FREE ALCOHOL IN THE UNITED STATES.

Chem. and Druggist, Feb. 2, 1901.

A Bill to amend the revenue laws so as to provide for rebate of the internal revenue-tax on domestic alcohol us in the manufacture of exported articles has been introduc into Congress. The object of this Bill is to extend manufacturers using domestic alcohol the same right to drawback of the tax paid thereon that is now enjoyed manufacturers using foreign alcohol. If it becomes la these manufacturers contend that it will greatly facilita the export-trade in chemicals, varnishes, flavourin extracts, perfumery, pharmaceutical preparations, a other articles in which alcohol is a necessary raw materi A memorial stating the advantages which it is claim would result from the enactment of the Bill has be prepared and signed by a large number of promin manufacturers in New York. In support of the amendm it is urged, among other things, that Great Britain, Germa and France give their manufacturers tax-free alcohol for th export trade, the result of this policy being that the Uni States is quite unable to compete with these countries, there is a duty of 2·06 dols. per gallon on the raw mater The memorialists, in conclusion, express surprise that use of foreign alcohol, free of tax, in the productio articles for export is allowed, while the domestic articl taxed. They also urge that there is no reason for discrimination in favour of foreign alcohol, and that i possible for a manufacturer to buy domestic alcohol, exp it, re-import it, and use it in the manufacture of articles export free of any tax whatever.

INDIAN HEMP.

Chem. and Druggist, Feb. 9, 1901.

The Government of India intend to amend the pres Bombay Abkari Act (1878) by another Bill, to be cal the Abkari Act Amendment Bill. The general intention f the measure is to secure as far as possible complete cont over the production and sale of hemp drugs, and to tax th by the imposition of direct quantitative duties. Some of more important points of the Bill are as follows:—Po is sought to prohibit absolutely, or except under lice the cultivation of the hemp plant and the productio f hemp drugs. It is also proposed to establish bonde r other warehouses for the storage of intoxicating dr , postponing until such time as may be fixed the levy of e duty (if any) payable on them when so stored. Provi n is further made for the framing of rules by Governme o regulate the time and place of payment of duty. E y person taking out a licence to cultivate hemp shall, if ca d upon, give such security for the observance of the condit ns of his licence as the collector may require.

Tea-sweepings and Caffeine.

Chem. and Druggist, Feb. 9, 1901.

By a recent decision of the United States Treasury Department tea-sweepings (for the manufacture of caffeine), when mixed with asafœtida, can now be imported duty free. For a long time the Treasury Department declined to permit the importation of tea-sweepings under any classification, holding that the Pure Tea Act excluded such merchandise, even though not designed for consumption as tea. Finally, a concession was made to the importers upon condition that sufficient asafœtida should be mixed with the sweepings. The question then arose as to whether such a mixture could be imported as a crude drug. The Courts have now upheld that it can, and refunds to a considerable amount will be made.

Australian Products: Eucalyptus, Dyes, Camphor, Resin, Tan, Gum, &c.

R. T. Baker. Comm. Intelligence, Feb. 16, 1901, 9.

Australia offers a vast and inexhaustible field for those experienced in the industrial utilisation of vegetable products. Although the practical value of economical botany remains imperfectly understood throughout the Commonwealth, there are not wanting indications of its approaching recognition as a new and valuable source of national wealth. Recently, in New South Wales, Mr. R. T. Baker, F.L.S., curator and economical botanist of the Sydney Technological Museum, appeared as a witness before a Royal Commission appointed to inquire into the condition of the western lands of the State. In the course of his examination he produced samples of eucalyptus oil in various stages extracted from trees in the eastern portions of New South Wales, and stated that the colony now produced eucalyptus oil of the highest quality, fully equal to the best in the market. He said that a vast amount of research had lately been made in connection with the flora of that part of the parent State, with very valuable results. For instance, myrticolorin, a new dyeing material, had been obtained from the leaves of the red stringy bark, in addition to the valuable oil extracted from the same source. This dye, which was not yet on the market, gave a lighter and better colour than the American quercitrin, which was obtained from the bark of an American oak. The New South Wales article was thus a by-product which would prove of great commercial importance. Mr. Baker produced several cloth samples showing the qualities of the myrticolorin dye. A quantity had been sent home to the leading manufacturers in England and Germany. The manufacturers in England were delighted with the results, and sent back several specimens of cloth, which he submitted to the Commission. Out of trees and shrubs in the eastern portion of the State he had, with the assistance of his staff, extracted camphor, perfumes (such as otto of roses, ionone, and cinnamon), dyes, and peppermint, and cajuput—oils which ought now to be pushed on the market. The camphor, in fact, was identical with the camphor of commerce, and was taken from the tree known as cinnamomum oliveri. New South Wales could also compete against India and Bulgaria with its geraniol extract for the reason that it combined several products, such as perfumes, which in the countries mentioned had to be manufactured separately. The very fact that the Buddah tree, so common as a parasitic growth in the western portion of the State, spluttered and showed resinous qualities when burned, went to prove that it held a marketable commodity which might prove of great commercial value, and there were other trees out west of which the same might be said. So far as the eucalyptus tree was concerned the nature of the soil in which it grew made no difference; it would yield the same results in oils and dye no matter where grown. Mr. Baker's evidence went to show that the vegetable products of the western, or dry country, in New South Wales, possessed an economical value not inferior to those of the eastern or coastal districts. It may be mentioned that there are in the west, as in the east, many millions of eucalyptus trees of various kinds, the trees and shrubs from which oils, resins, dyes, tans, and other products can be obtained being several hundred in number. Yellow dyes are furnished by the fever bark, cedar, cockspur vine, light yellow wood, mallotus discolor, crab-tree, and turmeric tree; red dyes by scrub, or brush bloodwood, red cedar, bloodwood, mallotus phillipensis, and mangrove; brown from the brigalow, Queensland cascarilla, fustic, bitter bark, pipturus argenteus, and satin wood; purple from hymenanthera dentata; sap green from the musk tree; and black from messmate, or stringy bark. Many other vegetable dyes might be mentioned. Essential oils are obtained from the native sassafras, ridge myrtle, tea tree, native peppermint, Queensland sassafras, native laurel, dogwood, sandfly bush, and all the varieties of eucalyptus. The resin-producing trees include the Moreton Bay pine, sassafras, pinkwood, Port Jackson fig, various kinds of pine, silky oak, beefwood, sandal wood, turpentine tree, grass tree, and cheesewood. The tan, gum, and kino producing trees and shrubs are also exceedingly numerous, but remain comparatively unutilised.

Export of Tartaric Material from the Italian Continent from Oct. 1, 1899, to Sept. 30, 1900.

Foreign Office Annual Series, No. 2550, *Feb.* 1901.

Articles.	To—	Quantity.	Total.	
			Quantity.	Value.
		Tons.	Tons.	£
1. Half - refined tartar.	U.S.A.	7½		
	U.K.	315		
	Germany	386½		
	France.........	145		
	Other countries	364	1,218	2,855
2. Vinaccia argols	U.S.A.	965		
	U.K.	1,390		
	Other countries	722	3,077	6,510
3. Crude argols..	U.S.A.	1,395		
	U.K.	60		
	Germany	170		
	Other countries	374	1,999	3,360
4. Wine lees	U.S.A.	240		
	U.K.	980		
	Germany	190		
	France.........	80		
	Other countries	1,555	3,045	1,596
	Total	..	9,339	14,321

BOARD OF TRADE RETURNS.

Summary of Imports.

Articles.	Month ending 31st Jan.	
	1900.	1901.
	£	£
Metals..............................	2,859,322	2,855,315
Chemicals and dyestuffs	552,230	491,300
Oils	1,060,964	972,291
Raw materials for non-textile industries.	4,196,534	4,073,790
Total value of all imports	44,555,914	45,937,516

Summary of Exports.

Articles.	Month ending 31st Jan.	
	1900.	1901.
	£	£
Metals (other than machinery)	3,726,694	3,622,533
Chemicals and medicines	782,763	852,450
Miscellaneous articles	2,917,326	3,092,136
Total value of all exports....	23,583,682	24,753,534

IMPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 31ST JANUARY.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Cement	Tons	3,934	9,457	8,082	18,009
China and earthenware.	Cwt.	23,093	24,713	59,474	62,135
Drugs	Value £	..	..	117,498	88,095
Glass:—					
Sheet	Cwt.	132,474	46,566	71,698	27,476
Plate	„	47,902	16,234	55,799	18,174
Flint	„	25,904	34,542	35,002	65,007
Bottles	Gross	104,969	135,639	43,807	57,004
Other	Cwt.	56,195	25,430	108,427	44,519
Glue, size, gelatin	„	17,959	16,560	39,511	36,148
Leather, unmanufactured.	„	143,110	130,833	882,732	788,442
Oil seed cake	Tons	44,232	37,951	269,329	244,603
Paints and pigments.	Value £	..	..	119,861	89,885
Paper, pasteboard	Cwt.	474,768	457,173	346,232	332,072
Scientific instruments.	Value £	..	..	45,216	37,809
Soap and soap powder.	Cwt.	12,405	21,888	17,800	19,019
Zinc manufactures.	„	46,794	26,781	62,702	32,079

IMPORTS OF METALS FOR MONTH ENDING 31ST JANUARY.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Copper:—					
Ore	Tons	15,106	7,409	117,470	106,238
Regulus	„	7,984	7,630	234,484	296,346
Unwrought	„	7,356	4,793	541,897	342,914
Lead, pig and sheet	„	20,682	18,198	337,415	303,116
Pyrites	„	72,989	70,322	115,004	120,318
Quicksilver	Lb.	40,388	423,900	4,667	51,509
Silver ore	Value £	..	..	103,146	102,522
Tin	Cwt.	61,689	72,821	352,451	479,598
Zinc	Tons	6,048	3,743	128,176	70,365

IMPORTS OF RAW MATERIAL FOR NON-TEXTILE INDUSTRIES FOR MONTH ENDING 31ST JANUARY.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Bark, Peruvian	Cwt.	3,581	3,949	7,663	9,493
Caoutchouc	„	40,473	51,963	522,110	580,787
Gum:—					
Arabic	„	5,593	4,935	12,011	12,076
Lac, &c.	„	12,998	14,334	43,729	47,756
Gutta-percha	„	9,067	7,902	120,305	131,618
Hides, raw:—					
Dry	„	59,239	30,419	159,816	79,831
Wet	„	68,122	49,989	143,510	114,829
Ivory	„	1,448	840	55,218	33,077
Manure:—					
Guano	Tons	6,436	376	25,547	2,605
Bones	„	9,033	5,436	42,428	21,895
Paraffin	Cwt.	118,724	114,381	137,083	166,855
Linen rags	Tons	1,580	1,237	12,862	11,948
Esparto	„	17,793	22,262	70,480	92,498
Pulp of wood	„	49,313	49,941	179,154	226,207
Rosin	Cwt.	200,995	135,825	46,398	34,648
Tallow and stearin	„	193,916	115,692	249,518	145,956
Skins:—					
Goat	No.	1,750,151	1,414,122	167,197	137,584
Sheep	„	1,398,209	1,584,098	172,356	180,652
Nitrate of soda	Tons	19,300	6,587	148,913	55,453
Phosphate of lime	„	35,589	34,929	58,619	56,750

IMPORTS OF OILS FOR MONTH ENDING 31ST JANUARY.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Cocoa-nut	Cwt.	44,622	86,115	59,192	108,273
Olive	Tuns	2,455	887	86,456	32,853
Palm	Cwt.	89,765	73,346	100,200	84,573
Petroleum:—					
Illuminating	Gall.	20,624,198	19,405,194	457,821	389,514
Lubricating	„	3,884,416	3,293,356	119,258	102,349
Seed	Tons	3,238	4,293	72,644	108,580
Train, &c.	Tuns	752	666	13,437	12,840
Turpentine	Cwt.	45,592	28,746	84,618	41,284

IMPORTS OF CHEMICALS AND DYESTUFFS FOR MONTH ENDING 31ST JANUARY.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Alkali	Cwt.	19,070	19,020	12,270	6,170
Bleaching matters	„		20,825		7,157
Borax	„	45,080	50,934	21,266	25,136
Brimstone	„	48,588	51,470	10,267	10,734
Nitrate of potash	„	32,392	23,160	26,845	20,043
Chemicals, other	Value £	..	..	120,743	141,887
Cutch and gambier.	Tons	2,035	2,304	37,732	46,359
Dyes:—					
Alizarin	Value £	..	..	17,381	14,855
Aniline and other	„	..	..	40,624	38,163
Indigo	Cwt.	7,657	2,702	111,405	47,939
Bark	„	24,376	28,566	8,703	10,946
Valonia	Tons	2,737	1,644	31,547	17,500

EXPORTS OF METALS (OTHER THAN MACHINERY) FOR MONTH ENDING 31ST JANUARY.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Brass	Cwt.	10,314	9,757	54,806	52,667
Copper	„	86,882	53,111	348,903	204,283
Lead	Tons	1,975	2,493	37,729	48,219
Plated wares	Value £	..	..	37,699	40,184
Telegraph wires	„	..	..	54,063	596,123
Tin	Cwt.	10,355	8,732	61,260	55,728
Zinc	„	14,080	15,006	13,627	13,728

EXPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 31ST JANUARY.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
		Lbs.	Cwt.	£	£
Gunpowder	Lb.	696,900	4,762	14,943	13,10
Candles	„	1,953,600	2,770,200	32,454	49,21
Caoutchouc	Value £	..	..	124,011	86,83
Cement	Tons	29,390	22,814	54,874	45,05
Products of coal.	Value £	..	..	147,823	150,09
Earthenware	„	..	..	131,350	149,16
Stoneware	„	..	..	11,698	12,78
Glass:—					
Plate	Sq. Ft.	168,936	6,881	8,480	13,93
Flint	Cwt.	6,726	10,173	17,062	22,96
Bottles	„	62,297	85,879	29,897	42,13
Other kinds	„	19,411	18,637	18,578	19,61
Leather:—					
Unwrought	„	11,700	12,707	115,644	123,12
Wrought	Value £	..	..	33,065	39,12
Seed oil	Tons	3,730	3,077	80,382	84,67
Floorcloth	Sq. Yds.	2,330,600	2,161,000	103,561	100,51
Painters' materials	Val. £	..	..	148,862	162,62
Paper	Cwt.	73,999	92,313	116,612	148,1
Rags	Tons	7,085	5,678	39,272	31,8
Soap	Cwt.	80,459	90,858	79,370	93,6

Exports of Drugs and Chemicals for Month ending 31st January.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Alkali .... Cwt.	354,130	..	93,722	..
Bleaching materials „	107,143	135,680	28,704	41,101
Chemical manures Tons	34,421	28,914	221,001	225,219
Copper sulphate .. „	3,667	7,059	87,560	162,908
Medicines....... Value £	..	..	103,444	113,680
Soda compounds:—				
Ash............ Cwt.	..	122,393	..	26,246
Caustic .... „	..	104,496	..	46,183
Bicarbonate .... „	..	27,066	..	9,380
Crystals .... „	..	13,432	..	2,221
Sulphate........ „	..	30,313	..	2,738
Other sorts ..... „	..	2,445	..	1,729

Monthly Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

Applications.

983. O. Rippich. Improved apparatus for decanting wort and other liquids. Jan. 15.

1133. J. McNeil. Improvements in evaporating apparatus. Complete Specification. Jan. 17.

1145. E. Lambert. Improvements relating to drying apparatus. Jan. 17.

1153. A. J. Boult.—From A. Roller, Maschinenfabrik, Germany, and A. Schiff, Russia. Improvements in and relating to drying apparatus. Complete Specification. Jan. 17.

1393. G. C. Marks.—From A. Hannetelle-Chapius, France. Improved concentratng apparatus, applicable to acids, saline solutions, and in general to other liquids capable of concentration. Jan. 21.

1556. S. Puplett. Improvements in freezing and refrigerating apparatus. Jan. 23.

1999. C. Spiegel. Improvements in furnaces burning naphtha residue. Jan. 29.

2109. H. Ruelle and E. Montagne. Improvements in and connected with smoke-consuming apparatus for furnaces and the like. Jan. 30.

2352. H. Reck and A. Borsu. Improvements in centrifugal separators. Feb. 4.

2384. R. Scheuffgen. Apparatus for preventing explosions in vessels containing explosive fluids. Complete Specification. Feb. 4.

2388. F. Kafferle. Improvements in or relating to pressure-reducing apparatus. Complete Specification. Feb. 4.

2467. H. S. Hatfield. Improvements in gas thermometers and pyrometers. Feb. 5.

2484. C. W. Vollmann. Improvements in freezing apparatus. Complete Specification. Feb. 5.

2550. R. Walker. *See* Class IX.

2613. R. Snowdon. Improvements in kilns. Feb. 7.

2775. H. C. Anstey. Improvements in evaporators. Feb. 8.

2819. G. Cope. Improved apparatus for mixing and agitating paints, oils, and the like. Feb. 9.

2892. H. Hildebrand. Improvements in heating or cooling vessels for liquids or gases. Complete Specification. Feb. 11.

2922. G. King. Improvements in means for closing the mouths of retorts. Feb. 11.

2975. J. Dewhurst. Improvements in means or apparatus for use in filtering and conducting liquids. Feb. 12.

2976. R. Price and J. Kershaw. A new anti-incrustation preparation. Feb. 12.

3173. E. S. Hermes. Improvements in bag filters for clarifying beer, wines, spirits, perfumes, water, and other liquids. Feb. 14.

3200. A. Wilson.—From E. M. Söhne, Germany. Improvements in centrifugal apparatus. Feb. 14.

3266. J. H. Brearley. Improvements in generator or regenerative furnaces or kilns. Feb. 15.

Complete Specifications Accepted.*

1899.

25,229. J. J. Meldrum, T. F. Meldrum, and J. W. Meldrum. Supplying air to furnaces, and steam-jet blowing or forcing apparatus therefor, and other purposes. Jan. 30.

1900.

996. W. P. Thompson.—From L. T. Wright, United States. Rotary stirrers for roasting furnaces. Jan. 23.

1828. F. W. Lefelmann. Acid-proof vessels and other articles. Jan. 30.

2663. W. P. Gibbons and G. B. A. Gibbons. Construction of regenerative and other furnaces, and muffles and bricks therefor. Feb. 13.

4721. J. V. Musgrave. Humidifying apparatus. Jan. 9.

5992. A. Smith. Manufacture and construction of filtering material and filters. Feb. 6.

6072. H. Reck and A. Borsu. Centrifugal separators. Feb. 6.

12,449. W. R. Jennison. Liquid coolers. Jan. 23.

13,749. S. G. Mahouleix. Apparatus for heating and cooling fluids, and for sterilising or pasteurising liquids. Feb. 20.

14,935. W. M. Barnes. Drying apparatus. Jan. 23.

16,152. C. M. Bump. Furnaces. Jan. 23.

16,974. P. Naef. Process and apparatus for crystallising and freezing. Jan. 30.

17,700. W. L. Jackson. Kilns. Jan. 30.

18,352. H. A. Desrumaux. Apparatus for filtering, purifying, or similarly treating liquids. Feb. 6.

19,126. J. E. Carroll. Method of distillation. Jan. 23.

19,340. L. Béchaux. Liquid fermentation apparatus. Jan. 30.

21,914. A. J. Boult.—From C. Hromadnik, Germany. Apparatus for use in treating liquids or materials in liquids. Jan. 30.

22,490. S. T. Bleyer. Furnaces. Feb. 6.

22,581. H. Desrumaux. Apparatus for filtering liquids. Feb. 6.

23,244. L. Kaufmann. Process for effecting rapid crystallisation. Feb. 6.

23,608. J. E. Bousfield.—From The Snowflake Refrigerator Company, Ltd., South Australia. Refrigerators. Feb. 20.

II.—FUEL, GAS, and LIGHT.

Applications.

906. H. Sefton-Jones.—From C. Fader, Republic of Argentina. Improved automatic gas-lighting apparatus, operated by gas pressure. Jan. 14.

919. T. E. Pye. Improvements in apparatus for the production and storage of acetylene gas. Jan. 14.

993. F. W. C. Schniewind. Improvements relating to regenerative coke ovens. Complete Specification. Jan. 15.

1018. J. Lewis. Improved means for effecting the ignition of incandescent gas lights or gas jets. Jan. 15.

1058. J. H. Sheldrake. An improvement in incandescence gas burners. Complete Specification. Jan. 16.

1173. J. H. Hartridge. Improved methods and means for carburetting air and enriching gas for illumination, heating, and power purposes; partly applicable for purifying hydrocarbons. Jan. 18.

1283. M. Martin. Improvements relating to apparatus for automatically generating acetylene gas. Complete Specification. Jan. 15.

1482. O. Imray.—From W. J. Donaldson, W. A. Mears, and G. S. Emerick, United States. Improvements in apparatus for burning pulverised fuel. Complete Specification. Jan. 22.

1525. J. W. Ward. Improvements in or relating to burners for incandescent gas lighting. Jan. 23.

1683. Thorn and Hoddle Acetylene Company, Ltd., and C. Hoddle. Apparatus for generating acetylene gas. Jan. 24.

1703. F. M. Bennett and J. O. Fowler, jun. Improvements in appliances for producing perfect combustion of gas. Complete Specification. Jan. 24.

1756. A. McLean. Improvements in the mode of and apparatus for treating peat. Jan. 25.

1789. H. Aitken. Improvements in means for the utilisation of naphthalene for illuminating and heating purposes. Jan. 25.

1823. C. Gluth. Improvements in and relating to supports for incandescent mantles for illumination purposes. Jan. 26.

1918. A. Laughlin. Improvements in and relating to gas producers. Complete Specification.

1977. E. W. Lancaster. Improvements in acetylene generators. Jan. 29.

2005. W. P. Thompson.—From A. Wasmuth, Germany. An improved process for strengthening incandescent bodies for gas lighting. Complete Specification. Jan. 29.

2020. E. Gobbe. Improvements in and apparatus for the utilisation of the heat of coke removed from retorts or ovens. Jan. 29.

2101. P. Goetschke. Improvements in incandescing media or incandescence materials for gas lighting. Jan. 30.

2221. J. H. Green and W. H. Green. Acetylene generator and holder, by carbide to water principle, for one or any number of lights. Feb. 1.

2225. W. J. Crossley and J. Atkinson. Improvements in heat interchanger for use in connection with gas producers. Feb. 1.

2261. W. Lowen.—From F. W. and Dr. C. Killing, Germany. An improvement in the construction or manufacture of burners used for incandescent gas lighting. Feb. 1.

2469. O. Imray.—From J. R. McLean, United States. Process and apparatus for enriching coal-gas. Complete Specification. Feb. 5.

2509. A. Rudolph. Improvements in air-carburetting apparatuses. Complete Specification. Feb. 5.

2533. C. H. Guest. Carburetters. Feb. 6.

2672. W. H. Westwood, E. T. Wright, and W. W. S. Westwood. Improvements in apparatus employed in the manufacture of coal and other gases. Feb. 7.

2691. Lawton's Patents, Ltd., and A. W. Lawton. A new or improved method of and means for dehydrating gases or gaseous mixtures, applicable for cooling gases or gaseous mixtures, or for other analogous purposes. Feb. 7.

2713. R. P. Pictet. Improvements in and in apparatus for the industrial production of liquid air. Feb. 8.

2750. J. C. H. Kramers and J. G. Aarts. Improvements in the manufacture of water-gas and semi water-gas, and in apparatus therefor. Feb. 8.

2766. K. Gossweiler. Improved acetylene generator, with automatic supply of carbide. Complete Specification. Feb. 8.

2820. A. J. Boult.—From Chemische Technische Industrie Gesellschaft mit beschränkter Haftung, Germany. Improved manufacture of automatic gas igniters. Feb. 9.

2831. G. C. Fowler, M. A. Fowler, E. J. Fowler, trading as Welcome and Co. An improved fuel. Feb. 9.

2841. A. Mitchell. Fuel, improvements on. Feb. 9.

2846. J. S. Kemp-Welch. Improvements in the manufacture of water-gas and producer-gas, and in apparatus used therefor. Feb. 9.

2859. H. H. Kinloch. Improvements in apparatus for and method of preparing and moulding peat or turf. Complete Specification. Feb. 9.

2875. G. H. Barber. Improved hydraulic main for gasworks or carbonising-plant. Feb. 11.

2912. A. Kahn and M. Heberlein. Improved manufacture of artificial fuel. Complete Specification. Feb. 11.

2944. J. J. Hendler and E. K. Reeves. Improvements in apparatus for generating and burning acetylene and other gases. Complete Specification. Feb. 11.

3017. J. von Romocki. From H. Ascher, Germany. Improvements relating to incandescent gas burners. Feb. 12.

3038. W. T. Sugg. Improvements in the production of surfaces for use in incandescent gas lighting. Feb. 12.

3099. F. L. Barrett. Improvements in machinery or apparatus for charging retorts used in the manufacture of coal-gas. Feb. 13.

3215. P. Jensen.—From G. Heine, Norway. Method of and apparatus for treating peat. Complete Specification. Feb. 14.

3264. J. W. Blakey. An improved anti-vibrating gas and air burner. Feb. 15.

3296. A. J. Boult.—From Société Lumière Boule, Belgium. Improvements in or relating to burners for incandescent gas lighting. Complete Specification. Feb. 15.

Complete Specifications Accepted.

1900.

2709. P. Leroy. Gas generators. Jan. 23.

2888. P. Naef. Method and apparatus for producing gas and by-products. Jan. 30.

2888*a*. P. Naef. Method and apparatus for producing gas and by-products. Feb. 6.

2888*b*. P. Naef. Method and apparatus for producing gas and by-products. Jan. 30.

2888*c*. P. Naef. Method and apparatus for producing gas and by-products. Jan. 30.

2888*d*. P. Naef. Method and apparatus for producing gas and by-products. Jan. 30.

2888*e*. P. Naef. Method and apparatus for producing gas and by-products. Jan. 30.

2888*f*. P. Naef. Method and apparatus for producing gas and by-products. Jan. 30.

2917. P. Naef. Method and apparatus for producing coke-gas and by-products in part applicable for other purposes. Feb. 13.

2917*a*. P. Naef. Method and apparatus for producing coke-gas and by-products in part applicable for other purposes. Feb. 13.

2917*b*. P. Naef. Method and apparatus for producing ke-gas and by-products in part applicable for other rposes. Feb. 13.

2917*c*. P. Naef. Method and apparatus for producing ke-gas and by-products in part applicable for other rposes. Feb. 13.

2917*d*. P. Naef. Method and apparatus for producing ke-gas and by-products in part applicable for other rposes. Feb. 13.

3844. E. W. Lancaster. Apparatus for stirring or gitating the contents of and cleaning acetylene generators. eb. 13.

4407. G. Stevenson. Apparatus for the generation and orage of acetylene gas. Feb. 13.

4736. A. H. Arozt. Gas for illuminating and heating rposes. Feb. 6.

4786. C. Morelle. Apparatus for generating acetylene s. Jan. 30.

5945. T. L. Whitehead. Device for diminishing or creasing the light of a gas jet from a distant position. b. 13.

5989. W. P. Thompson.—From W. Karsten, Germany, anufacture of incandescent mantles. Feb. 13.

6512. F. W. Jeffery. Burners for incandescent gas hting. Feb. 13.

7210. C. A. von Welsbach. Osmium illuminating filaents. Jan. 30.

7596. W. P. Thompson.—From A. Simonini, United tes. Lighting devices for causing the ignition of illunating gases and vapours. Jan. 23.

8415. O. Münsterberg. Means of obtaining intense at from limelight or other purposes. Feb. 20.

14,121. G. C. Marks.—From The General Electric Comny, United States. Methods of and means for producing ht. Jan. 30.

18,211. D. Chandler and S. B. Chandler. Revolving s scrubbers and washers. Jan. 30.

19,267. S. A. Scheele. Improvements in or relating to andescent gas burners. Jan. 23.

20,229. H. Shepherd. Acetylene gas generators. Feb. 13.

22,206. A. J. Boult.—From A. E. Grasset, France. rburetters for air and gas. Jan. 30.

22,226. C. E. J. Berthold. Automatic gas lighters. b. 6.

22,491. C. Carpenter. Incandescent gas burners. Jan. 23.

22,492. C. Carpenter. Apparatus for fitting pegs to andescent gas burners. Jan. 23.

22,853. D. W. Anderson, E. B. Shaw, J. F. Chalmers, d J. T. Wright. Heating systems. Feb. 13.

23,027. C. Carpenter. Igniting of incandescent gas rners. Jan. 23.

23,642. O. Reitz. Appliances connected with incanscent gas lighting apparatus. Feb. 13.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Application.

2105. J. Meikle. Improvements in the distillation of r, and in apparatus therefor. Jan. 30.

Complete Specifications Accepted.

1900.

10,267. E. J. Duff. Destructive treatment of refuse or ste carbonaceous materials. Feb. 6.

1901.

279. F. Rauch. Manufacture of tar. Feb. 20.

IV.—COLOURING MATTERS and DYESTUFFS.

Applications.

913. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in the manufacture or production of dyestuffs capable of giving on fibre shades fast against washing. Jan. 14.

922. H. Erdmann. An improved manufacture of indigo. Jan. 14.

999. J. Imray.—From La Société Anonyme des Matières Colorantes et Produits Chimiques de St. Denis, France. Manufacture of substantive black colouring matters. Jan. 15.

1357. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of colouring matters of the anthraquinone series. Jan. 21.

1358. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of colouring matters of the anthracene series. Jan. 21.

1644. T. R. Shillito. — From J. R. Geigy and Co., Switzerland. Sulphur dyestuffs. Jan. 24.

1766. F. Ullmann. Manufacture of diphenyl derivatives. Jan. 25.

1787. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of colouring matters on the fibre, and of products for use therein. Jan. 25.

2009. W. P. Thompson.—From the firm of Gebrüder Flick, Germany. Improvements in processes for the preparation of a soluble indigo paste. Complete Specification. Jan. 29.

2188. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacturing of colouring matters directly dyeing cotton. Jan. 31.

2397. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture and production of disazo colouring matters. Feb. 4.

2592. R. B. Ransford. — From L. Cassella and Co., Germany. Improvements in the manufacture of dyestuffs from amidonitro-salicylic acid and in dyeing therewith. Feb. 6.

2839. J. Imray.—From La Société Anonyme des Matières Colorantes et Produits Chimiques de St. Denis, France. Manufacture of blue dyestuffs. Feb. 9.

2907. H. H. Lake.—From Farbwerke Mülheim vormals A. Leonhardt and Co., Germany. Improvements relating to the manufacturing of colouring matters. Feb. 11.

2913. H. E. Newton. — From The Farbenfabriken vormals F. Bayer and Co., Germany. The manufacture or production of new basic dyestuffs. Feb. 11.

3239. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of new colouring matter and derivatives thereof, and the employment thereof in dyeing. Feb. 14.

3311. H. E. Newton. — From The Farbenfabriken vormals F. Bayer and Co., Germany. The manufacture or production of dyestuffs of the anthracene series. Feb. 15.

Complete Specifications Accepted.

1900.

1977. R. B. Ransford.—From L. Cassella and Co., Germany. Production of fast dyeings with dyestuffs containing sulphur. Feb. 6.

2195. W. W. Stolaroff. Manufacture of a permanent black acid-proof cotton dye. Jan. 30.

4115. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture and application of alizarin products for directly dyeing vegetable fibres. Jan. 30.

4677. R. B. Ransford.—From L. Cassella and Co., Germany. Production of mono-azo-dyes derived from amidonaphtholsulpho acids. Jan. 23.

5040. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of new aromatic compounds and colouring matters therefrom. Feb. 6.

5459. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of new halogen derivatives of the anthracene series, and colouring matters therefrom. Feb. 6.

5763. H. H. Lake.—From Farbwerke Mulheim vormals A. Leonhardt and Co., Germany. Manufacture and production of phenol glycin-carboxylic acid, and of derivatives thereof, and of intermediate products relating thereto. Jan. 23.

6053. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of new blue colouring matter. Feb. 20.

6628. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of the neutral esters of acetylphenylglycine-ortho-carbonic acid. Jan. 30.

7074. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of black colouring matter directly dyeing cotton. Jan. 30.

7075. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of a black colouring matter directly dyeing cotton. Jan. 30.

7076. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of a black colouring matter directly dyeing cotton. Jan. 30.

7292. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of blue trisazo dyestuffs. Feb. 13.

19,879. G. W. Johnson.—From C. F. Boehringer und Soehne, Germany. Reduction of azo and nitro compounds. Jan. 30.

21,970. M. Lange. Dyestuffs, and processes for production of same. Jan. 30.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Applications.

1042. J. E. Prestwich. Improvements in the method of and apparatus for treating textile yarns and threads with liquids. Jan. 16.

1160. J. E. Bousfield, of the Firm of G. F. Redfern and Co.—From F. Cantù, G. Miglioretti, and G. Maffei, Italy. The manufacture of sheets, waterproof fabrics, imitation linen goods, and the like, from casein. Jan. 17.

1939. T. Kay and Kay Brothers, Limited. Improved utilization of waste felt. Jan. 29.

2055. A. Fielding. A new or improved process of dyeing and (or) filling textile yarns or fabrics. Jan. 30.

2056. A. Fielding. An improved manufacture of viscose (cellulose sulpho-carbonate) for certain purposes. Jan. 30.

2283. R. Weiss. Improvements in apparatus for treating textile materials with circulating fluids. Complete Specification. Filed Feb. 1. Date applied for July 3, 1900, being date of application in France.

2927. R. B. Ransford.—From L. Cassella and Co., Germany. Improvements in preventing the deterioration of dyed cotton. Feb. 11.

3330. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the treatment of raw silk, of mixed raw silk and woollen goods, and of mixed raw silk, and cotton goods. Feb. 15.

Complete Specifications Accepted.

1900.

3075. J. Woodhead and N. Thompson. Treatment of gummed silk waste to prepare it for spinning. Feb. 20.

3416. H. W. Kearns. Method of producing a silk lustre on cotton yarns or fabrics. Feb. 20.

6193. A. Mellor and H. E. Mowbray. Machines o apparatus for cleaning and lustreing yarns of silk and lik fibres. Feb. 13.

16,161. W. R. Lake.—From C. F. Johnson, Unite States. Apparatus for use in connection with the merceris ing of yarn. Feb. 6.

19,688. W. Urben. Recovering solvent from compound or emulsions obtained in degreasing wool. Feb. 13.

23,722. H. H. Lake.—From National Package Compan United States. Manufacture of fibrous composition Feb. 6.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, and BLEACHING.

Applications.

939. E. Ashworth and J. Lindley. Improvements i apparatus used in the dyeing, bleaching, and treatment cotton and other textile materials. Jan. 15.

1140. O. Imray.—From Farbwerke vormals Meiste Lucius und Brüning, Germany. An improved process fo dyeing paper fabrics. Jan. 17.

1159. J. Y. Johnson.—From The Badische Anilin un Soda Fabrik, Germany. Improvements in printing textil materials with indigo. Jan. 17.

1285. C. D. Abel.—From Actiengesellschaft für Anili fabrikation, Germany. An improvement in dyein Jan. 19.

1639. J. T. Short. Improvements in or connected wi machines for washing, dyeing, or otherwise treating clothe fabrics, and other fibrous materials. Jan. 24.

1834. J. Skoupil. Improvements in the process a apparatus for dyeing, bleaching, and finishing textiles a fibres. Jan. 26.

2182. J. Müller. A process for dyeing gloves and like. Complete Specification. Jan. 31.

2393. R. B. Ransford.—From L. Cassella and C Germany. Improvements in dyeing with sulphide colou Feb. 4.

2555. J. F. Riding. Improvements in the bleaching vegetable textile materials and products. Feb. 6.

2565. R. E. Oldroyd, J. W. Tillotson, and S. S. Tillots Improvements in the method of and apparatus for dyeing and sizing. Feb. 6.

2631. J. E. Gilham and J. E. Musgrave. Improveme or devices in or in connection with piece dying, washi and bleaching machines for the prevention of crimping a similar defects. Feb. 7.

3084. R. F. S. Molesworth. Improvements in the p duction of azo colours on cotton and other fibres. Feb.

Complete Specifications Accepted.

1900.

2510. D. Stewart. Apparatus for driving, calico-printi bleaching, washing, dyeing, finishing, and like machine Feb. 6.

4534. J. Y. Johnson.—From The Badische Anilin u Soda Fabrik, Germany. Printing on raw silk or tex material containing raw silk. Feb. 13.

19,937. F. Shuman and C. Shuman. Mercerising machi Jan. 30.

VII.—ACIDS, ALKALIS, and SALTS.

Applications.

1234. A. G. Bloxam.—From Chemische Fabrik Rhena Improvements in apparatus for the manufacture of ni acid. Complete Specification. Jan. 18.

1385. O. Imray.—From Farbwerke vormals Meister, icius und Brüning, Germany. Improvements in the anufacture of sulphuric anhydride by the contact process. n. 21.

1491. C. G. Sudre and C. V. Thierry. Improvements in e treatment of oxides of metals or metalloids or comunds of same and products obtained therefrom. Comete Specification. Jan. 22.

1516. T. G. Webb and Webb's Patents, Ltd. Improveents in and connected with apparatus for concentrating lphuric acid and other liquids. Jan. 23.

1842. C. Enoch. Improvements relating to the producn of silicofluoride of sodium. Jan. 26.

1904. J. Y. Johnson.—From The Badische Anilin und da Fabrik, Germany. Improvements in the manufacture sulphuric acid. Jan. 28.

010. U. Wedge. A new or improved process and paratus for the treatment of chemical compounds for dising or raising same to a higher oxide. Complete ecification. Jan. 29.

039. E. C. Paramore. Improvements in the method of apparatus for generating, treating, and utilising chlorine . Complete Specification. Jan. 29.

282. C. L. Gelstharpe and F. Gelstharpe. A method of overing tin and producing copperas from waste tin cuttings other substances containing tin, and apparatus therefor. nplete Specification. Feb. 1.

342. H. Precht. An improved process for the production otassium magnesium carbonate. Feb. 4.

368. O. Imray. — From Farbwerke vormals Meister, ius und Brüning, Germany. Improvements in the nufacture of sulphuric anhydride by the contact process. . 4.

107. A. Germot and H. E. L. Fiévet. Process of and aratus for treating metallic sulphides. Feb. 4.

504. G. F. Jaubert. Improvements in the manufac- of alkaline earth dioxides. Complete Specification. . 5.

719. C. R. Lindsey. Improvements in the manufacture ead acetate. Feb. 8.

115. J. Boulton. Improvements in and relating to the ufacture of potassium cyanide and sodium cyanide. . 11.

71. E. M. Taylor. Alkali creosolate compound for ching and scouring. Feb. 13.

305. A. G. Bloxam.—From Chemische Fabrik Rhenania, many. Improved manufacture of nitric acid, and aratus therefor. Feb. 15.

127. H. Rabe. Process for the production of anhydrous huric acid. Complete Specification. Feb. 15.

28. G. W. Johnson.—From The Deutsche Gold und er Scheide Anstalt vormals Rössler, Germany. Imements in the manufacture or preparation of cyanide its compounds. Feb. 15.

29. G. W. Johnson.—From The Deutsche Gold und er Scheide Anstalt vormals Rössler, Germany. Imements in the manufacture or preparation of alkali ides. Feb. 15.

92. J G. Behrens. Improved process for manuring chemically pure acetic acid. Complete Specifica- Feb. 16.

Complete Specifications Accepted.

1900.

272. J. Potut. Means of and apparatus for the ufacture of sulphuric acid. Feb. 20.

12. J. Hargreaves. Manufacture of chlorides and es. Feb. 13.

44. F. M. Spence. D. D. Spence, and H. Spence. ufacture of aluminous compounds. Feb. 6.

5808. J. Künsdner. Manufacture of carbonate of soda crystals. Feb. 20.

9343. G. N. Vis. Vacuum evaporating apparatus for separating common salt (chloride of sodium) from solutions, especially from brine. Jan. 23.

17,928. A. C. Johnson. Processes for producing sulphuric acid. Jan. 30.

21,557. M. Meslan. Apparatus for the production of fluorine and the like. Feb. 6.

23,781. E. W. Engels. Process for the production of carbonic oxide. Feb. 13.

VIII.—GLASS, POTTERY, AND ENAMELS.

Applications.

1055. L. A. Garchey. Improvements connected with the manufacture of glass stone. Jan. 16.

1976. C. Franklin. A method of ornamenting and decorating figured, rolled, or other glass. Jan. 29.

1985. A. H. Fuller.—From A. Navarein, France. Improvements in glass decorations, transparencies, and the like. Jan. 29.

3100. R. D. Lucas. Improvements in or relating to the decoration of china, earthenware, glass, enamelled iron ware, and the like. Feb. 13.

Complete Specifications Accepted.

1900.

2656. G. A. J. Schott. Pumping apparatus for slip and glazes used in the manufacture of pottery and for other purposes. Jan. 23.

5344. A. H. Corn. Construction or shape of appliances or "thimbles" for use in supporting ceramic ware or pottery ware whilst being fired. Feb. 6.

6376. S. B. Furnival. Clay or filter-presses used in the manufacture of china and earthenware. Feb. 13.

6926. L. M. Regle. Glass-melting pots or crucibles. Jan. 30.

16,610. The Automatic Glass-Blowing Patents Syndicate, Ltd.—From H. J. Colburn, United States. Glass-blowing machines. Jan. 23.

16,613. The Automatic Glass-Blowing Patents Syndicate, Ltd.—From H. J. Colburn, United States. Glass-blowing machines. Jan. 23.

21,148. B. J. B. Mills.—From Société Anonyme des Enduits Archambault, France. Treatment of carboys, bottles, and other articles of glass, pottery, and the like, and of casks and other vessels of wood or other permeable materials, and of cork bungs and stoppers. Jan. 23.

23,879. G. von dem Borne and W. von Debschütz. Manufacture of polychrome ornamented glazed or similar ceramic ware. Feb. 6.

1901.

210. R. B. Ransford.—From Société Parisienne de Céramique, France. Ornamenting ceramic ware. Feb. 13.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Applications.

945. T. Oddy. An improved method of manufacturing Portland slag cement. Jan. 15.

1055. L. A. Garchey. *See* Class VIII.

1266. R. B. Rigby. Improvements in the manufacture of Portland cement. Jan. 19.

1479. H. H. Lake.—From D. Wachtel and Co., Germany. Improvements relating to the production of slaked lime. Complete Specification. Jan. 22.

2410. H. E. Rüsager. Improvements in the manufacture of Portland cement. Feb. 4.

2499. J. Wilkinson. Improvements in the manufacture of slabs or plates, suitable for use as building material, and for other purposes. Feb. 5.

2550. R. Walker. Improvements in kilns for calcining Portland cement, and the like. Feb. 6.

2861. V. Barreto. New or improved apparatus for slaking lime. Complete Specification. Feb. 9.

3101. F. Howett. Improvements in or relating to artificial stone, in situ pavements, floors, walls, ceilings, and the like. Feb. 13.

3158. F. H. Brooke. Improvements in the manufacture of silica bricks and blocks. Feb. 14.

3271. N. T. Ashton, J. Crompton, and J. D. Kelly. Improvements in hydraulic cement. Feb. 15.

3282. S. S. Bromhead.—From G. Möller and P. Pfeiffer, Germany. Process for the manufacture of solid blocks of cement out of cement slush. Complete Specification. Feb. 15.

Complete Specifications Accepted.

1900.

2739. A. W. Green. Construction of fireproof floors and roofs. Feb. 20.

5297. G. H. F. E. M. Drenckhahn and C. H. A. C. Sudhop. Manufacture of pipes of cement or the like material. Jan. 23.

5922. W. Lessing and D. Rheinfeld. Process for burning cement, gypsum, or the like, and apparatus therefor. Jan. 23.

16,307. H. Seifarth. Preparation of artificial stone. Feb. 13.

23,040. C. Krause and A. Beddies. A process for the impregnation of wood and fibrous substances. Feb. 20.

X.—METALLURGY.

Applications.

930. C. Diesler. Improved process of smelting and reducing metals. Complete Specification. Jan. 14.

952. S. Davis. Improvements in the process of stripping tinned-scrap and spelter-scrap. Complete Specification. Jan. 15.

1099. J. G. Lorrain.—From G. Thompson. Improvements in or connected with the manufacture of steel and its alloys containing steel or to be used therewith. Jan. 16.

1375. G. Grunauer. An improved manufacture of cast iron. Complete Specification. Jan. 21.

1376. D. Davies. Improved manufacture of iron, steel, and wrought iron. Jan. 21.

1403. S. Cowper-Coles. An improved apparatus for the electrolytic production of copper tubes and sheets. Jan. 22.

1699. G. B. Hammond and T. Dennis. Improvements in means or apparatus for use in connection with the coating of metal plates or sheets with tin lead of other metals or alloys. Jan. 24.

1738. W. Pethybridge. Improvements in the treatment of telluride gold ores. Jan. 25.

1758. H. H. Lake. From A. G. Betts, United States. Improvements relating to the refining of lead. Complete Specification. Jan. 25.

2237. E. E. Johnson and H. L. Sulman. Improvements in precipitating precious metals from their solutions. Feb. 1.

2255. C. J. Heal. Improvements in the methods of chlorination for the extraction of metals from their ores, concentrates, tailings, slimes, and the like. Feb. 1.

2286. W. J. Foster. Improvements in the manufa of iron in blast furnaces. Feb. 1.

2632. H. W. Williams. An improvement in cupolas blast furnaces. Feb. 7.

2677. A. A. Crosby. Improvements relating to cruc or retorts more particularly designed for use in conne with the treatment of ores. Complete Specification. Fe

2756. H. Leyendecker. An improved process for di ishing the solubility of lead in acids and other che compounds. Feb. 8.

2781. E. Kikut. Improvements in or relating to devices for furnace and for other purposes. Feb. 8.

2782. J. C. Butterfield. Improvements in obtaining from its ores. Feb. 8.

2939. C. Haber and A. Savelsberg. Apparatus employed in the treatment of molten lead, copper, other metals. Feb. 11.

3009. E. M. Totten. Improvements in and relatin a composition of matter for uniting or soldering alumi parts. Complete Specification. Feb. 12.

3044. F. C. H. Pape and W. S. Henneberg. Impr ments in crushing and lixiviating ores and metallur products. Complete Specification. Feb. 12.

Complete Specifications Accepted.

1900.

1082. C. F. Mendham.—From W. L. Bailey an Murray, China. Apparatus for working tin-plate and material. Jan. 23.

4941. C. L. Bell. Apparatus for casting me Jan. 23.

4961. R. Weidner. Alloy, and process of producing same. Feb. 13.

7026. P. Bergsöe. Process for obtaining pure tin tinned sheet iron waste and other materials coated or containing tin, and for refining raw tin. Feb. 13.

7028. C. Kellner. Extraction of zinc from waste ducts. Feb. 13.

8184. C. Goedecke, jun.—From C. Goedecke, Germ Blast furnaces for smelting dusty and fine granular ore. Jan. 30.

17,027. C. M. Westman. Method of and apparatus treating ores. Feb. 13.

17,189. A. Simon. Treatment of copper ores or min for the obtainment of copper and other metals theref and the recovery and treatment of by-products of process. Feb. 13.

17,190. A. Simon. Apparatus for the productio manganese, ferromanganese, and alloys of manga Jan. 23.

17,594. F. W. Preto. Process of extracting tin tin-plate and the like waste. Feb. 20.

19,400. R. W. James.—From The Bethlehem Company, United States. Method of and means determining and controlling the temperature of hi heated bodies. Feb. 13.

19,401. R. W. James.—From The Bethlehem Company, United States. Means for ascertaining temperature of highly heated receptacles or obj Feb. 13.

19,402. R. W. James.—From The Bethlehem Company, United States. Metal baths for tempering and the like. Feb. 13.

20,469. P. Rogers and J. Player. Machinery or a ratus for coating metal plates or sheets with tin or metals or alloys. Feb. 13.

1,195. D. Laird. Assay furnace. Jan. 30.

1,345. L. Mach. Process of manufacturing aluminium y. Jan. 30.

3,403. G Huth.—From F. Pieh, Germany. Flux for zing. Feb. 13.

3,477. A. J. Boult.—From E. C. Pohlé and S. Croas-, United States. Processes for the Reduction of actory ores. Feb. 13.

3,803. J. E. Jasset and A. E. Cinqualbre. Process for ositing nickel and other metals upon metallic surfaces. . 20.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

Applications.

84. S. O. Cowper-Coles. Improvements in means to mployed in the electro-deposition of metals. Jan. 22.

349. A. Brochet and G. Ransou. Process for the trolytic preparation of the bases of the alkaline earths. . 26.

90. J. T. Niblett. Improvements in electric storage eries or accumulators. Jan. 28.

66. H. Rose, J. Halifax, and C. H. Antrobus. Im-ements in and connected with positive rods for secondary ric batteries. Complete Specification. Jan. 29.

81. J. T. Niblett. Improvements in electric storage ries or accumulators. Jan. 29.

63. F. Landolt. Electrode for galvanic cells. Feb. 4.

490. T. A. Edison. Improvements in storage batteries. plete Specification. Feb. 5.

05. A. P. Strohmenger and A. B. Pescatore. Improve-s in and in apparatus for obtaining metals by electro-. Feb. 5.

87. G. Rosset. Improvements in electric batteries. 6.

53. G. W. Johnson.—From Société Paul Chapuy and France. Improvements in electric batteries. Feb. 9.

33. C. A. Wilde. Improvements in electrodes for adary batteries or accumulators. Feb. 11.

41. L. Gottscho. Improvements in thermo-electric ries. Feb. 11.

92. P. Jurie. Improvements in electric furnaces. plete Specification. Feb. 14.

13. W. P. Thompson.—From Société Mangano Elec-e pour la purification des eaux et des boissons, France. fying beverages and liquids by means of manganates r influence of the electric current. Complete Specifica- Feb. 15.

70. J. Liddle.—From The Globe Electric Company, al States. Improvements in battery electrodes. Com- Specification. Feb. 16.

91. R. F. Yorke. Improvements in secondary batteries. 16.

01. S. O. Cowper-Coles. Improvements in apparatus se in the electro-deposition of metals. Feb. 16.

02. S. O. Cowper-Coles. Improvements in apparatus use in the electro-deposition of metal upon tubes. 16

11. M Pisca. Improvements relating to electric accu-tors. Feb. 16.

16. W. Erny. Improvements relating to the construc-f electrodes containing zinc for use in electric batteries, method of producing and employing the same. 16.

7. W. Erny. Improvements in galvanic batteries. 16.

Complete Specifications Accepted.

1900.

1566. M. Wuillot. Accumulator plates. Jan. 30.

2783. J. Y. Johnson.—From The Deutsche Gold und Silber Scheide Anstalt vormals Roessler and Birger Carlson, Germany. Electrical arc furnaces. Feb. 13.

2994. M. Kugel. Process for the electrolytic deposition of nickel or its allied metals. Jan. 30.

5016. T. J. Holland and A. P. Laurie. Porous diaphragms for electrolytic apparatus. Feb. 13.

19,099. J. Myers. Electrode for accumulators of electricity. Feb. 20.

21,149. J. Meurant. Electrolytic process for the precipitation of metals and alloys from their solutions, as also for the deposition of metals or alloys or other metals or alloys or on other substances. Feb. 13.

22,605. T. Müller. Plate holders for electric accumulators. Jan. 23.

22,606. T. Müller. Process for chemically consolidating the active material of electric accumulators. Jan. 23.

22,607. T. Müller. Electric accumulator cells. Jan. 23.

23,106. C. A. Allison.—From The Waterbury Battery Co., United States. Galvanic batteries. Feb. 20.

23,107. C. A. Allison.—From The Waterbury Battery Co., United States. Galvanic batteries. Feb. 20.

23,743. E. Tiquet. Battery cells. Feb. 20.

1901.

484. H. H. Lake.—From Globe Electric Co., United States. Secondary electric batteries. Feb. 13.

XII.—FATS, OILS, AND SOAP.

Applications.

1014. J. W. Warren. Improvements in method for clarifying hydrocarbon oils. Complete Specification. Jan. 15.

1379. P. H. Joselin and J. Crichton. Obtaining blown oil. Complete Specification. Jan. 21.

1386. A. Kronstein. Improvements in oxidising wood oil and mixtures thereof. Complete Specification. Jan. 21.

1387. A. Kronstein. Improved process for thickening wood oil and manufacturing viscid bodies therefrom. Complete Specification. Jan. 21.

2011. A. W. Burwell. Improvements in oleaginous compounds or oils for tinning baths, and method of producing the same. Complete Specification. Jan. 29.

2847. L. M. B. Raynaud. An improved composition for the manufacture of soap for use in sea water. Complete Specification. Feb. 9.

2897. F. T. F. Wilson. A new or improved gun or rifle oil or lubricant. Feb. 11.

3375. R. J. Jordan. Improved cleaning soap. Feb. 16.

Complete Specifications Accepted.

1899.

23,539. S. Dyson and J. Gaskell. Manufacture of saponaceous products from petroleum or other mineral oils. Feb. 6.

1900.

3716. S. von Greave and A. Reinecken. Process of manufacturing oxidising agents from fats or fatty acids for converting hydrocarbons into fats or fatty acids. Jan. 30.

6909. J. C. W. Stanley and The Cotton Seed Oil Syndicate, Ltd. Treatment of cotton seed. Feb. 13.

9872. E. Maertens. Art of separating solvents from oily, fatty, waxy, soapy, or emulsified solutions of the same. Feb. 20.

21,468. R. Haddan.—From E. R. Edson, United States. *See* Class XIV.

21,469. R. Haddan.—From E. R. Edson, United States. Rendering apparatus. Feb. 6.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, Etc.

Applications.

960. W. M. Walters. Improvements in compositions or cements for coating surfaces. Jan. 15.

1399. W. B. Middleton. An improvement in the treatment of zinc oxide. Jan. 22.

2116. O. Imray.—From International Acheson Graphite Company, United States. A process for manufacturing graphite. Complete Specification. Jan. 30.

2295. J. B. Hannay. Improvements in water paints. Feb. 1.

2297. J. B. Hannay. Improved process and apparatus for manufacturing a white pigment of lead. Feb. 1.

2362. A. Gutensohn and T. Cupper. Improvements in the method of, and an apparatus for producing litharge from metallic lead. Feb. 4.

2429. H. McMurtry. Improvements in compositions for polishing leather or the like. Feb. 5.

2796. W. B. Middleton. Improvements in and connected with the manufacture of zinc compounds applicable more particularly to that of zinc paint. Feb. 9.

2819. G. Cope. *See* Class I.

2842. G. W. Flather. Improvements relating to the manufacture of varnish. Complete Specification. Feb. 9.

Complete Specifications Accepted.

1900.

2774. G. Bischof. Conversion of white lead into oil paste, and apparatus for that purpose. Feb. 13.

4615. E. Schaal and M. Schaal. Manufacture of a substitute for gum, copal, and amber. Jan. 23.

20,725. H. H. Lake.—From R. A. Worstall and C. F. Hackathorn, United States. Manufacture of varnish. Jan. 23.

21,553. F. Gerhardt. Binding substances for colouring matters, and protective coatings or paints. Feb. 13.

23,603. A. J. Boult.—From P. C. Ralli, H. Mayer, and L. Toch, United States. Compound to be used as a substitute for gutta-percha. Feb. 6.

XIV.—TANNING, LEATHER, GLUE, and SIZE.

Applications.

2645. J. Pate. An improved sizing preparation. Feb. 7.

3062. G. S. Falkenstein and C. Falkenstein. Improvements in the art of making artificial leather. Complete Specification. Feb. 12.

Complete Specifications Accepted.

1900.

2479. A. Thompson and E. Blin. Manufacture of tanning liquids. Jan. 30.

2972. A. J. Boult.—From The Fosslitch Leather Con pany, United States. Artificial leather. Feb. 13.

17,966. L. L. Kelsey. Process of making glue, and pro ducts resulting therefrom. Jan. 30.

21,468. R. Haddan.—From E. R. Edson. Obtainin gelatine and oil from fish and other gelatine-yielding an oil-yielding material. Jan. 23.

23,250. J. Wezel. Preparation of a substitute for anim glue. Feb. 20.

XV.—MANURES. &c.

Applications.

2035. C. Beyer. An improved machine for the distrib tion of artificial manure. Jan. 29.

2133. T. Gray. An artificial manure for the preservi of crops from destruction by wire worm and other pes Jan. 31.

2335. J. Ostersetzer. Improvements in the manufactu of artificial manures. Feb. 4.

3178. J. Hughes. Improvements in the treatment superphosphate for fertilizing purposes. Feb. 14.

XVI.—SUGAR, STARCH, and GUM, Etc.

Applications.

1390. J. Clark. Improvements in the manufacture brewing sugar. Jan. 21.

2251. L. Wenghöffer. Improvements in the treatm of gluten to render it more stable or durable and suital for transport. Complete Specification. Feb. 1.

2294. G. W. Johnson.—From M. Leconte and Co pagnie Electro Sucrière, France. Improvements in t manufacture of rice-starch and other amylaceous co pounds. Feb. 1.

Complete Specification Accepted.

1900.

6972. W. Prampolini. Process for manufacturing ela gum. Feb. 20.

XVII.—BREWING, WINES, SPIRITS, Etc.

Applications.

931. B. Fischer. Improvements in apparatus to prom the germination of malt. Complete Specification. Jan

933. Spiritine Ltd. and H. Ballantyne. Improvem s in the manufacture of solidified spirit. Jan. 14.

983. O. Rippich. *See* Class I.

997. F. Knüttel and The Berliner Actiengesellschaft r Eisengiesserei und Maschinenfabrikation. Process of cu g raw malt. Jan. 15.

1599. K. Enzinger.—Of The Filter and Brautechni e Maschinen-Fabrik Actiengesellschaft. Process and ar-rangement for filling casks. Jan. 23.

1774. T. Ingham. Improvements in fining or purif g beer and other alcoholic beverages, and in extracting nd purifying alcohol. Jan. 25.

2026. C. G. Sudre and C. V. Thierry. Improvemen or the treatment of distillers' spent residues or wash, and apparatus therefor. Complete Specification. Jan. 29

2311. A. Mambré. Improvements in drying and c ng malts and other cereals. Feb. 4.

2501. A. de Schepper. Improvements in machine for malting purposes. Feb. 5.

2680. O. Francke. Improvements in and relati t apparatus for the continuous production of malt. Fel .

2690. F. Grötte. Process of preserving beer. Complete pecification. Feb. 7.

3194. B. E. R. Newlands. *See* Class A.

Complete Specifications Accepted.

1900.

1228. E. A. Barbet. Production of alcohol and of pressed east by the aid of sugar-forming organisms. Jan. 30.

2333. S. Dymond. Apparatus for germinating and reparing all grain for brewers, distillers, and the like. an. 23.

3522. C. G. Sudre and C. V. Thierry. Treatment of istillers' spent residues or wash. Feb. 13.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

Applications.

A.—Foods.

1057. E. D. Bell. Improvements in alimentary preparaons. Jan. 16.

1573. H. Iscovesco. An improved process for refining ad sterilising butter. Jan. 23.

3043. P. G. Richter. Improvements in preserved food roducts, and the process of preparing the same. Comlete Specification. Feb. 12.

3194. B. E. R. Newlands. Improvements in the drying roasting or smoking of malt, hops, hams, or other imentary matters. Feb. 14.

3197. I. Klimont. Process for the manufacture of imroved artificial butter (margarine). Feb. 14.

B.—Sanitation; Water Purification.

1021. B. H. Thwaite. The destruction of bacteria in ewage, and apparatus therefor. Jan. 16.

1555. W. Defries. Improved means of improving or urifying water in respect of its gaseous contents. Jan. 23.

1616. R. Malabar. Improved means of purifying sewage. an. 24.

1777. O. Schmidt. Improvements in apparatus for urifying effluents. Complete Specification. Jan. 25.

1913. A. M. Clark.—From O. Fromme, Germany. Imroved method of and means for the pasteurisation of quids. Jan. 28.

2243. J. Westaway. A new or improved filtering appaatus applicable for the treatment of sewage, yeast, the y products of manufacturing processes, and the like. eb. 1.

C.—Disinfectants.

1520. J. H. Pollok. An improved carbolic disinfectant. an. 23.

1984. G. C. Fowler, M. A. Fowler, and E. J. Fowler. mprovements in disinfectants, perfumes, insect and vermin estroyers, and the like, and in the preparation and manuacture of the same. Jan. 29.

Complete Specifications Accepted.

1900.

A.—Foods.

6022. J. P. Tomlin. Antiseptic process for the preservaion and packing of eggs. Feb. 13.

16,199. E. W. Morris. Diabetic sugar-free milk. Feb. 0.

B.—Sanitation; Water Purification.

5809. W. Pirrie. Appliance for sterilising liquids. eb. 13.

20,625. J. Kroog. Sterilisation of liquids. Jan. 30.

C.—Disinfectants.

5981. A. Zimmermann.—From The Chemische Fabrik auf Actien vormals E. Schering, Germany. Antiseptics. Feb. 20.

XIX.—PAPER, PASTEBOARD, Etc.

Application.

2601. H. J. H. Fenton. Process for the production of bromo-methyl-furfural from cellulose. Feb. 6.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

Applications.

1467. J. Takamine. Improvements in glandular extractive products consisting of the active principle of the suprarenal glands, and the process of producing the same. Complete Specification. Jan. 22.

2899. E. Wirth. Manufacture of a nitro-derivative of carbazole from nitroso-carbazole. Complete Specification. Feb. 11.

3217. L. Weil. Obtaining saponine from horse-chestnuts. Complete Specification. Feb. 14.

3287. C. Bauer.—From L. Lederer, Germany. An improved process of forming triacetate of pyrogallol. Feb. 15.

3394. J. Wetter.—From F. Rose, Germany. Improvements relating to the preservation and concentration of fruit juice, or to the manufacture of fruit extracts. Feb. 16.

Complete Specification Accepted.

1900.

9872. E. Maertens. *See* Class XII.

XXI.—PHOTOGRAPHY.

Applications.

1092. R. Wedmann. An improved process for producing stippled or grained photographic pictures directly from photographic negatives or diapositives. Jan. 16.

1168. J. A. Hicks. A chemical compound for use as a special toning bath in connection with photography. Jan. 18.

1818. W. J. McConnell. Improvements in and relating to photography. Jan. 26.

2637. W. G. Perks and H. G. M. Fletcher. An improved method of separating flexible photographic films, cards, and the like. Feb. 7.

XXII.—EXPLOSIVES, MATCHES, Etc.

Applications.

984. C. H. Curtis, C. L. Watson Smith, D. J. Metcalfe, A. C. Pearcy, and A. F. Hargreaves. Improvements in explosives. Jan. 15.

2014. H. Geary and E. Neal. Improvements in packing and storing explosives, and in the manufacture of shells, mining fuses, and the like. Jan. 29.

2253. J. B. Bernadou. Improvements in smokeless explosives or colloids, and process for making the same. Complete Specification. Feb. 1.

2339. D. Bachrach. Improvements in nitro-cellulose and similar compounds, and process of making the same. Complete Specification. Feb. 4.

2367. A. Luck. Improvements in the manufacture of explosives. Feb. 4.

2650. J. C. Schrader. Improvements in and relating to machines for mixing explosive compounds. Complete Specification. Feb. 7.

Complete Specifications Accepted.

1900.

1888. G. Beneké. Factories for the manufacture of explosives. Feb. 6.

2448. K. Wiessner and M. Wiessner. Machine for the manufacture of wax matches. Feb. 13.

4593. W. D. Borland. Manufacture of nitro-explosives. Jan. 23.

8462. A. Reichwald.—From the Firm of F. Krupp, Ge many. Time fuses. Feb. 20.

21,065. L. Wöhler. Detonators. Feb. 20.

23,252. P. M. Justice. From The International Smok less Powder and Dynamite Co., Ltd., United State Smokeless powder in the process of manufacturing tl same, and in apparatus therefor. Feb. 13.

PATENT UNCLASSIFIABLE.

Application.

2679. A. Kronstein. Process for rendering materia proof against the action of moisture and of chemical agen Complete Specification. Feb. 7.

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R. L. Jenks	V., XIV., XIX.
J. B. C. Kershaw	VII., XI.
M. C. Lamb	VI., XIV.
T. A. Lawson, Ph.D.	IV., XX.
F. H. Leeds	III., XIII., XXI.
J. McCrae, Ph.D.	IV.
G. W. MacDonald, M.Sc.	XXII.
W. G. McMillan	X., XI., XIV., XXII.
W. Macnab	XXII.
A. Marshall	XI.B, XII., XXII.
N. H. J. Miller, Ph.D.	XV.
Chas. Mills	IV., VI.
C. A. Mitchell, B.A.	XII., XXII.
J. G. Parker, Ph.D.	XIV.
H. S. Pattinson, Ph.D.	VII.
H. T. Pentermann	XVI., XVII.
T. H. Pope	XX., XXI.
J. C. Richardson	XI.
F. W. Renaut	Patent List,
G. H. Robertson	XI.
Chas. Salter	I., II., III., XV., XVI.
R. Sandon	II.
H. H. B. Shepherd	IX.
J. Shields, D.Sc., Ph.D.	XI.
A. Shonk	Gen. Chem.
W. P. Skertchley	XII., XVIII., XX.
E. Sonstadt	III., VII., X.
A. L. Stern, D.Sc.	XVII.
E. Howard Tripp, Ph.D.	III., VII., XVI.
C. Otto Weber, Ph.D.	IV., XIII.
L. J. de Whalley, B.Sc.	XVI.
E. W. Wheelwright, Ph.D.	XXII.
A. Wingham	X.
Joseph T. Wood	XIV.
A. C. Wright, B.Sc., M.A.	IV., XVIII., XX.

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Vice-Chairman: Alf. Smetham.
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Eustace Carey.
Jas. T. Conroy.
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Max Muspratt.
E. Rhodes.
W. Collingwood Williams.

Hon. Treasurer: W. P. Thompson.

Hon. Local Secretary:

T. Lewis Bailey, University College, Liverpool.

SESSION 1900—1901.

Wednesday, April 24th, 1901.—Discussion on the Storage and Transport of Chemicals.

London Section.

Chairman: Otto Hehner.
Vice-Chairman: Walter F. Reid.
Committee:

W. G. Blagden.
J. J. Bowley.
A. C. Chapman.
H. Hemingway.
E. Grant Hooper.
D. Lloyd Howard.
W. J. Leonard.
R. Messel.
H. de Mosenthal.
B. E. R. Newlands.
Boverton Redwood.
Walter F. Reid.
A. Gordon Salamon.
F. Napier Sutton.
C. T. Tyrer.

Hon. Local Secretary:

A. R. Ling, Laboratory, 2, St. Dunstan's Hill, E.C.

SESSION 1900—1901.

Monday, April 1st, 1901:—
Mr. A. E. Berry. "The Effect of Selenium and Tellurium on the Marsh Test."
Dr. W. Newton. "New System for Manufacture of Borax and Nitrates."
Mr. J. Hughes. "Basic Superphosphate: its Preparation and Use as a Manure."
Dr. F. Mollwo Perkin. "Action of Caustic Potash and Soda on Stannous Sulphide."

Manchester Section.

Chairman: Dr. J. Grossmann.
Vice-Chairman: Ivan Levinstein.
Committee:

G. H. Bailey.
F. H. Bowman.
W. Brown.
J. Craven.
W. Heys.
J. M. Irving.
M. J. Langdon.
A. K. Miller.
H. Porter.
A. Rée.
F. Scudder.
Sir Thos. Wardle.

Hon. Local Secretary:

J. Carter Bell, The Cliff, Higher Broughton, Manchester.

SESSION 1900—1901.

Tuesday, April 2nd, 1901:—
Mr. T. A. Reid. "Notes on Glucose and other Brewery Products."
Dr. Herbert Levinstein. "Notes on Indigo."

Newcastle Section.

Chairman: N. H. Martin.
Vice-Chairman: F. S. Newall.
Committee:

A. Allhusen.
P. P. Bedson.
G. T. France.
T. W. Hogg.
H. Louis.
H. S. Pattinson.
John Pattinson.
W. W. Proctor.
W. L. Rennoldson.
G. Sisson.
J. E. Stead.
J. K. Stock.

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Edw. Halliwell.
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G. W. Slatter.
A. Smithells.
A. Turnbull.
Thorp Whitaker.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.

Hon. Assistant Secretary: A. Turnbull.

NOTICES.

Annual General Meeting.

he Annual General Meeting will be held in Glasgow, on ednesday, July 24th, and following days. Full particulars l appear in a subsequent issue.

Authors of communications read before the Society, or of its Local Sections, are requested to take notice that ler Rule 43 of the Bye-laws the Society has the right of ority of publication for three months of all such papers. ringement of this Bye-law renders papers liable to be cted by the Publication Committee, or ordered to be tracted for the Journal, in which case no reprints can furnished to the author.

LIST OF MEMBERS ELECTED 22nd MARCH 1901.

dison, Leonard, 78, Cantwell Road, Plumstead, S.E., Chemist.

lous, Hugh G., 21, Brechin Place, South Kensington, S.W., Brewery Director.

nold, G. Edmund, 6, Kingsfield Terrace, Faversham, Manager (Cotton Powder Co.).

r, Geo., The Dunnell Manufacturing Co., Pawtucket, R.I., U.S.A., Calico Printer.

wn, Samuel B., Oakdene, Whaley Bridge, Stockport, Calico Printer's Manager.

aand, Sydney, Manbré Saccharine Co., Ltd., Hammersmith, W., Manager.

etham, Howard, 18, St. Ann Street, Manchester, Chartered Patent Agent.

ob, Cecil, 136, Shaftesbury Avenue, London, W., Analytical and Consulting Chemist.

, Wm. S., c/o Farquhar and Gill, 40, St. Paul Street, Aberdeen, Colour and Varnish Manufacturer.

ner, Fred. B., New Brunswick, N.J., U.S.A., Chemical Manufacturer.

ett, Walter, Fairview, St. Margaret's Avenue, Stanford-le-Hope, Essex, Factory Manager.

Caffery, Rd. S., Chañaral, Chile, South America, Mining Engineer and Metallurgist.

shall, Jos. W., Boulevard Higher Grade School, Hull, Science Lecturer.

er, Dr. Franz, Basle Chemical Works, Basle, Switzerland, Chemist.

gan, Dr. Gilbert T., Royal College of Science, South Kensington, S.W., Demonstrator of Chemistry.

rray, Benjamin L., c/o Merck and Co., University Place, New York City, Chemist.

elius, Axel W. T., American Forcite Powder Manufacturing Co., Landing, N.J., Chemist.

ry, Lawrence, c/o Russian American Metal Co., 23, Schluesselberg Prospect, St. Petersburg, Russia, Metallurgist.

erson, David, Leabank, Rosslyn, Midlothian, Colour Chemist.

sley, Walter Eugene, c/o Schoellkopf, Hartford, and Hanna Co., 100, William Street, New York City.

e, Eugene, 101, Beekman Street, New York City, Chemical Merchant.

uce, Jno. Davidson, 2, Hawkhill Place, Perth Road, Dundee, Chemist.

rreu, Jno. E., Eagle Chemical Works, Barchester Street, Poplar, E., Tar Distiller.

rtheimer, Jacob, 34, Front Street, New York City, oap Manufacturer.

MEMBERS OMITTED FROM LIST.

). Johnson, Edw., 28, Walbrook Road, Derby, and Pernambuco, Brazil, Sugar Works Manager.

. Leuthardt, Peter, 163A, Fairfield Road, Droylsden, near Manchester, Chemical Manufacturer.

. McFarland, B. W., 278, Canner Street, New Haven, Conn., U.S.A., Chemist.

CHANGES OF ADDRESS.

Allen, W. W., l/o 1122; Room 1116, 30, Broad Street, New York City, U.S.A.

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Biggart, W. L., l/o Glasgow; c/o Western Chemical Co., Inchgreen Street, Bogston, Greenock.

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Brown, Cæsar R., l/o Victoria Docks; 23, Gower Road, Forest Gate, E.

Cleveland, D. B., l/o Struthers; 116, Olive Street, Cleveland, O., U.S.A.

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Crompton, B. F., l/o Adlington; Haigh Dyeworks, near Wigan, Dyer.

Darke, Jesse M.; Journals to 103, Shepard Street, Lynn, Mass., U.S.A.

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Jarvis, Talbot, l/o Castle Lodge; Latrobe Cottage, Bedford.

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Lynn, R. Rankine, l/o Zürich; 7, Highburgh Terrace, Dowanhill, Glasgow.

Lynne, Miss D., l/o Second Avenue; 4621, Forbes Street, Pittsburgh, Pa., U.S.A.

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Miller, Chas. E., l/o Gibson Street; 9, Great George Street, Hillhead, Glasgow.

Muspratt, S. K., l/o Liverpool; 9, Church Street, Flint, North Wales.

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Norman, G. M., l/o Bloomsburg; Moro-Phillips Chemical Works, Camden, N.J., U.S.A.

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Royal-Dawson, H., l/o Ealing; Prospect Cottage, Oulton, near Leeds, Brewer's Chemist.

Ruddock, F. G., l/o Stanley Street; Lower Walton, Warrington.

Sawyer, Harris E., l/o 172; 176, Federal Street, Boston, Mass., U.S.A.

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Singmaster, J. Arthur; Journals to New Jersey Zinc Co. of Penna., Palmerston, Pa., U.S.A., Chemist.

Smith, Harry, l/o Fairfield Road; 74, Holly Avenue, Jesmond, Newcastle-on-Tyne.

Smith, W. Stanley, l/o Highfield; Bryntirion, Bersham, near Wrexham.

Snape, Dr. H. Lloyd, l/o Aberystwith; Balholm, Lathom Road, Southport, Director of Education for Lancashire.

Sommerville, J. D., l/o Glasgow; Temple, Gorebridge, near Edinburgh.

Stevenson, M. R.; Journals to Ward House, Tyrone, Pa., U.S.A.

Stewart, R. P., l/o Industry Place; 59, Wellwood Terrace, Kerr Street, Kirkintilloch, N.B.

Stone, I. F., l/o Maiden Lane; 100, William Street, New York City, U.S.A.

Thompson, G. W., l/o Marshall Street; 40, Adams Street, Brooklyn, N.Y., U.S.A.

Van Marken, J. C., l/o Seymour Street; 150, Queen Victoria Street, E.C.

Waché, Alf., l/o Douai; 9, Place St. François Xavier, Paris.

Wates, E. A., l/o Brockley; 52, King Street, Woolwich, S.E.

Watson, Eric E., l/o Chile; 3, St. Aidan's Terrace, Birkenhead.

Watson, Jno. C., l/o West Leigh; Schluesselberg, near St. Petersburg, Russia.

Wedge, Utley, l/o Bayonne; Carthage, Miss., U.S.A.

White, W. Gilchrist, l/o Broadbottom; 30, Clarendon Road, C.-on M., Manchester.

Woolf, Mortimer; Journals to Mayfield, Mortimer Road, St. John's Wood, N.W.

CHANGE OF NAME AND ADDRESS.

Weissmüller, R. E., l/o Lewisham, to :—Miller, R. E. W., 8, Stanley Villas, Greenway Road, Runcorn.

CHANGE OF ADDRESS REQUIRED.

Lambert, Alan, l/o 18, Bishopsgate Street Within, E.C.

Deaths.

Butterworth, Jas., Newark, N.J., U.S.A. Jan. 21.

Raymond, C. W., Campbell Road, Bromley-by-Bow, E.

Liverpool Section.

Meeting held on Wednesday, February 27th, 1901.

MR. C. LONGUET HIGGINS IN THE CHAIR.

THE DETERMINATION OF ARSENIC AND ANTIMONY IN CUPREOUS MATERIALS.

BY ALLAN GIBB, A.R.S.M.

The estimation of arsenic and antimony in cupreo materials is of great importance to the metallurgist, and is desirable that he should have at his command methods estimation which, while being thoroughly reliable, can carried out in reasonably short time.

One of the methods which has been much used for t estimation of arsenic in copper was devised by Abel a Field (Chem. Soc. J. **14**, 290), and is based on the solubil of sulphides of arsenic and antimony in solutions of alkali sulphides. The solution containing copper, arsenic, is rendered ammoniacal and saturated with sulphurett hydrogen. The arsenic and antimony remaining in so tion are separated from sulphides insoluble in ammoni sulphide by filtration, and the filtrate is acidulated precipitate the dissolved sulphides.

This method affords a satisfactory separation, but ti must be given for the complete solution and the subsequ separation of the sulphides of arsenic and antimony, wl the washing of the bulky precipitate of copper sulph occupies a considerable time.

The separation of arsenic and antimony from copper more conveniently effected by precipitating them as ba ferric salts (Crookes, "Select Methods in Chemi Analysis," 2nd Ed., p. 430). Ferric nitrate is added to solution and its iron precipitated as basic acetate, t carrying with it the arsenic and antimony as fe arsenate and antimonate. Arsenic and antimony are se rated from the ferric precipitate by ammonium sulph and reprecipitated by acidifying the alkaline solution.

Odling (Chem. News, July 18, 1863) detected ars in copper by dissolving the copper in ferric chloride hydrochloric acid, and continuing to boil after comp solution has been effected, when arsenic, if present, di off as arsenious chloride, which is readily condensed, may be detected in the distillate by iodine.

The distillation of arsenic as arsenious chloride reduction by ferrous chloride and addition of hydrochl acid was described by Emil Fischer (Ber. d. Deut. Ch Ges. 1880, p. 1778). Later writers found that many ev rations were necessary for the complete volatilisation of arsenic unless very strong solutions of hydrochloric or the gas itself, were used in the operation.

The material under examination is dissolved in acid or hydrochloric acid and potassium chlorate, and excess of these reagents removed by repeated evapora with sulphuric acid. The residue, containing arsenic is distilled with ferrous chloride and hydrochloric and the arsenic determined in the distillate by titration th iodine or by precipitation by sulphuretted hydrogen.

A modification of Odling's process by Thomas G consisted in the addition of calcium chloride to the hy chloric acid solution of ferric chloride. Its boiling was thus raised, and the arsenic was completely volat by a few minutes' boiling. By this device quanti estimation was readily effected.

Dr. J. Clark (this Journal, 1887, 353) described a pr of separating arsenic from copper by distillation w hydrochloric acid solution of ferric chloride. In separ arsenic contained in pyrites, he replaces ferrous chlori used by Fischer, by cuprous chloride, in presence of nesium and sodium salts resulting from the soluti

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[*] Discussion on Pattinson's paper on "Estimation of Ars Copper," read before Newcastle-on-Tyne Chemical Society: News, **45**, p. 218, May 1882.

drochloric acid of the product obtained in his method of idising the sulphur and arsenic in the pyrites. He thus, obably, obtains a solution with a high boiling point, but this, as well as in his copper process, he recommends two more evaporations with fresh additions of hydrochloric id.

Stead (this Journal, May 1895) applied Fischer's method, odified by himself, to the estimation of arsenic in steel. e evaporates the solution several times with fresh additions hydrochloric acid to ensure the complete volatilisation of arsenic.

C. and J. J. Beringer (Text Book of Assaying, 3rd Ed., 340) give details of an experiment which shows that on ing a solution of ferric chloride and hydrochloric acid th copper, containing 3·48 per cent. arsenic, only 2·74 per it. was volatilised by one evaporation, whilst by boiling the ne copper with ferric chloride, containing calcium chloride, whole of its arsenic was volatilised.

The repeated evaporations to near dryness, necessary for nplete volatilisation of the arsenic when calcium loride is omitted, are tedious, and when antimony is sent they introduce considerable danger of volatilisation antimonous chloride. Platten (this Journal, 1894, 324), lowing the procedure described by Dr. Clark, found imony in nearly all his distillates. On the solution taining arsenic and antimony being evaporated to ness, or near dryness, a temperature may readily be ched higher than that at which antimonous chloride is atile. The following experiments show that a considerable error may occur if, in the presence of antimony, the illation is carried on until the solution approaches ness.

solution of ferric chloride and hydrochloric acid, on poration to dryness, gave a distillate which contained no e of compounds oxidised by iodine.

o a portion of the same solution 10 c.c. of a solution of monous chloride containing 0·001 grm. antimony were ed and the mixture distilled.

Distillate, when edges just showed dryness, contained 001 grm. antimony. Additional distillate, after evaporation to complete dryness with a further 15 c.c. hydrochloric l, contained 0·0002 grm. antimony.

iecker (Zeits. f. anal. Chem. 9, 516), in order to tilise arsenious chloride, heats the solution containing nious compounds with sodium chloride and sulphuric , the latter being in sufficient quantity to form a bath ch can be readily heated to 125° C., at which temperature arsenious chloride is effectively volatilised. Fresenius antitative Analysis, 7th Ed., p. 485) recommends this hod as suitable for separating arsenious and arsenic s.

y the addition of calcium chloride a temperature is lily attained, before dryness is even approached, at ch arsenious chloride is completely volatilised. Beringer cit., p. 341) gives experiments showing the accuracy his method, and finds that no arsenic is left in the tion after ten minutes' gentle boiling.

or carrying out this method the copper, in the form of filings or thin foil, is put into the distilling flask with lution of ferric and calcium chlorides in hydrochloric . On boiling, the copper is rapidly dissolved, and the nic present is volatilised as arsenious chloride. The owing data will suffice to show how the distillation eeds.

o 50 c.c. of ferric and calcium chloride solution were d 0·2 grm. pure electrotype copper and 5 c.c. of a tion of arsenious chloride containing 0·0025 grm. arsenic. The distillates were titrated by iodine solution, 1 c.c. of which was equivalent to 0·0005 grm. arsenic.

—	Temperature of Solution.	Iodine required.	Arsenic found.
	° C.	C.c.	Grm.
oiing....................	108	..	..
boiling 6 minutes	109	4·95	0·002475
" 9 "	110	0·05	0·000025
" 14 "	117	Nil	Nil
			0·0025

Practically the whole of the arsenic, if it is in solution, is volatilised when the solution boils, and it is only necessary to carry on the distillation sufficiently long to ensure complete solution of the copper. Usually it suffices to operate upon 1 grm. of copper, and complete solution of this should be effected in 15 minutes.

The solution solidifies at a temperature near 120° C., a temperature at which antimonous chloride is not volatile, and consequently there is no danger, from overheating the solution, of not bringing about complete separation of the two metals, since, for the complete volatilisation of the arsenic, the solution need never be evaporated to even incipient dryness.

As a means of estimating arsenic the process described leaves little to be desired, but the methods in use for estimation of antimony are by no means so satisfactory. The most accurate methods in common use for this purpose are of the gravimetric order, the most satisfactory being, probably, that in which the antimony is separated by electrolysis in the metallic state.

The arsenic* and antimony are obtained in solution by the method referred to above, in which the basic ferric acetate precipitate containing these two metals is digested in a solution of sodium sulphide. From this solution, after oxidation by hydrogen peroxide, antimony may be readily precipitated by electrolysis, the only unsatisfactory feature being the comparatively long time—at least six hours—occupied by the various operations.

In order to extend the arsenic distillation method to the estimation of antimony a solution is required which may be heated, without decomposition, to a temperature above that at which antimonous chloride is volatilised from hydrochloric acid solutions. A concentrated solution of zinc chloride (Watts' Directory of Chemistry, V., p. 1069) has long been used in the laboratory as a bath for heating substances to a constant temperature, and it may be heated without decomposition or volatilisation to 700° C.

On a saturated solution of zinc chloride being used to replace calcium chloride in the ferric chloride solution for distilling arsenic, a temperature is readily attained at which arsenious chloride is completely volatilised, but it is found to be impracticable, by continuing the evaporation, to distil off antimonous chloride from such a solution, as it solidifies at 120° C.—a temperature lower than that at which antimonous chloride volatilises. On boiling solutions containing antimonous and zinc chlorides only, the requisite temperature is readily attained, but the antimonous chloride is not entirely carried into the condensing apparatus and collected in the distillate. A portion of the volatilised antimonous chloride collects on the neck and sides of the distillation flask, owing to there being an insufficient flow of gas to carry it from the flask into the condensing apparatus. Practically the whole of the hydrochloric acid contained in the flask is volatilised before antimonous chloride begins to volatilise, and it is essential to introduce at this stage some material which will cause a flow of gas sufficient to carry the volatilised antimonous chloride from the flask. For this purpose hydrochloric acid may be introduced by means of a separating funnel, and by such addition, when the requisite temperature is attained, the whole of the antimonous chloride is obtained in the distillate.

The following data were obtained in the distillation of a synthetical mixture of arsenious and antimonous chlorides:—

Distillation Mixture.

Saturated zinc chloride solution............	50 c.c.
Hydrochloric acid	25 "
Arsenic—as arsenious chloride	0·005 grm.
Antimony—as antimonous chloride.........	0·0015 "

The distillates were removed at intervals and titrated with iodine solution, 1 c.c. of which was equivalent to 0·0005 grm. arsenic or 0·0008 grm. antimony.

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* "Quantitative Analysis by Electrolysis," Classen; translation by Herricks, p. 74.

——	Temperature of Solution.	Iodine.
	C.	C.c.
Boiled........................	108	..
After 7 minutes..................	109	4·2
„ 12 „	110	3·0
„ 17 „	112	2·8
„ 22 „	115	Nil
	Total.....	10·0 = 0·005 grm. arsenic.

During this period the flask was heated over gauze with a flame which just caused gentle ebullition. The gauze was then removed and the flask exposed to a strong flame.

——	Temperature of Solution.	Iodine.
	° C.	C.c.
After 5 minutes' further heating .	118	Nil
„ 11 „ „ „ ..	125	0·2
„ 13 „ „ „ ..	160	0·3
Five c.c. of hydrochloric acid was then introduced, a drop at a time, and heating continued seven minutes.	195	1.5
	Total.....	2·0 = 0·0016 grm. antimony.

The considerable interval, both in time and temperature, between the volatilisation of the arsenious and antimonous chlorides affords opportunity for collecting both distillates separately with certainty. The quantity of each metal can then be readily determined by titration with iodine.

To ensure the reduction of arsenates and antimonates it is convenient to dissolve part, at least, of the copper in the distillation flask, and it is therefore necessary that a reagent capable of bringing the copper rapidly into solution should be added to the acid solution of zinc chloride. As has been mentioned, suitable mixtures of zinc and ferric chlorides solidify before the temperature necessary for distilling antimonous chloride is attained, and consequently ferric chloride is not available as a solvent. A mixture of zinc and cupric chlorides with hydrochloric acid readily dissolves copper, and this solution remains in a fluid condition at a temperature considerably above 200° C. By means of this solution arsenic and antimony can be readily estimated in a single sample of the material under examination. The sample, except when it consists of metallic copper containing comparatively large proportions of arsenic and antimony, is preferably dissolved before introduction into the distilling flask, as the time necessary for the solution of such quantities as are necessarily taken for the estimation of small proportions is such that, with convenient solutions, the distillation will have proceeded too far before complete solution is effected. Further, fused zinc chloride will hold only a limited proportion of cupric chloride in solution, and, consequently, if comparatively large quantities of the sample have to be dissolved, the resulting chlorides of copper with the cupric chloride used as a solvent, necessitate the presence of inconveniently large quantities of zinc chloride in the solutions.

For practically carrying out estimations by this method the following solutions are required:—

(*a*) "Zinc chloride" solution prepared by mixing a saturated solution of zinc chloride with an equal volume of hydrochloric acid containing 100 grms. of copper per litre, as cupric chloride. The zinc chloride is conveniently prepared by saturating hydrochloric acid with metallic zinc and evaporating till the liquid is of a viscous consistency. This mixture should boil at about 108° C., and should be concentrated or diluted in order to effect this. The reagents can be readily obtained free from arsenic and antimony.

(*b*) A saturated solution of ferric chloride.

(*c*) A solution of iodine. A convenient solution for determining such proportions of arsenic and antimony as are usually present in cupreous materials is made by mixing 0·85 grm iodine and 2 grms. of potassium iodide with about 25 c.c. water and making up to one litre, when th iodine is completely dissolved. This solution, 1 c.c. o which is equivalent to 0·00025 grm. arsenic or 0·0004 grm antimony, maintains its strength fairly well.

Preparation of Sample for Distillation.—The weighe sample is dissolved in nitric acid or *aqua regia*, and th solution, having been diluted to about 250 c.c., is heated t near its boiling point. In the absence of more than trace of iron from the sample, 1 c.c. of saturated solution of ferr chloride is added, and solid sodium bicarbonate is adde cautiously until a small permanent precipitate forms in th nearly boiling solution. This precipitate carries with it th whole of the arsenic and antimony as basic ferric salts, an its quantity, when dealing with the proportions of arseni and antimony usually found in cupreous materials, nee never be such that the whole of the iron is precipitated.

The precipitate is allowed to settle and is collected on small filter paper and washed with hot water to remov nitrates. With the small excess of sodium bicarbonat necessary for this precipitation there is no danger of formin basic nitrates. This procedure entirely replaces the repeate evaporations with sulphuric acid which have commonly t be resorted to when the removal of nitric acid is necessar It also presents the advantage that it is immaterial wh quantity of the sample is operated on, as the element sought—arsenic and antimony—are concentrated in th comparatively small precipitate, for the distillation of whic a moderate quantity of the "zinc chloride" solution suffice This is especially advantageous in dealing with materia containing much iron, such as regulus and ores, as th chloride of iron formed in dissolving the sample woul if it were all introduced into the distilling flask, require large excess of zinc chloride to hold it in solution at th temperature attained during the distillation.

The Distillation.—The most suitable apparatus for th distillation is the ordinary round-bottomed fraction distillation flask; the 8 oz. size is very convenient, with delivery tube fused into the neck. The neck is stopped b a rubber bung, through which are inserted a thin therm meter, registering to about 250° C., and so placed that th bulb reaches to within half an inch from the bottom of th flask, and a small separating funnel, the stem of whi reaches about half-way into the body of the flask, and after being drawn to a point, bent so as to carry the co hydrochloric acid away from the thermometer and so obvia danger of cracking the bulb. The end of the delivery tu is bent and inserted into a bung in one arm of a three-bu U tube standing in a trough of cold water, and in which t distillate is condensed.

The precipitate containing the arsenic and antimony placed in the flask with 50 c.c. of the "zinc chlorid solution and about 0·25 grm. of pure electrotype copp which acts as a reducing agent towards the arsenic a antimonic acids, being itself dissolved by the cupric a ferric chlorides in solution. When the material und examination is metallic copper a portion of the weigh sample is reserved and placed in the distillation fla instead of electrotype copper. The bung, with the therm meter and funnel, is inserted, and the condensing tu containing just sufficient water to form a lute, is connecte

The flask is heated through wire gauze by a flame, whi just suffices to produce gentle ebullition, until the therm meter registers 115° C., when the condenser is removed a a fresh one placed in position. It is unnecessary to remo the burner and so cool the flask while this change is be effected, as the whole of the arsenic will have been volatilis while the antimony will not have begun to come off. T necessary temperature will be attained in about 15 minu from the time of first boiling.

The condenser having been replaced, the gauge is remov and the flask exposed to a strong naked flame, which cau the temperature to rise rapidly, reaching 150°—160° C. from 10 to 15 minutes. About 10 c.c. hydrochloric acid then run in, cautiously, from the separating funnel. As acid enters the flask, dense white fumes form, and the flow acid should be regulated so as to produce a steady str of gas from the flask. No liquid acid should be allowed fall on the fused zinc chloride in the bottom of the fla After the addition of the hydrochloric acid the heatin ntinued until the flask is cleared of fumes, and when this effected the temperature is usually about 200° C. The ndensing tube, with the second distillate, is removed, and e zinc chloride, &c. allowed to solidify in the flask, the ermometer being first removed. The residual chlorides y be removed from the flask with warm water.

Titration of the distillates.—The two distillates, containg arsenic and antimony respectively, are washed into parate flasks, and to the latter is added a little solution tartaric acid. The acid solutions are neutralised by amonia, fragments of litmus paper being introduced as dicators, and are then rendered slightly acid by hydroloric acid. About 2 grms. of sodium bicarbonate are ded to each, and the solutions are ready for titration. arch solution is used as indicator, and it is necessary that is should be coloured by iodine before addition to the say, as a considerable quantity of iodine, frequently 2—0·3 c.c., is required to effect this when using the lute standard solution employed in determining the small oportions of arsenic and antimony usually found in preous materials.

The following determinations were made on synthetical xtures of arsenic and antimony to ascertain the degree accuracy of the method for determining these metals in rying proportions, such as are usually found in cupreous aterials. In each distillation 50 c.c. of the "zinc chloride" lution were taken, and 0·25 grm. of pure electrotype pper added to ensure the reduction of arsenic and antinic acids. The first distillate was removed after 15 nutes' boiling, and 10 c.c. of hydrochloric acid were added en the temperature reached 150° C., and the heating ntinued for five minutes longer.

—	1.	2.	3.	4.	5.	6.
senic taken (grm.)	0·01	0·010	0·0100	0·001	0·0005	0·0005
timony " "	0·01	0·001	0·0005	0·010	0·0100	0·0005
iling tempera-ure (° C.)	108	108	108	108	108	108
nperature after 5 minutes (° C.)	116	115	116	116	115	116
senic found grm.)	0·01	0·01	0·01	0·001	0·0005	0·0005
al temperature ° C.)	190	198	190	202	194	194
tal time from oiling (mins.)	32	34	32	33	30	30
timony found grm.)	0·0098	0·001	0·0005	0·01	0·0099	0·0005

The length of time occupied by the operations previous the distillation necessarily varies with the nature of the aterial under examination, depending entirely upon the eater or less difficulty experienced in obtaining a lution.

The following are some determinations of arsenic and timony in some cupreous materials, the proportions of ese elements having been also determined, for comparin's sake, by the "ferric chloride" and electrolytic thods for arsenic and antimony respectively.

—	Arsenic.		Antimony.	
	Zinc Chloride Method.	*Ferric Chloride* Method.	*Zinc Chloride* Method.	*Electrolytic* Method.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
ritic ore	2·356	2·339	0·467	0·461
rnt pyrites	0·476	0·471	0·011	0·012
gulus	0·514	0·501	0·023	0·024
ecipitate	1·767	1·758	0·196	0·201
r copper	0·038	0·033	0·0011	0·001
ister copper	0·792	0·800	0·058	0·062
ugh cake copper	0·456	0·450	0·029	0·030
st select copper	0·042	0·044	0·003	0·003
ectrolytic copper	Trace	Trace	0·0005	0·0005

Though the foregoing procedure is that most generally opted, it allows of considerable simplification when the aterial under examination is metallic copper or some aterial readily soluble in an acid solution of cupric chloride, and containing comparatively large proportions of arsenic and antimony. Should the proportions of arsenic and antimony be such as to make 1 grm. of the sample sufficient for the determination, it is convenient to carry on the solution in the flask while the distillation is proceeding, in a similar manner to that adopted in distilling arsenic with calcium and ferric chlorides. The sample, in a fine state of division, is introduced directly into the flask, and the two distillates are collected as usual.

The proportions of arsenic present in cupreous materials are frequently sufficiently great to allow of this procedure being followed; but antimony, though almost invariably present in cupreous materials containing arsenic, usually occurs, except in exceptionally impure materials, in proportions which make it necessary to take larger quantities of the sample than would be necessary for the determination of arsenic alone. With even the dilute solution of iodine used, less than 0·0001 grm. of arsenic or antimony cannot be determined with accuracy, and consequently, if the sample contains less than 0·01 per cent. of either, or both, of arsenic or antimony, it becomes inconvenient to carry on the solution in the distillation flask.

Titus Ulke* describes a method of determining arsenic and antimony in metallic copper which has been devised by Aller. Working with 10 grms. of copper the bulk is dissolved by hydrochloric acid and potassium chlorate, and the solution, after boiling to free from chlorine, is transferred to the distilling flask with the remainder of the copper. The solution is evaporated to small bulk and taken up with hydrochloric acid, the evaporation being repeated. The distillate is then removed, and is said to contain the whole of the arsenic. To the residue in the flask 75 c.c. saturated zinc chloride solution are added and the whole evaporated to near fusion, when it is allowed to cool, and hydrochloric acid is added before continuing the heating. A third evaporation is made with hydrochloric acid before the distillate is removed for the determination of the antimony.

The arsenic and antimony are separated from their respective distillates as sulphides, and these precipitates are collected and weighed on tared papers.

This series of operations appears to be very cumbersome, but Ulke says it is claimed that the arsenic and antimony in metallic copper can be determined by this method in about two hours.

Though the method of determination described in the present paper has been treated, mainly, as one for the determination of arsenic and antimony in copper and cupreous materials, sufficient work has been done with it to prove its use as a general method for separating arsenic and antimony. The arsenic and antimony in any material having been obtained in solution as arsenic and antimonic acids can always be precipitated in combination with iron as described, and the precipitate, so obtained, distilled with zinc and cupric chlorides in the presence of metallic copper or cuprous chloride to act as a reducing agent.

I am much indebted to Mr. H. D. Crowder for the assistance which he gave me in carrying out the experiments upon which the process described was based.

Discussion.

Mr. Alfred Foden asked whether the speed of Mr. Gibb's process was not discounted somewhat by the close attention required by the distillation and the necessity for the preliminary precipitation and filtration of basic iron salts. The common occurrence in copper of large proportions of arsenic with comparatively small proportions of antimony necessitated the use of large quantities of the sample for the estimation, and, consequently, for the complete separation of the arsenic and antimony as basic ferric salts, a correspondingly large quantity of iron must be precipitated. To completely remove nitrates from this precipitate by washing would be a matter of considerable difficulty. He would like to be assured by Mr. Gibb as to the completeness and entire reliability of the separation of the two, when present in varying proportions.

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* "Present Commercial Methods of Copper Assaying and Analysis," Eng. and Mining J. 1899, p. 727.

Mr. Gibb, in reply, said that the washing of considerable quantities of precipitated basic ferric salts was certainly a matter of some difficulty, but, even in the examination of comparatively impure cupreous materials, the quantity need never be large. The weight of iron precipitated need rarely exceed 0·25 grm., even when the arsenic and antimony were in such widely differing proportions as may occur in good *tough cake* copper. The washing of much greater quantities of basic ferric salts than that mentioned could be rapidly effected with the aid of a filter-pump. The only claim made as regards rapidity was that accurate determinations could be made by the method described in very much less time than by any of the commonly used methods. The preliminary separation, which need never occupy 60 minutes, and more usually could be effected in 15 minutes or less, was common to the usual gravimetric methods for determining arsenic and antimony, and the time occupied by the subsequent separation by alkaline sulphides, followed by separation of arsenic by magnesia mixture, and antimony by electrolysis, could not compare favourably with that occupied by distillation with zinc chloride and subsequent titration of the distillates obtained. The distillation required no more attention than did any other chemical operation in which liquids were heated. With regard to the completeness and reliability of the separation, that was shown clearly by the experiments described.

London Section.

Meeting held on Monday, February 18th, 1901.

MR. OTTO HEHNER IN THE CHAIR.

DISCUSSION ON THE OCCURRENCE AND DETECTION OF ARSENIC IN MANUFACTURED PRODUCTS.

The Chairman, as an introduction to the discussion, said: In opening the discussion on this subject, which for some time past has occupied so great an amount of public attention, I would like, in the first instance, to ask you to approach the matter in a calm and judicial spirit, and to remind you, although such a reminder may be perfectly unnecessary, that we have absolutely nothing to do with the case which is still being enquired into by courts of law, and that we have not to express any opinion on the circumstances which have brought about the Manchester catastrophe. We have met in order to consider whether manufacturers of sulphuric acid and those who use it for industrial purposes, as well as the professional men who guide and advise the technologists, have to take any steps, and, if so, what steps, in order to avoid, as far as practicable, possibility of mischief in the future.

In order that the discussion on so important a subject should remain within bounds, I propose to throw out some suggestions as regards the lines within which, in my opinion, the matter might be most usefully discussed, but, in so doing, I do by no means intend to limit the field to these suggestions, numberless interests being at stake which ought fitly to occupy your attention.

It will, I think, at once be agreed to in principle, that the contamination of food, drink, or drugs with arsenic, is inimical to public interests, not only to public health, but to the safety of each person. No consideration of commercial advantage, convenience, or cheapness of manufacture can weigh in the scales as compared with health interests, if the latter are involved.

When it is considered that much upward of one million tons of sulphuric acid are annually produced in this country alone, and more than nine-tenths of that quantity from pyrites more or less arsenical, that sulphuric acid is employed in the manufacture of a vast number of articles of daily use, some idea can be formed of the importance of the matter. Taking two-tenths of 1 per cent. as the average amount of arsenic contained in pyrites acid, then no less than 1,800 tons of arsenic would annually be distributed in the acid alone, making no subtraction for the acid which is subjected to a de-arsenication process before use. On the other hand, acid with much more than 0·2 per cent. of arsenic is found. Only an infinitesimal fraction of that amount of acid is, of course, used in articles directly intended for food, drug, or drink. The two chief consumers are the makers of Leblanc soda and of artificial manures (super phosphates and ammonium sulphate). These, as a rule, i not invariably, use arsenical acid. That portion of the arsenic which is present in the arsenious condition goes i soda manufacture into the hydrochloric acid, while that i the higher state of oxidation is left in the salt cake, whence part goes into the soda and the caustic alkali, and into the numberless substances manufactured by their aid, such a soap, glass, ultramarine, borax, &c. The proportion o arsenious and arsenic acid is variable. Wherever arsenica hydrochloric acid, again, is used, there arsenic is introduced as, for instance, in the manufacture of glycerine, whethe pharmaceutical or for dynamite manufacture.

In the manufacture of superphosphates, a proportion o the arsenic escapes as chloride or fluoride, and pollutes th air, while the major part remains in the superphosphate Here it is counted by the analyst as phosphoric acid, and i paid for as such by the purchaser. It is spread far an wide over the ground, and, while it probably does n material harm, if any, to the crops themselves, it is liable t be taken up by them in traces.

Wherever arsenical, sulphuric, or hydrochloric acid i employed in the preparation of articles which do no crystallise, but are obtained by the evaporation of th solution. the bulk of the arsenic enters the article, an remains in it, such as in that of glucose, glycerine, an oxide of iron. But even where crystallisation of the fin product takes place, part of the arsenic often enters th crystals. The occurrence of arsenic in phosphates ha become widely known owing to recent proceedings. It ha been met with in borax and boric acid, in ferrous sulphat acid and neutral sodium, and potassium carbonates, and have found traces in sugar and in molasses, in bakin powder, through the potassium acid sulphate, &c. &c. Th Pharmacopœia teems with instances of substances whic must be tested for arsenic. Under our laws, each vend of any substance that either serves as food, or is used the preparation of food, is liable to prosecution if contan nation can be proved, and to the infliction of a substanti fine. The responsibility resting upon the persons primari responsible, namely, the makers of sulphuric acid therefore, enormous. Under section 26 of the Food an Drugs Act, 1899, the expression "food" includes (*int alia*) "any article which ordinarily enters into or is used the composition or preparation of human food." It wou be interesting to argue that hence H_2SO_4 is a food, but leave that to the lawyers.

Now I want you seriously to consider whether it feasible that all sulphuric acid which is *sold* by t sulphuric acid maker be freed from arsenic, and, if possib from other contamination liable to produce injury to heal or failing this, whether or not all acid which has not be thus freed, be plainly labelled "arsenical," so plainly tha would be evident to the meanest understanding that su acid must not be used for the preparation of matters lia to be consumed by man. If my information is correct, cost of de-arsenicating acid is quite inconsiderable, or e nil. There are but a few hundred makers of acid in country, but thousands of users. Many of these are dev of knowledge of the most elementary kind. I do not th that it is fair to these to have specially to ask for arsenic-free material, when as a matter of course th ought to get it without a special request. I would als like to *go* further and say that no arsenical acid ough be used in the manufacture of superphosphates and of so But whether you agree with this suggestion or not you have to consider what shall be understood by "de-arse cated" acid. Chemical purity is out of the question an not to be attained. Every material in the world cont probably infinitesimal traces of every element. Wha practical purity as regards arsenic? This is eminent estion to be answered by practical men, not by theorists. t we cannot be satisfied with indefinite statements, of ich chemists unfortunately are much too fond: it will : do to remove all but "traces"; we must have definite as, precise definitions. We have to consider practicable alytical methods to fix the quantities with sufficient uracy, further, what amount of arsenic may safely be owed without chance of injury to health, and, lastly, the ability of practical manufacturing methods to effect the eet sought. As regards the latter point, however, I e every confidence that the scientific manufacturer will l means, if he has not got them already, to satisfy any sonable requirements.

Of the analytical method I propose to speak at greater gth further on: I hope to be able to satisfy you, that difficulty exists to detect, and approximately measure, nute quantities of arsenic. To fix the quantity permis- le in any article is not a matter for a chemist, who must guided by the doctor and sanitarian. Taking, provi- nally, the experience collected from the Manchester lemic, and attributing, solely for the purpose of my ument, the whole of the ill-effects of the beer to the enic and to nothing else, I think I cannot be far wrong n I take two-hundredths of a grain of arsenic (arsenious l) in a gallon of beer to be the smallest amount that has n suspected to have had any effect, and that, therefore, -hundredth of a grain may be taken as the safe limit. v, as liquids are consumed by man in larger proportion n solids, and that, therefore, the same proportion of im- ity in a liquid is a much more serious matter than in the e of a solid, we are on the safe side (assuming the correct- s of the minimum limit of one-hundredth grain) if we e our deductions upon the beer experience. No brewer ld use as much as 36 lb. of glucose to one barrel of gallons, but taking such an exaggerated proportion it ld follow that 1 lb. of 7,000 grains of glucose might tain 0·01 grain, or 10 grms., just over one-hundredth milligrm. of arsenic. As at the very outside 5, but let even say, 10 per cent. of sulphuric acid as compared n the amount of starch or sugar are used in the manu- ure of invert sugar or glucose, it would follow that for manufacture the sulphuric acid might contain without ger as much as 0·001 per cent. (1 in 100,000), or one- h of a milligrm. of arsenic in 10 grms. Digressing for oment and assuming that 50 lb. of malt were used for barrel, 1 lb. might contain, without objection, 0·007 ns, or 10 grms. of malt might contain exactly one dredth milligrm. arsenic as an outside limit. Now, e conditions might all most easily be observed by the nufacturers of glucose and acid, and by the maltster; n my experience, as far as it goes, I feel convinced that preparation of acid with 10 times less arsenic than ve stated presents no difficulty. But to be further on safe side I would suggest that we should halve the ounts of arsenic permissible, namely, that sulphuric acid ht be considered de-arsenicated if it contained not more n 0·05 milligrm. in 10 grms. or one of arsenic in ,000, calculated as arsenious acid. I have tested a nber of samples of commercial de-arsenicated acids with ch less than that quantity. I make the suggestion, ever, more with a view to obtain the opinion of the ety, that is to say, of acid makers, glucose manufac- rs, brewers, and sanitarians, than to lay down a definite posal. I should explain, that I have stated the quan- s above for 10 grms., because my analytical work has ght me that quantities of arsenic lying between 0·01 0·001 milligrm. can be most readily and accurately ged. What we urgently want is an agreement; want greement is an everlasting source of trouble to every- . It must not be open to every crank to raise charges inst vendors of food, &c. simply because by some means other he thinks to have, or has actually, discovered rly insignificant and infinitesimal traces of arsenic. ler our conditions of life infinitesimal arsenical contami- on is utterly unavoidable. I have only to remind you the late Sir Edward Frankland actually showed arsenic acted from the London atmosphere.

might further be a useful subject for discussion, ther the state in which arsenic is present in food materials is an important factor as regards the physiological effects. Just as there is at least one arsenic compound, namely, cacodylic acid, which is stated to be harmless, although it includes about 50 per cent. of the element, so there may be, and doubtless are, other compounds, which are exceptionally poisonous. Arseniuretted hydrogen is one of them: we know that it, or a similar compound, is produced from arsenious acid by the action of some *fungi* (*penicillium brevicaule*); is it possible that it, or some other equally poisonous substance, is formed during the fermentation of arsenical fluids? I have made a few experiments to get an answer to the question, but so far without success. No trace of arsenic can be discovered in the distillate obtained from highly arsenic-contaminated beer for instance.

The experience of manufacturers of brewing sugar and similar substances who in the past have exercised a strict control over their products would be very welcome. I know that a number of them have had many years of experience in that respect, and they could tell us what means of control they have adopted, and whether they have had any difficulty in obtaining materials of sufficient purity.

The professional part of the subject is also worthy of discussion. I freely confess that although I have for many years been engaged in the analysis of food products, I had never been struck with the need, which we now well know to exist, for testing them for arsenic, unless injury to health had been attributed to the food-material in question. It is, of course, always easy to be wise after an event, and to recognise that in the past one has omitted to do things which it would have been well to do if one had known. Has any chemist been far-seeing enough to scent the danger and to guard against it in his daily work; I do not, of course, refer to the testing of sulphuric acid itself, but to that of articles directly or indirectly made by its aid.

It would further be most desirable, although slightly outside the title by which the discussion has been announced to the members, to obtain whatever information there may be available concerning the physiological action of impurities other than arsenic in sulphuric acid or products made from it.

And, lastly, I would suggest whether the antiquated distinction between brimstone and pyrites acid might not well be given up. If all acid that might be sold were purified and practically freed from arsenic, as already at the present time a great deal of acid made from pyrites is a great deal purer than acid made from brimstone, the distinction would be without utility. Given two equally pure articles of the same kind it is indifferent from what raw product they are made; as a rule only prejudice insists upon one kind in preference to the other. Just as saccharose made from beet is sold indifferently with that made from cane, because, when pure, both are identical, so in the case of sulphuric acid. Of course if anyone directly asks for acid made from brimstone it would be a deception to give him acid made from pyrites, however pure it may be, but it would surely be more rational to judge substances by their purity rather than by their derivation. When I buy a pure chemical it is a matter of little moment to me how it is produced, as long as I get it pure. The question of the presence of arsenic in malt and the limitation of the amount of the impurity also comes legitimately within our discussion, but I trust that members taking part in the debate will keep away from the contentious subject of so-called "pure" beer. This Society has nothing to do with that matter.

Mr. David Howard thought that the question before them had two sides. One, the use of such quantities of arsenic as might possibly be injurious, and the other the ideal that existed in some people's minds of chemical freedom from arsenic. The latter was an easy matter to promise, especially if the seller lived abroad. In fairness to English chemistry he was bound to say that he believed such guarantees from abroad were not more reliable than English ones. The important question for them to consider was the proportion of arsenic which was really dangerous. That depended very much upon what the arsenic was in. A man's weight was about 1,500,000 grains, and it was possible to drink his own weight of beer in a week. What would be the effect of even one grain in a million so taken into the system? On the other hand, if common salt were contaminated to the same extent, it would take a very long time indeed to consume enough to get the maximum medicinal dose of arsenic. The fact to bear in mind was that arsenic in any appreciable quantity was to be carefully guarded against. Another important fact to remember was that sulphuric acid was by no means the only source of arsenic in chemicals. How many green glass bottles—how much iron wire would be found even tolerably free from arsenic? Zinc they knew more about; but even in that case, how many knew where to lay their hands on any quantity of zinc absolutely arsenic-free? And the same remark applied to any mineral of volcanic origin which was used in the arts. Then there was the question of selenium, a body which some authorities considered to be absolutely harmless, and others considered more deadly than arsenic. The whole question was one of great difficulty. He repeated that what was chiefly wanted was a clear recognition of what any particular body was to be used for. Next, let all beware of any talk of chemical purity. The chances were that any such guarantees would be traps either to the buyers or the sellers, and no sensible manufacturers could give them honestly. Having decided on some method of testing, it was in the next place absolutely necessary to have a clear standard of purity. He had known cases where, dealing with one part in a million, two chemists had differed widely in their proportions. If, therefore, it were agreed that a substance should not contain more than a given percentage of any given substance, the method of determination should also be agreed upon, or disputes as to purity would certainly arise. Next, to clear ideas of standards, one required a proper sense of proportion. For example, the fact that even one per million of arsenic in tartar emetic might do no great harm should be no reason for passing a much less proportion of arsenic in beer. It was not altogether a question of whether the substance was to be used for food, but whether it would be used in such quantity as to render the presence of arsenic really dangerous.

Dr. E. Divers said that Mr. Howard's remarks might be illustrated by an experience of his own with respect to arsenic of volcanic origin. There was a celebrated mineral water in Japan which consisted of a mixture of volcanic hot and cold water, the hot water containing sulphuretted hydrogen, and the cold water being strongly acid and charged with alumina and so forth. From 10 gallons of that liquid, after standing for a month or two he had got a bright yellow deposit of arsenic sulphide, which he had estimated to equal one part in a million of the water. Another point he could speak upon was that of selenium, and particularly in connection with the vexed question of brimstone acid versus pyrites acid. Very little, if any, brimstone acid was made in this country; but if they drew upon the vast stores of brimstone in Japan, they would get a sulphur which contained both selenium and tellurium, and thus get a sulphuric acid largely charged with both those elements. That sulphur was, however, as free as it could possibly be from arsenic. Therefore, one could not be sure of pure acid by trusting to sulphur rather than pyrites, unless they also decided as to the source of the sulphur itself.

Mr. S. Hall remarked that, *apropos* of Mr. Howard's suggestions, he had recently been asked to guarantee a soap arsenic-free. With a view to that, he had made some experiments, using the Gutzeit test. The result was an apparent trace of arsenic. On repeating the test, using lead-paper, he had failed to get even a trace of arsenic. He had then used Mr. Kirkby's modification of Gutzeit's test, and found it to work extremely well. All the sulphuretted hydrogen formed was retained in the first of the three bulbs through which the gas passed before it reached the mercuric chloride paper. He began with 2 mgrms. of arsenic, which was too much, and reduced the quantity gradually until he found that even one-fiftieth mgrm. could be seen perfectly well. He had, of course, first tested his zinc and hydrochloric acid. He then tried his soap, nd on the first experiment decomposed it straight away in the flask of the apparatus. The result was that sulphuretted hydrogen passed through. He then deco posed the soap first, and turned the whole of the fatty aci and acid liquor into the flask. Not the slightest trace arsenic was found; and the same occurred when he to off the fatty acids and used only the acid solution. then added one-tenth mgrm. of arsenious acid to 10 gra of soap, and decomposed it, leaving the fatty acids stil the top. There was a clear sign of arsenic. Also, wh the fatty acids were taken off, apparently all the arse was retained in the acid solution. There was no difficu in detecting the arsenic down to one-fiftieth of a milligram

Dr. Messel said that, contrary to Dr. Divers' beli Sicilian brimstone was not invariably free from seleni nor from arsenic, and in sulphur from Iceland and fr Spain these impurities were likewise occasionally found. S phuric acid made from brimstone offered, therefore, absolute guarantee of purity to the glucose manufactu The standard of purity in sulphuric acid demanded by Chairman could readily be met by manufacturers purify their acids with sulphuretted hydrogen, or by using catalytic process, no matter from what raw material acid was produced. The former process consisted keeping the acid condensed or concentrated in the Glo tower separate; by so doing a large proportion of b arsenic and selenium was eliminated from the gases, the arsenic especially was retained by it. Probably fact accounted for the large percentage of arsenic with in sulphuric acid mentioned during recent revelatio

Sulphuretted hydrogen was next passed through the dil chamber acid, and the resulting acid would then meet Chairman's requirements. Sulphuric acid produced by catalytic process yielded an acid of still greater purity, the manufacturer was, in his own interest, compelle realise such extreme purity, as otherwise his expen catalytics and apparatus would in a short time be destro Selenium was absolutely eliminated by either the phuretted hydrogen or the catalytic processes, and n occurred in purified acid. The quantity of selenium tained in unpurified chamber acid, prepared from Rio T pyrites, he found to be three parts per million. If sulph acid could so readily be purified, he must for all that op the idea that all acid used should be so treated. superphosphate manufacturer who, in addition to his make, bought large quantities of acid, would otherwis seriously handicapped, especially in foreign competi and it had only quite recently been proved again tha small quantities of arsenic contained in superphos were harmless to the land and to the crops. When extraordinary demand as to purity was made on sulp acid, sold at a few shillings per ton, it behoved then to overlook Mr. Howard's remarks, and he recomme analysts to go to the Royal Institution and look at a b in a cabinet containing the Faraday relics. It was lab "Action of dilute sulphuric acid on green glass bo October 1884," and illustrated this action in a most str manner. He considered it ill-advised to compel m facturers to use any particular kind of acid, but an a ment should be arrived at as to what standard of purit acids used for the preparation of foodstuffs should sa and determine by what method any impurities were ascertained. If manufacturers properly tested their materials such revelations as had recently been made not occur again.

Finally, he advocated dropping the denominations stone, oxide, pyrites, acid, &c., and using the express sulphuric acid free from arsenic, &c., especially in vi the many kinds of raw material available to the manufacturer.

Dr. J. A. Voelcker thought it altogether unnecess use sulphuric acid entirely free from arsenic for u superphosphate. He was aware that statements ha made as to arsenic being taken up by plants; but statements rested upon very slight evidence, and the absolutely no evidence as to the quantity thus tak Nor was there any proof whatever that harm ha arisen to either man or animals through having eaten or foods grown with superphosphate containing arseni thought it was pushing matters too far to yield to h regard to the possible contamination of food products ch had gone through the soil, to which soil a material sibly containing some small quantity of arsenic had haps been added. In the first place, the amount of nic contained in superphosphate was almost beneath ce. One might say that ordinary mineral super- sphate contained less than 0·03 per cent. of arsenic. had tested several samples, and his experience was that l per cent. was an average amount of arsenic to find in n He had also tested the crops grown on land to ch superphosphate containing some arsenic had been lied, and he could not say that in any case had he found indication of arsenic in the grain or crops grown on such l. If there was this lurking danger through the use of rphosphate, what a dreadful state the cattle of the ntry must be in, eating, as they did, some 50 lb. per l daily of roots containing arsenic! He thought that scare was disposed of by the fact that no authenticated had occurred of danger to either the cattle themselves human beings who had eaten the flesh of cattle which consumed such crops. He thought, therefore, that re manufacturers of superphosphates were required to e their products arsenic-free, there should be some lutely definite evidence as to whether arsenic was taken crops or not, and, if so, in what quantity and in what . It would be just as reasonable to object to the use rmyard manure because of the germs it contained, or to se of superphosphates in any form, because sulphuric was employed in their manufacture. The whole ment from the agricultural point of view seemed to to be without foundation.

r. B. E. R. **Newlands** thought it would be interesting e meeting to know Sir Joseph Gilbert's views on this ct of the subject. He had written to him to elicit his ion, which had been given in the following note: "In course of our Rothamsted wheat experiments, I think e years 1845–46, we applied on small patches, side by arsenates and phosphates. The result was negative."

r. Thos. **Tyrer** said that every chemical manufacturer d for an acceptable standard and a reliable test. He, nally, was satisfied with Marsh's and Reinsch's tests ey stood. He had tried every modification that had suggested, and had come to the conclusion that after hat no one was a material improvement on the old sh's method carefully done. Some of the tests, how- seemed to be specially applicable to certain bodies. being so, they should be applied in those special cases. n instance of good work in this direction, he would a paper by E. W. T. Jones (this Journal, 1901, 281). a description of how the Reinsch test should be rmed he knew of no better piece of work. Dr. Messel said, in effect: "Whatever you want you shall have; do not in commercial matters run us into toxicological when you simply want the ordinary thing." In the ent state of their knowledge, and during the present , it would be a mistake to give any guarantee of ical purity. If any guarantee were given, it should the effect that so much of a certain substance being n, no sign of arsenic was exhibited. To that extent he d go, but no further. One of the difficulties from the ufacturer's point of view was how to apply the various , and in that matter professional chemists could help greatly. Mr. Hall had referred to the admirable ratus of Kirkby. When illustrations of it first appeared e papers, it struck his son (Mr. Charles Tyrer) as being brous in certain respects, and he set to work to devise nprovement upon it.

ith regard to the Gutzeit test, most people who had it had obtained adverse results. That was due to the that the early descriptions of its application were not . Now that the doubts and difficulties had been cleared he Gutzeit test was as safe and precise as any other this Journal, 1901, 281). He stood there as a manu- rer and endorsed every word that had been said in the ssion so far, and hoped that the result of this important ssion would be that manufacturers would have some- definite to go upon, and that whatever test were put e next pharmacopœia for arsenic, it would be one that body could understand. With regard to selenium, he and his son had made various tests for that body with arsenic. (Mr. Tyrer here exhibited a series of mirrors showing the results of these tests.)

Mr. F. J. **Lloyd** had been surprised to hear the remarks of Dr. Messel, and still more to hear them supported by Dr. Voelcker. He thought that the manufacturers of acid manures were in a fool's paradise, and would find it out too late to save themselves from foreign competition. There was on the market at present a substance called a "weed killer," which consisted of a compound of arsenic. It was most successful in its operation. How, then, could anyone say that arsenic was not injurious to plants? That arsenic was absorbed by plants there could be little doubt. Dr. S. Vines, in his "Physiology of Plants," stated that this had been proved by Phillips in America; and that not only arsenic but other metallic oxides could be absorbed. He did not believe that the absorbed arsenic went into the food product, for, being injurious to the plant's growth, those which absorbed it never matured. He had recently examined a number of acid manures, and found they all contained arsenic. In one of them he had found as much as 0·3 per cent. That was equal to 21 grains to the pound, and therefore for a heavy dressing of that manure no less than one pound of arsenic per acre would be applied. Hence what really happened was that the farmer, while applying a manure to promote the growth of the plant, was also applying the most deadly poison for plants, and the result of such manuring was not what it should be. From a careful study of field experiments with acid manures during the past 20 years, he had come to the conclusion that the acid manures of to-day did not give the results which the amount of phosphoric acid they contained would justify one in anticipating. Whether these results were due to the arsenic contained in the acid manures manufactured of late years or not, experiments alone could prove. He saw no other explanation of the facts, and, if he were right, manufacturers would have to make their manures from acids containing less arsenic, or those who continued to use the inferior acid would undoubtedly suffer, and suffer severely, from the competition of other manures.

Dr. Bernard **Dyer** regretted that his friend Mr. Lloyd had not taken more to heart the Chairman's suggestion, that in discussing this question all sensationalism should be avoided. If, as Mr. Lloyd averred, superphosphates at the present day did not produce such excellent results as they did 20 years ago, the very obvious explanation was that 20 years ago very little phosphatic manure, comparatively speaking, had been used. The land had been manured for countless years with farmyard manure containing an abundance of nitrogen, with an incommensurate quantity of phosphoric acid, and the land was starving for phosphates. When the new manure was put on the land it produced magical results. Now that the land was used to it, it was not surprising that it no longer produced the same results. At Rothamsted a large number of fields had been manured for 60 years past with nothing but chemical manures produced from sulphuric acid, made, presumably, from arsenical pyrites. If this manure were so dangerous it was extraordinary that at no place could one see finer crops of grain and roots than at Rothamsted. Surely that was the most practical comment that could be made upon the suggestion that these minute quantities of arsenic had any harmful effect upon vegetation. And not only the crops, but the stock at Rothamsted was remarkably healthy and vigorous.

Dr. L. T. **Thorne** said that, while some action was undoubtedly necessary, it was very desirable not to yield to panic. The object of the meeting was to learn the views of both manufacturers and professional chemists as to the limits that might fairly be required. They might look forward to the investigations of the Royal Commission, that had just begun to sit, with both interest and hope, because they knew that it was chosen with care and judgment, and contained men who, from their positions and varied experience, would command the respect of the world. He would not express any opinion as to the Chairman's suggestion of a limit of 1/100th grain of arsenious oxide to the gallon of beer as the standard, because he thought that the Commission, after hearing evidence as to what was the dangerous point, would be able to fix that limit much more efficiently than they could. Speaking from the point of view of the manufacturer of brewing sugars, he was prepared to readily accept whatever limit the Commission might see fit to impose, for it was quite easy to carry the purification to any required standard short of chemical purity, to speak of which was, of course, an absurdity. Even the purest metals were well known not to be chemically pure, and analysts often thought with anxiety of the difficulty of replenishing their stock of pure zinc. With regard to acids, there was no doubt that commercial acid could be and was obtained of a degree of purity amply sufficient for the purpose. The point to be avoided was claiming that commercial acid was or should be chemically free from arsenic. There need be no fear that commercially pure sulphuric acid could not be depended upon with absolute certainty. The selenium scare had been worked up strongly within the last few days, but he agreed with Dr. Messel that they need have no fear of trouble on that account for the method of purification generally used for arsenic removed practically all the selenium also. He had made a number of tests to detect selenium in commercially pure acids, and had failed, even with the delicate codeine test which, in the absence of other oxydising agents, was capable of detecting 1/60th grain per pound of acid. There was of course the medical point of view to be considered. But whether selenium was or was not as poisonous as it was stated to be, there could be no doubt that sulphuric acid could be obtained so free from it as to be absolutely safe. It was essential that a standard of purity should be fixed. From the brewing sugar manufacturers point of view this might be as rigid as they liked, but in fixing it, it should be borne in mind that there were other interests to be considered, and from the public point of view all that was necessary was that they should fix the standard so as to secure the safety of the public health. The next important point which he hoped the Commission would establish was the particular test to be adopted. His own experience of the Marsh test was that it was perfectly satisfactory for the determination of arsenic in any substance he had had to examine. On the other hand, it was necessary to carry it out in a right manner. The number of modifications of it in use were legion, and a good deal of the difficulty which had been found lately was doubtless due to these differences of manipulation. When they had a reasonable limit of purity established, and a carefully defined test and method of carrying it out, there need be no fear of any recurrence of these calamities, and no unfair restrictions imposed on manufacturers or other people, whilst the safety of the public would be assured.

Dr. O. J. **Steinhart** asked where the increased amount of arsenic in glucose came from. Mining friends assured him that arsenic-free pyrites was more and more difficult to obtain. Perhaps this difficulty accounted for the present trouble. How did the manufacture of sulphuric acid by the contact process affect this question? He was told that the elimination of the impurities from sulphurous acid was very essential.

Dr. R. **Messel** remarked that so far the speakers had confined their observations to the investigation of arsenic in foodstuffs, and for this purpose the Reinsch and Marsh processes were practically the only ones available. Acids, however, held so important a part in chemical industry, that he thought they ought to be considered also. From his point of view, as a manufacturer, it would be advisable to adopt as simple a test as possible, and the tin test, he believed, would be found to answer this requirement. It was more delicate than the old Marsh test and could be done in a very short time. Moreover, it avoided all complications with regard to impure or inactive zinc, and it would readily and with certainty determine the quantity of arsenic present. One part arsenic in 184,000 parts sulphuric acid using 1 c.c. of the latter could readily be detected, and considering the delicacy obtainable, using such small quantities, he thought the test might commend itself to their notice, at any rate for the examination of acids.

The quantities used in the above test were 1 c.c. C.O.V., 1 c.c. stannous chloride, containing 1 grm. $SnCl_2 2H_2O$ per c.c., and 2 c.c. strong HCl. On boiling in a test tube a allowing to stand for one hour, 0·00001 grm. arsenic 1 c.c. C.O.V. showed a distinct colour almost immediately

Mr. **Graham Aldous** thought that the Chairman h taken a most commendable course in recommending th this subject be treated in a reasonable manner. T Chairman's suggested standard of one hundredth of a gra per gallon was an eminently safe one. It meant one p in seven millions—a proportion which any man or wom might surely take with perfect safety. He believed that medicinal dose of arsenic might range from one-twelfth one-sixtieth of a grain, the first proportion being giv with circumspection, the latter with an easy mind. If doctor could give 1/60th of a grain in a compa tive small quantity of liquid with impunity, it seem somewhat anomalous to hold up a brewer as a purvey of arsenical beer if his product contained 1/10 grain per gallon. Such action, he should have thoug might have been more reasonably taken on, say, on twentieth of a grain per gallon. There should be so method of testing agreed upon, and no legal action sho be taken if the test did not show arsenic to be present more than an absurdly small quantity.

Mr. A. H. **Allen** protested against the suggestion the last speaker that a definite test should be employ and if a sample passed that test it should be deem beyond reproach. As a public analyst, it would be wit the Chairman's recollection that butter used to be exami by a particular test; but those interested in adulterati butter so manipulated the article, that the butter pas the test, and it was held that public analysts were exceed their duties in going past that particular test. It very desirable to agree on a method of examination arsenic; and he was ready to agree to use what oth had worked and found satisfactory, but only on cert terms. Others might find a certain test excellent, he preferred to use his own tools, to which he accustomed. He did not think this matter could be sett at a single meeting, and he would suggest that a su committee be appointed to issue a report which could discussed at a subsequent meeting. He felt a seri responsibility in certifying samples as containing less th a certain proportion of any particular body. One co not say that there was none. On the other hand, if said there was a trace—well a trace of arsenic was a seri thing, and some over-zealous officials were only too hap to take proceedings without consulting the public anal who had only stated the result of analysis. The quest was a very difficult one, for one could find arsenic almost anything if one only took enough of it. Theref an absolute test of chemical purity would not answer. had adopted a test in the case of beer which answered purpose, and when the test gave no indication of arse he gave a certificate that he had not found any, but he not say that there was none there. Some years ago he concerned in litigation at Castleford, where, in the mak of glass they used about a ton of arsenic a week. It desired to know whether the alleged injury to crops due to the arsenic from the glass works. He there examined certain crops, but found no arsenic in growing plants; he did not examine the roots.

Mr. W. **Martindale**, as a pharmacist, differed f Mr. Aldous's statement that 1/60th grain was the sma dose of arsenic usually given. Smaller doses were quently given, and definite therapeutical effects were obta from half that dose given repeatedly. He quite agreed the Chairman that 1/100th grain per gallon was the ut limit that could be allowed with safety.

Mr. W. **Thomson** said that, with regard to the qua of arsenic that could be taken with impunity, it mus remembered that for eight months the people of Manch were taking large quantities of arsenic, and yet it made a number of people more or less ill, and produc certain number of deaths, all of which were certified t from alcoholic neuritis. It was therefore difficult to what was a safe limit. He felt that the proper course to take a definite quantity of material, say, 10 grms., if by a delicate test, say Reinsch's or Marsh's tes showed a trace of arsenic, then that material was per thing for people to take. Many people were much ;e readily affected by arsenic than others, and they st be legislated for as well as the people who could s arsenic with comparative impunity. With regard to , Tyrer's modification of Gutzeit's apparatus, he would to know whether he had taken into consideration that eniuretted hydrogen was soluble in water to a consider- e extent, and therefore that the wash-water might dissolve arseniuretted hydrogen, and prevent its detection.

Ir. A. H. Lymn, referring to the remarks of two pre- is speakers who had spoken of arsenic existing in glass, having himself had some experience of the glass istry, wished to point out that very few glasses were le without arsenic. It was put in to promote the re- on between and mixture of the other constituents, but t of it went away during the process. Whether what left in the glass of the apparatus used affected the tests arsenic carried out in the same, he very much questioned. had himself carried out numbers of complete glass lyses, and found an estimable quantity of arsenic; but n testing any material for small quantities of this stance in the Marsh apparatus, he had never found that amount remaining in the glass of the apparatus affected result in any way.

r. James Edmunds doubted whether they had yet hed the cause of the recent cases of illness and death. had been in the habit of using arsenic in both hospital private practice, and had usually given doses of one, or sometimes three milligrammes of arsenious anhydride e times a day after food for a good many weeks. He for many years written that prescription, perhaps, ity times a week, and he had never known a case of nical neuritis to result. It was practically very difficult ccount for a fact like that in connection with the present tion. Again, quite recently he had had two very pro- nced cases of neuritis under his care, one of the patients ng been ill for three months and still being confined ed. He had endeavoured in consultation with other icians to discover the cause of that neuritis, but in vain. idea that it might have arisen from alcohol was, he ved, negatived in that case by the fact that the man been an abstainer for life. That showed that such cases rred now and then, and of late these cases had been remarkable than any he had seen before. These facts e him doubtful whether he had got to the bottom of the tion. It had occurred to him that there might be some erial poison in connection with these cases.

he Chairman, in declaring the discussion adjourned, said the next meeting would be devoted to the consideration he analytical processes to be adopted if possible to in a consensus of opinion as to the method, and also the limit of safety, as far as it was in their power to do Unless some agreement were come to no trade could secure. That the same limit for tartar emetic should pplied to beer would be absurd on the face of it. In fication of his suggested limit of 1/100th grain per n, it was a practical suggestion founded on the data ained in the carefully written book by Kelynack and by on arsenical neuritis. If it should turn out that the t cases were not due to arsenic at all, so much the r. In any case, the brewer and the sulphuric acid er should be able to supply the public with articles ely within safe limits.

Meeting held on Monday, March 4th, 1901.

MR. OTTO HEHNER IN THE CHAIR.

efore proceeding with the formal business of the meeting Chairman said that on November 6th, 1899 (this Journal, , 972), when it had devolved upon him to preside in absence of the then Chairman, Dr. Boverton Redwood, ad referred to the loss sustained by science in the death at eminent chemist, Prof. Bunsen. On that occasion he used the following words: "his (Bunsen's) name has a household word for nearly sixty years,—the sen burner, the Bunsen pump,—being familiar to In giving utterance to these words of pious respect d fallen into the common error of associating Bunsen's with the pump, which they owed to their fellow-member, Prof. Hermann Sprengel, Ph.D., F.R.S., as was fully proved by his publications. He (the Chairman) took this occasion to correct the error, by calling the pump in question the Sprengel pump, feeling that credit should be given to whom it was due.

Dr. R. Messel said that it must afford the members great pleasure to hear the Chairman's statement. The world was indebted to Prof. Sprengel for his safety explosives, for his method of exploding semi-sensitive or hydrated explosives by cumulative detonation (now employed to detonate wet guncotton), and for his introduction of picric acid by itself as a powerful explosive, which, as Melinite or Lyddite, had greatly raised the influence of artillery in modern warfare. From none of these inventions had Prof. Sprengel derived any pecuniary benefit; and it was only natural that he should be somewhat sensitive when his discoveries were attributed to others.

ADJOURNED DISCUSSION ON THE OCCURRENCE AND DETECTION OF ARSENIC IN MANUFACTURED PRODUCTS.

The Chairman, resuming the discussion on this subject, said that, having at their last meeting heard the views of manufacturers on the occurrence of arsenic in various manufactured products, it was now proposed to discuss the best means for detecting and approximately estimating arsenic in such products. Every chemist who had approached the question of the detection and approximate estimation of arsenic in beer must have been struck with the fact that, though perfectly well aware of the best methods to be employed for the search for arsenic, he was now confronted in reference to beer with a problem such as had never been faced before. When it was considered that the quantities of arsenic concerned were in most cases excessively small, that in most cases they were absolutely unweighable, it would be seen that they had to deal with an entirely new problem. One of the most important witnesses before the Royal Commission now sitting had given one-hundredth grain of arsenic per gallon as the largest permissible amount. That was a quantity which was equivalent to only 0·6 mm. per gallon. With such small quantities the ordinary methods of determination must fail. It was essential, in the problem before them, that the analyst should not only state whether arsenic was present or not but that its approximate quantity should also be given. They must abandon in such a serious matter the loose verbiage often employed by chemists to the effect that there were "traces" present or "infinitesimal traces"; for the term "traces" conveyed no definite meaning, and its conception varied with each individual experimenter. All chemists were aware that there were two principles underlying the usually adopted methods for the detection of arsenic,—namely, the Reinsch principle, which depended on the precipitation of arsenic on metallic copper in presence of hydrochloric acid, and the principle of Marsh, which depended on the evolution of arsine with hydrogen from zinc or other metal. The Reinsch method was the one first recommended by the Committee, embracing a number of eminent chemists, which dealt with this question in the early stage of the recent poisoning cases. But while the Reinsch method was capable of distinguishing between a really arsenicated beer and one which was almost free from arsenic, it did not enable the chemist to arrive at any approximation of the quantity of arsenic present. It was further found that it was not in all cases reliable as a merely qualitative test; for, if arsenic were present in the arsenic condition, or in organic combination, *e.g.*, cacodylic acid, no deposit was obtained on the copper, while, on the other hand, if sulphites were present, then the copper became tarnished, and it was not always easy to say whether or not arsenic was the cause of the discolouration of the copper, and proof of it could only be obtained by oxidising the deposit, and obtaining crystals of arsenious oxide, or "Marshing" the solution of the deposit on the copper. But even if arsenic were present in the arsenious state, under some conditions no precipitation would take place. For instance, if cane sugar were present, the copper often failed to precipitate arsenic upon its surface on account of the levulose being decomposed by the hydrochloric acid with formation of a pumice precipitate, which continually came off and prevented the arsenic from adhering. He should here state that his remarks throughout were not the outcome of his own experience only, but included that of several friends also, among whom he should specially mention Dr. Dyer and Mr. Ling. The chief defect of the Reinsch method was that it was not quantitative, not even roughly so. With regard to the Marsh test, he ought first to point out that the name was frequently wrongly applied to the Marsh-Berzelius method. About 1827 Marsh introduced the method, which consisted in holding a piece of cold porcelain into the hydrogen flame suspected to be arseniferous, when a black lustrous stain of arsenic would be obtained in the presence of much arsenic. That was a comparatively crude method, and Berzelius modified it by applying to the glass tube through which the hydrogen passed a flame which caused the arsenic to deposit in the tube. The Marsh test was generally used in two modifications. That of Gutzeit depended on the fact that when hydrogen mixed with arsine impinged upon paper containing a metallic salt, such as silver nitrate or mercuric chloride, a more or less deeply coloured stain was produced. The reaction was an exceedingly sensitive one, but it suffered under a number of disadvantages. Other substances besides arsenic would discolour the paper —phosphoretted hydrogen, for example—and there were no means of showing, with absolute certainty, that the stain was due solely to arsenic, however great the probability of its being due to arsenic might be. He took it that in a court of law, in dealing with so important a matter as the occurrence of arsenic in foods, and in rendering a person liable to a criminal prosecution, it would not be sufficient to say: "I obtained a stain which I believe, but am not certain, to be arsenic." Therefore this would never, in his opinion, be a test upon which a prosecution could or ought to be based. He now came to the Marsh-Berzelius test. There existed a voluminous literature on the subject. Some investigators had come to the conclusion that the Marsh test was of a delicacy so great that it was practically valueless, because arsenic could by it be found in almost everything, while others maintained that it was a blunt test, which gave no reaction with minute quantities. He himself had come to the conclusion that both sides were right. The Marsh test might be the most super-delicate or a very blunt test, according to circumstances. All depended upon the investigator's knowledge of the circumstances. One might imagine that when hydrogen was evolved by any of the usual means, the arsenic would be carried off as arsine, and that this, on passing through a hot glass tube, would be decomposed with deposition of arsenic. But, if anybody evolved hydrogen from aluminium and sodium hydroxide in the presence of arsenic, none of the arsenic would be evolved as arsine, because the latter was decomposed and retained by the alkali. This method was excellent with comparatively large quantities, but quite useless in dealing with the very small quantities that might occur in malt or beer. As to the question of the evolution of hydrogen from zinc by means of an acid, there was the greatest diversity of opinion as to how the freedom of the zinc and the acid from arsenic should be ascertained by a blank experiment, and how long a "blank" should be allowed to run. It was immensely difficult to obtain materials from which, in two or three hours' gentle evolution of hydrogen, a trace of an arsenic mirror could not be obtained. In his opinion, there were very few chemicals in the world that would stand a test of such severity, and much of the criticism to which the Marsh-Berzelius test had been subjected was due to the exaggerated expectation that prevailed as to what the purity of chemicals should be. If it were recognised that in order to evolve a gramme, say 11 litres of hydrogen, 32·5 grms. of zinc must be dissolved, and that one-thousandth of a milligramme of arsenic gave a plain mirror in a tube about 0·1 inch wide, it would be recognised that a substance must be of remarkable purity to allow of two or three hours evolution of hydrogen without a trace of arsenic being detectable, for such zinc would contain less than one part of arsenic in thirty millions! If analysts would discard the idea of running a blank for hours, and recognise that, when arsenic is present in solution it is given off in a few minutes, at most in half an hour, they would see th it was useless to carry out a blank to such an extent would be almost certain to vitiate the experiment. A material that would give a perfect blank for 15 minutes w good enough, for any such amount of arsenic as had, f instance, to be dealt with in beer, in solution was a evolved in a quarter of an hour. On adding to zinc a hydrochloric acid, contained in a flask holding abo 250 c.c., and of such purity that in 15 minutes no trace of mirror was obtained, one-hundredth of a milligramme arsenious acid and allowing arsine and hydrogen to ev for 15 minutes, and then changing the tube, it would found that the whole of the arsenic had been evolved 15 minutes, the second tube remaining absolutely clea secondly, in using the Marsh test, he found it best n use too large a bottle. Some experimenters used bot which held three or four litres on account of the frothi experienced with some materials. When it was consider that one had to deal with quantities amounting hundredths and even thousandths of a milligramme arsenic, the absurdity of such disproportion of apparat the quantity of material would at once be apparent. The fore he advised the use of the smallest flask compat with the physical conditions such as bulk of fluid to examined. He considered a flask of about 150—250 c big enough; if he increased the size beyond that he did with reluctance, and only if compelled by frothing of t fluid, but this could mostly be avoided. Thirdly, he h found that hydrochloric acid was better for ev hydrogen from zinc than sulphuric acid, although t contrary was often asserted in chemical literature, becau if the former was not quite pure it could easily be puri by vigorous boiling, whereas sulphuric acid could not be purified. Moreover, a much stronger reaction was obtai with hydrochloric acid than with sulphuric, on taking eq quantities of arsenic; in other words, hydrochloric w more sensitive than sulphuric acid. Above all things was necessary to see that the zinc employed was not o pure but sensitive. It had been pointed out by Dr D some 15 years ago that with certain kinds of zinc he failed obtain an arsenic reaction at all; and he himself had late together with a friend, come across another sample wh was not sensitive to fractions of milligrammes of arse though it evolved hydrogen freely. What was the cause this he could not say, but his experiments had revea another curious fact. The zinc which had failed to g the arsenic reaction was in the form of rods; when th rods were fused and granulated the metal became sensi at once. Zinc suitable for the Marsh test should, theref not only give a good 15-minute blank, but should also g a satisfactory mirror in 15 minutes with 0·001 or 0 milligrammes of arsenious acid. In choosing the quan of a substance to be tested, he first asked himself: "W do I want to find; what do I require from the tes There were some analysts who said "I would rather emp a method which is fairly blunt, so that my conscience m be easily at rest." That might be an easy way of escap a difficulty; but he thought rather that it was the anal business to find what was present, and draw the between that which was important and that which irrelevant. What that line might be in all cases he did at present know. He had suggested that an arbitrary might be drawn, and by the chemist, not by the m itself. He found that he could discover the one-thousan a mm., or 0·000001 grm. of arsenic in 100 c.c. of a so There was no difference whether that quantity were c tained in 10 c.c. or in 100; after 15 minutes both gave same density of mirror. Now, if 10 c.c. of beer, for insta readily showed 0·000001 grm. As_2O_3, then such beer w contain 0·007 grains per gallon, an utterly insignifi quantity. To search for less was objectless. He faile see therefore why he should take a gallon when he could 10 c.c. do all that might reasonably be required of the ana He took a flask holding about 250 c.c., fitted it with a or india-rubber, doubly bored. Through one hole of cork passed the stem of a tapped funnel, the exit being connected with a tube holding a long scroll of lead acetate paper, then a plug of cotton wool, then gr lated calcium chloride, about 3 inches in length, er plug of cotton wool. To this tube is joined the glass tube, quill size, drawn out in the middle to a ness corresponding to the standard wire gauge No. 13 2 inch) at the place where the arsenic mirror would its appearance. The end of the hard-glass tube was a out finely and bent upward at right angles, as usual.

o the flask about 10 grms. of the best arsenic-free zinc able were introduced, together with about 5 c.c. of . Then the hydrochloric acid, which must have been ghly well boiled previously, was slowly dropped in. about 10 c.c. had been added a quiet evolution of gen took place. The hydrogen issuing from the end tube might be ignited without any fear of explosion, otton wool ensuring absolute safety, while the narrow of the hard-glass tube rendered flashing back as far first cotton-wool plug, a rarely occurring matter. hydrogen flame, while oxygen was still present, very pointed, but gradually became rounded at p. Heat, by a good Bunsen flame, could now be d to the hard-glass tube, at the spot where the tube to narrow. The time should be noted, and the flame away exactly after a quarter of an hour. The tube hen be perfectly clean. If it were not, it must not cluded that the chemicals were impure. Change the take either a new cork, or chop up pieces of the old into fragments, warm them with a little of the chloric acid and introduce them or the decoction into sk to see whether the arsenic proceeded from the If pure chemicals giving a perfect quarter of an blank were secured, introduce into the flask, by of a very dilute solution, two-thousandths of a mgrm. enious acid, and continue the experiment for a r of an hour. Generally it was best to operate with in hand. Care must be taken that the evolution of drogen was steady, and that the flame of it did not about two mm. in length, or the mirror would be over a great length of the narrow tube instead of short and sharply defined at the end nearest the If a tube with two constrictions was taken and two were applied at the same time near the constrictions ne mirror was obtained at the first constriction, g, conclusively, that the whole of the arsenic was ted by one heating, always, mark, with quantities not exceeding one-hundredth of one mgrm. Mirrors ore than 0·015 mgrm. were so dense, that they did ow of any exact comparison being made. When cond tube, of a second 15-minutes test, showed no of arsenic, another quantity of arsenious acid was uced, and thus a scale of standard mirrors was pro- allowing readily of an estimate of one-thousandth gram. The mirrors were sealed up in the tubes still full of hydrogen, and were mounted on a glass r a white card, preserved in the dark. It was not ry to recharge the apparatus afresh every time, but rse if a substance had been met with containing a quantity of arsenic, the whole apparatus must be y cleaned out and a fresh blank be made before ling with a new test. When beer had to be tested, en was allowed to evolve till all air had been driven out. 15-minute blank was made; then 10 c.c. of the beer owly dropped in by the funnel, being most careful introduce any air, as a trace of air might burn the ngly minute amount of arsenic to be dealt with. er must drop in slowly, or frothing was persistent noying. The beer need not be concentrated or treated way; if frothing was persistent, a little strong alcohol be added, but additions of any kind, including that inic chloride should be avoided if it were at all e. Of sulphuric acid 10 grms. should be taken and with water; if the mirror proved too strong, repeat less quantity. The same amounts of glucose and r might be taken. In the case of malt 10 grms. ashed in dilute hydrochloric acid, first cold, then hree or four times repeated. Thus in at most half an e detection and approximate estimation was complete, legree of accuracy quite unattainable by any other h.

nirror were examined microscopically it was seen to of arborescent heads of elementary arsenic; if there were crystals of arsenious acid in it, then air had been admitted, and the test was, for quantitative purposes, valueless. Now came the important question of the identification of the mirror as due to arsenic. Nothing was simpler: Take the tube away from the apparatus, remove all hydrogen by suction. Fuse off the narrow part of the tube on both sides of the mirror, so that the latter was now hermetically sealed in a capillary tube. Heat a pair of forceps till nearly red-hot; hold the capillary tube with these at one end, and draw the tube gently through a flame, making it equally hot throughout till the mirror had disappeared; it was oxidised by the air in the tube, and no arsenic had a chance to escape. On cooling the tube and examining it with a strong gas-light the naked eye could see the glistening of arsenious acid crystals, even if the amount of arsenic were as little as one or two thousandths of a milligramme. Microscopic examination, which was however, quite unnecessary, showed the shape of the magnificently well-formed octahedra and tetrahedra characteristic of arsenious oxide. There was thus detection, estimation, and identification of arsenic combined in one operation. But he had never yet met with a mirror which did not consist of, or which at least did not contain, arsenic. The mirror might not consist totally of arsenic, but he believed it did. Selenium or tellurium did not in the least interfere with the production of the mirror, as the former was entirely retained by the lead-paper, and the latter did not give a mirror even if there were no interposition of lead-paper. He had tried the Marsh-Berzelius test, as described, and it had worked most admirably well in his hands, and he could most cordially recommend it.

In reference to the Reinsch test he would further observe that even when the deposit on the copper was dissolved off with hydrogen peroxide and pure sodium hydroxide and the solution "Marshed," the mirror obtained was never so dense as that obtained by "Marshing" direct, showing that the deposition on copper was not quantitative. Arsenates which gave no reaction with Reinsch gave the same density of mirror as did arsenites, but rather more slowly. Organically combined arsenic in form of cacodylic acid gave a Marsh mirror as readily as did inorganically combined arsenic. This was important in view of the possibility of the arsenic in beer not being present in inorganic combination, but in organic, in which case the Reinsch test left one perfectly in the lurch. As to the drawing out of hard-glass tubes to the exact scale which he had described, and which he had always used, there was no difficulty with a little practice. Nitrates, contrary to assertions, did not in the least interfere with the Marsh-reaction, nor did any substance which he had experimented with.

Dr. Divers inquired whether the inactivity of the zinc to which the Chairman had referred was not due to the absence of lead.

The Chairman replied that if merely melted and cast, it became active.

Dr. Divers asked whether, in melting, the addition of a little platinum chloride did not help it.

The Chairman replied that the addition of platinic chloride had a tendency to make the reaction less delicate.

Dr. L. T. Thorne said that his experience was that although granulation undoubtedly improved the zinc it did not fully account for its sensitiveness, and something else must take place. He had granulated a small quantity of zinc and got high sensitiveness, and then with the next quantity only partial sensitiveness.

The Chairman replied that probably what happened was that an impurity, such as carbon, was present. By slow cooling pure zinc and zinc carbide, or something analogous, separated, the crystallised substance thus constituting a battery by which arsenic was thrown down. By the melting of such zinc some of the carbon would be burnt away. Possibly a trace of selenium made zinc less sensitive.

Messrs. B. E. R. Newlands and Arthur R. Ling then gave a communication as follows:—We must all agree with our Chairman that it is distinctly wrong to raise charges against food vendors simply because some chemist has discovered infinitesimal traces of arsenic. One of the first points, in fact, to be agreed upon at the present juncture is, where the limit shall be fixed in order to ensure the safety of both the manufacturer and the public, and in considering this question, we as chemists can only be guided by what the medical authorities tell us. There are several other phases of this important subject we are now discussing on which there is equal need of agreement, and the next in order is the method to be adopted—a question which can only be decided by the chemist himself. It is on this point that we venture to offer some of our experiences. Before doing so, however, we may say that no matter from what standpoint the question be viewed the method chosen must be the one capable of the greatest accuracy. It would seem, therefore, that the chemist in certifying minute amounts of arsenic, providing his results are accurate, is only acting in the best interests of his clients, be they manufacturers or private individuals.

Some compounds of arsenic are more toxic than others; and we do not know at the present time the state in which arsenic exists in foods. Nor are these the only reasons why the analyst should take into account amounts of arsenic less than those which are actually harmful. Thus, if several of the food materials we consume are contaminated with minute traces of arsenic, we may, from all sources, be taking medicinal doses.

Now the amount of arsenic which may be regarded as the limit permissible in any given substance will naturally depend upon the maximum amount of that substance used either directly or indirectly for food purposes. If we adopt the limit of one-hundredth of a grain per gallon in the case of beer, as suggested by the Chairman, then we must ensure that all the materials used in the production of the beer contain less arsenic than could possibly give that amount. In the case of sugars there is no difficulty in detecting an amount of arsenic equal to one-thousandth of a grain per pound, which is a proportion equivalent to one-hundredth of a grain per gallon in a liquid. Now even supposing such a quantity commonly occurred in sugars, which is certainly not a fact, taking the maximum proportion in which sugar is used by brewers, it would only contaminate ordinary beer to quite a negligible extent. Then a similar amount (0·001 grain per pound) can be readily detected in malt, and the amount of arsenic in a beer brewed entirely from malt introduced by malt contaminated to this extent would be far less than 0·01 grain per gallon. The same minute amount of arsenic can be detected in other materials which the brewer employs, and he may rest assured that if these are properly tested, his beer can contain only negligible traces of arsenic.

The whole of our experience during the past few months in detecting minute amounts of arsenic has been with the Marsh and Reinsch methods, and, as in our hands the former has proved the more delicate and widely applicable, we have for the most part adopted it. We have no doubt, however, that by operating upon a sufficient quantity of material and taking the necessary precautions, the Reinsch method is capable of detecting 0·01 grain of arsenic in a gallon of beer, but in our experience amounts of arsenic in cane sugar exceeding 0·01 grain per pound would escape detection by this method. Our attention was first directed to the fact that it is impossible to detect comparatively large amounts of arsenic in cane sugar by Dr. Bernard Dyer. The cause of this is, we believe, the humous matter produced by the decomposition of the laevulose on being boiled with hydrochloric acid, and we may remark that with other sugars which are not so readily decomposed the Reinsch method works more satisfactorily. In the case of cane sugar, working in a 10 per cent. solution, which is a dilution we do not feel safe in exceeding, the decomposition of the levulose is so great that the copper is, as a rule, at the end of an hour completely occluded by humus. We have obtained some experimental evidence that the failure of the method with cane sugar is not entirely due to the protection of the copper by humus, but that the arsenic is actually removed from the solution by the latter in preference to being deposited on the copper.

There is, however, another reason why we prefer the Marsh method to the Reinsch. It is, that by working under standard conditions, as Mr. Hehner has described, it may be made to yield quantitative results.

Working in this way we find it possible to detect 0 grain of arsenic per gallon in beer employing 10 c.c. of sample, and 0·001 grain of arsenic per lb. in a sugar malt employing 10 grms. of the sample. This correspo with 0·0000014 grm. of arsenic in each case. For pract purposes we think that at least 20 c.c. of beer or 20 gr of a sugar or malt should be taken.

It is interesting to note that working on three 10-g portions of cane sugar (which had given negative res by Marsh's method), to which were added respect'v 0·002 grain per lb. of arsenious oxide, and the equival quantities of arsenic oxide and arsenious sulphide in e case mirrors of practically the same depth were obtai It is important to note that in the case of the experin with arsenic oxide a quarter of an hour had elapsed be the mirror commenced to appear. This leads us to sug that after introducing the substance to be tested into Marsh apparatus, the experiment be allowed to run half an hour.

We find that using the same zinc and with equal kn quantities of arsenic the mirror obtained when hydrochl acid is employed is more intense than that produced w sulphuric acid is used to generate the hydrogen. We l at present no explanation to offer as to the reason of It has also been observed by us that different samples of exhibit different degrees of delicacy as regards the detec of arsenic—a fact which we believe was first drawn atte to by Dyer (Proc. Chem. Soc. 1893, 120).

Some few weeks ago we fermented some worts to w arsenious oxide at the rate of 0·04 and 0·08 grain per g respectively had been previously added, together wi small amount of a sulphite, our primary object at the being to ascertain whether the sulphuretted hydro which is always formed when worts containing sulp are fermented with yeast (Windisch, Wochenschr. Br 1900, **17**, 91; see J. Fed. Inst. Brewing, 1900, **6**, would precipitate the arsenic. The results were nega after three days' fermentation the same amounts of ar were found to be present as at the commencement o experiments. The experiments also indicated tha development of the yeast does not cause the diminuti the arsenic, which seems also to be confirmed by so other experiments since made.

O. Emmerling states (Ber. 1896, **29**, 2728) that ord beer yeast ferments arsenical glucose without causin evolution of arseniuretted hydrogen; and in conn with this matter it is of interest to mention that observed some years ago that the cause of poisonin arseniferous wall papers was due to the action of c micro-organisms which during their development giv to the production of a gaseous compound of arseni appears that mould fungi in particular have this fa and, according to Gosio (Ber. 1897, **30**, 1024), a them *Mucor mucedo* and *Aspergillus glaucus*; this further states that he isolated an organism from n wall paper which exhibited the power to a pronc degree, and to this he gives the *Penicillium brev* When this organism is cultivated in a flask on arseni media, so poisonous is the gas evolved that a mouse in the flask died in a few seconds. It has recently proved by P. Biginelli (Atti R. Accad. dei Lincei, 1900, **9**, [11], 210 and 242) that diethylarsine is, events, one of the substances produced in this way.

Various authors have suggested as a method of de arsenic the production of the garlic odour which is c when certain mould fungi are allowed to devel arsenical media, and according to Marpmann (Centralb. 1900, **41**, 666) the various *Penicillia*, *Asp* and *Mucors* serve for this purpose.

We have recently commenced some experiment worts containing 0·1 grain per gallon of arsenious These were sown with mould fungi, but in no case l observed the production of a garlic odour, nor ha been, even after a week, any diminution in the of arsenic present in the liquids. These expe are only preliminary, and we hope to repeat the pure cultures of moulds. It appears to us of int ascertain if diethylarsine is formed by the growth of in liquid media, such as beer wort containing arseni s we are aware, the experiments we have quoted were acted with semi-solid media. We do not consider that results with the fermentation of arsenical worts with are conclusive, and we intend to repeat them.

r. A. H. Allen said that for his own part he had r distrusted the quantitative indications of the Marsh-elius test, and he was glad to have learned from Hehner the best way of applying it. On the other , he had been content to aim at a lower measure of ey and had employed a modification of Reinsch's test. is he could readily detect one-hundredth of a grain of ious oxide per gallon, working on 100 c.c. of beer, was, of course, a larger quantity than Mr. Hehner yed. Some chemists, in applying Reinsch's test, were at to boil the suspected liquid with hydrochloric acid opper, without taking any precautions to ensure the ce of sulphites or other substances capable of giving a dark deposit on the copper, or taking care that rsenic was in the arsenious condition. In his ience, Reinsch's test did not indicate the presence enic when in the form of arsenic acid or an arseniate, rate until after prolonged boiling, during which it robable that traces of cuprous chloride were formed reduced the arsenic to the arsenious condition, when lily reacted with the copper.

the determination of arsenic in beer, he also began ositing the arsenic on copper, working in the following r:—

litre or 500 c.c. of the beer, according to the strength qualitative indication of arsenic, was evaporated down ut 200 c.c. in a porcelain basin, about 20 c.c. bromine- and 20 c.c. hydrochloric acid added, and the excess mine boiled off, the volume of the liquid being kept ut 200 c.c. A few drops of a freshly prepared n of cuprous chloride in hydrochloric acid, and three r pieces of pure copper foil were then added, and ling continued for half an hour. The pieces of copper removed and replaced by fresh ones till finally no ing took place. They were then treated in a beaker ydrochloric acid and crystals of potassium chlorate, care to have excess of the latter, till the arsenical was removed. The solution was warmed till free e oxides of chlorine, and transferred to a distilling In more recent experiments a good alternative, and e respects preferable, method, practised by Dr. John and Mr. E. W. T. Jones, had been used. This cover the pieces of copper in a beaker with water, out 10 c.c. of 5 per cent. caustic soda and ten drops tion of hydrogen peroxide, and allow to stand in the ll the arsenical coating was dissolved. A few drops cuprous chloride solution and about 15 c.c. fuming hloric acid were added and the liquid distilled into ill the liquid in the flask measured about 15 c.c. The tion was repeated with 20 c.c. fuming hydrochloric e distillate rendered alkaline with ammonia, and then acidified with hydrochloric acid, keeping it cool by ion in water. It was then finally neutralised with bicarbonate, a slight excess of sodium bicarbonate and the liquid titrated with N/200 iodine solution starch as an indicator), 1 c.c. of which represented 475 grm. As_4O_6, or 0·00025 grm. *nearly*.

ank determination should be made on the reagents ed, the amount of iodine solution required being ed. The hydrochloric acid, copper, cuprous chloride, soda, and hydrogen peroxide were all liable to contain r less arsenic.

erting to the question of Marsh's test, he personally he preference to hydrochloric acid, though it had ondemned by very high authorities. It was remark- at some observers found platinic chloride to be onable, as it had been highly recommended by He had felt no inclination to employ Gutzeit's , though it was undoubtedly delicate, it was open to objections, amongst which was the fact that the on was simply a yellow stain, instead of a character- rror or crystals of arsenious oxide, which appealed far more strongly as a positive proof of the presence nic.

The Chairman, referring to Mr. Allen's remarks, asked what he would do in the case of a beer containing even a large amount of arsenic, say, one-tenth of a grain per gallon, which was equivalent to one and one-third mgrm. of arsenic per litre. He would be surprised to learn that that amount could be accurately titrated. Being so small in quantity, the operation must require considerable skill.

Mr. Allen replied that a narrow burette was necessary, one having 20 divisions to the cubic centimetre being suitable. As 1 c.c. of a 1/200th normal solution of iodine (= 0·635 grm. per litre) represented only one-fourth of a milligramme of arsenious oxide, a litre of beer containing 0·0013 grm. would require something over 5 c.c. of iodine solution.

Mr. L. Archbutt said he could quite confirm the delicacy and accuracy of the method of titrating very small quantities of arsenic with centinormal iodine. He had taken, as an experiment, about 5 mgrms. of As_4O_6, distilled it over with HCl, precipitated the As_2S_3 by adding zinc sulphide to the distillate, filtered the precipitate, boiled it with water, filtered again, and titrated the As_2O_6 formed, with a loss of only 0·025 mgrm.; thus:—AS_2O_6 taken; 0·00475 grm., found 0·00450 grm.

Mr. Forbes Carpenter asked if the Chairman referred to arsenicum or arsenious acid.

The Chairman replied, that in every case he had meant arsenious acid.

Mr. F. C. J. Bird asked whether the scale of correct deposits was prepared by adding arsenious acid to water or to beer. It was stated that sulphur in any reducible form combined with a portion of the arsenic, and prevented it from depositing during the test. Personally, he thought that statement was open to question. He had taken one-twentieth mgm. of arsenic and mixed it with sufficient acid to contain a thousandth of its own weight, and passed it through small bottles containing lead acetate solution. From that mixture he had obtained a mirror similar to one given by the same amount of arsenic in the ordinary way. Very little had been said about Gutzeit's test. He had always found it extremely useful as a preliminary test, although it was open to certain objections. For instance, it was generally considered a merely negative test, but that was not so. If applied to the detection of arsenic in coal-tar colours, no effect was obtained under ordinary conditions; but if one heated the solution to boiling, and added more acid from time to time, one obtained the arsenic stain in its full intensity. He was glad to hear the Chairman refer to hypophosphites, for this was an impurity which had been overlooked by all who had proposed to ensure the accuracy of the test by passing the evolved gases over lead acetate or through solution of lead acetate. In the case of Gutzeit's test, the only safeguard was preliminary oxidation. For ordinary chemicals hydrogen peroxide was useful, and for others bromine. It was necessary to heat the solution and add acid, as he had said. The oxidised arsenate shown by Gutzeit gave a stain equal in intensity to the arsenical test of Reinsch. One authority had stated that the presence of chlorides was prejudicial to Marsh's test. He would like to know whether that was so; and also whether, in working with such small quantities as had been mentioned, the presence of large quantities of organic matter interfered with the detection of the arsenic.

Mr. J. L. Baker said that it seemed highly desirable that chemists should use one method only for the estimation of small quantities of arsenic, and that with rigid conditions. In so delicate a test as the Marsh-Berzelius, the smallest divergence from arbitrary standard conditions made an appreciable difference in the results, and until a procedure was formulated by some committee of chemists no agreement of results could be expected. The most convenient way to test malts was to treat 10 grms. of the whole malt for 15 minutes with dilute sulphuric or hydrochloric acid. Comparative experiments with ground malt gave practically identical results. When using the method advised by Mr. Hehner it was easy to estimate 1/1000th grain of arsenious acid per lb., using 10 grms. of malt. Nearly all anthracites contained traces of arsenic, gas coke in many instances heavy traces; and most malts containing arsenic would be found to have been kilned with fuel containing a certain amount of coke.

The Chairman said that it made no difference whether in the density of the mirror a few 1000ths of a mgrm. of arsenic were added to quantities of water or to beer. Beer presented the mechanical difficulty that it was apt to froth, and must, therefore, be introduced quite slowly into the flask; but when once in it went quite smoothly. It made no difference if any organic matter were added. As to the interference of chlorides, there was absolutely nothing in it. It was also said by Blondlot that nitrates interfered with the test, but he had added some nitric acid to the zinc and hydrochloric acid, and found that it made no difference. He thought that, speaking generally, there had been a lot of loose talk about this matter in the past. Another objection to the Gutzeit test, beyond those he had previously referred to, was that, whilst with the Marsh test one could easily regulate the evolution by the size of the flame, in the Gutzeit test one had no such indication. In testing glycerine for arsenic by the test prescribed in the pharmacopœia, if the zinc happened to be very pure, there was no evolution of hydrogen at all, and one might report arsenical glycerine to be pure according to the pharmacopœia test. But as soon as heat was applied, hydrogen was evolved and a reaction obtained.

Mr. A. E. Berry said that he had been working the Reinsch test with a modification which he thought considerably increased its sensitiveness, and which consisted in introducing the copper at intervals of a quarter of an hour instead of all together. Boiling was continued for one and a half hours, and four pieces of copper were introduced separately every fifteen minutes during the first hour, and any sulphide that might be present was deposited upon the first or second copper, and any arsenic that might be present was left to be deposited upon the later coppers. He did not agree with the Chairman that a slight deposit of sulphide upon the copper did not affect the deposition of arsenic; he believed that it was necessary the copper should possess a clear bright surface, and this might account for the difficulty some speakers said occurred when testing cane sugar and other bodies by this method, as these substances might give rise to a deposit of humus or other organic matter which would interfere with the deposit of arsenic. He had examined a sample of yeast quite recently by the Reinsch test, and when adding all the copper together at the commencement in the ordinary way obtained no indication of arsenic; but, on testing the same sample of yeast with the modification above mentioned, a distinct deposit of arsenic was found on some of the coppers, and the crystals afterwards readily recognised.

A possible error when testing for arsenic by the Reinsch test might occur in consequence of arsenious chloride being volatile under certain conditions. If, for instance, the solution under examination became too concentrated, and at the same time contained a large percentage of hydrochloric acid, it was possible that arsenic might be volatilised and lost.

Mr. A. C. Chapman said that in a discussion at the Society of Public Analysts on this subject, he had suggested that the Reinsch method was an admirable one for dealing with the detection of traces of arsenic in beer. Two months had passed since then, and yet he had nothing to add, save that his limit of sensitiveness in regard to this test had gone up enormously; and he felt convinced that the Reinsch test was, for the purpose of "sorting," the most generally serviceable for the food chemist, although attention had been directed by Dr. Dyer to one of its limitations. He found that he could detect with perfect ease and absolute certainty the 1/150th of a grain of arsenic per gallon in beer, and he had also, in numerous cases, tried the two tests side by side, and found that the results obtained by the one confirmed those given by the other. When they got down to infinitesimal quantities the ratio of experimental error to quantity to be measured became seriously great. He had on several occasions applied to the quantitative determination of arsenic the method of working described by the Chairman, and found it to answer extremely well. He had not worked by titration, and thought that course was open to objection. With regard to the other two tests, the objection wa fundamental one—that they did not give any tangible recognisable arsenical compound. One had a stained pa which might be due to arsenic, probably was due to it, might be due to something else; whereas, if one ha mirror or definite crystals, it admitted of no contradicti He had also made experiments in connection with the de mination of minute quantities of arsenic, by comparison his mirrors with standards. That was practically the met to which he was at present reduced; but he never justified in going further than the 1/200th of a mg There were certain points in which he considered that Reinsch test had an obvious advantage over the Marsh He could not confirm Mr. Baker's results on malt. had never been able to wash out the arsenic. He generally found larger indications when he worked on whole malt than when he worked on the acid extract. using Marsh's test one could not well deal with more 10 grms. But the arsenic in malt was not evenly tributed, consequently 10 grms. was not a reliable quant and a test which enabled one to work on 100 grms. tend to eliminate that source of error. And so the Rei test was greatly superior to the Marsh test for malt, altho the latter would have to be employed for purpose estimation. With regard to the question of arseni malt, Mr. Baker had suggested the 1/2000th grain pound. He thought they might just as well claim chea purity at once. Moreover, the results of numerous ex ments tended to show that the whole of the arsenic w might be found in malt did not necessarily find its into the beer.

Mr. A. Angell said that in two instances he had f arsenic in sweetmeats; but though he had examined samples of beer and nine samples of malt from all par Hampshire, he had not found a trace.

Mr. Graham Aldous said that at the last meetin had taken the view that the limit of arsenic permiss beer proposed by the Chairman was somewhat unrea able. He now must somewhat qualify that opinion, fo felt that it was out of place for any but a skilled scienti dogmatise on the matter. He supposed, however, th standard would be fixed, and would indicate the possible amount of arsenic that would be harmful to public health. The brewers might be depended upo render every assistance. At present arsenic was *bête noir*, and they were even rejecting samples of ordi scrubbing and cleansing materials like soda, becaus analyst could not certify them as absolutely free fro That showed their sincerity in the matter, and anxiety, not only to brew beer absolutely free from a in any form, but also to keep away from their premise substance containing traces of it. Even if they dre line at a certain point and found arsenic outside that he thought that the brewers arm should be jogged b analyst, and that he should be cautioned to investiga materials and get even that infinitesimal amount out beer. They had referred to 0·007 grain per gall something outside the amount of arsenic which probably be deleterious found in beer. If to that added 0·0038 grain, which was less than half that o amount, they then came to the line that was pro to be drawn, namely, 1/100th grain per gallon. It se a little strange to an ordinary mind, that the ad of less than half an extremely minute and safe qu should at once bring them to the danger line.

Mr. Main asked if it were necessary that glucose s contain quantities of sulphites. Also whether i necessary to remove them before using Marsh's te whether the lead paper would sufficiently remove when the test was made.

Dr. L. T. Thorne desired to testify to the value of th Marsh test as described and carried out by the Cha He quite agreed as to its extreme delicacy and relia With regard to the sensitiveness of hydrochloric ac sulphuric acid, his experience was not quite the sa other speakers. The difference was very small, bu really pure sulphuric acid one could get almost if no as accurate and delicate tests as with hydrochloric The manipulation of the Marsh test was reasonabl ertain, and he agreed with the Chairman that it had great advantages over the Gutzeit test, which was out of the question for this purpose. He was not quite f he understood Mr. Ling correctly, that he desired to e limit at 1/1000th grain per pound. If so, he should his protest, as he thought there were very few chemists nstantly at work on the test who could say definitely er a solid organic substance contained such a small ity or not. If they carried the point to that extreme cy they would enter the regions of controversy, and would be continuous difference of opinion between nt analysts. The degree of 1/1000th grain per pound ith substances such as malt was far beyond the point ible danger, and would, he considered, pass the point ertainty: he entered his protest from that point of not from the point of view of the impossibility of ing that degree of purity. They must have a limit which should be determinable without doubt. With limit there was certainty; but if they fixed a limit as far more delicate than was required by public and at the same time entered the grounds of ersy, as he believed such a limit would do, then the of the limit would do more harm than leaving matters were.

A. R. Ling said, with regard to the Reinsch test, had some evidence that, as ordinarily carried out, of the arsenic was not collected on the copper. e had tested malts by the Reinsch method, using ms. of the sample for the test, and subsequently ng off any arsenical deposit from the copper and cing the solution into a Marsh apparatus. The btained in this way was much less than was obtained e same malt by applying the Marsh test direct to quite agreed with Mr. Chapman's view as to the lity of testing several samples of the same malt han one sample of 10 grms., as arsenic, if present, er evenly distributed over the whole bulk.

Adair Roberts regarded the discussion as extremely ing and instructive from the analytical point of view. ey were a society of industrial chemists, and what nted was a standard that would be practicable and and, up to the present, they had not got much in the solution of this question. The procedure in should above all things be uniform. As an instance esirability of that, he might mention that he knew cent case of a sulphite salt being submitted to ation by seven chemists. Five of them pronounced rom arsenic, the other two reported having found hus giving controversial results. There ought to be ard by which food products could be declared free rsenic even though they did show a minute trace n exhaustive experiment.

Thos. Tyrer said that what manufacturers wanted tandard. Some points had been made clear. One, was not desirable that tests should be excessively . Many products which were used largely in the domestic life, and even in medicine, were never d absolutely free from appreciable traces of arsenic, er had been. Eminent men, whose evidence as s carried great weight, had said that they dare not there was 1/3,000,000th part of arsenic present, but there was 1/1,000,000th. As a manufacturer of eutical preparations, which were more important r, he had to deal with the presence of arsenic. Let e careful that they did not do harm to existing es. There was a tendency among purchasers to Let us get our things from Germany." If they did would not be found better than English goods, and ald not be able to get hold of the German house de them. As to whether the conditions defined by irman were too fine or not fine enough, they must, umed, await the outcome of the Commission now On that Commission were men competent to the interests of both public and manufacturers, and every confidence that the result of their enquiry e for the general good.

Tyrer here exhibited some tubes showing ying quantities of material (zinc and acid) in similar apparatus; the mirrors were uniform; with same proportional capacities in generating flasks, (*b*) varying amounts of all materials; the mirrors varied proportionately.)

Here, then, was a new condition. If the size of the apparatus were taken into account the same substance under the investigation of various skilled operators would give results which would vary immensely. It was clear that this consideration of capacity in proportion to quantity might be important. His son had made a suggestion in explanation which he had not yet had time to fully consider, namely, that the quantity of hydrogen generated was so great in proportion to the amount of arsenious acid in the solution that probably the latter was driven out. Against that theory there was the advice that the evolution of the hydrogen should be allowed to go on for an hour and a half, which time, however, their Chairman reduced to 15 minutes. However, they were not left altogether in doubt on that point, for in Roscoe and Schorlemmer's Chemistry, the Marsh-Berzelius test was fully described, with the size of the flask, the degree of dilution, and every condition which should secure uniform results. The results which he had just laid before the meeting were obtained by carrying out those conditions. It was absolutely necessary that they should know exactly where they stood. It had been laid down that chemical purity was but a comparative term; then what was to be the limit of impurity. It was necessary to have something definite.

The Chairman said that, notwithstanding the late hour and the exhaustive summing-up to which they had just listened, he would like to give the impression the two evenings' discussion had made upon himself. He had thought it his duty to bring forward some suggestions as to limits for consideration of the various manufacturers concerned, but while many had been willing to criticise, but few, among whom was Dr. Messel, had come forward with a definite statement as to what a manufacturer was willing to undertake practically. He was therefore somewhat disappointed in the results of the discussion, for little assistance had been given them in arriving at a limit. The limit of safety in food materials was really a question for medical men; nobody else could say what was the limit outside which arsenic would be dangerous to the public. They themselves could only be guided by recorded cases. Beers containing 0·02 grain per gallon of arsenic were said to have produced injury; he had, therefore, suggested the half of that quantity as the limit of safety, and he found his suggestion confirmed by the first witness before the Royal Commission on the subject. If 0·01 were to be the limit for beer, it would be easy to arrive at the limit for glucose and sulphuric acid. Then he was met by the statement that whatever was the limit for beer could not be applied to tartar emetic. Of course not! but when the proper time arrived Mr. Howard and Mr. Tyrer would assist them in arriving at their limits; for the present they were discussing beer and materials involved in its manufacture. Then they had gone on to the discussion of the analytical processes to be used, and had tried to arrive at unification. He fully recognised the difficulty of the subject. Before they could lay down limits they must be sure of being able to detect impurities down to and beyond that limit, and for that they must have a definite method; for no two were alike in their results. Therefore he had suggested a method of working and must express his thanks for the kind manner in which it had been discussed. He hoped that members would realise that a limit without a method was a fallacy. If the limit were to be settled by the Royal Commission, they ought to be ready with the method, and not trust to the Commission for that. That was his reason for going into minutiæ that evening to a degree that he felt was beyond the proper function of that Society. It had been said that wherever 12 analysts were gathered together there would be 13 opinions, each one being sure that he knew better than his fellows, because each one had experience mainly of his own particular way of working. Therefore it was exceedingly difficult to obtain adoption of any one method, however well it might be shown to work in some hands. In order that the discussion should lead to a definite result, he suggested that the Section should appoint a Committee to work out and report upon a method.

He suggested that this Committee should be representative of all interests concerned, the manufacturer of sulphuric acid and of drugs, the maker of glucose, the brewer, the analyst, the excise.

Mr. T. Tyrer said that the Chairman was labouring under a wrong impression as to the attitude of manufacturers on this question. The Chairman's argument went to show that they were more uncertain now than ever on this question, whereas he had said that the discussion had let a little more air and light in on it. What was to be the position of the poor man whose goods were reported as containing arsenic? If he went to the medical man, he knew what a medicinal dose was and what over-doses would do. But the conditions were different in different cases, and therefore all turned on what was the limit to be allowed. The pharmacopœia said "none" in all these cases; therefore that was no guide. All he could say was that he, in making ordinary chemical articles, was not going to guarantee absolute chemical purity when arsenic could be demonstrated to the seventh place of decimals.

A Committee consisting of the Chairman, Messrs. A. C. Chapman, A. R. Ling, A. H. Allen, Dr. L. T. Thorne, Grant Hooper, Dr. R. Messel, D. Howard, C. Estcourt, and George E. Davis was then elected to work out and report upon a method of testing for arsenic.

Manchester Section.

Meeting held on Friday, March 1st, 1901.

DR. GROSSMANN IN THE CHAIR.

THE TREATMENT OF NOXIOUS VAPOURS FROM TAR DISTILLATION.

BY JOHN CRAVEN AND W. H. COLEMAN.

Since the early days when coal tar was first produced in quantity as a by-product arising from gas manufacture, two terms—"coal tar" and "nuisance"—appear to have become somewhat intimately connected with one another. The first commercial application of any magnitude of this very complex mixture appears to have been for the production of heat by burning under the gas retorts where it was originally formed, and even this apparently simple method of disposal taxed the ingenuity of the gas engineers of the time to such an extent that coal tar was invariably spoken of as a "nuisance," although not quite in the same sense as in the present day. Many schemes were invented after its first production, and many manufacturers grappled with the material, some successfully, in order to bring it into some valuable commercial use, both in its original form and after submitting it to various treatments, such as boiling it in open pans to get rid of the more volatile constituents, with a view to utilising the residues for roofing felts, wood preservatives, &c.—treatments which must have caused the most disagreeable odours in the neighbourhood surrounding such operations. It was about the year 1838 when Bethell, we believe, in Manchester, first began operations of actually distilling coal tar on an extended scale, having in view not only the utilisation of the residues from the distillation, but also that of the distillates, and gradually from that period its distillation has risen more and more towards a scientific operation, until its products now take an important position in the rank of heavy chemical manufactures.

In the year 1893 all works where the distillation was carried on came under the inspection of the Local Government Board, and from that date serious attempts have been made in order to prevent nuisance arising from such an operation—attempts which have been partially successful, but which by no means have yet, from many points of view, approached anything akin to perfection. As a consequence, too, of the gradual surrounding of many of our industrial and chemical centres on the outskirts of our large cities, this question of nuisance is coming more the front each year, and one is brought seriously to fa the possible pollution of the atmosphere which may eman from works where the working up of gas residuals effected; and so, as in our own case, one is endeavouri to meet the emergency by attempting to find out the b means of grappling with what has hitherto appeared assume the form of a difficulty.

Nuisance from noxious vapours from tar works m arise from several main sources:—

1st. From the storage wells for the raw material.

2nd. From the actual initial distillation of such materi

3rd. From the spaces into which the hot residual pi is run.

We propose to deal with these sources simply, and le out of consideration secondary operations upon products of the first distillation.

As regards storage of tar in quantity as received fro gas works, one must bear in mind that it conta mechanically suspended in the viscid material, a c siderable quantity of ammoniacal liquor or gas wa varying in amounts in different qualities of tar, and which there are quantities of ammonium sulphide, wh being volatile, give off sulphuretted hydrogen and vap of ammonium sulphide. When such tar is received quantity at a works it is generally stored in wells or ta sunk in the ground. The simplest and most appa means of avoiding any nuisance here, is, obviously, to k such tanks tightly covered over, and to avoid distur the level of the liquid as much as possible; in a w where the storage cannot be regulated by the distillat then the gases displaced from the tank should be allo to pass through a box containing hydrated oxide of i In several instances, however, these covered tanks led to more or less disastrous explosions, naked light their vicinity having ignited gases above the tar level, which must have existed in considerable amount in atmosphere of the tank; but we believe, inasmuch a surface of a quantity of stored tar is invariably covere a layer of ammoniacal water, that these explosions occurred on gas works themselves, where possibly t has been leakage of ordinary coal-gas into the space a the liquor level.

Passing this primary source by, which is not by means of great importance, we will at once deal wit second at greater length, as here one usually has the difficulty to contend with, and it is here also where has to devote most attention.

During the primary distillation of tar, noxious va are given off, including ammonium sulphides, sulphur hydrogen, carbon bisulphide, probably carbon ox phide, and many other volatile sulphur compounds sulphuretted hydrogen appears to be the most evil o and to cause more terror in the minds of the ord individual, we, at the outset, determined for ourselve comparative amounts of sulphuretted hydrogen ev during the entire process of distillation, and tabulate results obtained on Table "B."

Table "A" is one which has been extracted comparison with our own from the report of the inspector of alkali, &c. works for the year 1897. I be observed from these tables that the vapours fro ordinary tar still during work contain what might termed large quanties of sulphuretted hydrogen, wh allowed to pass untreated into the surrounding atmos of a works, might rightly be considered a nuisance menace to public health.

It is of interest to note that this gas is given off periods of the distillation, the larger quantity appare the second period when the higher temperatures hav attained in the still.

The determination, in our own case, of the sulph hydrogen was made by aspirating portions of the ga a partially closed receiver attached to the worm-end condenser, care being taken that as little air as p should enter the receiver during the whole per distillation, this precaution being necessary in o obtain relative results, and passing the gases thr solution of iodine of known strength.

We propose first of all, therefore, to deal with the methods nerally in use at the present time for keeping these xious vapours under control, and their subsequent treatnt, and then to offer suggestions resulting from our own periment and working results.

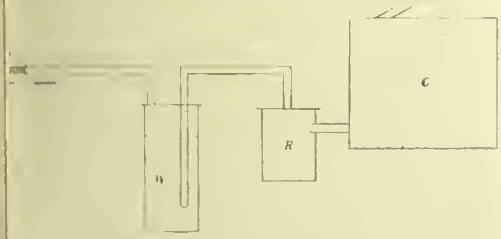
General Methods.

1st.—By Aspiration and Burning.
2nd.—By Aspiration and Absorption.

In the Alkali, &c. Works Regulation Act it is stated, in first part, clause 9, that "the owner of any works ecified in the schedule to this Act shall use the 'best acticable means' for preventing the discharge into the nosphere of all noxious gases and of all offensive gases olved in such works, or for rendering such gases harmless l inoffensive when discharged."

The plan adopted for "aspiration and burning" follows, a rule, the principle as set out in Fig. 1.

Fig. 1.

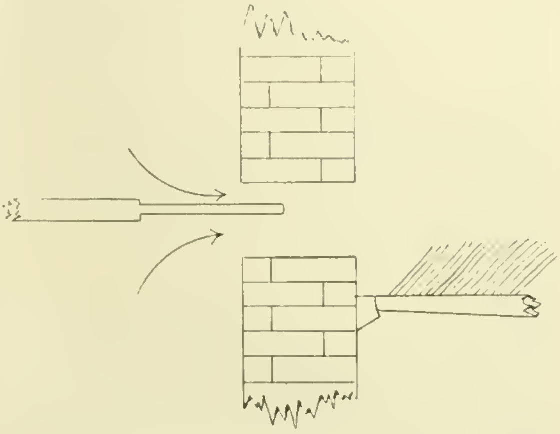


ere the aspirator at E, provided it be powerful enough l we must emphasise this), draws the gases delivered the receiver R through a water-seal W, and projects n on to a suitable fire, such as the indispensable and h recommended boiler fire, where, if the burning appas be improperly arranged, considerable damage is uently done to the boiler plates; and, further, the iency of any fire, upon which the large quantity of m necessary is projected, is seriously decreased. Now, is method of treatment, although appearing adequate, e are several serious and legitimate objections: firstly, conversion of sulphur compounds into sulphurous acid, ch, although less objectionable in odour, is not an ement of the evil, but simply a conversion of one tance objectionable and poisonous to animal life into her which is most harmful to vegetation, although fficient to constitute a nuisance, delivered as it is into chimney shaft; secondly, the gases are frequently tered during their passage through the fire area; and ily, there is very serious liability to explosion, which only too plainly shown itself by the number of accidents rded at many tar works where the system is applied. explosions, in the cases where they have occurred in works with which we ourselves are connected, have, we k there is no doubt, been caused by a sudden or even lual falling off of the aspirating or ejecting power, and equently by a flash back to the vapours above the er seal in the catch box. In one case it was found out r the explosion that the pipe D had been observed to ome slowly hot, the heat working its way gently from fire towards the water-seal, thus showing that combuswas going on within the pipe itself. Of course one at suggest, and we know that it is actually done, that xplosion lid on hinges might be provided in order to vent to the flash-back; also that water-seals of very ll dimensions, or with as small a space as possible above water-level, might be employed; but those of us who are in connection with the working of large quantities of tar much prefer, if feasible, to eliminate any possibility ither fire or explosion, especially where there is conion with a still in which tar is being heated, and from h exceedingly inflammable hydrocarbon vapours are g given off.

is, however, considered by some that if a space be around the pipe where it projects into the fire, as shown in Fig. 2, the end of the pipe where the gases are being ejected is kept somewhat cool by the inrushing air, and that this cooling effect prevents ignition at the pipe end, and consequently eliminates any possibility of a flash-black. It is known that this simple device has been adopted where trouble had previously arisen, and where adopted the plan is reported favourably upon.

We consider, then, that these serious facts and possibilities ought to condemn such a method of disposal of the noxious vapours, *i.e.*, by burning, as neither efficient nor desirable.

Fig. 2.



The second generally accepted and much applied method, that is, aspiration of the vapours and absorption of the sulphur compounds by the usual absorbents, has, we have learned also from our own experience and from that of others with whom we are in touch, its serious drawbacks, and objections of a similar nature as those to the first method.

As usually applied the gases and vapours are drawn again by the ejector E from the receiver, in some cases passed through the just-mentioned water-seal, and then passed directly through hydrated oxide of iron or lime, laid, either in the form of a thick bed kept in position with bric work or in thinner layers, in an ordinary gas purifier. Although we have not as yet determined the amount of carbon bisulphide in these vapours, there is not the slightest doubt that many tars—such as, for example, those which have been produced latterly in those gasworks where high temperatures have been employed for carbonisation—contain very much larger quantities of carbon bisulphide than those where lower temperatures have been in vogue. Consequently, during the early part of the distillation, or just before real distillation commences, in the case of these tars larger quantities of carbon bisulphides are evolved, which are not easily condensed by the ordinary means, and are taken forward with the ejected vapours from the receiver to the oxide of iron or lime purifiers.

The result in some cases is probably, and we know it almost certainly to have been so, that when the mixture of carbon bisulphide, sulphur compounds, and a large quantity of air have been traversing the absorbing medium, a considerable amount of heat has been developed, due to the so-called revivification of the oxide of iron or to the oxidation of the sulphur compounds of lime, the carbon bisulphide having ignited, with consequent explosion. In some cases the oxide of iron had simply taken fire without serious or disastrous result. It may well be understood, therefore, that in attempting the purification of these vapours by such methods one is face to face with an awkward possibility of dangerous results, and is also bearing an extra source of anxiety which is scarcely desirable. One must mention, however, that some distillers, although following out these principles which we have given only in substance, vary the methods of application in many ways, such, for instance, as by the intervention of special condensing apparatus between the actual receiver and the water-seal. By so doing there is no doubt that a twofold object is attained: firstly, the arrest of a further portion of any light hydrocarbons which may have escaped condensation in the first condenser, and secondly, the arrest by condensation of a portion of the noxious vapours. In large modern works such an addition of intervening apparatus would be considered of very great importance, and would act undoubtedly not only as a powerful adjunct to any subsequent purification apparatus, but also as a secondary condenser during the early stages of the distillation.

Having given, so far, a rough outline of what is usually done in order to prevent the emission of objectionable odours from this source into the atmosphere, we will now pass on to what we ourselves have latterly been doing on an experimental working scale in order to endeavour to effect a more complete purification, and to cast off the anxiety of what appear to us as inefficient methods attended with a certain amount of danger.

At the outset we determined to do away, if possible, with any connection either with fire or with dry absorbents likely to fire on oxidation, and so immediately turned attention to what is usually termed "wet purification," and met at once with sufficient encouragement to warrant either the continuance of experiments on our own part or the placing of results before others who may be interested in similar work. Having had sufficient experience with the unreliable ejector for aspiration of the vapours, our receivers were almost entirely closed and directly connected with a good air pump, which drew the gases from them and then forced them through an absorber. The first absorbent tried was naturally hydrated oxide of iron, prepared directly in the vessel itself by the addition of calcium hydrate to sulphate of iron solution, a small excess of lime being added. In view of the fact that only one absorbing vessel was employed for our experiment, we were much surprised to find that the absorption of sulphuretted hydrogen was, so long as our material lasted, perfect, inasmuch as no blackening of lead paper could be observed at the outlet. When, however, sulphuretted hydrogen was found to be passing, and that the material was consequently inactive, a current of air was passed through the liquid by the same pump after the distillation was completed, and we obtained a revivification at first which enabled us to put the vapours from another subsequent distillation through the apparatus without the passage of any observed sulphuretted hydrogen.

As the revivification occurred very much more quickly than we expected in a wet condition, a certain quantity of the hydrated oxide of iron was prepared in the absorber, and a series of distillations of known quantities of tar were conducted, and the vapours from these distillations passed through the absorber, and after each complete distillation, which represented a batch of about 40 tons of tar, was finished, air was blown into the absorber for a period of about one hour. By so doing we reached a point at which, of course, our material became useless, and our resulting figures showed that 1 cwt. of lime and 2 cwt. of sulphate of iron in about 200 to 300 gallons of water had sufficed for about 300 tons of tar. The cost of absorption, therefore, might almost be considered negligible. Although by this simple means we had succeeded in eliminating our sulphuretted hydrogen, the vapours issuing from the apparatus were observed to still possess a peculiar, though not disagreeable, odour, which was undoubtedly due to ligh hydrocarbons, and we thought that purification might not so long as this was observed, be taken to be perfected inasmuch as it should be one's aim to deliver the purifie gases, not into the chimney shaft, but simply at the end o the apparatus, a few feet from the ground, where supervision is easy, and the sense of smell might be a guide t an attendant or inspector as to the state of the process.

In order, therefore, to remove this slight odour, whic much resembles that of an old disused ordinary gas pip the vapours were passed through a second absorber containing a heavy tar oil, the oil in this case having first ha a considerable amount of air pumped through it in ord to remove volatile sulphur compounds. We have thu obtained the gases emitted from our apparatus practicall free from smell, but unfortunately we have not as yet bee able to devote more experimental attention in this directio or to place any plant together in series.

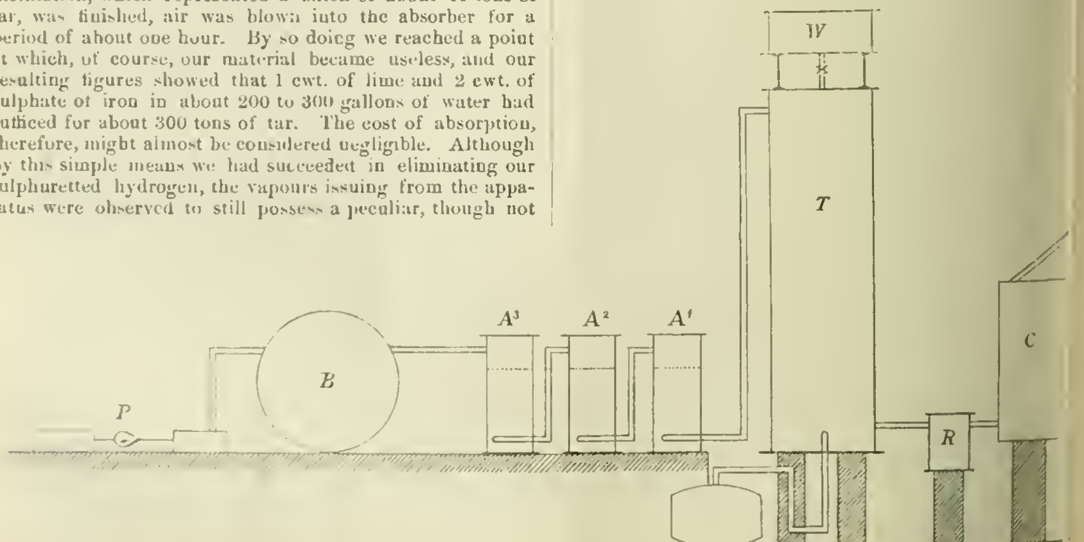
In order, however, to express the conclusions we hav arrived at from such results, we venture to suggest wh we should consider a very perfect method for the treatme of these gases by means of Fig. 3, which represents rough an appliance through which the method might be work out.

The uncondensed vapours leaving the condenser C are be aspirated from the top of the partially closed receiver by the pump P through the entire apparatus, the suctio to the pump to be in connection with a small boiler tank B, and the apparatus connected with this vessel.

T is a coke-scrubber, down which a very small stream water flows from the tank W to absorb any uncondens ammonia, and to assist condensation of any light hydr carbon vapours which might have passed the prima condenser. There would also be condensation here some of the sulphuretted hydrogen which would pass wi the ammoniacal water to receive treatment along w the ordinary ammoniacal liquor resulting from the t distillation.

A^1 is charged with an ordinary high-boiling coal-tar also, to act as an absorber of any carbon bisulphide a hydrocarbon vapour which might possibly pass the col scrubber. A^2 and A^3 might be charged with a mixture water, sulphate of iron, and lime to absorb the sulphuret hydrogen, or it might be advisable to charge the last vess A^3, with milk of lime only. The absorber A^1, contain the tar-oil, would require to be charged according to t amount of material absorbed and the efficiency of tower and primary condenser, but as any substances wh might be absorbed by it would in no way contaminate oil for sale, frequent recharging would be a matter little moment, and merely a matter of convenient arran

Fig. 3.



ent. A² and A³ might be arranged so that they could be arged with their respective solutions by means of the me pump P; the spent material would easily be run into ceptacles and thrown upon a cinder heap for disposal.

One important point, however, must not be lost sight of; is that in the pipe leading from the receiver R there is casionally a deposition of sulphur, which is most probably rmed by the decomposition of carbon oxysulphide or nmonium sulphides by air. Where such a deposit curred, it would be wise to endeavour to arrest all free lphur by the intervention of some simple appliance fore allowing the gases to reach the scrubber. In most ses, however, the formation of free sulphur is so small at it seems to deposit itself on the inner surface of the e leading from the receiver, and would scarcely call for ention.

We regret very much that we are not as yet in a sition to give more complete data as regards results m an apparatus of something like the form suggested, : have every confidence in being able to obtain the ults to be desired, or, at any rate, of being able to omplish a complete removal of all noxious vapours and omplete suppression of any possible nuisance without iger or anxiety. Such an installation could also be ced in a central convenient position in works where one s further than the primary distillation, and could then connected with the various operations following upon crude distillation to considerable advantage.

eaving this principal source, then, we will turn our atten to the third, where, again, one has to give every attention rder to prevent vapours and odours which can at the most ittle more than disagreeable to a few individuals who sider that the slightest offence to their sense of smell ht to constitute a grave nuisance.

During the operation of running off pitch resulting from distillation of tar, and under certain conditions, acrid ours are given off, which to some are objectionable, but not be said in any way to be actually detrimental to lth; indeed, they are credited with a decidedly curative ie in many cases of disease. Tar distillers will bear us in the statement that parents (frequently by their or's advice) bring children suffering from infectious plaints to a tar works in order that they may be made hale the vapours from the hot pitch, and in many cases efit is known to have been obtained. Be this as it may, e people object strongly to these vapours, and, conently, where the neighbourhood of a works is densely ulated, something has to be done to effect their arrest.

he pitch left in the tar-still at the close of the distillation a very high temperature, and cannot be run off at once ccount of the danger of fire; on the other hand, it must be allowed to cool too far, or it will not run at all.

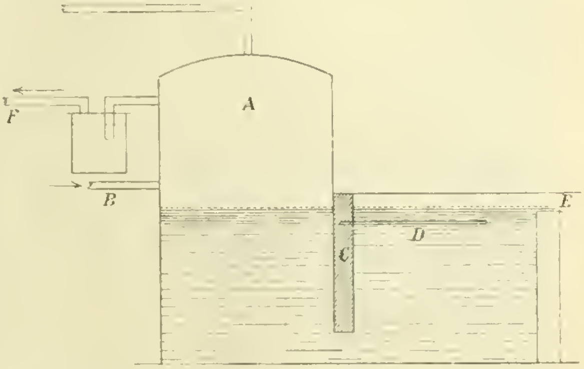
robably the best process in order to have all noxious ours here under control—and this is the one most rally adopted—is to run the hot pitch in the first ance into some form of cooler, and to leave it there l the temperature has fallen as low as is compatible its remaining liquid and flowing out, then to run it out a covered hole or "pitch bay." The vapours are in this prevented from spreading, and in the course of a few s they condense, and are in great part reabsorbed by pitch itself.

ne of the best forms of pitch cooler is that known as ' French weir," and is illustrated by the rough diagram, 4. A is a wrought-iron chamber partly sunk in the nd; the hot pitch enters through the pipe B, and fills cooler up to the level of the overflow E. indicated by the ed line. When the next charge of pitch is run off it es forward the cooled pitch in A under the wall C and horizontal iron plate D, over E, to the pitch bay, and s its place until it is in turn pushed forward by the wing charge. Any vapours displaced from the chamber ay be drawn away for purification by the pipe F.

ith regard to the covering in of pitch bays, there is an tion, and it is that when hard pitch has been made osions have occurred by the ignition of the fine dustcarbonaceous particles, issuing at a high temperature, g fired an explosive mixture of hydrocarbon vapours air in the confined space.

In the present day, however, when very little hard pitch is made (and especially since the fall in the value of anthracene has curtailed somewhat the point to which the tar is heated), the vapours must be very much less objectionable, owing to the fact that the pitch remaining liquid at a lower temperature than when hard pitch is made, the vapours must contain much less acridine—an exceedingly nauseous and irritating body that was formerly given off in considerable quantity.

Fig. 4.



In conclusion, we would point out that with reasonable care, and the more careful and scientific control which is yearly becoming more general (though not yet to the full extent to be desired) in tar works, most, if not all nuisances —using the word as meaning harmful to health, and not merely as unpleasant—can be avoided, and it behoves every tar distiller to do his best to free the industry from this stigma under which it has so long laboured; there seems hope, too, in the fact that at the present day tar distillation can only be profitably carried on where the process is thoroughly and scientifically supervised.

It is possible, moreover, that other manufacturers are endeavouring, upon the same lines, to accomplish the suppression of nuisance, and have possibly succeeded; but a short publication of what is being done in this direction might further lead to a solution or meaning, as far as this branch of the trade is concerned, of the much disputed term the "best practicable means"—a term which seems to form the base of operations and debate in all cases at law where an offender may be unfortunately involved.

Table A.

Time.	H_2S in Grains per cb. ft.	——
3.0 a.m.	—	Firing commenced.
10.0 a.m. to 12.15 p.m.	Traces	At 10.0 a.m., and subsequently, there was a strong smell of CS_2 in the neighbourhood of the receiver.
12.30 ,,	0·09	
1.45 ,,	—	
4.45 ,,	0·8	
4.55 ,,	1·4	
5.0 ,,	12·5	
5.3 ,,	23·0	
5.5 ,,	39·0	
5.10 ,,	20·0	
5.30 ,,	37·0	Carbolic.
6.0 ,,	33·5	
6.25 ,,	22·0	
6.45 ,,	20·0	Creosote.
8.45 a.m.	62·0	Anthracene.
9.3 ,,	42·0	
9.20 ,,	93·0	
9.27 ,,	70·0	
9.35 ,,	—	Steam.
9.50 ,,	55·0	
10.0 ,,	53·0	
10.35 ,,	78·0	Steam increased.
11.8 ,,	99·0	
11.15 ,,	—	
12.0 noon	78·0	A sample of the permanent gas leaving the receiver was found to burn freely with a slightly luminous flame.
12.30 p.m.	83·0	
1.20 ,,	78·0	
2.20 ,,	62·0	
3.20 ,,	57·0	Steam reduced to a minimum.
3.30 ,,	—	

Table B.

Time.	H_2S in Grains per cb. ft.	——
6.15 p.m.	5·14	
6.30 „	10·18	
7.15 „	Traces	
8.15 „	„	
9.15 „	„	
10.15 „	—	
11.15 „	—	
12.0 a.m.	—	
1.15 „	—	
2.15 „	—	
3.15 „	—	
4.15 „	—	
5.15 „	—	
6.15 „		
7.15 „	—	
8.15 „		
9.15 „	—	
10.15 „	—	
11.15 „	10·42	Light oil.
12.15 p.m.	18·15	
1.15 „	15·34	Creosote.
2.15 „	18·02	
3.15 „	36·38	
4.15 „	26·86	Anthracene.
5.15 „	33·22	
6.15 „	72·41	
6.30 „	100·97	
6.45 „	114·47	
7.0 „	111·93	Fire drawn.

THE DETECTION OF ARSENIC IN BEERS, BREWING MATERIALS, AND FOOD.

BY WILLIAM THOMSON, F.R.S. EDIN., F.I.C., AND JAMES PORTER SHENTON, F.C.S.

Owing to the recent arsenic in beer scare, we have learned that arsenic must be regarded as having been one of the constituents of beer, in which it exists in traces of greater or lesser importance, especially in that brewed in the North of England, where coke is used for drying the malt, and where the influence of arsenic has been much more felt than in the South, where anthracite coal is generally employed. We know that arsenic has been found in large quantities in glucose prepared from starch, by the action of impure sulphuric acid upon it, and the glucose so prepared has contaminated seriously the beer brewed with it; and these discoveries have shaken to its depths one of the most important industries of the country, and also most seriously affected other industries associated with it, such as that of the gas-coke manufacturer. At the present moment, therefore, it is incumbent upon chemists, especially those in the North of England, to be able to determine with certainty and with accuracy the presence and quantities of arsenic in malt, in beer, and in various other food materials, and in coal and coke.

We think that it is the duty of chemists as far as possible to discuss and publish their experience with processes employed by them in the work which devolves upon them at this time. We therefore give the results of our experience so far as we have been able to divert our attention from the pressing demands of brewers, malsters, and others.

Until lately no chemist who was called upon to analyse beer would have thought of testing for arsenic, because it would naturally occur to him that if arsenic were present, marked poisoning of a large number of people would result; and therefore the small fees paid to public analysts for the analysis of foods did not warrant them in making elaborate and apparently unnecessary analyses which would cost the analyst many times the fee he obtained for his work. I would remark, therefore, that some of the criticisms passed on the city analyst by members of the council, although they appeared fair to those who do not understand clearly the work involved in food analysis, were decidedly unfair towards the city analyst, who would naturally not look for potent poisons in a food which was not alleged to have produced poisoning.

The same misconception occurred when a bottle of Manchester water was sent to an eminent bacteriologist with the request that he would examine it for typhoid fev or other pathogenic organisms, when there were hundre of thousands of persons making crucial tests with th water every hour of the day, by drinking it and n suffering from typhoid or other fever.

It is certain now that arsenic may be present in be and may produce symptoms which are not readily recognis as the results of arsenic poisoning, but which may attributed to other causes, such as alcohol. The disease so-called alcoholic neuritis is said to be more prevale in the North of England than in the South, and according to Dr. Reynolds, almost unknown in Scotla where the alcohol is consumed in probably larger quantit and in a more concentrated form than it is in England.

From what we know now, it is highly probable that so-called alcoholic neuritis of the North of England probably arsenical neuritis, and it now becomes the duty the analysts of the North to detect this widely distribu and poisonous metal wherever it is likely to become mi with our food materials.

The difficulty which chemists encounter, to begin w is to find reagents which are to be employed for th analyses which are themselves free from arsenic. principal substances so employed, which are most diffic to obtain pure, are sulphuric acid, hydrochloric acid, zinc.

We have found it impossible to purchase from p chemical dealers, either sulphuric or hydrochloric acid from arsenic, and after obtaining quantities of so-ca pure acids from various sources we have had to throw th all aside and prepare these acids in a pure condi ourselves. The processes for their preparation are simple that it is difficult to understand why acids sh be sold as arsenic-free by manufacturers of pure chemi which almost invariably contain arsenic.

We think it advisable, therefore, to give, as follows, processes which we have found most successful in obtai our supplies of reagents.

Sulphuric Acid.—The commercially pure acid cont probably a grain of arsenic per gallon, *i.e.*, about eighteenth of a grain per pound. To prepare arsenic-sulphuric acid, the commercially pure acid is mixed wit small quantity of chromic acid, about 30 to 50 grains to pint; an ordinary glass retort to hold about 40 oz obtained (without stopper); the acid so treated is introd into this retort till it is about two-thirds full, by means long tube ending in a funnel; the tube is then carel withdrawn, so as not to touch the sides of the neck with end. If by accident the neck is touched by the tub withdrawing it, the impure acid may be washed out jet of water from a wash-bottle and the first portion of distillate rejected.

The retort is placed in a thin sheet-iron sand-b (an ordinary meat or other tin tied round with wire answer the purpose), and a ring burner is applied to bottom of the tin; the top of the retort is covered wi hood of asbestos cloth, but the neck should not b covered, as we have found by experience. The sulp acid distils over into a glass flask, and is found to sho traces of arsenic mirror when 25 cubic centimetres of i diluted with water and allowed to act on pure zinc i Marsh apparatus for one hour, and this degree of fre from arsenic in the distillate continues till nearly the of the acid has been evaporated. It is needless to say the chromic acid converts any arsenious compounds pr (which are volatile) into arsenic acid, which is not vola

We should here remark that the retort is liable to b especially in the neck, furthest from the bulb, where break usually begins, and extends suddenly up near the bulb; more especially does this happen when the is wrapped with asbestos cloth, and then a large qua of very irritating fumes are liberated. We got over difficulty by putting the whole apparatus in a wooden with a hole in the end, through which the neck of the projects, so that, in case an accident occurs, the g turned off from the outside, the lid is put on the box the whole is then covered with a wet cloth kept read this way any annoyance from such accidents is absol prevented.

For the preparation of pure hydrochloric acid almost e same process is adopted: a few grains of chromic acid e added to the pint of hydrochloric acid, which is filled to a large alembic holding about one gallon, with a ground ppered neck of well-annealed glass, the end of which drawn out, and fits into the tube of a Liebig's condenser, e two being ground together with a little emery powder. e end of the condenser passes through a large india-bber stopper, and an ordinary glass tube is also fitted o the same stopper, and is attached by a rubber tube a tube coming from a cork in a bottle, the bottom of ich has been removed; this bottle is set in a dish con-ning some caustic soda solution, which stands about a arter of an inch around the bottom of the bottle, so that y excess of acid or chlorine which is evolved may be sorbed therein, and so that air may pass out or be drawn o the receiver without the risk of drawing some of the stic liquor into the receiver, which is now fitted on to larger cork, through which passes the end of the con-ser, and some pure water is placed in the receiver to orb any hydrochloric acid gas which passes over at t from the concentrated commercially pure acid. The d which distils off contains free chlorine, but this can removed by adding to it a few drops of pure carbolic d, when it may be employed for arsenic testing; the sence of free chlorine prevents the formation of arsenic rors in the Marsh apparatus, and also the deposition of enic on the copper foil in the Reinsch's test, whilst the sence of a little carbolic acid allows mirrors to be formed n very minute quantities of arsenic; but we are not quite stied with this method. We have employed pure sub-oride of copper, and redistil the acid to get it free from e chlorine; but this we have not found quite satisfactory, we are now arranging an apparatus for preparing it n pure common salt and arsenic-free sulphuric acid.

'he process which we have found most satisfactory for detection and approximate estimation of arsenic in r is the following:—

ifty c.c. of the beer, equal to about $1\frac{3}{4}$ ounces (less than herry wineglassful), is measured into an 8-ounce glass k. The beer is heated to boiling over a Bunsen burner lst shaking, to prevent frothing, and then set on a sand-h to evaporate to a syrupy consistence; to this is added c.c. of nitric acid, and 5 c.c. of strong arsenic-free phuric acid, and the liquid boiled down till it darkens. ien this occurs about 1 or 2 c.c. more nitric acid is ed (which can readily be obtained free from arsenic), the concentration continued on a sand bath. When liquid again begins to blacken, more nitric acid is ed, and the concentration continued till no further dis-ration of the liquid takes place (about 25 c.c. of the ic acid is usually required to effect the complete oxida- of all the organic matter). The liquid now occupies a ime of about 5 c.c.; this is diluted with its own bulk of er, and boiled down till all nitrous fumes and nitric are expelled.

'he liquor is then diluted and transferred to a graduated e and made up to 15 c.c., and 1, 2, or 3 c.c. of this is red into the Marsh flask, which is a Jena conical or nmeyer's flask of 50 c.c. capacity, the tube from which ses through an ordinary wooden stopper soaked in ffin wax, the wax being melted between the stopper the neck of the flask by a heated piece of glass before oducing the liquid to be tested. India-rubber stoppers uld not be employed: one was found by us to introduce antimony and arsenic. The liberated hydrogen is sed through a tube containing a coil of filter-paper ing with a plug of cotton wool, and through another ll bore 3/16ths of an inch internal diameter, hard glass e drawn out at one end. The apparatus is set going by ing dilute pure sulphuric acid to the zinc (about seven water to one of acid), a light is applied to the drawn-end of the tube, when the hydrogen ignites and burns a small flame. The supply of gas from the apparatus ild be regulated to give a flame of from 3/32nds to h of an inch in length, and the flame of a Bunsen ier is placed so as to heat about three-quarters of an of the tube to redness about 3/16ths of an inch behind drawn-out part of the tube; the liquid to be tested is run into the Marsh flask, in small quantities at a time, through a tube or small funnel, preferably a graduated tube with a stop-cock arranged so that it may run the liquid to be tested from one tube or dilute sulphuric acid from another side by side with it. The graduated tube should contain about 15 c.c. of the liquid to be tested, and 1, 2, or 3 c.c. run in at first, and more if necessary afterwards, so as to obtain sufficient deposit of arsenic to make a mirror of standard size; the quantity of liquid required to give such a mirror being known, the total quanity of arsenic present may be easily calculated.

Nearly all this arsenic present in this small apparatus comes off in a few minutes.

It is necessary to have the flask about one-third full of granulated zinc, so that the liquid may come into close contact with the zinc. Other methods have been devised for treating large quantities of the beer, and separating the arsenic by sulphuretted hydrogen and titrating, but these seem to us to be quite unsatisfactory in dealing with quantities of arsenic trioxide varying from 1/50th to 1/500th of a grain per gallon.

In our process it is necessary to prepare standard mirrors, by introducing from a weak standard solution of arsenic trioxide quantities corresponding to the 1/500th, 1/400th, 1/300th, 1/200th, 1/100th, 1/75th, 1/50th, 1/25th of a grain per gallon; and where the arsenic exceeds 1/10th of a grain per gallon, the standard mirror may probably be obtained by putting into the apparatus, say, 1 c.c. or less, the former being the 1/15th part of the arsenic present.

In making these estimations care must be taken to have as nearly as possible the same size of apparatus, the same amount of zinc, and the same quantity of liquid, and the Marsh generating flask should be as small as possible.

In some qualities of zinc the purity is so high that it is difficult to get the acid solution to act upon it, and it has been found necessary in some cases to put a drop or two of purified sulphate of copper solution in the apparatus to start the reaction. This has the effect of reducing the size of the mirrors, but the loss is so small that it does not materially affect the result.

It has been stated that sticks of zinc are not suitable for the Marsh test, because they have the effect of preventing the formation of arseniuretted hydrogen, possibly from some voltaic action, due possibly to the crystalline nature of the zinc. It is stated to be arsenic-free when tested as a blank experiment, and when arsenic is added in minute quantities still no arsenic mirror is produced; but when the sticks are melted, and the zinc granulated by pouring into water, and the same experiment repeated by adding the same quantity of arsenic as before, the mirror is obtained to its full extent.

We have made some experiments to ascertain the truth as to this. We tried a sample of rod zinc, which dissolved with great ease in dilute sulphuric acid, and gave no indication of arsenic when 20 grms. of it were dissolved in a Marsh apparatus. We introduced into a Marsh apparatus charged with this rod zinc 1/4000th part of a grain of arsenic trioxide, and in an experiment extending over one hour obtained a mirror which was only about 1/10th the size it should have been. We granulated some of the same rod zinc and made a similar experiment with the granulated material, and still obtained a mirror which was only 1/10th the correct size.

Another sample of granulated zinc, which also dissolved readily in dilute sulphuric acid, gave when similarly treated a larger mirror with the 1/4000th of a grain of As_2O_3, but still much short of the amount obtained when using another pure zinc which was not readily acted upon by acid. We have not yet determined the impurity present in the zinc which holds back the arsenic. We have found it to be free from lead, copper, or other heavy metals.

During our earlier experiments we had observed that a small quantity of platinum introduced into the Marsh apparatus will effectively retain considerable quantities of arsenic. This fact has been already pointed out by other workers, but we think it necessary to emphasise it, as the use of a few drops of platinic chloride solution is recommended in such standard works as Fresenius' "Qualitative Analysis"; and, in Wynter Blyth's work on poisons, mention is made of the desirability of alloying a little platinum with the zinc to obtain a regular flow of hydrogen.

Aluminium dissolved readily in caustic soda, liberating hydrogen, but much smaller mirrors are obtained by its use than in the ordinary way with pure zinc when using 1/1000th of a grain of As_2O_3.

Magnesium does not readily dissolve in caustic soda, but it does so easily in weak sulphuric acid, but this also holds back most of the arsenic when using 1/4000th of a grain.

Lead and tin salts hold back considerable proportions of arsenic when added to zinc and sulphuric acid, and mercury salts prevent the formation of arseniuretted hydrogen. The most satisfactory result is obtained when pure redistilled zinc is employed, which is not readily acted upon by sulphuric acid.

We do not regard the process as specified recently by the Brewers' Association as satisfactory, first because minute quantities of arsenic in beer cannot be detected at all by it with certainty; second, the indications are not so distinct as by the Marsh test, because the white colour of the trioxide is not so well adapted for comparison as the black of the metallic arsenic; third, the whole of the arsenic is not removed from the copper by heating: about one half only being burned away as the trioxide to be deposited on the part of the glass tube close to it; fourth, on heating the beer with hydrochloric acid some of the arsenic is sure to volatilise as the chloride; fifth, because some of the arsenic may possibly be in the form of arsenic acid, and the reaction would take place much more slowly with it; sixth, because it is difficult to imagine that all the liquid in a considerable volume of beer would come sufficiently in contact with a small strip of copper lying at the bottom of the vessel to remove all the arsenic present.

The next test which has been suggested is the one by Gutzeit, which has been modified in various ways by Siebold and others. This consists in passing the arseniuretted hydrogen (produced by acting on the arsenic compound with zinc and acid) through a coil of dry filter paper, previously soaked in lead acetate solution. This, we found, did not remove all the sulphuretted hydrogen. We then tried by passing the gas through cotton wool, previously soaked in acetate of lead solution and dried: the gas discoloured slightly the wool along the whole length of the six inches of thin glass tube in which it was packed, and then produced a dark as well as a yellow stain on the dry filter paper previously soaked in bichloride of mercury solution. We then tried the process suggested at the meeting of the London Section of the Society of Chemical Industry, by Mr. C. T. Tyrer, by passing the hydrogen through a strong solution of acetate of lead contained in potash bulbs, and obtained a very bright yellow stain free from any dark colour, and the amount of yellow colour seemed as great if not greater than that obtained by passing the gas through dry cotton wool previously saturated with lead acetate solution. It would appear, therefore, that the arseniuretted hydrogen is not dissolved to any appreciable extent in a saturated solution of lead acetate, and this seems to us the best method of carrying out the Gutzeit test. It is questionable whether this is not the best test for determining approximately minute quantities of arsenic after all the organic matter is completely destroyed. One disadvantage of the process is that the yellow colour cannot be seen at all by gas light.

We made further experiments by passing the hydrogen from the Marsh generating flask, containing minute quantities of arsenic, through a solution of sulphuretted hydrogen, and then passing the gas on to the heating tube, but the solution did not fix the arsenic, and sulphide of arsenic was deposited on the end of the heating tube.

A similar experiment was made with a solution of bichloride of mercury, in which a heavy precipitate was formed, and the whole of the arsenic was fixed by the solution, but the results did not prove promising as regards obtaining an improved method for the determination approximately of the small quantities of arsenic.

In the examination of *malt* we treat 5 grms. of the sample with 25 c.c. of HNO_3 in an 8-oz. flask, heat till the violent action is over, and then add 5 c.c. of sulphuric acid, and proceed exactly as in the case of beer.

Coal and Coke.—5 grms. of the former, or 2·5 grms. of the latter, in very fine powder, are heated with 25 c.c. of nitric acid for an hour, after which time 5 c.c. of sulphuric acid are added, and the heating continued for another half hour. After cooling, the mixture is diluted to about 100 c.c., and filtered from the suspended particles. The filtrate is concentrated with further additions of small quantities of nitric acid to destroy any organic matters in solution, and evaporated till all nitrous fumes and nitric acid are expelled. The solution so obtained is then transferred to a Marsh apparatus, and the black mirror or yellow mercury compound obtained.

Action of Acids on Arsenic contained in glass vessels.—It has lately been suggested that arsenic is dissolved by pure acid from the glass bottles in which they are kept.

I. Marshall and C. S. Potts (Amer. Chem. Journ., X. p. 425) have found the glass of German and America apparatus to contain from 0·095 to 0·446 per cent. o arsenious acid. They find, however, that acids and ammonia do not remove any trace of arsenic from such vessels, but fixed alkalies, they assert, readily extrac arsenic from them.

With a view to find whether arsenic could be removed from (*a*) white glass, from (*b*) light green glass, or from (c blue glass of which Winchester quart bottles are made. W reduced some of each to fine powder, and treated 5 grms. o each with 20 c.c. of pure sulphuric acid in the cold fo 17 hours. This acid removed exceedingly minute trace of arsenic from all the samples: the smallest amount wa obtained from the white glass, the next smallest from th green, and the largest from the blue glass; but the quantitie are so exceedingly minute that we feel satisfied that strong sulphuric acid may be stored in glass bottles withou becoming contaminated to any appreciable extent wit arsenic.

We then made three more tests by shaking up 5 grm of the same kinds of powdered glass with 40 c.c. of pur hydrochloric acid, and leaving in the cold for 17 hours; i none of these experiments did we find the faintest trace c arsenic. We ought to remark, however, that the hydrochloric acid used in these experiments was that from whic the free chlorine had been removed by means of a few drop of carbolic acid to the quart of acid.

Selenium.—When a solution of sodium selenite is intro duced into a Marsh apparatus a copious dark-brow precipitate is thrown down in the generating flask, and aft a few minutes a bright red mirror is formed at the end of th tube, which is heated. We have not determined th delicacy of this test, and have not observed any red mirro from any of the samples of beer or sugar which we ha examined.

Discussion.

The Chairman agreed with Mr. Thomson as to th difficulties experienced in obtaining pure acid, a especially pure zinc. He wished to point out that neith Marsh's nor Reinsch's test was ever intended to be quantitative test, and he did not think they should be used such. He had always used cotton wool instead of calciu chloride; by doing so all risk of explosion on lighting t hydrogen was avoided.

Mr. Carter Bell said he could confirm what t Chairman stated as to the use of cotton wool in the pla of calcium chloride, he always used it himself with benefic result. Mr. Thomson spoke about putting copper sulph into the generator; this should not be done, as it had tendency to keep back the arsenic. To hasten the evoluti of hydrogen a little piece of magnesium might be put with the zinc, which would dissolve with the zinc and all he hydrogen to come off more freely.

Mr. A. Shearer agreed with Mr. Thomson as to t delicacy of Marsh's test as described in the paper. If t beer were suitably prepared beforehand, Marsh's test v much more delicate than Reinsch's test. He would be g to learn Mr. Thomson's experience as to the comparat delicacy of the two tests named. He had recently, rather his own surprise, detected arsenic by Reinsch's test in b which certainly did not contain more than one-fortieth grain per gallon. He believed that Reinsch's test been proposed by the committee of experts appointed e Brewers' Association as a method adapted to readily stinguish a thoroughly bad beer. Certainly if Marsh's test ould register 1/500th of a grain of arsenic per gallon it ould seem to be too delicate for practical purposes as a alitative test. For quantitative estimation of arsenic in er it seemed very desirable that some standard method ould be agreed upon and adopted by chemists, as me very unpleasant discrepancies between analysts had curred.

Mr. **Charles Estcourt** said the so-called Reinsch's thod did not give the whole of the arsenic at the finish a sublimate. In any case it was not a test which was aple of application, for if it took less time at the com- ncement, much more time was occupied in the preparation the microscope and its use. The question was, What t was fairly reliable and could be rapidly applied? He ught Mr. Thomson's method met both these conditions, hough he himself would not go so far as to the destruction the organic matter.

Mr. A. W. **Duncan** said he did not agree with Mr. omson that the Gutzeit test gave a negative reaction h antimony. The colour produced on the paper cap taining mercuric chloride was, however, brownish grey, l not yellow or orange as that from arsenic. He had ted many samples of zinc from English and German rces. Sometimes samples from the top of a parcel were , but other portions of the same contained serious ntities of arsenic. Charles R. Sanger stated that nstein found no error when using zinc either platinised silvered before being used; but Headden and Sadler low results by using a spiral of platinum wire wound nd a zinc rod. He had tried the latter without any arent bad effect, a normal mirror being obtained; but thought it safest to avoid the addition of any other als to the zinc, and had only done so for the sake of eriment. The Marsh-Berzelius test for arsenic had n much improved by Sanger in 1891, and it was this lification that he himself used. By the use of a plementary hydrogen generator a constant size of flame an even arsenical mirror could be obtained. It gave d quantitative results.

Ir. **Pettigrew** said, that in discussing Mr. Thomson's er, the scientific basis, on which the methods rested, been entirely overlooked. Smee had pointed out arsenic could be deposited as such, or given off as I_3 as desired, by the electric currents. The process did not end on the mere quantity of hydrogen gas given off. In opinion the arsenic was first deposited as arsenic on reducing medium, zinc, magnesium, or aluminium, and, ing up local action at the point of contact, was evolved AsH_3. If this were so, and he could think of no other ory, then Mr. Thomson's use of $CuSO_4$ in the reducer entirely wrong, quite as much as the use of deposited inum or a platinum wire wound round a zinc rod ch Mr. Thomson condemned. In order to get the full e of the reduction, it was necessary to have a medium ch would dissolve without bringing electro-negative im- ties to the surface. Impure zinc dissolved freely use of these impurities; pure zinc would not dissolve ly because they were absent, and it was bad in principle add electro-negative media to aid the zinc in its mposition of the acid. All such electro-negative lia simply had arsenic deposited on their particles, and it as copper did in the Reinsch test. This, as Thomson had acknowledged, was very pronounced platinum, and so it was with every other negative urity, whether copper, iron, or carbon, being merely a ter of degree. Surface action was the most important or in such reductions, just as in the estimation of ate in water by electro-chemical means. With small nce area there was an enormous evolution of hydrogen pared with the AsH_3 evolved, while with large surface on every particle of the liquid was quickly removed solution and given off in as concentrated a state possible. Mr. Thomson added the beer extract, in ll quantity at a time, to the reducer, the result being with traces of arsenic the AsH_3 given off was diluted so much hydrogen that it escaped in the bulk of gas out decomposition, and if a quantity of arsenic were present his mirrors could never be comparable. Everyone who had experience in the extraction of traces of one gas from another would appreciate this point. Mr. Thomson's methods for the purification of acids were well known in text-books, but the speaker used a tower filled with scrap copper, inserted half-way in the distilling flask, and thought purer acid could thus be got than by using phenol for getting rid of free chlorine.

A little apparatus used by Mr. Scudder for the qualitative detection of arsenic in liquids or in zinc was worthy of record. The material was put into a tube with funnel and delivery tube, the latter being shaped like an inverted U. Another wider tube (7 mm.), about 100 mm. long, was filled with very fine glass beads, and $AgNO_3$ solution sucked up to a file mark on the tube. On connecting this with the delivery tube and starting the reduction, any trace of AsH_3 was quickly shown by the $AgNO_3$ on the beads, a black line forming at the mark. By this means a very faint trace was more easily detected than with the spotted paper used in such like tests. He might also mention that a little roll of filter paper was a better means than cotton wool of preserving the calcium chloride tube from excessive moisture, and also for preventing any risk of explosion, and the roll was quickly renewed after each experiment.

Mr. **Scudder** said he had tested samples of spent oxide acid, and found them free from arsenic. The Chairman (Dr. Grossmann) had remarked that the Marsh test was not originally put forward as a quantitative one. That was quite true, but then the original Marsh test was published in 1836, and shortly afterwards Berzelius improved it and made it a quantitative one. As such it has been gradually improved, and the test stood to-day as one of the most refined and scientific methods of chemical analysis. Reference might be made to the classical investigation of the method by Charles Sanger, made in 1891. With a modern Marsh apparatus he (Mr. Scudder) could detect 0·001 mgrm. As_4O_6. With regard to standard mirrors it was obvious that there was a definite range of limits permissible for comparison, such as, for instance, in the Nessler test for ammonia. This point had been too much overlooked by various workers. He himself did not care to make any comparisons with mirrors over 0·01 mgrm. As_4O_6. In fact he preferred to adapt the minimetric method of testing so successfully used by the late Dr. Angus Smith, and to limit the mirrors to the smallest amount detectable. He had used as a maximum quantity of beer 25 c.c., and as little as 0·5 c.c. was sufficient for some beers examined. His standard mirrors ranged from 0·001 mgrm. to 0·01 mgrm. As_4O_6. If 25 c.c. of beer yielded no mirror the quantity of arsenic present was less than 1/300th part of 1 grain per gallon.

Dr. **Knecht** was pleased that Mr. Thomson had taken the precaution of destroying the organic matter before proceeding to estimate the arsenic in the Marsh apparatus. Even if arsenic were present in the glucose or other contaminated material as As_2O_3, it was not a foregone conclusion that this was also the case after fermentation. It was quite possible that after fermentation the arsenic, or at least a portion of it, might enter into organic combination and possibly escape detection. He had recently been engaged in estimating small quantities of arsenic in human hair, and found that distillation with concentrated hydrochloric acid did not give the whole of the arsenic present. He had consequently adopted a somewhat extreme course for destroying the organic matter, *viz.*, heating in sealed tubes with nitric acid of 1·5 sp. gr. to 250° C. for two hours. The excess of nitric acid was afterwards driven off, and the arsenic estimated by the Marsh process as indicated by Sanger.

Dr. B. W. **Gerland** said the shortcomings of the Marsh method had been pointed out by numerous authors, and this discussion and his own experience had corroborated this. The reaction depended upon numerous details, which were partly unknown, and the known ones not always under control. If the test solution were mixed with organic matter, the uncertainty was probably increased. For the estimation of arsenic the Marsh method must be condemned. He knew of no more reliable means for separating arsenic than sulphuretted hydrogen. For minute quantities of arsenic the addition of a little bismuth solution in tartaric acid assisted materially in bringing down arsenic and bismuth in a form which filtered well, and from which the former could be separated easily by ammonium carbonate.

Mr. H. N. **Morris** said that Mr. Thomson had found that the presence of traces of chlorine in hydrochloric acid prevented the arsenic from showing in the Marsh test. He thought that traces of sulphurous and-nitrous acids in sulphuric acid affected the test also. Impurities in the zinc which prevented any arsenic present in the metal showing in the Marsh test might be affected by traces of sulphurous or nitrous acid.

Mr. **Thomson**, in reply to the Chairman, said, as to cotton wool, he saw no objection to its use instead of the chloride of calcium tube. With regard to the removal of arsenic by means of copper, as in Reinsch's test, he did not consider that it was possible to remove it entirely by that means. The test, as suggested by the Brewers' Association, would lose a considerable amount of arsenic by evaporation as chloride whilst the operation was going on, and one could hardly imagine it possible for small strips of copper to remove the whole of the arsenic from a large volume of liquid.

In reply to Mr. Duncan, he might say the stopper from which he obtained contamination with arsenic and antimony was a white rubber one. Referring to the suggestion that arsenic could be administered in larger doses in the form of cacodylic acid than in the ordinary form, it was possible that arsenic in combination with certain organic bodies had much less physiological action than the trioxide. It might therefore be argued that, if combination with one class of organic matter reduced its toxicological effect, its combination with another organic substance, such as might be found in beer, might increase its toxicological action beyond that which would be obtained by administration in the ordinary way. With regard to Mr. Morris's remarks, he also had suspected that arsenic might be found in pickles, and he had examined some samples and found them free from any trace of arsenic. The question had often been asked, What quantity of arsenic should be allowed in beer? He was of opinion that if it could be detected at all in 100 c.c. of any sample of beer, such beer should be condemned, not because a small amount would be likely to produce poisoning, but because arsenic was not a constituent of malt. The drying should be carried out without producing contamination with arsenic, and the brewers should find some other method of drying than by means of the direct fumes from coal or coke. If it were admitted that they could only dry by the present methods directly over the fumes of coal or coke, the beer would always be liable to contain arsenic in considerable quantities, which might prove injurious to health, and it would be impossible for public analysts to be constantly testing the enormous quantities of beer consumed in England. It would also involve great difficulty in determining the quantities, because one analyst would be sure to find different proportion to another when working on the same beer containing such minute quantities of arsenic as the twentieth to the hundredth of a grain per gallon, and it was not quite certain that even more minute quantities were not injurious to health when taken regularly.

Nottingham Section.

Meeting held at University College, Nottingham, on Wednesday, February 27th, 1901.

PROF. F. STANLEY KIPPING, F.R.S., IN THE CHAIR.

DISCUSSION ON THE PRESENCE OF ARSENIC IN BEER.

The discussion was introduced by a paper read by Mr. S. R. **Trotman**, City Analyst, in the course of which he briefly indicated the likelihood of the introduction of arsenic into beer by means of various brewing materials.

Dr. **Stern** observed that with reference to the presence of arsenic in malt, very different amounts had been found by analysts. Dr. Tattershall, in his evidence before the Royal Commission now sitting, had stated that beer brewed from malt and hops could hardly contain more than $\frac{1}{200}$ grain arsenic per gallon. Mr. Trotman had made a similar statement; but another analyst had stated that he found as much arsenic in a beer brewed from malt and hops as in one containing Bostock's arsenical sugar; moreover, two different analysts in a case recently before the courts, had found totally different amounts of arsenic in the same beer. It appeared to him that these discordant results were due to the fact that every analyst used a different method for making the estimation. In Germany and other countries there were official methods prescribed for all the ordinary or commercial analysts. Something of the same kind was wanted in this country. He would very much like to hear what methods the analysts who were present employed.

Mr. W. E. **Hardy** said he had no doubt that the brewing trade, given time, would in due course be able to absolve themselves from all blame, and deal with the matter in the frank and open manner which had characterised their action up to the present. So far as the local brewers were concerned, he thought they could congratulate themselves upon the fact that their beers were free from arsenic.

Mr. W. D. **Hanson** said that the question of arsenic in brewing sugars had been pretty thoroughly thrashed out, and its presence in such materials was most unlikely ever to occur again. The interesting point now was in relation to its presence in malt. He desired to know whether arseni in malt, dried by means of coke or coal, could be removed altogether by efficient cleansing machinery if it were deposited on the grain, and not absorbed in any form.

Mr. F. J. R. **Carulla** suggested that the malt should be washed, and the washings tested for arsenic, and th malt dried, and tested to see if arsenic were present. I derived from coke fumes, it would be natural that th arsenic should be on the surface and be found in th washing, whilst any due to artificial manures would be i the body of the malt itself.

Mr. **Hardy** asked Mr. Trotman to say whether ther was more liability of the presence of arsenic in coal than i coke.

Mr. **Trotman** replied in the affirmative, adding that h certainly thought there was greater possibility in anthraci coal than in coke. He was not speaking exactly so muc from a practical point of view as from the result of theoretic application.

Mr. **Stirk** suggested that if they were going to find complete solution, it would be better to start with th barley.

Mr. **Trotman** agreed, but contended that it was a matt of time.

Mr. J. **White** (county analyst of Derbyshire) too exception to one or two statements which had been mad Mr. Trotman said that the presence of arsenic trioxide wa the cause of the whole of the poisoning. No one knew, a matter of fact, in what form or combination arsenic d exist in beer, but everything pointed to the fact that it d exist in some form which had a greater toxicity than arsen trioxide. Mr. Trotman had used the word "scare" a go many times. He did not think it a good word to use, as t word "scare" applied to an imaginary danger. There ha however, been a very real and great danger; therefore th ought not to perpetuate that word "scare," and the soon it was abandoned in connection with the question of arseni poisoning the better. He had also made reference arsenic being found in malt through the action of artific manures. He (Mr. White) heard an authority speaki on that part of the question, and in view of the argume advanced on that occasion he thought they might give the idea of arsenic being carried into the tissues of t barley from any manure used in its cultivation. He (M White) quite believed the whole of the arsenic lay on outside of the malt, and that efficient brushing of the gr would remove it effectually. Regarding the estimate of 200th part of a grain of arsenic to a pound of malt, he not know if Mr. Trotman intended to suggest it as maximum. It was quite contrary to his own experie

He had analysed a sample of malt a few days since, and he proportion was considerably greater than that, and he heard of a sample which contained one 40th part of a grain per pound declared by an analyst upon whose results he ould depend. One 40th of a grain to a pound of malt would produce beer containing one-twentieth of a grain per gallon. If that were so, they were getting on to the maximum medicinal dose; and if beer brewed exclusively rom malt and hops contained that quantity, he did not hink the author was justified in dealing with the introluction of arsenic into beer by means of the malt used in uch a light-hearted way. The question would no doubt ltimately resolve itself into what could be passed and what ejected. There would have to be an official standard. He elieved it was in Sweden that they adopted an official test or estimating the quantity of arsenic present in wall-paper. Something of the kind would have to be done in the future o determine what allowance of arsenic should be permitted n beer. For the purpose of detecting the presence of rsenic in beer he was satisfied that Reinsch's test was fficient, provided the test were carried out under he conditions laid down by the committee of experts ppointed by the Manchester Brewers' Association, with e exception that they used too small a quantity of beer. ut the Reinsch test gave no possible way of determining e amount of arsenic present, and that seemed to be the ost important point. Mr. White then explained the way which he used Marsh's test for the estimation of the rsenic, and exhibited standard mirrors prepared by him om known amounts of arsenic.

Mr. J. T. Wood intimated that the agricultural chemists America had adopted an official method for almost all e analytical operations they undertook. The tanning hemists had also adopted official methods of examining nning materials, and it seemed rather peculiar that no fficial methods prevailed for testing brewing materials.

Mr. Milthorp (Newark) said, as a maltster, at the resent moment they were in a state of chaos at his stablishment, having for the first time in their history what as known as a spring cleaning. He was pleased to hear at brushing would get over the difficulty so far as malt as concerned. He was surprised to hear the remark of r. Trotman regarding coal and coke, because he had scontinued entirely the use of coke in his maltings, as ey had received instructions from most of their brewers at anthracite coal only should be employed for drying the alt.

Mr. L. Archbutt asked Mr. Trotman to give some ounds for his contention that coke contained less arsenic an anthracite coal. He had had occasion to estimate senic in several samples of coke, and he was perfectly nvinced that there was arsenic in all, and that in some it as present in considerably more than the minute trace entioned by Mr. Trotman. He thought it would be very sirable if Mr. Trotman would give them some information to the methods which he had used, as the discussion had tered upon the analytical as well as the manufacturing le of the question. He suggested that, coupled with the aximum which would be fixed, the test should be defined which that limit was to be ascertained.

Mr. J. G. Wells remarked that the attention that had en drawn to the presence of arsenic in beer had arisen om one particular case, in which the arsenic had been oved to be derived from the glucose manufactured a certain firm. That had drawn them into issues, wever, which were wide of the original question. nalysts were not content with the detection and timation of the appreciable quantities of arsenic that ould be caused by the use of this particular arsenical ucose, but were taking up cases where infinitesimal ces of arsenic were found in the raw materials used by ewers. He heartily endorsed what Dr. Stern had said garding the careless methods used by many analysts, and was glad to see they had in one or two instances been lled up by coroners before whom they had given evidence the indefinite character of their evidence. Regarding the esence of arsenic in barley, there was no doubt that rleys which had been heavily manured with artificial nures containing arsenic showed traces of arsenic.

Respecting the question of purifying the malt from arsenic which it had picked up in the process of kilning, he quite agreed with previous speakers as to the efficiency of brushing, for no doubt careful cleansing would to a great extent get rid of small traces of arsenic. Another point raised was the fact that selenium was a possible poisonous constituent of beer. He submitted that little or nothing was known about the toxic action of selenium and its salts, and as far as he could make out it was an unknown quantity. He was rather curious to know how much arsenic really constituted a fatal dose. The quantities given by different authorities varied considerably, and the amounts on which brewers, or rather retailers, had been summoned for adulteration also varied considerably. He saw the latter had varied from 1/30th of a grain per gallon to 1½ grain. Until they settled what was a dangerous quantity, he urged it was not much use analysts giving evidence as to the amount of arsenic present in beer.

Mr. S. F. Burford said that the recent mishap was quite exceptional, and was not likely to occur again. It was certain that in the future glucose would be rigorously examined, and if also some other means of drying the malt could be devised, they would be sure of pure beer. He urged that some official maximum allowance of arsenic in beer should be adopted.

With regard to manures, superphosphates were used for various crops without any harm resulting; all they had to do was to keep cool while steps were taken to prevent a recurrence of the recent mischief.

Mr. Archbutt, referring to Mr. Wells' remarks, said that, although previous to the illness caused by arsenical glucose, nothing was heard of peripheral neuritis due to arsenic in beer, it did not necessarily follow that some of the cases of illness which had occurred amongst beer drinkers had not been due to arsenical poisoning. It was not until so many cases occurred in one district that suspicion had been aroused. Was it not possible there had sometimes been arsenic in malt in the past in sufficient quantity to give rise to cases of illness, and that no one had suspected the illness to be due to arsenical poisoning? Cases were reported as early as January 1900. He did not think they should jump to the conclusion that, because they did not hear of arsenical poisoning, cases had not occurred.

In replying to the discussion, Mr. Trotman said that since the meeting was chiefly composed of maltsters and brewers he had purposely avoided treating the subject from an analytical point of view. Most of the points raised had already been fully discussed. He did not think that brushing the malt would remove any appreciable quantity of the arsenic, for since the malt was damp when put upon the floor, the arsenic, being deposited upon it in a state of minute subdivision, would become practically a part of the malt itself.

Newcastle Section.

Meeting held at the Durham College of Science, on Thursday, February 28th, 1901.

MR. ALFRED ALLHUSEN IN THE CHAIR.

Prof. P. Phillips Bedson delivered a lecture on "The History of the Artificial Production of Indigo," in which he traced the gradual development of the knowledge of this dye which led up to Baeyer's synthesis of 1878, and the advancement made since that time. The lecture was illustrated by specimens and experiments; and by the kindness of the "Badische Anilin und Soda Fabrik" the lecturer was able to demonstrate experimentally the most recent method of manufacturing this dye (see this Journal, 1901, 239).

The Chairman expressed a hope that the artificial production of Indigo would not seriously interfere with that produced by the Indian growers, who were fully alive to the possible competition with which the artificial product threatened their livelihood.

New York Section.

Meeting held on Friday, February 15th, 1901.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

THE ASSAY OF GOLD SODIUM-CHLORIDE.

BY MESSRS. JOHNSON AND SONS.

In the November issue, 1900, page 1038, there is an abstract of a communication by Mr. L. F. Kebler (J. Franklin Inst. 1900 **150**, 235) on a method of assaying gold sodium-chloride. The system adopted in our laboratory, which is both simple and rapid, is as follows:—We dissolve 15 grains of the gold sodium-chloride in one ounce of distilled water and precipitate by sulphurous acid, collect on a filter, dry, ignite, and weigh. At the same time we take seven grains of chemically pure metallic gold, dissolve in aqua regia, evaporate, redissolve in distilled water, precipitate by sulphurous acid, collect on a filter of same weight as used for the assay of chloride, dry, ignite, and weigh; the object of this is to fix the amount of loss in the process, and a corresponding addition is made to the weight of the gold product from the gold chloride assay; our results are absolutely reliable to the second place of decimals. We may mention that this substance does not appear in the British Pharmacopœia. The actual percentage of pure gold in gold sodium-chloride ($NaClAuCl_3 + 2H_2O$) is 49·45.

LACTIC ACID IN THE MANUFACTURE OF LEATHER.

BY ALAN A. CLAFLIN.

Lactic acid occurs naturally in many of the processes of leather-making. I purpose discussing in this paper the substitution of the commercial variety for this naturally occurring lactic acid. The chemistry of the processes of leather manufacture is so involved, and many of the explanations of those processes so debatable, that in this industry it is necessary to rely largely upon practically demonstrated results. In fact, generally speaking, no laboratory experiments can serve as a basis from which to predict results, the laboratory methods serving only as a means of explanation of results already obtained.

With the cheapening in cost of production of lactic acid, a larger field of consumption naturally was desired by the makers, and the introduction of lactic acid into the leather industry was due to the energy of the lactic acid makers, rather than to the initiative of the tanners. Lactic acid was first introduced into the leather industry in 1896, and in the five years since, I believe, sufficient time has elapsed to judge satisfactorily (even in this industry of slow processes) the results and benefits obtained. The demonstration of its availability, however, is in a large measure to be credited to the progressive and investigating spirit of several of the leading American tanners.

Lactic acid is used in three of the processes of leather manufacture: in colouring, in bating, and in plumping. Its use has been developed in the above-mentioned order, and consequently we may first consider the application of lactic acid in colouring leather.

It was an easy transition from the use of lactic acid with bichromates in mordanting wool to use it in a similar manner in mordanting leather which is to be dyed with the alizarines or natural dyestuffs. This method, at first not practicable because of the high temperature required for the lactic acid to reduce the bichromates, was made of value by the fact that if sufficient sulphuric acid is used to decompose the bichromates the lactic acid will reduce the free chromic acid at a temperature readily withstood by chrome-tanned stock. Although the use of the alizarines in dyeing leather, which was fairly general when the dry alizarines were first introduced, is now limited, this method (lactic and bichromates) is used to some extent at the present time, and especially with fustic for a fast yellow shade on skivers. But this use of lactic acid is hardly in the scope of this paper, which deals with the replacing o the naturally occurring lactic acid; and it is in replacing th natural lactic acid of the sour tan liquors for the purpose o clearing the stock that the commercial lactic acid finds it largest employment by the leather colourer. Clearing i the general name given to the preliminary treatment tha skins receive preparatory to colouring. This colouring no only removes iron and other stains from the skins; it als renders the grain more porous and capable of taking more even shade. The two agents most largely employe for this purpose have been sour tan liquor and a dilut solution of sulphuric acid, the former by the bark tanne and the latter by the chrome tanner. The sour tan liquo has the disadvantage of being dirty and weak, and th sulphuric acid of being corrosive if used too strong or not thoroughly removed. Acetic acid, oxalic acid, an solutions of the bisulphates also have been suggested, an have some advantages over the sour liquor and sulphuri acid, but the acetic acid has a tendency to coarsen th grain, while the two latter are only slightly less corrosiv than the sulphuric acid, do not remove lime spots, and als are crystallisable, which sometimes has caused trouble.

Turning again to the sour liquor, this may be assumed t have the composition of 0·3 per cent. acetic acid, an 0·8 per cent. lactic acid, with various other organic acids i less proportion. Substitute for this 1 or 2 per cen solution of commercial lactic acid and very satisfactor results are obtained. The usual method of application is t treat four to six dozen skins in a pin wheel from 30 minut to one hour. In many cases a stronger solution is use especially where skins are coloured by the brush or d method. These solutions, which contain about 10 p cent. of absolute lactic acid, are used by either method i the colourer chooses, and it is in the use of these strong solutions that the advantage of the use of lactic acid more apparent. Lactic acid dissolves all iron and lin stains readily, but more important is its opening effe To what this opening effect of lactic acid is due, is n certainly known; the action is more similar to that glycerin than perhaps any other agent, and is probab related in some way to the hygroscopic nature of the aci It is certainly an effect peculiar to lactic acid, as it h also been observed in the use of lactic acid on texti fibres. This opening action is readily shown in the lab ratory; two similar pieces of chrome-tanned calf skin a treated, the one with a 10 per cent. solution of lactic ac and the other with an equivalent solution of sulphuric aci brush-dyed with an aniline colour, then thoroughly washe The lactic acid treated skin shows the deepest shade.

Now turning to the subject of bating we find bati processes are of two kinds, one depending on bacteri action, the other upon an acid bath. The work of Mr. J. Wood on the nature of bacterial or manure bates is famili to all readers of the Journal of this Society.

And now I wish to call your attention to the acid bat or drenches. Acid bates are old, dating back to Macbri in 1774. Since then almost every acid obtainable reasonable price has been suggested for the purpose, a many patents have been granted for the use of these acid their salts and various combinations thereof. Th suggestion of the use of acids for the purpose of bati has depended, of course, on the theory that the chi function of a bate is to remove the line from the hide skin. The uniform failure of acids to replace the bacteri processes as bates, would demonstrate the contrary were not for the fact that two acid bating processes have be adopted generally; namely, the use of an old sour liqu as a bate for hides, and the bran drench for various ski especially sheep skins. My experience with these leads to make the general statement that for many classes stock the removal of the lime is the chief function of t bate, and that, if the acid selected for this purpose does n affect injuriously the skin, good leather will result. If now examine the sour liquor and the bran drench, t chemist familiar with acetic and lactic fermentation w at once notice that both of these are most available und conditions which are favourable to the development lactic bacteria, and unfavourable to acetic fermentati that is at a fairly high temperature, and with a lar ount of nitrogenous matter present. Analysis abun- ntly corroborates this view. Braconnot first discovered sour tan liquors what Vogel afterwards proved to be tic acid,* although it is to Andreasch† that we are ctly indebted for our knowledge of the sour liquors and relative proportions of the acids contained therein. ndreasch‡ showed the usual proportion to be three parts tic to two parts acetic and other acids.

My own analyses have given for these liquors, which are table for bating, the proportion of 5 parts of lactic acid 2 parts of acetic and other acids. The analysis of the n drench by Freundt, Wood,§ and others shows even re lactic acid. Now we come to the substitution of the nmercial for this naturally occurring lactic acid. Its sibility could be predicted, but not assured, by laboratory periments. This assurance must come from the tanners o used the commercial lactic acid and made good leather. e first practical experiment was made by some of the epskin tanners, who were already using lactic acid in ouring. A mixture of 3 parts of lactic acid and 1 part acetic acid was first used, but the acetic acid was shortly minated as unnecessary and slightly injurious. The cess met with by the sheepskin tanners induced . Theodore Haight, of the firm of Hall, Haight, and Co., lston Spa, N.Y., very extensive tanners of heavy upper her, to make experiments on a large scale with lactic l. The success of the experiments of Mr. Haight was h that he abandoned the use of his other bating agents adopted lactic acid permanently. With this result the cticability of the lactic acid bate may be said to have n demonstrated, and it has been since then only a stion of for what kind of stock the lactic acid bate is cially adaptable. With the experience of about 200 ers at my disposal, I will give my opinion, subject to criticism of many who have had far wider experience nis field of chemistry, where the laboratory helps us so e. For bating steer and cow hides for heavy upper ner, belting, carriage stock, &c., lactic acid is well ed; the slightly increased first cost is far more than pensated by the increased yield of finished leather, and greatly decreased risk of over or under bating, and ened demand for skilled supervision. For sheepskins same is true, except that for these, where a depleting n is desired, the bate must be used at a higher tempera- . For calfskins the advantage of lactic acid is disputed the manure bate, all dependent on that mysterious ation called "bringing down." Many, especially some chrome calf makers, find that by using a warm lactic bate the skins are brought down sufficiently, and the adaptable for their use. For goat and kid skins the ure bate must be used, but is wisely followed by a acid drench. To summarise: the advantages claimed ctic acid by its adherents are cleanliness as opposed to economy as opposed to waste, and accuracy as opposed ncertainty.

considering the subject of bating, we find that many intended for sole and other very heavy leathers are ated at all, but put directly into the handler liquors. e handler liquors are old sour liquors with a minimum nnin material and a large amount of free non-tanning present. The presence of this acid necessarily removes ge part of the lime, but it has also another function— of plumping the hide. This plumping is extremely im- nt in the manufacture of sole leather, and of more or consideration in the making of all leather. Plump means heavy leather and a profit, while depleted stock mean the reverse. In the old days of very slow tan- , liquors were weaker, and the plumping in a large sure took care of itself. Lately, tanners seeking for ker methods, have used stronger liquors, and these made the necessity of plumping more evident. To mplish this, many sole-leather makers (*i.e.*, acid hem- tanners) have used a plumping bath of sulphuric acid minary to the real tanning. This course is open to much criticism, as beyond the well-known baneful effect of sulphuric acid on leather, plumping is an action which should be carried on simultaneously with the tanning, its object being to hold the hide plump and open, so that the tannin material may act gradually and evenly throughout. Sulphuric acid cannot be used in the liquors, as it combines with the tannin. With these objections to this process in mind, let us turn to the sour tan liquor. The free acid in this, as before said, as Andreasch and previous observers have shown, consists of lactic and acetic acid. Andreasch* has also shown that lactic acid is predominant in those liquors which have had many hides worked through them. Now liquors of this description are well known to tanners as the best for plumping, that is, an old sour liquor, one through which many hides have been passed and therefore containing much lactic acid, is better than one which is newly soured, and contains principally acetic acid. With the presence, then, of lactic acid known to be desirable, it is a question of to what extent the commercial acid may be used. This problem is now being solved by practical experiment by the tanners of this country, and the results I can give you should not be considered as yet conclusive The maximum amount of lactic acid we can expect to obtain in the handler liquor is about 0·8 per cent., and the presence of this maximum amount with only a small proportion of other acids gives the best results. To obtain this preponderance of lactic acid many expedients have been suggested, especially the sterilisation of the liquors, and impregnation with lactic bacteria, or the addition of nitrogenous matter and phosphates. Andreasch† noted, however, what lactic acid makers had long known, that lactic bacteria developed best in a medium slightly acidified by lactic acid. It is in supplying this desirable lactic acidified solution that commercial lactic acid is most valuable to the tanner for plumping. By its use under at all favourable conditions the lactic bacteria will develop to their full capacity, and the maximum yield of lactic acid will be obtained. I append a few analyses showing this. They were made on a parallel series of handlers. To series A there was an addition of lactic acid sufficient to make a 0·2 per cent. solution of lactic acid in the head handler. In series B there was no addition of lactic acid.

	Series A.		Series B.	
	Lactic.	Acetic.	Lactic.	Acetic.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
1	0·82	0·3	0·29	0·52
2	0·80	0·25	0·40	0·6
3	0·77	0·40	0·62	0·4
4	0·75	0·31	0·65	0·6

The leather resulting from the lactic acid treated handlers showed noticeable increase in plumpness and solidity, and also an improvement in colour and texture of grain. It will be noticed that, if anything, the addition of the lactic acid rather diminished than increases the total acidity, but what is more important is the great uniformity it ensures, thus making one more step in the direction of exactness in leather making.

In conclusion, it may be well to note two causes of error in the determination of lactic acid and its separation from acetic, namely, the volatility of lactic acid, especially in dilute solutions, and its tendency to form anhydrates. These tend to vitiate results obtained by Procter's,‡ Jean's,§ or any method dependent on the separation, by evaporation or distillation, of the mixed acids. The methods depending on the volatility may have some value as an indication, but should always be checked by some gravimetric method, such as that of Palm,‖ Weber,¶ or the precipitation of the insoluble, basic, stannous lactate.

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* Roscoe and Schorlemmer, Vol. III., Part 1, p. 134.
† E. Andreasch, Der Gerber, **22** and **23**.
‡ F. Andreasch, Der Gerber, **22**, 513—514.
§ J. T. Wood, this Journal, 1893, 422.

* F. Andreasch, Der Gerber, **23**, 536
† F. Andreasch, Der Gerber, **23**, 595.
‡ Leather Laboratory Handbook, H. R. Procter, p. 128.
§ F. Jean, Ann. Chem. Anal. appliq. 1900, **5**, 285; through this Journal, 1900, 1152.
‖ Palm, Fresenius Zeits. **22**, p. 225.
¶ Weber, Zeits. Anal. Chem. **24**, 614.

Scottish Section.

Meeting held on Tuesday, February 19th, 1901.

MR. ALEXANDER DAVIDSON IN THE CHAIR.

THE INTERACTION OF POTASSIUM PERMANGANATE AND ALKALI THIOSULPHATES IN NEUTRAL SOLUTIONS.

BY LEONARD DOBBIN, PH.D.

PART I.—SUMMARY AND REVIEW OF THE WORK OF PREVIOUS AUTHORS.

MUCH divergence of statement is met with in the literature with regard to the nature of the changes that take place during the interaction of potassium permanganate and alkali thiosulphates. Several of the more recent authors of papers upon the subject appear to be quite unaware of the earlier work carried out and published by others, or at any rate they do not take any notice of it. Serious errors, which will be pointed out later, have found their way into several of the published papers. A number of the various recorded sets of experiments have been planned from altogether different points of view, and have been carried out under considerably varying conditions; while different results have been observed, depending upon the temperature and upon whether the solutions were mixed in presence of acid or of alkali, or in absence of both. Further, the results obtained have been found to vary according to whether the permanganate was added to the thiosulphate or the thiosulphate to the permanganate, and so forth.

The various points referred to in the foregoing cannot be satisfactorily made clear without a review, at some length, of the papers published on the subject.

The earliest experiments bearing upon the matter are contained in a note by Fordos and Gelis (Ann. Chim. 1848, **22**, [3], 60) upon the analysis, by volumetric methods, of the oxygen compounds of sulphur. The authors state that potassium permanganate is without action upon several of the acids of sulphur, and that when it does act, the reaction is complicated and would require minute examination. They found, moreover, that the permanganate is not entirely reduced to the condition of protoxide, since in their experiments a blackish deposit was always found which did not dissolve in a large excess of hydrochloric acid. For these reasons they abandoned the use of permanganate as their oxidising agent.

The next references are contained in a paper by Péan de Saint-Gilles (Comptes Rend. 1858, **46**, 624) on the oxidising properties of potassium permanganate. It is stated in this paper that neutral solutions of thiosulphates, when added to acidulated solution of permanganate, interact with it incompletely (as regards formation of sulphate), a mixture of sulphuric and dithionic acids, in the proportion of 4 to 1, being produced; but that in alkaline solutions one "equivalent" of thiosulphate takes up exactly four "equivalents" of oxygen so as to be entirely converted into sulphate. No evidence is given in this first paper in support of the statement that the sulphur acid formed when the action takes place in acid solutions is really dithionic acid. In a fuller account of his experiments, subsequently published (Ann. Chim. 1859, **55**, [3], 374), Saint-Gilles gives some further particulars concerning this point; but the evidence which he adduces is insufficient to establish his conclusion that dithionic acid is produced, since he merely removes the sulphate present by adding excess of baryta water and filtering, then evaporates the filtrate to dryness, and ignites the residue, when he obtains a fresh quantity of barium sulphate.

Having had his attention particularly directed to tl matter by M. Gelis, Saint-Gilles admits in his later pap that the oxidation to sulphate is not quite complete even alkaline solutions, and he states that the permangana actually employed only amounts to from 98 to 99 per cer of that required for such complete oxidation.

In the same year as that in which the first paper l Saint-Gilles appeared, Cloëz and Guignet (Comptes Ren 1858, **46**, 1112) published one upon the determinatiou sulphur in gunpowder and in various sulphur compoand by precipitation as barium sulphate, after boiling tl substances under examination with concentrated soluti of potassium permanganate. In one experiment which th cite, 1 grm. of crystallised sodium thiosulphate (co mercial) gave 1·850 grm. of barium sulphate, containi 0·254 grm. of sulphur, while theory requires 0·258 gr of sulphur. The deficiency of sulphur observed here m have been a point of some significance, as will be evide further on, but in view of the fact that commercial th sulphate was under examination, it is not possible to s whether it was so or not. The authors evidently look up it as negligible; and they say they have satisfied themselv that even the most stable sulphur compounds are complete oxidised by potassium permanganate.

Stimulated, apparently, by the publication of the pap by Saint-Gilles, which seemed to contradict their obser tions, Fordos and Gelis re-examined some of their forn results, and almost immediately published a further pa (J. de Pharm. 1859, **36**, [3], 113). In this paper tl state as additional reasons which had previously influen them in abandoning potassium permanganate as th oxidising agent, the facts that, in acid solutions quantity of the reagent required was always below t figure indicated by theory (for complete oxidation before, to sulphate), and that in the case of neutral alkaline solutions the burette readings were "uncertai because the precipitate which was formed rendered difficult to observe the colour of the liquid. Moreover, oxidisable solution decolorised more permanganate wl hot than it did when cold. They now proceeded to exam the liquids obtained by filtering off the precipitates t were produced in solutions (presumably neutral, althou this is not stated) of salts of the several sulphur acids w potassium permanganate was added in excess to the lat From these liquids the sulphate present was first remo by precipitation with excess of barium chloride, and filtrates were then concentrated after the addition of hyc chloric acid and more permanganate. The formation, ur these conditions, of a further precipitate of barium sulph which they always observed when thiosulphates (as wel salts of several other sulphur acids) were the substa under investigation, indicated that the oxidation to sulpl by means of permanganate alone was not complete in of the cases examined by them. They devote a spe section to the behaviour of sodium thiosulphate, and find more permanganate is required and more sulphate is for in the case of a hot than in that of a cold solution; further, that the oxidation to sulphate is almost comp when the thiosulphate is added to the permanganate u such conditions that the latter is maintained in ex throughout the experiment. They are of opinion that initial effect of the interaction of thiosulphate permanganate is the formation of tetrathionate, and adduce an experiment which is designed to prove that salt is and that sulphate is not produced at first. In accompanying paper on the Solubility of Barium Sulp in Solution of Sodium Thiosulphate it is pointed out so far as the non-formation of sulphate is concerned, opinion is untenable, and that the experiment upon w it is based is fallacious. The explanation of their falling into an error is that the very appreciable solul of barium sulphate in solutions containing large exce sodium thiosulphate (or in any case its greatly ret precipitation from such solutions) sufficed to preven presence of sulphate from being indicated in the way, although it is beyond question that sulphate was formed in their experiment.

The next considerable experiments upon the oxidat thiosulphate by means of permanganate are described in earches by Spring and Levy (Bull. de l'Acad. Roy. de lg. 1876, [2], **42**, 103) on tetrathionic and trithionic ids. These authors refer to the previous experiments of int-Gilles upon the subject, but not to those of Fordos d Gelis, although they mention the latter chemists in ir paper in connection with other matters. It is not ite clear, therefore, whether Spring and Levy were are of the work of Fordos and Gelis or not. The first periment they describe consisted in causing potassium manganate to interact with potassium thiosulphate in proportions of $2KMnO_4$ to $6K_2S_2O_3$, when, if the nge took the direction which they seem to have regarded probable, they state that interaction might occur as lows :—

$$5K_2S_2O_3 + 2KMnO_4 = 3K_2S_4O_6 + 2MnO_2 + 8KHO.$$

There is an obvious omission of $4H_2O$ on the left side his equation.]

According to their observations "the reaction took place he cold; peroxide of manganese is deposited, and the r liquid has a strongly alkaline reaction. It is composed a mixture of potassium tetrathionate, sulphate, thiohate, and hydroxide." It may be mentioned here, in sing, that throughout the experiments described in the ent paper, the author has been uniformly unable to ct the faintest alkaline reaction of the liquid at any e in the addition of potassium permanganate to solutions sodium and of potassium thiosulphates which were tral to start with. It appears to be the fact, however, tetrathionate and sulphate are formed in the interon as described by Spring and Levy in their first riment.

he authors are of opinion that the tetrathionate formed e earlier stages of the oxidation is eventually oxidised sulphate when permanganate is added in excess, but fall into an extraordinary error in interpreting their lts after they have determined "how much potassium nanganate it is necessary to employ in order to convert en weight of potassium thiosulphate into sulphate, a rmination which M. Péan de Saint-Gilles omitted." y find that "the reaction takes place between exactly nolecules of permanganate and 10 molecules of thiohate," and they represent, as follows, the change which suppose to occur :—

$$10K_2S_2O_3 + 22KMnO_4 = 21K_2SO_4 + 22MnO_2.$$

they evidently do not perceive, and the error does not ar to have been pointed out by any subsequent writer, one sulphur atom and ten oxygen atoms too many are esented on the right of the sign of equality above. It ar that the conclusion of the authors that complete ation to sulphate has taken place cannot be sustained the evidence of this determination.

nge and Smith (this Journal, 1883, 463) showed in , that sodium thiosulphate is not completely oxidised sulphate in acid solutions when "only an excess of O_4 has been added on the assumption that it will be ed to MnO." When, however, they added to solutions iosulphates a large excess of potassium permanganate. nore than sufficient for complete oxidation with ation of MnO_2,"—then ferrous sulphate in excess, and ed back with permanganate, quantities of the latter required amounting to 99·5—100 per cent. of that sary for complete oxidation to sulphate. This paper unge and Smith's is elaborate and practical, and ins a number of other important matters which, ugh of considerable interest in connection with the nt subject, cannot be more particularly referred to

nig and Zatzek are the next authors who deal with subject. In elaborating a method for the direct mination of carbonic acid in the presence of alkali ides, sulphites, and thiosuphates (Monatsh. 1883, 4, they first treat the mixture with a concentrated on of potassium permanganate so as to convert the of the sulphur salts into substances which do not any volatile sulphur compound on subsequent nent with dilute nitric, sulphuric, or acetic acid. Finding amongst the published papers* contradictory statements concerning the completeness of the oxidation to sulphate, by means of potassium permanganate, of the salts of the lower acids of sulphur, they undertake an independent examination of the question and deal with it in a separate paper (Monatsh. 1883, **4**, 738).

With respect to thiosulphates they find that the oxidation is far from complete in acid solutions, whether hot or cold (about 88 per cent. being the highest observed proportion of the thiosulphate converted into sulphate). In cold neutral solutions the oxidation of 95·85 to 98·32 per cent. to the state of sulphate was attained. The oxidation to sulphate is stated to be complete in alkaline solutions (ammoniacal solution and solutions containing potassium carbonate and sodium carbonate respectively were employed), and analytical data, which appear to be quite satisfactory, are given in support of this statement. The authors next proceed to ascertain how much permanganate is actually employed in oxidising one gram of sodium thiosulphate in alkaline solution, and the mean number they obtain is 1·6366 grm.; but while they themselves point out a little further on that the calculated quantity required for complete oxidation to sulphate is 1·7 grm., they make no suggestion to account for the discrepancy, nor, indeed, do they refer to it at all. A portion of their paper is also devoted to a discussion of the precipitate formed during the interaction, but this part of the subject will be considered later.

In the following year Brügelman (Zeits. anal. Chem. 1884, **23**, 24) published a short paper on the conversion of thiosulphates into sulphates by means of potassium permanganate. He employed a solution (saturated in the cold) of the latter substance, adding it in excess to the boiling thiosulphate solution, and apparently operated with neutral solutions only. After the removal by filtration of the precipitate formed during the interaction, he determined, as barium sulphate, the quantity of sulphate contained in the filtrate. In each of four experiments 0·0628 grm. of crystallised sodium thiosulphate was used, and quantities of barium sulphate were obtained corresponding to from 98·89 per cent. to 101·11 per cent. of the sulphur of the thiosulphate used. Brügelmann does not make any reference in his paper to the work of earlier investigators, and even calls the oxidation of thiosulphate by means of permanganate an experiment hitherto untried. Moreover, he simply asserts that the interaction takes place in accordance with the equation—

$$2KMnO_4 + Na_2S_2O_3 = K_2SO_4 + Na_2SO_4 + Mn_2O_3.$$

On account of the want of concordance in the analytical results quoted above, the paper appears to possess little significance as a contribution to the subject.

A paper by Gläser (Monatsh. 1885, **6**, 329) on the action of potassium permanganate upon sodium thiosulphate is partly a reply to the portion of Hönig and Zatzek's paper (see above) relating to the composition of the precipitate formed when the substances are mixed in solution in presence of potassium carbonate, and partly a re-investigation of the question whether the oxidation of the thiosulphate to sulphate is complete or not. The solution of the permanganate was added to the boiling solution of the thiosulphate until a lasting red colouration was established, and after filtration the sulphate in the solution was determined as barium sulphate. The author concludes from the results of three experiments that the oxidation to sulphate is complete; but the analytical results cannot be regarded as satisfactory, since in one case two and a half milligrams, and in each of the two other cases seven milligrams more of barium sulphate were obtained than the highest possible quantity as indicated by calculation. The least satisfactory experiment is No. 2, in which, from 0·1979 grm. of sodium thiosulphate, 0·3792 grm. (instead of 0·3721 grm.) of barium sulphate was obtained—an error amounting to nearly one part in fifty. Gläser finds, as mean result of six experiments, that 1 grm. of crystallised sodium thiosulphate "under different conditions" (which are not stated) required 1·6621 grm. of permanganate for complete oxidation. This figure represents only 97·7 per cent. of the theoretical quantity, but no suggestion is made to account for the discrepancy.

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* Hönig and Zatzek refer to all the authors hitherto mentioned, except Spring and Levy, and Lunge and Smith.

In the same volume of the Monatshefte (Monatsh. 1885, **6**, 492), Hönig published "a correction," in which he points out that he and Zatzek had studied the action of potassium permanganate upon neutral and alkaline solutions of sodium thiosulphate at the ordinary temperature only, and re-asserts that the oxidation, under this condition, is complete in alkaline solution alone. A little later, Hönig and Zatzek published a further paper (Monatsh. 1886, **7**, 48), in which they adduce evidence to prove that the oxidation to sulphate, in neutral solution, is not complete even when permanganate is employed at the boiling temperature. They added permanganate to boiling neutral solution of thiosulphate until a lasting red colour was established, then reduced the excess of permanganate by means of alcohol, filtered, and removed the sulphate by precipitation as barium sulphate and refiltration. On adding bromine water to the second filtrate, a further precipitate of barium sulphate was produced in every case, showing that this liquid contained sulphur combined otherwise than as sulphate. They suggest that "a small part of the sulphur is oxidised only to dithionic acid, since this acid alone possesses the property of not being oxidised further by potassium permanganate at the boiling temperature, while it is so oxidised by the halogens."* No such further precipitation was observed when the oxidation was carried out in alkaline solution. The latter portion of the paper is a further contribution to the controversy respecting the composition of the precipitate formed during the interaction of the permanganate and the thiosulphate.

These two papers called forth another from Gläser (Monatsh. 1886, **7**, 651), who now proceeds to determine how much sulphur escapes complete oxidation in the case of boiling neutral solutions. He finds that from 1·98 per cent. to 2·69 per cent. of the sulphur of the thiosulphate employed is not converted into sulphate, by means of permanganate added in excess, after 15—20 minutes' boiling; while even after 8 to 9 hours' boiling there is from 0·21 per cent. to 0·3 per cent. of it still present otherwise than as sulphate. He also finds, however, that the oxidation is complete, even in neutral solutions, when the thiosulphate is added to excess of a boiling concentrated solution of permanganate and the mixture is boiled for 15 minutes; and he refers to Brügelmann (*vide ante*, p. 213) as having already obtained this result. This latter reference is not quite accurate, however, since Brügelmann added excess of concentrated permanganate solution to boiling thiosulphate solution.

The last paper, treating of the subject, to which it is necessary to refer at any length is one by Lückow (Zeits. anal. Chem. 1893, **32**, 53) on some volumetric experiments with sodium thiosulphate and potassium permanganate. The writer does not refer in his paper to any previous authors. His experiments consist in adding excess of a standard solution of potassium permanganate to measured quantities of a standard solution of sodium thiosulphate in presence sometimes of free acid and sometime of free alkali, boiling for a short time, and then, after acidulation with dilute sulphuric acid, in the cases where free alkali was present, adding excess of a standard solution of oxalic acid corresponding to that of the permanganate employed, and titrating back with permanganate. Shortly stated, and put into a form slightly different from that of the author, his results show that $2Na_2S_2O_3$ take up from 6·9 to 7·3 atoms of oxygen, while eight atoms would be required for complete oxidation into sulphate; and from these results he concludes that, besides sulphate, there must also be formed oxygen compounds of sulphur containing less oxygen than sulphuric acid. He adopts seven atoms of oxygen as the quantity taken up by $2Na_2S_2O_3$ (the mean of the eight experiments adduced is actually 7·1 atoms) and shows that this quantity would be accounted for by one half of the sulphur going to form sulphate and the other half to form dithionate; and this he asserts to be the course of the reaction. The author closes his paper with the furt assertion that the sodium dithionate (which he says transformed by barium chloride into soluble barium dit nate and sodium chloride) can be recognised in the oxidi solutions by the familiar method, but he gives no indicat as to what this method is.

Part II.—New Experiments.

In view of the great diversity in the statements foun exist in the literature of the subject, as detailed Part I., it seemed desirable to submit certain partic points to a further examination; and in doing a very large number of experiments, both qualit and quantitative, were carried out. In these experim neutral solutions were alone employed.

For the purposes of the quantitative experim standard solutions were prepared of sodium thiosulp potassium thiosulphate, potassium permanganate, iodine, the strengths of which were respectively—

$$\frac{Na_2S_2O_3.5H_2O}{10},\ \frac{3K_2S_2O_3,H_2O}{30},\ \frac{KMnO_4}{10},\ \text{and}\ \frac{I}{10}\ \text{grms. per l}$$

Equal volumes of the various salt solutions empl thus contained the dissolved salts in equimolecular pr tions, and the thiosulphate solutions decolorised ex their own volume of the iodine solution.

1. *Proportions in which Thiosulphates and Potassium Permanganate interact.*

Independent experiments were made to ascertai relative proportions in which sodium thiosulphate potassium thiosulphate interact with potassium per ganate. The method usually employed was to ad permanganate slowly to the thiosulphate solution after agitation and settling, a pink coloration was v The results obtained were found to be moderately conc when successive experiments were carried out under s conditions, but they varied considerably with variati certain conditions, such, for example, as the temper the rate of addition of the permanganate, &c.

The following table shows the results obtained :—

Table I.

No. of Experiment.	Standard Thiosulphate c.c. taken.	Standard KMn O_4 c.c. required.	Remar
	Standard $Na_2S_2O_3$		
1	10	23·95	Permanga added ordinary perature
2	10 (+50 c.c. H_2O)	23·92	
3	10 („)	24·0	
	Standard $K_2S_2O_3$		
4	10 (+20 c.c. H_2O)	22·77	
5	10 („)	22·87	
6	10 („)	23·08	
7	10	24·63	Permangar added to thiosulph.*
8	100 (+200 c.c. H_2O)	219·1	See below.
9	10 (+20 c.c. H_2O)	25·65	„

* An experiment similar to this had already been made by and Golis (*loc. cit. ante*, p. 117).

On repeating Experiments 4—5 on a larger sca ploying 100 c.c. of thiosulphate instead of 10 c.c., and running in the permanganate with constant agitati quantity of the latter required (as shown in Experi was very considerably smaller in proportion than t quired in the experiments quoted. On the othe when the permanganate was run into the thios solution very rapidly, much more of it was requir when it was added gradually and with constant A number of experiments were made in order to a the maximum volume of the permanganate solutio could be decolorised at ordinary temperatures w total quantity was added all at once to the measur sulphate and the liquids were mixed together as ra possible by brisk agitation. The maximum figure in this way is shown in Experiment 9.

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* Compare the statement regarding tetrathionate in Experiment 26 (Part II., Section III.).

he relative volumes of the solutions employed in these eriments represent the relative numbers of the molecules ch interact. Spring and Levy (*loc. cit. ante*, p. 112), g 1 grm. of the salt $3K_2S_2O_4$, $5H_2O$ in solution, and ing a solution containing 10 grms. of potassium per- ganate per litre, found that 10 molecules $K_2S_2O_3$ uired exactly 22 molecules $KMnO_4$ This result is in o agreement with Experiment 8, but with this experi- t alone.

II. *Composition of the Precipitate produced by the Interaction.*

lthough the question as to the composition of the dark rn precipitate formed when dissolved thiosulphate and anganate interact is dealt with by several of the ors who have already been referred to, the latter all omit to make any investigation as to the condition of ation of the manganese which it contains, and as a rule simply assume that it is on the MnO_2 level. Brügel- n (*vide ante*, p. 213) assumes that it is Mn_2O_3. It is all more remarkable that no experiments were made re- ing this point, seeing that many authors of papers on ganese compounds have found that the dark brown ances (manganites) obtained by precipitation and in ways, and formerly taken to be hydrated manganese cide, almost invariably contain some manganese which a lower level of oxidation than MnO_2.[*] The chemists red to in Part I. who examined the precipitates formed e interaction of thiosulphate and permanganate appear, he most part, to have been more concerned with the stage of the oxidation of the sulphur than with that of the anese, and, at first at least, to have been quite uniformly are of the existence, referred to above, of the numerous rate researches into the composition of the manganites ned (amongst other ways) from potassium perman- e by the action of reducing agents other than thiosul- a.[†] Gröger (Chem. Zeit. **18**, [1], 1894, 743), however, omparatively recent paper, investigated the stage of tion of the manganese in the precipitates produced g the reduction of potassium permanganate by a er of substances, including sodium thiosulphate, but d not inquire into what became of the thiosulphate. precipitations were carried out in a flask placed on a g water bath, and the figures for sodium thiosulphate that the precipitate which it yields in this way with nganate in neutral solutions only contains about 80 ent. of the peroxide oxygen required for MnO_2. In ne solutions, on the other hand, the manganese in the pitate was found to be exactly on the MnO_2 level.

number of new experiments were carried out in order ertain the oxidising power of the precipitates formed ld solutions. The method ultimately adopted in ng the determinations consisted in collecting on an tos filter the precipitate produced by a known weight re potassium permanganate, decomposing it by means ute hydrochloric acid in a closed vessel in presence of s of potassium iodide, and then titrating the liberated by standard thiosulphate. The permanganate was ery case added to cold neutral thiosulphate solution, ne latter was always in considerable excess throughout, t in Experiment 12, below, where the permanganate dded until a lasting pink colour had been established. precaution was taken to avoid error owing to loss of or to any of the other known causes. The results ned are given in the following table, in which column A shows the quantities of standard thiosulphate that should have been required, theoretically, to take up all the iodine liberated by the decomposition of the precipitates in presence of potassium iodide, had the manganese been entirely on the MnO_2 level of oxidation, while column B shows the quantities actually required :—

TABLE II.

No. of Experiment.	Standard $Na_2S_2O_3$: c.c. taken.	Standard $KMnO_4$: c.c. taken.	A.—Standard $Na_2S_2O_3$: c.c. required by theory for MnO_2.	B.—Standard $Na_2S_2O_3$: c.c. actually required.
10	10	5	10	9·1
11	10	5	10	9·1
12	10 (+50 c.c. H_2O).	23·85	47·7	45·1
13	10	10	20	18·35
14		5	10	9·2
15	10	15	30	27·6
16		5	10	9·3
17	10	24	48	45·9
18	$K_2S_2O_3$ 10 c.c.	5	$K_2S_2O_3$ 10 c.c.	$K_2S_2O_3$ 9·2 c.c.

In Experiments 14 and 16 the permanganate was added to the filtrates from Experiments 13 and 15 respectively.

The results show that, under the conditions of the experiments, a not inconsiderable part of the permanganate is always reduced below the stage of MnO_2, and it may be noted that the deficiency of oxygen below that required for MnO_2 is somewhat greater in the precipitate formed in the earlier stages of the precipitation than in those formed near the end. This is illustrated in Experiment 10 as compared with Experiments 16 and 12, the respective percentages of peroxide oxygen in these three experiments being 91, 93, and 94·5. The mean oxidising power of the precipitates obtained in the nine experiments quoted above was 93·4 per cent. of that indicated by theory for MnO_2. This represents a ratio of MnO to MnO_2 of 1 to a little over 14.

Hönig and Zatzek in one of their first papers (Monatsh. 1883, **4**, 744) examined the proportions in which potassium and manganese are present in the precipitate, dried at 100°, and in opposition to Morawski and Stingl (J. prakt. Chem. [2], **18**, 1878, 81), who represented by the formula $Mn_4KH_3O_{10}$ the composition of the precipitate obtained when potassium permanganate is reduced by means of various organic substances, they state that the precipitate formed when the reduction is effected by thiosulphate is represented by the formula $KH_3Mn_3O_8$. Gläser (Monatsh. **6**, 1885, 333) afterwards upheld Morawski and Stingl's formula for the substance as prepared in this way also, against that advanced by Hönig and Zatzek. While the different authors supported their views by analytical data, none of them, as already indicated, determined the peroxide oxygen in the precipitates. But it is practically certain that some, at least, of the substances they examined did not contain all the manganese on the peroxide level of oxidation, and hence it is impossible to place much reliance upon formulæ assigned on the assumption that they did. It is worthy of note, moreover, that Hönig and Zatzek (Monatsh. 1883, **4**, 752), and also Gläser examined precipitates obtained by the interaction of potassium permanganate and sodium thiosulphate, while it cannot be discovered from their papers that they made any attempt to ascertain whether or not the precipitates formed contained sodium as well as potassium, the determination of potassium being alone mentioned. Experiment shows that the precipitate formed under the conditions just mentioned invariably contains a notable quantity of sodium even after the most thorough washing. It may also be mentioned here, in confirmation of an observation made by Hönig and Zatzek, that the thoroughly washed precipitate was always found to contain distinct traces of sulphur compounds.

The relative proportions of potassium and of manganese were not made the subject of any minute independent study, but the results tabulated below are obtained from experiments carried out with the moist precipitates to obtain some knowledge of the variations in these proportions when the precipitations were brought about by mixing potassium permanganate and thiosulphate in varying proportions, the conditions being otherwise substantially the same in each experiment :—

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[*] e Lenssen, J. pr. Chem. 1860, **80**, 468;
Gorgeu, Ann. Chim. [3], 1866, **66**, 155; and Comptes Rendus, 1879, **88**, 797;
Guyard, Bull. Soc. Chim. 1864, **1**, 90;
Kessler, Z. analyt. Chem. 1872, **11**, 257;
Wright and Luff, J. Chem. Soc. 1878, **33**, 513;
Pattinson, J. Chem. Soc. 1879, **35**, 365-6; compare also Chem. News, 1880, **41**, 179-80;
Pickering, J. Chem. Soc. 1879, **35**, 659;
Volhard, Annalen, 1879, **198**, 319;
Wright and Menke, J. Chem. Soc. 1880, **37**, 42;
Veley, J. Chem. Soc. 1880, **37**, 581.
are also Fresenius, Z. analyt. Chem. 1872, **11**, 297 and 414. of the papers here referred to are very detailed and highly tant.

[†] the close of their last paper (Monatsh. 1886, **7**, 52). Hönig tzek refer to the existence of numerous papers on manganites.

TABLE III.

No. of Experiment.	Molecular Proportions taken of		Atomic Proportions found of	
	$K_2S_2O_3$.	$KMnO_4$.	K.	Mn.
19	10	21·9	1	3·3
20	10	9·05	1	4·3
21	10	8·99	1	4·7
22	10	5·07	1	8·5

Although the quantities of potassium sulphate obtained in some of these analyses were too small to permit of the result showing a high degree of accuracy, still the results indicate that the proportion of potassium in the precipitates increases very markedly as the proportion of added permanganate increases. In Experiment 19, permanganate had been added until a lasting pink colour was produced, while in Experiment 22 not quite one-fourth of the quantity necessary for this had been added. From what has been stated in this section it is clear that the composition of the precipitates is subject to such variations with variations in the conditions of their formation as to render it incapable of representation by any definite formula.

III. *Nature of the Products of the Oxidation of the Thiosulphates.*

A perusal of the various papers that have already been referred to, shows that while several authors discuss the nature of the oxidation products formed when thiosulphates and permanganate interact, the views expressed are in almost every case unsupported by any convincing experimental evidence. Spring and Levy, however (*loc. cit. ante*, p. 111), succeeded in separating potassium tetrathionate from the dissolved products of the interaction of the two potassium salts (by precipitation with alcohol and subsequent purification). They thus showed conclusively that tetrathionate is one of the substances formed, but they do not give any indication of the quantity of this salt obtained in their experiment or of their ideas as to the relative proportions of tetrathionate and of sulphate formed.

As this branch of the subject did not appear to be very satisfactorily cleared up, it seemed desirable to carry out a number of new experiments with a view to obtaining a fuller insight into the course of the interaction.

Experiment 23.—Potassium permanganate was added to a cold neutral solution of potassium thiosulphate until a very slight but distinct pink colour remained after thoroughly shaking up; the mixture was then set aside for the precipitate to settle. In a few minutes the precipitate had subsided considerably, leaving a clear layer of liquid of which the upper position was still distinctly pink, while the lower portion, just immediately above the precipitate, was colourless. On filtering some of the pink upper layer and allowing it to stand for a day or two in a closed vessel, it also became colourless, a brown precipitate separating. These observations indicate that both the precipitate and some substance in the solution are capable of further slowly decolorising permanganate solution. Moreover, the thoroughly washed but still moist precipitate was found to possess the same property. The filtrate was neutral, and it was free from thiosulphate since it did not become cloudy on prolonged boiling with dilute sulphuric acid, nor act upon solution of iodine, nor give any dark precipitate with mercurous nitrate. The latter reagent produced, however, a bulky precipitate of a pale yellow colour, whilst barium chloride produced an abundant white precipitate which did not dissolve in dilute hydrochloric acid and evidently consisted of barium sulphate. When the SO_4 had been removed from the filtrate by acidulating with dilute hydrochloric acid, adding excess of barium chloride in the cold, and filtering, and the new filtrate was afterwards boiled down with concentrated nitric and hydrochl acids and then diluted with water, a further precipitate barium sulphate remained, showing that a salt of a lo acid of sulphur had been present. The mercurous nit reaction seems to indicate that the salt in question i tetrathionate.

Experiment 24.—Potassium permanganate was added a cold neutral solution of potassium thiosulphate in s quantity that the liquid was somewhat intensely colou after the precipitate had subsided, and the mixture was aside in a closed flask. Some weeks later the liquid still distinctly coloured, but after the lapse of several mo the colour had entirely disappeared. In order to vestigate the properties of the colourless liquid, a quan of it was filtered and divided into two portions, one which was examined without further treatment, while other was boiled for some time and then cooled. observed reactions are given below :—

Reagent.	Unboiled Filtrate.	Boiled Filtrate.
$HgNO_3$.......	Pure yellow precipitate (pale).	Greyish black pr tate.
$HgCl_2$........	Whitish precipitate, gradually increasing and becoming very pale yellowish.	Opalescence at then distinct white precipitate short time.
Iodine (in KI)	Not decolorised........	Immediately decolo
$KMnO_4$	Purple colour endured for days.	Colour immediatel charged and a precipitate forme
$Cd(NO_3)_2$...	.. ..	No precipitate.

A quantity of pure potassium tetrathionate was pre for the purpose of examining its reactions in solution. When such a solution was mixed with sul and examined by means of the foregoing reagents, found to behave in every respect like the filtr Experiment 24.

Experiment 25.—Potassium permanganate was ad a boiling neutral solution of potassium thiosulphate the liquid was visibly pink and remained so after boili four minutes. On boiling for five minutes longer th colour disappeared. Part of the liquid, filtered a stage and cooled, was found to be neutral; and mercurous nitrate was added to it a bulky precipita produced which was not quite white, as mercurous su should be, but nevertheless it was only faintly yellow

Experiment 26.—40 c.c. of standard solution of pot thiosulphate were mixed in the cold with the calc quantity of standard permanganate (106·4 c.c.) requ oxidise the whole of the sulphur to the condition phate, assuming that the reaction took this course. quantity of permanganate proved sufficient to im moderately intense purple colour to the liquid aft further formation of a precipitate had ceased. The n was next boiled for four hours in a flask fitted inverted condenser, and the purple colour had th appeared. 5 c.c. more of standard permanganate we added and the mixture was similarly boiled for fiv longer, when the colour had again disappeared. Th was then filtered and the filtrate showed the fo properties :—1. It was neutral; 2. It had a slig unmistakable decolorising effect upon dilute iodin tion; 3. It gave a slight grey precipitate with me nitrate.

In connection with this experiment it may be that dilute solution of potassium tetrathionate was f be only comparatively slowly oxidised by po permanganate when boiled with it.

The extent to which potassium permanganate is in its interaction with thiosulphates having been mined in Experiments 10—18 (Table II.), anothe of experiments was carried out in order to determ much thiosulphate was oxidised by known quan permanganate in the earlier and also in the later the action, and so to ascertain whether tetrathionate first product of oxidation (as Fordos and Gelis, an and Levy, for example, suggest (*vide ante*, pp. and the sulphate eventually formed merely a produ ier oxidation of this tetrathionate. The quantities of ygen required to effect these two oxidations are so very rent that any considerable preponderance of the one n over the other at the commencement of the interaction ld be easily recognisable. Thus $2K_2S_2O_3$ could give $_4O_6$ by loss of two potassium atoms which would only ire one oxygen atom between them, while $K_2S_2O_3$ ld require K_2O and four atoms of oxygen in order to give $2K_2SO_4$. The method of experimenting consisted in slowly adding standard potassium permanganate to standard sodium or potassium thiosulphate in the cold in quantities insufficient to complete the reaction, filtering off and well washing the precipitate, and then determining the unchanged thiosulphate in the filtrate and washings by means of standard iodine. The following table shows the results obtained:—

TABLE IV.

No. of periment.	A. Thiosulphate taken.	B. = Iodine.	C. $KMnO_4$ added.	D. Iodine used.	E (= B−D). Thiosulphate oxidised by quantity of $KMnO_4$ added.	$F\left(=\frac{10C}{E}\right)$. 10 molecules Thiosulphate require of $KMnO_4$*
	C.c. $Na_2S_2O_3$	C.c.	C.c.	C.c.	C.c.	Molecules.
27	10	10	5	7·54	2·46	20·3
28	10	10	10	5·45	4·55	22·0
29	10	10	15	3·25	6·75	22·2
30	10	10	15	3·1	6·9	21·7
31	10	10	20	1·3	8·7	23·0
32	10	10	12	4·53	5·47	21·9
33	10	10	12·05	4·5	5·5	21·9
34	10	10	18	2·0	8·0	22·5
	$K_2S_2O_3$					
35	10	8·89	5	6·55	2·34	21·4
36	10	8·89	5	6·6	2·29	21·8
37	10 (+20 c.c. H_2O)	8·89	5	6·4	2·49	20·1
38	50·1 (+100 c.c. H_2O)	44·54	40	24·9	19·64	20·4
39	10 (+20 c.c. H_2O)	8·89	6	6·0	2·89	20·8
40	10·02 (+10 c.c. H_2O)	10·89	5	8·5	2·39	20·9
41	10 (,,)	10·57	10	6·17	4·7	21·3
42	10 (,,)	10·87	15	3·97	6·9	21·7
43	10 (,,)	10·87	20·04	1·9	8·97	22·3

* Stated in this form for ready comparison with Table I.

though these results are not altogether free from slight ularities, there are some tolerably definite conclusions may be drawn from them:—

) The figures in Column F show that on the whole permanganate is required towards the end than at the ning of the interaction to oxidise the same quantity iosulphate. (Compare with this the fact ascertained xperiments 10—18 that the permanganate is further ced at the beginning than towards the end.)

) Other things being equal, thiosulphate in dilute ion seems to require more permanganate for its oxidation than the same quantity requires in more concentrated ion. See Experiments 36, 40, and 37.

) The view that tetrathionate is formed exclusively early exclusively at the beginning and sulphate at the of the interaction, is quite untenable since the quantity iosulphate oxidised per molecule of permanganate used ly slightly different at the beginning from what it is rds the end.

e following experiment may also be quoted here:—

xperiment 44.—The relative proportions of sulphur ent as sulphate and present otherwise than as sulphate determined in the filtrate obtained in Experiment 8. sulphate was determined in a weighed portion of the te by adding excess of barium chloride to it in the cold acidulating it with dilute hydrochloric acid. The sulphur was similarly determined in another weighed ion of the filtrate after evaporating it to dryness with entrated nitric and hydrochloric acids and dissolving the lue in hot water and a drop of dilute hydrochloric acid.

Results.

	Grm.
Total sulphur per 100 grms. of filtrate	0·0985
Sulphur as sulphate per 100 grms. of filtrate ...	0·0843
Therefore sulphur otherwise than as sulphate per 100 grms. of filtrate	0·0142

ence 85·6 per cent. of the total sulphur was present as hate and 14·4 per cent. of the total sulphur was present rwise than as sulphate.

rom the various experiments quoted in this section it d appear that sulphate and tetrathionate are the only sulphur compounds produced by the interaction of permanganate and thiosulphate in neutral solutions. At any rate no evidence of the formation of any other sulphur compound could be obtained. It is probable that two oxidising actions take place side by side, the one giving rise to sulphate and the other to tetrathionate. The quantities of oxygen required for effecting these respective oxidations with equal weights of thiosulphate stand to each other as 8 to 1, as may be seen in the following *pro forma* equations:—

$$3K_2S_2O_3 + 8KMnO_4 = 6K_2SO_4 + 8MnO_2 + K_2O;$$
$$6K_2S_2O_3 + 2KMnO_4 = 3K_2S_4O_6 + 2MnO_2 + 4K_2O.$$

The proportions in which the two changes occur vary with varying conditions, but at the earlier as well as at the later stages of the interaction, in cold dilute solutions, the oxidation to sulphate largely predominates, about $\frac{6}{7}$ths of the thiosulphate being converted into sulphate while the other $\frac{1}{7}$th is converted into tetrathionate.

IV. *Summary of Main Conclusions.*

I. When potassium permanganate interacts, in the cold, with neutral solutions of alkali thiosulphates there are produced:—

A.—A dark brown flocculent precipitate of varying composition; and

B.—A neutral solution.

II. The quantity of potassium permanganate which must be added to a given weight of dissolved thiosulphate in order to produce a lasting pink colour always falls short of that required by theory to oxidise the latter salt completely to sulphate, on the assumption that the permanganate is only reduced to manganese peroxide.

III. The precipitate consists of manganite. It always contains some manganese which is on a lower level of oxidation than MnO_2. When thoroughly washed it contains alkali metal and manganese in proportions which vary within tolerably wide limits with variation in the conditions under which it is produced; it always contains traces of sulphur compounds; and it possesses the property of slowly decolorising dilute solution of potassium permanganate.

IV. The solution filtered from the manganite contains sulphate and tetrathionate, at whatever stage of the interaction it is examined. Even when free from thiosulphate, it still possesses the property of slowly decolorising dilute solution of potassium permanganate, a further brown precipitate separating. This property is due to the presence of the tetrathionate. The latter salt is not completely oxidised to sulphate even after prolonged boiling with excess of potassium permanganate.

V. There is no evidence of the formation, even in small quantity, of any sulphur compound except sulphate and tetrathionate.

THE SOLUBILITY OF BARIUM SULPHATE IN SOLUTION OF SODIUM THIOSULPHATE.

BY LEONARD DOBBIN, PH.D.

The fact that barium sulphate is very distinctly soluble in solution of sodium thiosulphate, although it has been pointed out on at least two occasions (Fresenius, Zeits. Anal. Chem. 1891, **30**, 459; Salzer, *ibid.*, 1892, **31**, 377), does not appear to be by any means generally known; at any rate, its important bearing on the analysis, both qualitative and quantitative, of mixtures containing sulphates and thiosulphates is not referred to in any of the most recent analytical text-books that the author has examined. It seems desirable again to direct attention to the subject, partly for the purpose of suitably rounding off one of the matters referred to in the preceding paper, but more particularly on account of its far-reaching importance, and of the fact that mistakes have already arisen, and are likely to arise again, in consequence of chemists being unaware of this possible source of serious error.

A chance observation in the laboratory first brought the matter under the writer's notice, and indeed led to the independent discovery and investigation of the facts. A solution of sodium thiosulphate having been partially oxidised by means of potassium permanganate for the purpose of obtaining the precipitated manganite for an experiment in view at the time, a small quantity of the filtered liquid was mixed with barium chloride. The precipitate which immediately formed was treated with dilute nitric acid, and in this it almost instantly dissolved. As it had been assumed that the precipitate consisted of barium sulphate, its ready solubility in dilute nitric acid occasioned some surprise. It was the following up of this observation which originally led to the investigation of the interaction of potassium permanganate with the alkali thiosulphates as detailed in the preceding paper. The idea at first entertained was that sulphite might be a product of the earlier stages of the oxidation of the thiosulphate. Experiment soon showed, however, that sulphite was not produced in the reaction at all, while it was ascertained, after some little investigation, that the precipitate consisted of nearly pure barium sulphate. The great readiness with which the precipitate dissolved on the addition of dilute nitric acid while it was still mixed up with the solution of unchanged thiosulphate was found to depend upon the presence of the thiosulphate. Qualitative tests made with mixed solutions of sodium sulphate and thiosulphate having subsequently shown that the presence of thiosulphate greatly retarded or entirely prevented the precipitation of barium sulphate, while it strikingly influenced the solubility of the precipitate (when produced) in nitric acid, some quantitative experiments were also carried out in order to obtain an idea of the proportion of sulphate which might be entirely overlooked in the course of analytical work. These experiments were made with solutions of sodium thiosulphate and sulphate of known strengths, and have already been published (Pharm. J. 1900, **64**, 182), but they may be summarised here again.

The sodium thiosulphate solution, A, was the usual "decinormal" one, and the sodium sulphate solution, B, was of the same sodium concentration (*i.e.* $\frac{Na_2SO_4}{10}$ grms. per litre). The latter solution, when diluted with 25 times its volume of water, still gave an immediate precipitate on the addition of barium chloride; but when diluted with 25 times its volume of solution A, barium chloride produc no precipitate even on standing for several minutes, althou a partial precipitation took place after prolonged standin In examining the effect of the presence of sodium thi sulphate in greatly increasing the solubility of bari sulphate in dilute nitric acid, mixtures were prepar containing: in experiment *a*, 1 c.c. of solution B a 20 c.c. of water; and in experiment *b*, 1 c.c. of solution 10 c.c. of solution A, and 10 c.c. of water (both mixtur were thus of the same SO_4 concentration). Barium chlori was added to *a* and *b*, and rapidly produced precipitates both. To each of the resulting mixtures there was th added its own volume of dilute (20 per cent.) nitric ac The precipitate in *a* did not visibly diminish in quanti while that in *b* dissolved slowly and completely, and yield a liquid which, after remaining perfectly clear for a sh time, became clouded by a precipitate of sulphur, owing the decomposition of thiosulphuric acid. Dilute hyd chloric acid was also found to dissolve barium sulphate presence of sodium thiosulphate, but not in anything li so marked a manner.

In the course of an investigation on the employment potassium permanganate in the analysis of compounds sulphur, Fordos and Gelis carried out an experim which was designed to prove that tetrathionate is, and th sulphate is not, produced in the first stage of the oxidati of thiosulphate in this way (*vide* Part I. of the precedi paper, p. 212). They say (Journal de Pharmacie, 18 [3], **36**, 117):—"In studying what was the first effect the action of permanganate of potash on hyposulphite soda, we observed that a tetrathionate is at first formed. a solution of permanganate of potash containing 0·5 g of this salt, is gradually added to a dilute solution c taining 4 grms. of hyposulphite of soda, a solution obtained which is not precipitated by acidulated chlor of barium, and which, on evaporation, gives sulph sulphurous acid, and sulphuric acid just as a solution tetrathionate would do under the same conditions."

On repeating this experiment with the quantities of salts mentioned, dissolved in such quantities of water t when mixed the volume of liquid was approximately litre, the observation that the filtrate was not precipita by acidulated solution of barium chloride was confirm but it was found that on the addition of neutral solution barium chloride to a part of the filtrate, there was slo formed a white precipitate which re dissolved complet or very nearly so, after the addition of a considera quantity of 20 per cent. nitric acid, followed by seve minutes' shaking, whereas it only partially re-dissolved the addition of dilute hydrochloric acid. On the ot hand, two portions of the same filtrate which were mi with solution of barium chloride, after previous acidulat with moderate quantities of dilute nitric and hydrochl acids respectively, did not give any indications of precipitation of barium sulphate within the five minute so that elapsed before opalescence, due to the separation sulphur, became apparent. On the assumption that permanganate added in this experiment was exclusi used up in the formation of sulphate in accordance the *pro forma* equation:—$3Na_2S_2O_3 + 8KMnO_4 = 3Na_2S$ $3K_2SO_4 + 8MnO_2 + K_2O$, there would be present in the filt 0·22 grm. SO_4 and 3·7 grms. thiosulphate ($Na_2S_2O_3$, 5H per litre. These numbers may be compared with those the solution used in experiment *b* described above, wi contained 0·46 grm. SO_4 and 11·8 grms. thiosulph ($Na_2S_2O_3$, $5H_2O$) per litre.

For the sake of comparison, a solution, C, was prep (on the basis of the above equation) to imitate the filt obtained by Fordos and Gelis. 3·7 grms. $Na_2S_2O_3$, 5H 0·4 grm. Na_2SO_4,$10H_2O$, and 0·2 grm. K_2SO_4 were solved in water and the solution was made up to a l In its behaviour with barium chloride and dilute acids, solution was indistinguishable, from the filtrate previo examined, and the barium sulphate precipitates obta from the two liquids, after having been most thorou washed, both slowly decolourised a dilute solution of io When a portion of the solution C was evaporated, after addition of acidulated barium chloride, it exhibited reactions mentioned by Fordos and Gelis in the paragr ed above; and necessarily so, since it contained hate and thiosulphate. These experiments show that opinion of these authors regarding the tetrathionate is nable.

s regards other fallacious conclusions based upon riments in which the production or non-production of ecipitate of barium sulphate in presence of dissolved sulphate is concerned, it seems almost certain that e must be numerous. A few cases have been met recently in the literature while other matters were g looked up. Wright (Chem. News, 1870, **21**, 104), xample, added barium chloride to a dilute solution of m thiosulphate and, getting no precipitate, then added ochloric acid in small quantity and allowed the ure to stand for some time, when sulphur separated. latter was removed by filtration, and, as it was found e wholly volatile, and therefore free from barium hate, Wright concluded that the thiosulphate was free sulphate. The determinations by Pickering (J. Chem. 1880, **37**, 129) of the quantities of sulphate formed g the interaction of sodium thiosulphate and iodine at ary temperatures, are quite certainly unreliable to a ee of which their author had no idea These de- inations were based upon the erroneous assumption the excess of sulphate found by precipitation as m sulphate, after the interaction of a given weight of ulphate with iodine, over that similarly found in the weight of the original thiosulphate was necessarily to sulphate formed during the interaction.

e fact that the precipitation of barium sulphate is so y impeded by the presence of dissolved thiosulphate, s grave doubt upon the usual qualitative separation e sulphur acids as a method capable of giving reliable ts in examining for small quantities of sulphate or of ite in presence of much thiosulphate.

a paper on the estimation of sulphides, sulphites, ulphates, and sulphates in presence of each other, ardson and Aykroyd (this Journal, 1896, 171), under ending of the estimation of sulphates in presence of ulphates, &c., observe that "none of the methods in e were of any value." They then allude very rally to certain difficulties in way of making the ation, but the solubility of barium sulphate in ulphate solutions is not one of these, and there is no rk in their paper from which it might be inferred that were aware of it as a possible source of error. In to the discussion on the paper Mr. Richardson red, however, to the solvent action of ammonium ate on barium sulphate. It is rather to be regretted these authors, who evidently have carefully examined estimations, and who mention quite a number of ical points which have come under their observation, t give somewhat fuller particulars than those contained eir useful paper, with respect to the methods of ate determination which they examined and found of lue and to the nature of their objections to them.

e chief inspector under the Alkali Acts states in his ual Report for 1899 that "No completely satisfactory od is known for the estimation of sulphate in gas r" (36th Ann. Rep. on Alkali, &c. Works, 1899, 47). sulphate in this liquor is associated with sulphide, ulphate, and thiocyanate.

e whole subject of the qualitative and quantitative sis of mixtures of salts of the commoner sulphur s seems still to demand further investigation in order nce it upon a satisfactory footing.

eting held at Glasgow, on Tuesday, March 5th, 1901.

MR. GEORGE BEILBY IN THE CHAIR.

E ENDOWMENT OF TECHNICAL RESEARCH: AN OBJECT LESSON.

BY WM. FREW, PH.D.

ER years ago I had the honour of reading a paper re this Section on "The Education and Training of wers," which was followed in the winter of 1898 by a second paper, read before the Midland Counties Institute of Brewing, on "A Modern School of Brewing." The aspirations contained in those two papers have been partially realised by the establishment, under the ægis of the University of Birmingham, of the first British School of Malting and Brewing, which has the well-known brewing chemist, Mr. Adrian J. Brown, as its director. It is a small, but, I am glad to say, successful beginning, and praise is due to the very few brewers (and those by no means the wealthiest of a wealthy class) who provided the necessary endowment, and who were not prevented by much hostile and interested criticism from loyally supporting this new movement.

In those papers I pointed out that much of the great industrial progress made in Germany during the last fifty years has been due to the endowment of technical research, and I expressed the hope that the establishment of a School of Brewing might soon be followed by the foundation of scientific stations for research, where the many unsolved problems of the great brewing industry might be investigated, not by one man, but by a staff of highly-trained specialists, who would be in constant and intimate touch with contemporary practice. To quote from my Birmingham paper: "We have been told with great emphasis that endowed research has always been a failure, but the whole history of the rise and progress of every industry in Germany confutes that very rash assertion. The great value of those stations is that the problems sent in for investigation are not solved by one man only, but they are treated by chemists, physiologists, engineers, and technologists, each looking at the question from his own standpoint. The researches carried out at those stations are always done with a due regard to the possible practical value of the results, and they are all the more valuable because the results are, in most cases, freely published to the world. Supported, as they are, by all classes of brewers, they are always in intimate connection with contemporary brewing practice. To take only one instance of their usefulness, Dr. Hansen's epoch-making discoveries would have taken a much longer time to come into practical use in Germany and Austria had it not been for the strenuous efforts and valuable work of the staff of the Munich station, and the consideration of this fact forces one to the conclusion that, had Britain been the happy possessor of such a station, the use of pure yeast might have been as universal here to-day as it is on the Continent." My long-harboured intention of dealing in greater detail with the question of research stations was stimulated by the issue of a most interesting illustrated description of the Berlin "Institute for the Fermentation Industries and for Starch Manufacture," one of the most complete and comprehensive of the many magnificent research stations with which the German Empire is provided. Quite recently my attention was also directed to the admirable report upon and catalogue of the German agricultural exhibits at the great Exhibition in Paris last year. ("Die deutsche Landwirtschaft auf der Weltausstellung in Paris, 1900." Bonn: Universitäts-Buchdruckerei. Von Carl Georgi.) In this most interesting volume are to be found, besides descriptive reports of the various exhibits, special treatises by well-known scientists on such subjects as "The (Agricultural) Educational System of Germany," "The Development of Agricultural Implements in Germany," "The Development and the present Condition of Agricultural Research in Germany," &c., &c.

In my present contribution I intend to draw upon the last-named report by Geh. Hofrath Professor Nobbe (Tharand) for some historical facts bearing upon the development, during the last fifty years, of the Experimental Research Stations in Germany, and their condition at the present time. I then hope to show, taking the Berlin Institute as an illustration, what a modern research station means, and by so doing I hope I may, in some small measure, hasten the establishment of analogous institutions throughout the length and breath of Great Britain and Ireland.

Professor Nobbe regards the great Justus von Liebig as the man from whose writings those chemists, who inaugurated experimental research in agriculture, drew their inspiration. Amongst those Adolf Stöckhardt, Professor of Agricultural Chemistry in the Academy at Tharand, may perhaps be regarded as the real father of the new movement, for in Leipzig in the year 1850 it was resolved, at his suggestion, to found a Chemical Research Station. In the deed of association of this first Agricultural Research Station (Möckern, near Leipzig) its purpose was declared to be "to contribute to the enlargement of the knowledge of the practice of agriculture and the industries connected therewith, by means of scientific investigations carried out in the most intimate connection with practical experiments, and to publish everything found, in this way, to be useful and advantageous."

In 1851 this station at Möckern was founded, and it comprised, even at first, a practical agricultural section under Gutinspektor Bähr, as well as a scientific section under the chemist, Dr. Emil Wolff. It was quickly followed in 1853 by the foundation of a similar station at Chemnitz; in 1855, by one at Grosskmehlen (Prussia); 1856, Dahme and St. Nicholas, both in Prussia; 1857, Munich and three other stations; and so on, until at the present time there are some sixty-nine more or less highly organised agricultural research stations in the German Empire. With the increase in the number of stations their internal organisation has become more and more complete. From that humble beginning at Möckern in 1851, with its two sections, we proceed upwards with the passing years until in 1900 we find such stations as that in Berlin with *six* sections, besides various culture stations; and that in Halle, under Maercker, with its seven divisions and its great experimental farm at Lauchstadt. Besides the many-sided scientific investigations into all the problems of modern agriculture and the industries dependent upon and connected with it, the research stations of Germany, like those in America, have done valuable work in the establishment of standard methods of analysis for the control of manures, food-stuffs, seeds, food preparations and such beverages as wines, beers, &c. The great services rendered by the experimental stations of America and Germany in the matter of standard methods of analysis were fully described by Mr. Hendrick, of the University of Aberdeen, in a paper on "The Development of Official Methods of Agricultural Analysis" which was read before this section in April of 1898 (this Journal, Vol. XVII., p. 526). In the discussion which followed upon this most interesting paper, I pointed out that chaos reigned in the matter of brewing, as well as in that of agricultural analysis in this country, and I suggested that the Society of Chemical Industry was a suitable body to take in hand the subject of official methods of analysis. A small committee of members of this section was appointed but, I fear, the results of their labours have been disappointing. Until we have efficiently staffed and well-endowed research stations there is little hope of any progress in this direction, for the commercial chemist will not spare the time to do the necessary and very tedious test analyses. "High" and "low" chemists will continue to fatten upon the ignorance and cupidity of consumer and supplier until they are scotched by endowed research. Although many of the stations are now subsidised to some extent by the German Imperial and local authorities, it may be as well to point out, as part of this object-lesson, that they are the outcome of private enterprise and that their great success has been due to that devotion to the interests of the Fatherland and of the industry as a whole which has been, up to the present, so characteristic of the German, and which contrasts so favourably with the selfish greed and cynical individualism so often seen in Great Britain. Our manufacturers have still too much of the spirit of Harry o' the Wynd, "who fought for his own hand."

At the end of the report to which I have referred, there is an interesting table giving the amount and particulars of the annual incomes of the 69 German Agricultural Research Stations. From this we find that the total income of the stations amounts to 2,244,630 marks. Of this, 601,500 marks (26·79 per cent.) come from the State, 58,660 marks (2·61 per cent.) from the provincial governments, 914,080 marks (40·72 per cent.) from agricultural and other societies, 654,890 marks (40·72 per cent.) from control and other analyses, and 15,500 marks (0·7 per cent.) from o sources; so that less than one-third of the whole incom supplied by Imperial and local authorities.

It would be interesting to discover how much is spen a similar way in Great Britain and Ireland with their agricultural interests and the enormous allied indust In making this comparison, no regard should be paid to money spent individually by farmers or others for analysis of raw materials, manures, or finished products that does little or no good to the industry as a whole. combined efforts for the advancement of the whole indu by well-endowed, well-organised, thoroughly scientifi search along with scientifically-controlled practical ex ments on a working scale, can be taken into accoun cannot myself speak with any authority on the subje agricultural research in this country, but I do not thi am wrong in saying that its endowment is grossly inade and utterly out of proportion to the immense inte involved. In the case of the closely allied brewing indu I can say that in the course of a hundred years of mu wealth, the magnificent sum of 25,000*l.* represents all it has done for the efficient training of those who hav materially aided the proprietors of the breweries to ac their wealth. In the endowment of research laborat for the benefit of the whole industry, not one single p has, to my knowledge, been spent. As results, we badly trained brewers, quackery abounding, quack nost advertised in the brewing papers, and the most objectio pseudo-science rampant. The spirit industry has, as t I am aware, done nothing whatever in any public wa further scientific research.

I now come to the last section of my very inade description of a part of endowed technical researc Germany, and in it I propose to briefly describe the " Institut für Gärungsgewerbe und Stärkefabrikation, of the most perfect and comprehensive of stations Empire.

The institute forms a part of the Royal Agricu High School of Berlin, and the buildings and ground which they stand are the property of the Royal Agricu Department. The entire management of the affairs o institute is, however, given over to the various soc represented in the institute, of which the following list:—

The Society of Spirit Manufacturers in Germany.

The Society "Experimental and Teaching Statio Brewing in Berlin."

The Society for those interested in Starch.

The Society of Corn-Spirit and Pressed Yeast M facturers.

The Association of Vinegar Manufacturers.

The total yearly income of the institute amou 850,000 marks; the value of the buildings is 1,50 marks, and the estimated value of the land belongi the institute is 2,000,000 marks. The number of me of the various societies amounts to, roughly, 9,00 they belong to every part of Germany, the majority Prussians.

The advancement of the several industries is s after by scientific investigations, practical experi by publication of results, and by teaching. For purposes there are laboratories and accommodat teaching, a practical experimental station for each industries represented, and experimental fields w vegetation house. In the institute there are for scientific officials, representing the following branc Chemistry and physics, botany and bacteriology, techi of the industries, national economy and statistics, neering and agriculture. Altogether there are 115 p employed in the institute.

The institute buildings are shown in the two illustr To the left of Fig. 1 we see the experimental brewer its two kilns forming an ornamental frontage. At th are the experimental stations for the spirit, starc vinegar industries (shown on the right-hand side of F whilst the laboratory and teaching accommodation vided in the main building shown in the foregro Fig. 1 and the left-hand side of Fig. 2. Surround institute buildings are spacious recreation ground ntation, and experimental fields, with the vegetation ise and the grain store.

\t the head of the institute stands Dr. M. Delbrück, ilst associated with him in the scientific work of the sta- a are men such as Dr. Windisch, Dr. Lindner, Dr. Struve, Remy, and Engineer Goslich. For nearly twenty

Fig. 1.

:s the late Dr. Hayduck, so well known for his re- ches in every branch of the fermentation industries, an active member of the staff of the institute.

. would take too long to go into a detailed account of equipment of the institute and the work carried on e, but I may mention that in 1899, 3,315 samples analysed in the laboratories, and 405 persons took ntage of the educational facilities provided by the tute. Pure cultures of yeasts are supplied on a mercial scale to breweries and distilleries and annual bitions of barleys, hops, and machinery are held in the ute buildings. The following journals are issued by institute :—

Zeitschrift für Spiritusindustrie."—Circulation, 5,800.
Wochenschrift für Brauerei."—Circulation, 3,200.
Deutsche Essigindustrie."—Circulation, 900.
Blätter für Gersten-, Hopfen- und Kartoffelbau."—Circulation, 10,000.

lst important books on subjects related to the stries have been published by many members of the .

ie equipment of the institute includes a very complete ry supplied with all the current technical literature.

Fig. 2.

ı closing this brief and very sketchy account of nical research in some branches of German industry, ould like to make my position perfectly clear. The title of this paper is, "An Object-Lesson." I do not one moment wish to set up the German system as a ern to be followed slavishly in this country. The itions here are different and would probably require r treatment, but what I do wish to emphasise is the ral recognition in Germany of the principle, that what od for the industry as a whole must, in the long run, ie best for the individual members of that industry. Not the desire to crush the weaker members, but the desire to benefit the whole, should be the aim alike of the true citizen and of every member of an industry.

In few cities is industrial selfishness so apparent as in Glasgow, and it almost seems hopeless to talk of the endowment of research where such meagre provision has been made by an enormously wealthy industrial community for technical scientific education. The buildings in which the Mother of technical colleges is housed would be a disgrace to many a German town possessing but a tithe of the wealth of Glasgow. They are a testimony to the suicidal meanness of men who, in vulgar ostentation, squander much of that wealth which ought to be employed in rendering the position of the industries to which they belong secure against attacks from outside. Science is the true beacon of all industry; without its guiding light we are left with only the flickering will-o'-the-wisp of an ignorant empiricism to lead us, as often as not, astray. To ensure the best scientific work, ample endowment is necessary, so that the workers may be removed from the tainting influence of commercialism.

THE VALUATION OF BARLEYS FOR BREWING AND DISTILLING.

BY WILLIAM FREW, PH.D.

The laboratory tests for the valuation of barleys to be used in brewing or distilling are, for the most part, almost as unsatisfactory as those used by the average brewer or distiller who judges the barleys simply by their outward appearance and certain other empirical tests equally unreliable for anything but the roughest approximation to the real value. In barley, as in many other things, the appearance is often very deceitful, and the large fine-looking grain is by no means invariably the best. In the laboratory one estimates the amount of moisture; the total nitrogen; the 1,000-corn weight; the bushel or hectolitre weight; the relative steeliness; the *apparent* starch; the corn-size; the amount and kind of impurities and half-corns; and last, but not least, the germinative power of the barley. All these estimations give us a considerable amount of information, but they do not suffice to accurately foretell the quality of the resulting malt or the behaviour of the barley during the malting process. How much less can the ordinary "practical man's" tests, as applied to barley bought in the open market, be relied upon? This is recognised to a certain extent and, in the case of barleys from new districts, small trial maltings of (say) fifty quarters are made. These certainly give much more information, but any one who is familiar with the utterly unscientific frame of mind of the ordinary brewer or maltster would hesitate before venturing to compare the results of two such maltings. It is only possible to compare such results when one is certain that the conditions have been exactly the same in all the experiments, and I do not exaggerate when I say that *that* is practically impossible of attainment in most of the maltings in this or any other country.

The germination test for barley is very frequently applied by the practical man, and it is, without doubt, most valuable. In its roughest form it consists in taking 100 corns of barley and placing them upon a moist substratum for about three days, at the end of which time the number of germinated corns is counted. Certain serious objections, however, may be raised to the process as it is so often carried out. In the first place, only a small number of corns are used, and, as one's personal equation is so very strong, those are unconsciously selected; and, in the second place, only the germinative *energy* is measured at the end of the three days' germination period. To render this test more genuinely useful, not less than 300—500 corns should be taken and should be counted out by an automatic counter or approximately measured out without counting; these should then be steeped for six hours in water, and laid between folds of moist filter paper on the shelves of an Aubry germinating box. After three days have elapsed, the germinated corns should be counted and the percentage expressed as "*germinative energy*"; on each succeeding day up to the tenth the germinated corns are counted and the total is expressed as "*germinative capacity*." Applied in this way the test gives some information as to the regularity, as well as to the amount, of germination, but, considering the amount of time taken up by the test, the results are meagre.

For the past ten months I have been using in my ordinary practice a method recommended by Schifferer, of Kiel, and Luff, of Weihanstephan, for determining the malting value of barley, which gives all the information supplied by the test just described, together with other information which cannot be obtained by any other process.

Instead of taking 300—500 corns, one takes at least 1 kilogram of the barley in question, which is accurately weighed out, and poured slowly from some little height into a vessel full of the water in use for steeping purposes. After it has been thoroughly mixed with the water by stirring, the floating corns and straws are skimmed off and set aside to dry in the air, after which they are weighed. The rest of the barley is then placed in a cylinder of (brass) wire gauze of suitable size, which is hung in a vessel of (steeping) water. Along with the larger cylinder there is also immersed in the same water, a smaller similar cylinder into which are weighed 100 grms. of the barley (see Fig. 1). The steeping water is changed once or twice daily, when the barley is thoroughly washed with fresh water, and the steeping is continued until (in my case) the 100 grms. of barley in the small steep have absorbed 50—55 grms. of water. In my experiments I have found that the time required for this, with the particular water used for steeping purposes at Wellpark (T = 55° F.), is from 48—56 hours. In practice the necessary time is from 60—75 hours, the difference being due to the fact that in the small steep the barley is freely suspended in the water, so that the water, as it becomes charged with soluble matter from the barley, falls to the bottom of the vessel and fresh water takes its place, and also, to the fact that in the small steep there is continual aeration of the barley. After steeping is finished the barley is placed in wooden boxes (for 1 kilo. of barley, 6½ ins. square × 6 ins. high), which have been rendered waterproof by being dipped in melted paraffin wax, and are provided with perforated zinc bottoms and wooden lids through which the thermometers are inserted. These boxes are placed on massive slabs of concrete or paving stone (Fig. 2), in a room with a fairly even temperature of about 55° F. The germinating barley is turned out of the boxes and replaced slowly by hand in the morning and evening of each day, at which times the temperatures of the barley and of the room should be noted. In my experiments I allow a germinating period of nine days, at the end of which the green malt is turned out in a thin layer on a board, where it lies for 24 hours to wither. After this period of withering it is placed in a small experimetal kiln, heated by gas, and is dried in eight hours up to a final temperature (maintained during the last two hours) of 190° F. With my own experimental kiln, of which I give an illustration and sectional drawing (see Figs. 3 and 4), the malts are taken off with about 4 per cent. of moisture (determined by dry
for 4 hours at 104°—105° C.), and have a flavour simi
to that of a very pale malt. The ventilation in this kiln
so good that the finished malts are quite as free as th
dried for 96 hours on the brewery kilns. The kiln whic
use is made of sheet iron, and is of cylindrical shape. In
sectional drawing, A is the heating chamber containi
number of luminous flame burners; it is provided w
door (shown open in Fig. 3), and is entirely separate
a division of sheet iron from the air-chamber B, which
for the better distribution of the heat, a perforated she
iron placed some 3 ins. from the bottom. The air-cha
is also provided with a door, so that the rootlets which
detached from the malt in the course of turning ma
collected and weighed. C is a removable sieve (show
the left-hand side of Fig. 3) of brass wire gauze, upon w
the malt is placed, and the whole kiln is covered by
hood D with its funnel. This hood is provided wit
opening for the thermometer, and it can easily be rem
for the purpose of turning the malt during the ki
process. The kiln from the base to the top of the f
stands about 3 ft. high, and its internal diameter is
14 ins. By means of a graduated brass dial upon th

Fig. 1.

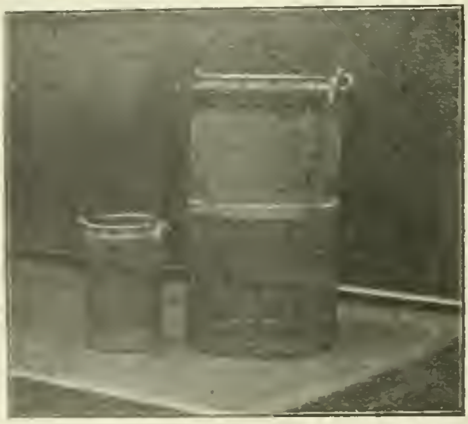


Fig. 2.

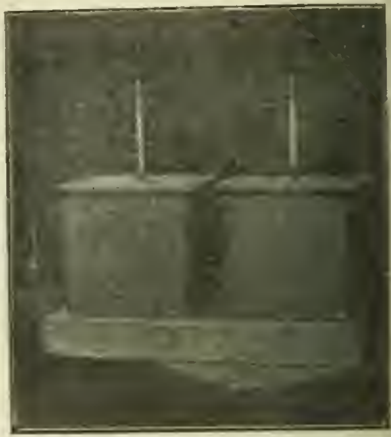
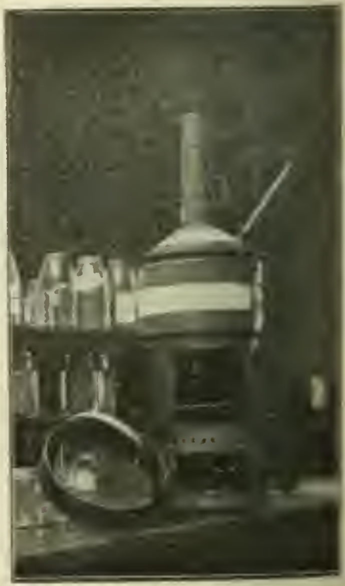
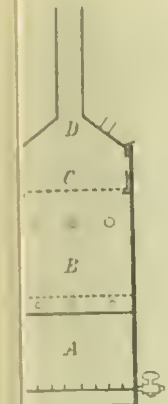


Fig. 3.



he gas supply, it is an easy matter to obtain an exact ica of the standard kilning temperatures adopted by the rimenter.

Fig. 4.



n removal from the kiln, and whilst the malt is still n, a small sample with rootlets is taken for the deter- ation of moisture; after which, the bulk of the malt is separated from the rootlets, and both are weighed. We have now data for determining: 1. The percentage of light corns and straw in the original barley. 2. The rate of absorption of water during steeping. 3. The behaviour of the barley during germination. 4. The total loss from steeping, respiration, and from the growth of rootlets. The malt is allowed to lie exposed to the atmosphere in a thin layer for 24 hours, during which time it takes up an addition 1·5 per cent. of moisture; it is then ready for analysis, which, in my case, is always carried out on very fine and fairly coarse grists, according to the revised Vienna Congress methods.

I find, as the result of nearly a year's experience, that this method gives results, so far as behaviour during germination, modification, extract, soluble nitrogen, and soluble phates are concerned, strictly comparable with those ned in practice. It is possible to predict from the e behaviour of the barley during the experimental ng, what its tendencies on the large scale will be. By ing out such small maltings, one has a constant control upon the maltster, and one is often able to introduce suitable modifications in the malting process, and so obtain from the very beginning, better results on the large scale. When such experiments have to be made on the large scale, the first hundred quarters of malt are usually much inferior to those coming after them. It is also practically impossible to make comparative experiments on the large scale, as the ordinary maltster is a thoroughly unscientific person with a profound contempt for regularity in working. By carrying out, as I have done during the past year, small maltings of various barleys under similar conditions, it is possible to obtain a fair idea of the advantages and disadvantages of the many barleys now offered to the brewer. Comparative experiments on the influence of variations in the malting process may be carried out with an exactitude impossible of attainment when working on the large scale.

To the distiller, this method, with necessary modifications, should prove equally useful as by combining it with an actual fermentation and distillation on the small scale, he might obtain much valuable information as to the alcohol-yielding properties of the barleys submitted to and used by him for malting. I have given no minute details of the process, such as the temperatures from hour to hour on the small kiln, as it will be necessary for each one to find out those best suited to his own kiln and to the conditions under which the process is carried out on the large scale. After those details have been satisfactorily arranged, however, they must be strictly adhered to in all future experiments if uniformity of results be desired.

I give a few comparative results showing how deceptive appearance and weight of barley may be, and also how the quality of a certain class of barley for malting purposes may be affected by the proportion of total nitrogen contained in it.

——		A_1.	A_2.	A_3.	B.	C.	D.	E.
vs:								
oisture	Per Cent.	12·7	14·8	13·49	10·75	11·18	13·56	15·24
roteids (N × 6·25)*	„	12·63	11·58	10·76	9·16	11·21	9·65	10·32
ushel weight	Lb.	57·2	54·7	54·7	50·9	56·3	53·5	55.9
:								
xtract (coarse grist)*	Per Cent.	71·7	73·0	73·84	72·0	70·03	75·4	78·0
xtract (coarse) ÷ Extract (fine)† = 100	„	97·2	8·2	97·0	98·9	96·1	98·0	99·3

ote.—A_1, A_2, A_3, three different lots of one European barley.
B and C.—Husky foreign barleys. B, large fine-looking grain, larger than D.
D and E.—Mid-European barleys, Hungarian type.

* ated on 100 parts of dry matter.

† is figure represents the relation between the extract obtained from coarse and fine grists respectively, and is useful in determining r the starch of the malt has been rendered accessible to the brewer in his mashing process with coarse grist.

conclusion, I would only add that in my own case, so the yields of extract are concerned, my laboratory and those made on the large scale agree to within cent. This difference is due to the long kilning l in common use in this country whereby much matter e in cold water is formed. The actual amount of products rendered soluble by diastatic action in ng has in all cases corresponded within a few tenths er cent.

ope to supplement this paper by a short note on the of malt from barley, and on some points in the malting ley.

Yorkshire Section.

Meeting held at Yorkshire College, on Monday, January 28th, 1901.

MR. G. WARD IN THE CHAIR.

HE SOLUBILITY OF LIME IN WATER AT DIFFERENT TEMPERATURES.

BY A. GUTHRIE.

arliest quantitative experiments on the solubility of seem to have been made by Dalton (New System of Chemical Philosophy, 1808). His results, when calculated to modern figures, are:—

100 c.c. of saturated lime water contain—
At 15·6° C. .... 0·129 grm. of CaO.
At 54·4° C. .... 0·103 „ „
At 100° C. .... 0·079 „ „

Phillips (Annales de Chimie et Physique, c. xvi, p. 213, 1821) followed shortly afterwards:—

100 c.c. of saturated lime water contain—
At 15·6° C. .... 0·129 grm. of CaO.
At 100° C. .... 0·0795 „ „

In 1878 Lamy (Annales de Chimie et de Physique) is responsible for numerous tables on the solubility of different forms of CaO at different temperatures, and also from different sources. The following table by Lamy shows the solubility of a good marble lime:—

100 c.c. of water at 0° C. will dissolve 0·1430 grm. of CaO.
„ „ 10° C. „ 0·1384 „
„ „ 15° C. „ 0·1348 „
„ „ 30° C. „ 0·1195 „
„ „ 45° C. „ 0·1033 „
„ „ 60° C. „ 0·0885 „
„ „ 100° C. „ 0·0584 „

Maben (Pharmaceutical Journal and Transactions [3], **14**, 505):—

100 c.c. of water at 0° C. will dissolve 0·1318 grm. of CaO.
„ „ 5° „ 0·1309 „

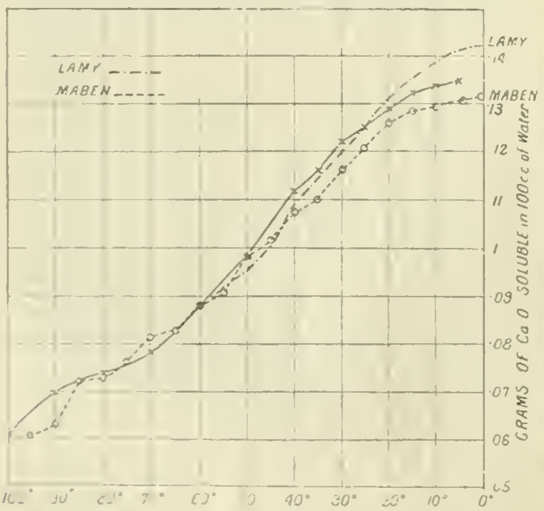
100 c.c. of water at	10° C.	will dissolve	0·1298	grm. of CaO.
,, ,,	15°	,,	0·1284	,,
,, ,,	20°	,,	0·1234	,,
,, ,,	25°	,,	0·1208	,,
,, ,,	30°	,,	0·1160	,,
,, ,,	35°	,,	0·1100	,,
,, ,,	40°	,,	0·1073	,,
,, ,,	45°	,,	0·1015	,,
,, ,,	50°	,,	0·0982	,,
,, ,,	55°	,,	0·0906	,,
,, ,,	60°	,,	0·0880	,,
,, ,,	65°	,,	0·0828	,,
,, ,,	70°	,,	0·0810	,,
,, ,,	75°	,,	0·0763	,,
,, ,,	80°	,,	0·0734	,,
,, ,,	85°	,,	0·0720	,,
,, ,,	90°	,,	0·0633	,,
,, ,,	95°	,,	0·0606	,,
,, ,,	100°	,,	0·0606	,,

From the preceding figures it will be seen that the solubilities given by Maben are slightly different from those of Lamy; while Dalton and Phillips' figures differ very considerably from these two, especially at 100° C. Owing to the difference between these former investigators, it was thought necessary to carry out some further determinations.

An apparatus was arranged so that the filtration took place under the surface of the liquid; a milk of lime, which was originally a well-burnt marble lime from which a large quantity of lime water had been withdrawn, was put into the apparatus, and the temperature of the whole reduced to 3° C. and kept there for about three hours, the lime water being kept continually in motion. The temperature was now raised to 5° C. and 70 c.c. of the liquid were filtered and neglected; other 30 c.c. were now withdrawn, and 25 c.c. of this were titrated with N/10 HCl. The temperature was now raised to 10° C., and this process repeated at intervals of 5° C., from 5° to 40°, and then each 10° up to 100° C. The results are tabulated below.

100 c.c. of saturated lime water at			5° C.	contain	0·1350	grm. of CaO.
,,	,,	,,	10°	,,	0·1342	,,
,,	,,	,,	15°	,,	0·1320	,,
,,	,,	,,	20°	,,	0·1293	,,
,,	,,	,,	25°	,,	0·1254	,,
,,	,,	,,	30°	,,	0·1219	,,
,,	,,	,,	35°	,,	0·1161	,,
,,	,,	,,	40°	,,	0·1119	,,
,,	,,	,,	50°	,,	0·0981	,,
,,	,,	,,	60°	,,	0·0879	,,
,,	,,	,,	70°	,,	0·0781	,,
,,	,,	,,	80°	,,	0·0740	,,
,,	,,	,,	90°	,,	0·0696	,,
,,	,,	,,	100°	,,	0·0597	,,

It will be seen that the above figures agree approximately with those of Maben and Lamy. This is best shown by the accompanying curves:—



Discussion.

Dr. McCrae pointed out that evidently two different standards had been employed in the series of numbers compared. Whereas the numbers given under Lamy and Maben referred to grams of lime dissolved by 100 c.c. of water, the author's numbers indicated gra of lime per 100 c.c. of solution. He also suggested th unless a considerable time elapsed after each particul temperature was obtained there would be the possibil of supersaturation.

Mr. Fairley suggested that it would be desirable make a similar series of observations, starting at the hi temperature and proceeding towards zero. In this w supersaturation would be eliminated.

ANALYSIS OF A LIME FOR TANNERS' PURPOSES.

BY G. W. FLOWER, B.SC.

The following is the analysis of a sample of lime used tanners' purposes. It showed very bad slaking propert and seemed to be poor in available lime. The sam after careful grinding, was sifted through muslin. fine material amounted to about 68 per cent. of the whol

The available lime was determined, and found to be follows:—Fine material, 41·02 per cent.; coarse mate 9·76 per cent. A good specimen would possess about 89 cent. of available lime.

The insoluble residue, including silica, amounted to 11 per cent. for the fine lime and 29·97 per cent. for coarse. Calculated on the whole, the result is 17·70 cent. This is a comparatively large amount. Silic often cause difficulties in the burning of the limestone.

The ferric oxide found was 5·57 per cent. for the material and 8·26 per cent. for the coarse. Calculate the whole, the result is 6·42 per cent.

The total calcium in each portion of the lime wa follows:—Fine lime, 65·3 per cent.; coarse variety, 4 per cent. Reckoned on the whole, the result obtaine 59·20 per cent.

2·25 per cent. of magnesium oxide was found in the material and 1·74 per cent. in the coarse. Calculate the whole, this amounts to 2·09 per cent. of MgO. presence of magnesium in large quantities prevents proper slaking of the lime, but since it is here in so quantity it does not seem likely that the bad quality o lime is due to this element.

The quantities of carbon dioxide found were 5·01 cent. in the fine portion and 8·90 per cent. in the portion, or, calculated as carbonate of calcium, 11·3 cent. and 20·22 per cent. Calculated on the whol result found is 14·21 per cent. of $CaCO_3$.

The sulphate present, was found to be equivalent to per cent. of $CaSO_4$ in the fine portion and 4·14 per ce $CaSO_4$ in the stony portion. Taken together and red on the whole, 3·01 per cent. of $CaSO_4$ was found. chloride in the two portions gave 0·35 per cent. of Ca the fine portion and 0·34 per cent. of $CaCl_2$ in the portion. Reckoned on the total sample, 0·33 per ce $CaCl_2$ was present. Organic matter was determine found to be 0·8 per cent.

Thus, from the tanners' point of view, the lime is many ways. More than one-third insoluble, whil available lime only amounts to 31·02 per cent., it conta appreciable quantity of iron, which might lodge mecha in the pores of the skin, and become dissolved i processes, giving a dark-coloured leather.

The lime is also underburnt, judging from the amo carbonate it contains.

Result of Analysis.

	Per Cen
SiO_2 and insoluble matter	17·70
Fe_2O_3	6·42
CaO	49·8
$CaCO_3$	14·21
$CaSO_4$	3·01
$CaCl_2$	0·33
MgO	2·09
Organic matter	0·8
Moisture by difference	5·5
	100·0

Good Specimen.

	Per Cent.
CaO	91·95
MgO	1·30
CO_2 and moisture	6·75
	100·00

DISCUSSION.

fr. **Fairley** remarked that if any barium salt were sent in the lime this would, in the analysis, have been ghed as barium sulphate along with the silica. He asked e insoluble residue had been spectroscopically examined barium.

fr. **Flower**: It was *not* so examined.

Meeting held at the Queen's Hotel, Leeds, on Monday, February 25th, 1901.

MR. G. WARD IN THE CHAIR.

PID METHOD FOR THE DETERMINATION OF PRUSSIAN BLUE IN SPENT OXIDE.

BY J. M. POPPLEWELL.

ı methods which are mostly in use at present are those Drehschmidt, Burschell, and Knublauch, Burschell's hod being a modification of Drehschmidt's.

rehschmidt's method (described by him in the 4th ion (German) of Muspratt's Chemie, Vol. V., p. 505) sists essentially in conversion of the cyanogen compounds mercuric cyanide, reduction to hydrocyanic acid, and ipitation as silver cyanide, using excess of standard r nitrate, and titrating back with standard ammonium hocyanide.

ı Burschell's modification the ferrocyanides are first acted by means of alkali and precipitated by an iron and the Prussian blue thus purified is estimated by mercuric cyanide process.

ı Knublauch's method (this Journal, 1889, **8**, 732) it cessary to allow the oxide to stand in a solution of tic potash for 15 or 16 hours, whereby the ferrocyanogen pounds become soluble. These are subsequently preated as Prussian blue, redissolved in potash, and titrated ı standard copper sulphate.

ı another method, devised by Dr. A. O. Nauss (this rnal, 1900, **19**, 934), it is also necessary to allow the le to stand for 15 or 16 hours in alkali so as to bring ferrocyanides into solution.

will be noticed that the above methods require some siderable time to perform, and this is sometimes a great dvantage on a chemical works, where rapidity is almost nportant as accuracy.

xperiments have been made with a view to finding a ker method than those mentioned, and I find the owing (which is really a modification of Knublauch's) s very satisfactory results, in addition to which an nation can be completed in much quicker time, an hour a half sufficing.

lethod.—Weigh out 5 grms. of the finely-ground ple on a watch glass, and transfer to an 8-oz. beaker; about 50 c.c. of a 5 per cent. sodium hydrate solution raise to boiling point. The solution must be kept at temperature for about five minutes to ensure complete omposition of the Prussian blue. The sulphur contained he oxide is also acted upon, forming sodium sulphide sodium thiosulphate. Filter the solution into a 10-oz. ker and wash the residue thoroughly. Heat the filtrate boiling point and add about 50 c.c. of a 5 per cent. ıtion of ferric chloride and acidify with hydrochloric l. A precipitate of Prussian blue and sulphur is thrown rn. If this remains in a finely-divided state, giving the ıtion a pale blue colour, a further quantity of ferric oride must be added until the solution is of a dark red our, which is due to sulphocyanide, or, in cases where e or no sulphocyanide is present, until the precipitate Prussian blue and sulphur coagulates, when it will settle to the bottom, leaving a clear supernatant liquor. Filter and wash the precipitate and transfer the filter to the 10-oz. beaker previously used for the precipitation and add about 50 c.c. of a 5 per cent. solution of sodium hydrate. Agitate in the cold for 10 minutes. This decomposes the Prussian blue, thus:—

$$Fe_4(FeC_6N_6)_3 + 12NaOH = 3Na_4FeC_6N_6 + 2Fe_2(OH)_6$$

leaving sodium ferrocyanide in solution. This is then filtered and the precipitate of ferric oxide together with sulphur, which is left behind, is thoroughly washed with cold water until two or three drops of the washings give no blue colouration on adding to a dilute solution of acid ferric chloride. The filtrate is then transferred to a large porcelain dish (about 6 ins. diameter), acidified with 25 per cent. sulphuric acid and titrated in the cold by means of standard copper sulphate, using spots of a 1 per cent. solution of ferric chloride as an indicator. The titration is complete when a drop of the filtered solution gives no blue coloration with a spot of ferric chloride.

Preparation of the decinormal Copper Sulphate Solution.—12·48 grms. of $CuSO_4 5H_2O$ are dissolved in one litre of distilled water.

1 c.c. of this solution should = 0·01056 grm. $K_4FeC_6N_6 . 3H_2O$.

1 c.c. of this solution should = 0·0072 grm. Prussian blue.

The solution should be checked by titrating a known quantity of pure recrystallised potassium ferrocyanide.

The following are comparisons of the results obtained by the three methods, given as Prussian blue.

Sample.	By the above method.	By Knublauch's method.	By Drehschmidt's method.
No.	Per Cent.	Per Cent.	Per Cent.
1	1·836	1·800	2·569
2	2·730	2·725	2·866
3	3·671	3·685	4·852

The high tests obtained by Drehschmidt's method are (according to Dr. Lubberger in the Journal für Gasbeleuchtung) due to the fact that there exists in spent oxide, in addition to the ferrocyanides, other cyanogen compounds which do not yield Prussian blue and are not precipitated by iron salts. These compounds, however, yield mercuric cyanide, when boiled with mercuric oxide, and are consequently estimated as Prussian blue in Drehschmidt's method.

AN ANALYSIS OF THE LEEDS GAS LIQUOR.

BY ARTHUR W. COOKE, F.C.S.

Gas liquor as a rule contains from 1·5 to 2·5 per cent. total ammonia, the average being about 2 per cent. It does not generally contain an appreciable quantity of uncombined ammonia, nearly all of it being combined, chiefly in the form of carbonate, sulphide, and chloride.

A complete analysis of a gas liquor is not very often performed, as several of the bodies there present are not of technical importance. The chief point of interest to the chemical manufacturer is the total quantity of ammonia which the liquor contains. Next in importance comes the percentage of "fixed" ammonia, by which is meant that proportion of the ammonia in the form of salts which are not volatile at the temperature of boiling water. Another important point in the analysis is the percentage of "free" or "volatile" ammonia. By "free" or "volatile" ammonia is meant those salts of ammonia which are volatile at 100 °C. These consist almost wholly of carbonate and sulphide. The term "free" is used in the technical sense and is not to be confounded with chemically "free" or uncombined ammonia.

It is often found necessary to estimate the carbon dioxide and sulphuretted hydrogen, and occasionally the sulphocyanide and ferrocyanide. The other bodies are very seldom estimated.

I thought that it might perhaps be of interest to have the figures of the analysis of a sample of the Leeds gas liquor. The sample analysed represents the whole of the make of the three Leeds Gas Works for the month of January 1901, and is an average of about 6,000 tons of liquor. The analysis was performed in the laboratory of my firm, Messrs. Brotherton and Co.

The results are stated in grams per 100 c.c. liquor :—

		= to NH_3
Ammonium carbonate $(NH_4)_2CO_3$	3·397	1·205
" sulphide $(NH_4)_2S$..........	0·372	0·186
" chloride NH_4Cl	1·261	0·401
" sulphocyanide NH_4CNS ...	0·093	0·020
" sulphate $(NH_4)_2SO_4$	0·063	0·016
" thiosulphate $(NH_4)_2S_2O_3$ ...	0·384	0·088
" ferrocyanide $(NH_4)_4FeC_6N_6$	Trace	..
" cyanide NH_4CN	None	..
Ammonia derived from other sources (by difference).	..	0·031
Total ammonia	..	1·945

"Free" ammonia	1·418
"Fixed" ammonia......................	0·527
Total sulphur	0·422
"Ounce strength".........	8·96

The total sulphur was distributed as follows :—

	Per Cent.
As sulphide..............................	41·47
" sulphate	3·55
" thiosulphate.........................	39·34
" sulphocyanide	9·24
In other forms (by difference)..........	6·40
	100·00

Besides the compounds of ammonia which the analysis shows, there are present in every gas liquor, bodies derived from coal tar, chiefly those of the benzene and pyridine series. These, so far as I know, have never been estimated, so that a really complete analysis of a gas liquor has yet to be made. Such an undertaking would be a very difficult one. I have nothing much to add in the way of new methods for the estimation of the different constituents. Perhaps it will be as well, however, to mention one point in connection with the estimation of the carbon dioxide present as ammonium carbonate. The general method for estimating this body is to add a known quantity of the gas liquor to an ammoniacal solution of calcium chloride, when calcium carbonate is precipitated, thus:—

$$(NH_4)_2CO_3 + CaCl_2 = CaCO_3 + 2NH_4Cl.$$

This precipitate is then washed and titrated by means of standard hydrochloric acid. If this experiment is performed in the cold a flocculent precipitate is produced, which is somewhat difficult to filter. On warming, the precipitate becomes granular, but the point is that it should not be boiled, or even heated for any length of time, otherwise a reverse reaction will set in, carbonate of ammonia being re-formed to some extent, thus :—

$$2NH_4Cl + CaCO_3 = CaCl_2 + (NH_4)_2CO_3.$$

and as this body is volatile some of it is likely to be lost.

The general method for the estimation of the sulphuretted hydrogen is to precipitate as zinc sulphide, and treat the precipitate with bromine and hydrochloric acid, after which the SO_3 formed is precipitated by means of barium chloride, and the barium sulphate produced is weighed, and the sulphuretted hydrogen calculated from the amount thus obtained; or the zinc sulphide is dissolved in hydrochloric acid containing excess of standard iodine, the undecomposed iodine being titrated by means of standard sodium thiosulphate. A quicker method, however, which gives results accurate to the second decimal place, and of quite sufficient accuracy for technical purposes is, I find, to proceed as follows :—

Take 25 c.c. of the sample dilute to about 150 c.c. with water, and distil in an apparatus similar to those used in the estimation of ammonia, into about 700 c.c. of water containing sufficient caustic soda to combine with all the CO_2 and H_2S contained in the liquor. This solution is cooled, slightly acidified with acetic acid, and titrated with decinorn iodine.

By this method results may be obtained in a little o half an hour. The other methods take a much longer ti

The residue left in the distilling flask, which amounts from 10 to 15 c.c. in volume, may then be used for estimation of fixed ammonia, or for an approximation the thiosulphate present in the liquor, by acidifying a titrating with decinormal iodine.

There is a method frequently used in estimating sulphuretted hydrogen in what is known as "concentra gas liquor," but this does not give good results when plied to ordinary gas liquor. This "concentrated liquor" contains about 16 per cent. ammonia, 12 per c carbon dioxide, and 3 per cent. sulphuretted hydrog but no fixed ammonia, and is used in the manufacture carbonate of soda. The method consists in titrating so of the diluted liquor in a porcelain basin, by means c standard ammoniacal solution of copper sulphate, dur constant stirring. A flocculent precipitate of copper phide is produced, which, as soon as the last trace of has combined with the copper, becomes granular and f to the bottom of the basin. With a little practice a sh reading may be obtained. In the case of gas liquor, h ever, the end reaction is not sharp by any means, so t the results are doubtful in value.

Although an appreciable quantity of hydrocyanic exists in crude coal gas, it is seldom found in gas liq The reason for this is evidently in the fact of the prese of an excess of CO_2, which drives the hydrocyanic acid of its combination with ammonia.

In entering into large contracts for the purchase liquor, it is usual to tender on the sliding scale, on basis of the price of sulphate of ammonia—the rising or falling in proportion to the rise or fal sulphate. It is usual also in tendering to quote, no per cent. of ammonia, but in "ounce strength." term "ounce strength" is a survival of the times wh direct titration was made by means of sulphuric acid. expresses the number of ounces of strong sulphuric necessary to saturate one gallon of the liquor. It is usual now to make a test in that manner. When the fig for ounce strength are required, the number of grm ammonia per 100 c.c. liquor, obtained by distillatio multiplied by the factor 4·61, which gives the de figures.

With the exception of that produced in the large to the liquor is sold on tests performed by the Twa Hydrometer—every degree Twaddell being assumed t equal to the strength of two ounces (this Journal, 1 20, 23).

I may say in conclusion that the high figure which now to be given for the raw material, combined with high price of fuel, of which of necessity a large an is used in distilling on the large scale (as the li contains fifty parts of water to one of ammonia), an crippling of the outlets for the manufactured produc account of the war, render it necessary for the man turer to be on the look-out for any improvements may effect a saving in the working of the processes.

Discussion.

Mr. **Ward** asked how Mr. Cooke had determine distribution of the sulphur over the various sul containing salts.

Mr. **Cooke** replied that this was a long work, b believed that the results given were substantially accu

Mr. **Fairley** suggested that the presence or abse free uncombined ammonia would depend upon condensing arrangement used.

THE DYEING OF WOOL AND SILK UNIO FABRICS.

BY REGINALD B. BROWN.

(*Dyeing Department, Yorkshire College, Leeds.*)

It is frequently demanded of the dyer that he shall pr a plain even colour or "solid shade," as it is terme e composed of wool and cotton, wool and silk, cotton silk, or even all these three fibres woven together. he production of design fabrics it is also sometimes able to obtain the colour effect, not by weaving coloured ds nor by printing the design on the fabric, but by ving with undyed yarns of different materials, and equently dyeing in such a manner that the threads of fibre acquire a distinct colour.

e have lately been engaged upon a series of experiments the object of ascertaining in what manner the dyeing erties of the two chief animal fibres are dissimilar, this iry being made with special reference to the processes e adopted in dyeing mixed fabrics composed of these ubstances. There is no doubt that investigations into and kindred subjects are being constantly carried out e laboratories of many of the larger colour works, with thoroughness of detail characteristic of the firms ged in that industry, but their results are, as a rule, published in the empirical form of dyeing receipts, h naturally refer only to the products of the firm erned. Within the last few years have been sent out al such collections of receipts, of course illustrated patterns, descriptive of the dyeing of wool and silk fabrics, and this fact, together with the circumstance patterns of a number of such fabrics had recently been in our department of the Yorkshire College, led me to tigate the general principles on which the methods of g are based, and certain of the steps in that investi- n, in which I have been assisted by several students assistants in the department, form the subject of the nt paper.

would be a task of considerable magnitude to ascertain lyeing properties in this respect of the whole of the ring matters at present in use, since the number of ct dyestuffs now on the market, at a moderate estimate, exceeds one thousand, and in the first instance the experiments were confined to those colouring matters which are applicable to wool and silk in an acid dyebath, the so-called "Acid Colours." The dyestuffs of this class are employed very largely in the dyeing of both wool and silk for the production of bright colours, on account of their ready solubility and simple mode of application. If, then, we limit our enquiry to the acid colouring matters our problem is two or perhaps three-fold: Is it possible to dye a union fabric composed of wool and silk, firstly, in a solid shade, *i.e.*, the wool and silk to be exactly the same colour; secondly, to dye one fibre only, leaving the other perfectly white; and lastly, to dye the two fibres in totally distinct shades?

Although wool and silk resemble each other in some respects very closely, and are, as a rule, capable of being dyed by the same dyestuffs, yet the conditions under which the two fibres acquire the maximum depth of colour in any given solution of a colouring matter are often very different. The most important of these conditions is the temperature of the solution, others are the acidity and concentration of the dyebath and the length of time of dyeing.

In order to determine the effect of temperature, six typical acid colouring matters were chosen, and pieces of wool and silk of equal weight (representing a fabric composed of equal parts of the two fibres) were dyed in their solutions at various temperatures commencing at 0° C., and proceeding by intervals of 20° to the boiling point. One per cent. of each colouring matter was used, except indigo carmine, of which 5 per cent. was taken. The bath was acidified with 20 per cent. of acetic acid, the temperature was brought to the desired point, and the patterns entered and dyed for one hour, maintaining constant the temperature and the level of the dyebath.

The results with the six colouring matters employed were as follows:—

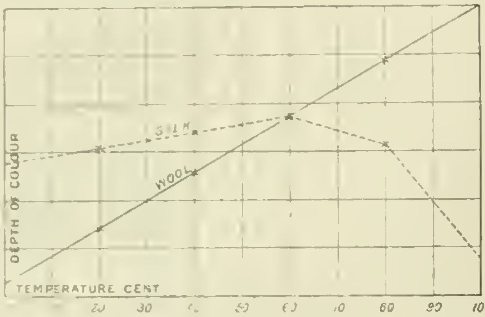
Brilliant Crocein 3 B (Bayer).	Napthol Yellow S (B.A.S.F.)	Acid Green extra concentrated B. (Cassella).	Indigo Carmine.	Fast Acid Violet R (M. L. & B.).	Naphthylamine Black 6 B (Cassella).
Silk, much deeper than wool; wool, a pale pink tint only.	Silk, a little deeper than wool.	Silk, bright green; wool, very pale green.	Silk much deeper than wool.	Silk, bright red violet; wool, pale bluish pink.	Silk, slate-blue; wool, pale grey tint.
Silk, deeper than wool.	Wool and silk, equal in depth.	As at 0°..........	Silk, a little deeper than wool.	Silk very much deeper than wool.	Silk, very much deeper than wool.
Silk, a little deeper than wool.	Wool, deeper than silk.	Silk, much deeper than wool.	Wool and silk equal in depth.	As at 20°..........	Silk, deeper than wool.
Wool and silk, equal in depth.	Wool, full golden yellow; silk, very pale yellow.	Silk, deeper than wool.	Wool, very much deeper than silk.	Silk, deeper than wool.	Silk, a little deeper than wool.
Wool, deeper than silk.	Wool, deeper than at 60°; silk, pale yellow tint.	Wool and silk, equal in depth.	Wool, full blue; silk, nearly white.	Wool and silk equal in depth.	Wool and silk equal in depth.
Wool, a full scarlet; silk, pale pink.	Wool, full yellow; silk, almost white.	Wool, deeper than silk.	Wool, paler than at 80°; silk, white.	Wool, full red violet; silk bluish pink.	Wool, deep blue; silk, pale grey.

comparing these results, or by examination of the patterns, it is evident that the acid colouring matters t all behave alike towards wool and silk, but there are n points of general resemblance. At low tempera- the silk is almost invariably dyed a deeper shade than ool, whilst with increase of temperature the wool is and more deeply dyed, and in a boiling solution the acquires a far stronger colour than the silk. The ts may perhaps be better appreciated if they are repre- d graphically by means of curves, taking temperatures scissæ and depth of colour as ordinates. The dyeing r of each fibre at all temperatures may be represented raight lines on this diagram, or, if the temperatures be sufficiently near together, by continuous curves. e lines or curves are, of course, only approximate, but ight be possible to estimate the amount of colour lly on the wool or silk by dyeing for comparison a of standard patterns on wool and silk with varying nts of the colouring matter, and in this way a more ct representation of the actual relative depths of r would be obtained. This would involve a very large amount of labour, and for the present I will content myself with showing you a few of the colour diagrams drawn to roughly express the condition of the two fibres after dyeing at different temperatures. The deepest colour occurring in the series is expressed arbitrarily by six colour units. The line for wool is first drawn, and by comparing the silk with the wool the silk line is afterwards put in.

By adding the ordinates of the wool and silk lines at each temperature, a third line may be drawn representing the exhaustion of the dyebath at various temperatures for the colouring matter under investigation, but this requires a more exact estimation than any illustrated in these diagrams, and the exhaustion should be verified in every case by colorimetric observations. Such exhaustion curves may also readily be drawn for the dyeing of a single substance, *e.g.*, wool, under any given set of conditions, and affords useful information as to the amount of colour remaining in the dyebath in cases where the solution is used for dyeing further quantities of material, and also enables us to gauge the tendency of the colouring matter to dye level, since this, as shown by Hallitt (Journ. Soc. Dyers and Colourists, 1899, **15**, 33; this Journal, 1899, 368), **18**, is inversely proportional to the exhaustion of the dyebath.

Such diagrams as are here given serve to indicate, firstly, the temperature at which the fibres are dyed alike, viz. the point at which the wool and silk lines intersect. They also show the suitability of the dyestuff for shot effects, i.e., for dyeing one fibre as much as possible without affecting the other, and at what temperature this effect is obtained. The distance of the silk line from the wool line at any given temperature is, of course, a measure of its suitability for this purpose; we see, for instance, that by dyeing with indigo carmine (Fig. 3) at 80° or 100° C., the wool is dyed a full colour, and the silk remains nearly white, but this dyestuff is not a suitable one for dyeing the silk only, since the silk line is nowhere more than approximately two units above the wool line.

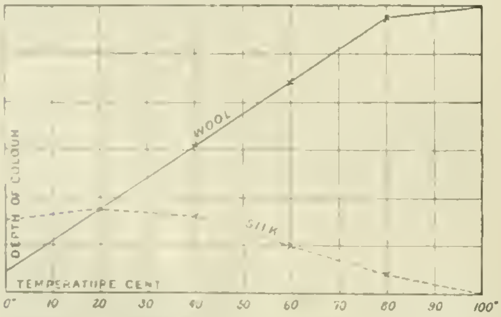
Fig. 1.



Effect of Temperature in Dyeing with Brilliant Crocein on Wool and Silk Unions.

The practical method to be adopted in dyeing wool and silk unions in a plain colour may be deduced from the above results, and there are, in fact, three possible ways of achieving this end. The first and most obvious method is to dye the fabric at the "solid temperature," but this can only be done successfully when this temperature is above 80° C., since, at low and moderate temperatures, wool is, with most acid dyestuffs, incompletely dyed, and possesses a somewhat bare appearance. The second alternative is to dye the wool with a portion of the colouring matter at the boil, then cool down the bath to 40° C., or lower, and add the remainder of the colour. This method has the disadvantage that a long time is required to cool the contents of an ordinary dye vessel from 100° to 40°, and during the cooling operation comparatively little dyeing takes place, since most of the colour has already been absorbed by the wool. It will, therefore, often be found advantageous to employ a fresh dye liquor for the cold or tepid solution intended for dyeing the silk. If we are furnished with the colour diagram, or the same data in tabular form for a dyestuff giving the required shade, we can easily calculate the amounts of colour to be used in each bath. For

Fig. 2.



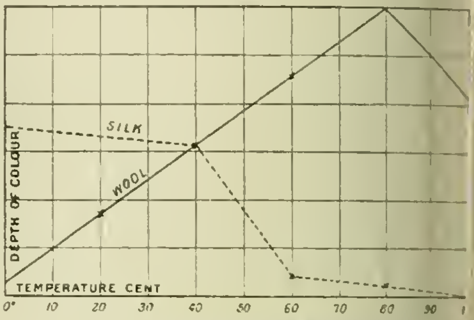
Effect of Temperature in Dyeing with Naphthol Yellow S. on Wool and Silk Unions.

instance, suppose that with a given dyestuff:—At 100° wool takes up 90 per cent., silk, 5 per cent. At 20° silk takes up 70 per cent., wool, 10 per cent. of the col in solution. A simple calculation shows that—

$$\frac{\text{Colour on wool at }100^\circ - \text{Colour on silk at }100^\circ}{\text{Colour on silk at }20^\circ - \text{Colour on wool, at }20^\circ} = \frac{\text{Colour to be applied at }20^\circ}{\text{Colour to be applied at }100^\circ}$$

In this case the required ratio is $\frac{90-5}{70-10} = \frac{85}{60}$ or 17 : If the total amount of colour to be used is 2·9 per c we shall obtain a solid shade by dyeing with 1·2 per cen the boil, and afterwards with 1·7 per cent. in the cold.

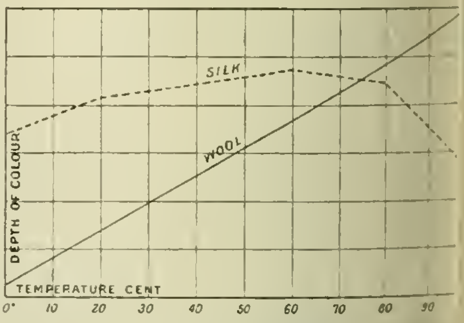
Fig. 3.



Effect of Temperature in Dyeing with Indigo Carmine on Wool and Silk Unions.

Having thus studied in some detail the effect of perature in the dyeing process, the next consideration the effect of continuing the operation for different lengt time. One or two experiments only have been mac this direction, and they tend to show that even in a bo dyebath in the first moments after immersion the colo more attracted by the silk, but on prolonging the bo for a time which varies with the dyestuff the colour b to be removed from the silk and taken up by the It would not be advisable in practice to regulate in this the colour on the two fibres, the results being more certain than when dyeing takes place at a given temper for a time sufficiently long to attain the state of perm equilibrium. This time is for a boiling bath usnally 30 minutes, and for a cold solution 1 to 1½ hours.

Fig. 4.



Effect of Temperature in Dyeing with Fast Acid Violet on Wool and Silk Unions.

In a concentrated boiling solution of Indigo Carmi silk at the end of the first minute is equal in depth of col the wool; on longer boiling the wool at first becomes without any loss of colour by the silk, but after 1 minutes, when a certain point of exhaustion of the dy has been reached, the wool not only continues to dye expense of the solution but the colour is gradually re from the silk until, finally, the latter is left without c Assuming that the union of fibre and colouring matt mical operation, it would appear that the compound of ol and acid colour is far more stable in water or acidified ter at the boiling point than the corresponding npound of silk and acid colouring matter, for by boiling dyed silk in acidified water with white wool the greater t of the colouring matter is usually transferred to the er. The advocates of the solid solution theory would plain the dyeing process thus: the original solution being irly concentrated one, the colouring matter is dissolved n it by both fibres and we have solutions of colour in er, wool, and silk. But as the wool continues to take colour, which at this temperature is more soluble in l than in water, the concentration of the bath decreases, when a certain dilution is attained, the water having a ater solvent action than the silk tends to remove colour n this fabric, and this colour is in its turn dissolved by wool until the condition of equilibrium is reached. s explanation is supported by the fact that in very dilute ing solutions it does not appear that the silk takes up e than a trace of colour even in the first moments of ing. The action of the sulphuric acid present on the l fibre is known, however, to increase its attraction for colouring matter, and this should be taken into account any satisfactory and complete explanation of these nomena. It is evident, at any rate, that the wool is h more firmly united with the colouring matter than is silk, and there is little doubt that an exhaustive study these and similar instances would lead to a better retical understanding of the dyeing operation.

wo other factors, it was thought, might possibly influence relative dyeing powers of the two fibres, *viz.*, the acidity he solution and the relative proportions of wool and silk ent. A few experiments indicate that with increase of both fibres become deeper up to a certain point, after h the depth of colour remains almost constant. When desired to dye the wool only and leave the silk ectly white, acetic acid should be employed rather than neral acid, but for dyeing solid shades sulphuric acid is rally to be preferred, In another experiment varying ortions of wool and silk were dyed at the boil in lar solutions, the total weight of material being tant. At this temperature the wool has a greatly rior attraction for the colouring matter employed, and uch so, in fact, that it practically ignores the presence e silk, and the dyestuff is taken up by the wool precisely as if this were the only material in the bath. Since the amount of colour is constant and the weight of wool gradually decreases, the depth of shade increases, but is not in inverse proportion to the weight of wool, since the relative weights of wool and water also vary. We have, therefore, more and more colour left in the solution by the wool as the amount of this fibre decreases, and of this colour the silk takes up a small proportion, increasing with the concentration of the bath, *i.e.*, with the decrease of wool. Hence the depth of colour increases on both wool and silk as the proportion of wool is lowered, and the relative depth of the shade on the two fibres does not vary greatly. This result applies, of course, only to a boiling dyebath.

I have so far dealt chiefly with the production of solid shades, but the production of two colour effects depends equally upon the principles here laid down. In this case also we may either dye with a single colouring matter at a definite temperature, a method only useful when one or other fibre is to be left white or very pale, or we may dye with one dyestuff at 100°, subsequently cooling the bath and adding the silk colour to the cold solution, or again, we may dye in two successive baths at 100° and at 20°—40° C. respectively with the selected dyestuffs. The necessary information for choosing acid colouring matters suitable for each fibre, and also for selecting those which dye solid shades at given temperatures, will be found in the following tables.

I have first given a list of colours which are especially suited for dyeing plain colours, since they dye the fibres equally at high temperatures. This list is deficient in useful red and yellow colouring matters, the cloth reds and allied colours which appear it being somewhat dull and difficult to dye even. The Mikado colours also do not readily mix with many acid dyestuffs. The second list gives a number of colours which dye the wool only at 100°, or leave the silk with a very pale tint, and where an asterisk is prefixed to the name the silk remains perfectly white. The third list is of those colours which dye the wool very much less than the silk in a cold or very slightly warm dyebath. The letters in brackets indicate the makers of the colours and the numbers following these the temperature (if any) at which wool and silk are equally dyed. We have experimented with more than twice the number of colours here given, but only those are mentioned which exhibit distinctive features.

LIST 1.—*Acid Dyestuffs giving Solid Shades at High Temperatures.*

Reds.

Orchil Red A (B.A.S.F.) [80°].
Cloth Red B, G, 3 G extra (By.) [80°].
Bordeaux B H (By.) [80°].
Phœnix Red A (C.) [80°].
Clayton Cloth Red (Clay) [80°].
Anthracene Red (By.) [80°].

Yellows.

Only when dyed in acid bath.
Mikado Orange (L.) [100°].
Mikado Yellow (L.) [100°].
Mikado Gold Yellow (L.) [100°].
Curcumin W. (Ber.) [80°].

Greens.

Guinea Green B (Ber.) [80°].
Acid Green B (C.) [80°].
Fast Green Blue (By.) [85°]
Fast Light Green (By.) [80°].
Milling Green (Dahl) [80°].
Neptune Green S (B.A.S.F.) [80°].

Blues.

Erioglaucine A (G.) [80°].
Ketone Blue (M. L. & B.) [80°].
Alkali Blue [80°].
Wool Blue N extra (By.) [80°].
Hoechst New Blue (M. L. & B.) [90°].
Naphthyl Blue (K.) [100°].
Fast Acid Blue R concd. (M. L. & B.) [80°].
Naphthazine Blue (Dahl) [85°].
Acid Violet 4 B N (S.C.I.) [100°].
Acid Violet 6 B (Ber.), 3 G N (B.A.S.F.) [85°].
Acid Violet 6 B N, 4 B, 2 B (B.A.S.F.) [80°].

Blacks.

Naphthyl Blue Black N (C.) [80°].
New Victoria Black (By.) [90°].

Browns.

Wool Brown B (Ber.) [100°].
Resorcin Brown (Ber.) [80°].

LIST 2.—*Acid Dyestuffs which give a Full Colour on Wool, leaving the Silk nearly White at 100° C.*

Reds (in order of shade from bluish-red to scarlet).

Chromotrop 8 B (M. L. & B.) [60°].
Chromotrop 6 B (M. L. & B.) [50°].
Azo Fuchsin B (By.) [50°].
Acid Magenta [50°].
Guinea Carmine B (Ber.) [35°].
Azo Acid Magenta B, G (M. L. & B.).
Brilliant Orseille C (C.) [45°].
Azo Carmine B X (B.A.S.F.) [60°].
Tolan Red G (K.) [40°].
Fast Red P R extra (By.) [40°].
Azo Fuchsin G (By.) [40°].
Fast Red B (B.A.S.F.) [60°].
Chromotrop F 4 B (M. L. & B.) [40°].
*Palatine Red (B.A.S.F.) [60°].
Azo Red A. (C.) [60°].
Fast Red N S (By.) [60°].
*Victoria Rubin O (M. L. & B.)
Chromotrop 2 B (M. L. & B.) [50°].
Azo Bordeaux (By.) [50°].
*Lanafuchsin S B (C.) [40°].
Brilliant Bordeaux S (Ber.) [40°].
Mars Red G (B.A.S.F.) [60°].
Ponceau 6 R (B.A.S.F.) [60°].
Apollo Red (G.) [40°].
Chromotrop 2 R (M.) [45°].
Ponceau S extra (Ber.) [45°].
*Azo Crimson L (By.)]40°].
Fast Red E (By.) [60].
Guinea Red 4 R (Ber.).
*Sorbine Red (B.A.S.F.) [30°].
Lanafuchsin S G (C.) [20°].
Azo Coralline (Dahl.) [50°].

LIST 2.—*Acid Dyestuffs which give a* ***Full Colour*** *on Wool, &c.*—continued.

Reds—continued.

*Ponceau 2 S extra (Ber.) [40°].
*Azo Crimson S (By.) [30°].
*Wool Scarlet 4 R (B.A.S.F.) [40°].
Brilliant Cochineal (By.) [30°].
Azo Cochineal (By.) [30°].
Cochineal Red A (B.A.S.F.) [40°].
Crocein Scarlet O X F (K.) [40°].
Brilliant Cochineal 2 R (C.) [40°].
Ponceau 2 R (Ber.) [50°].

Oranges and Yellows.

Palatine Orange (B.A.S.F.) [20°].
Orange G T (By.) [40°].
Orange II. (By.) [40°].
Orange I. (By.) [30°].
Orange III. (P.) [40°].
Orange E N L (C.) [50°].
Ponceau 4 G B (Ber.) [40°].
*Orange G G (C.) [40°].
Orange Crystals (C.) [20°].
Victoria Yellow concd. (M.) [40°].
Mordant Yellow (B.A.S.F.) [20°].
*Fast Yellow (B.A.S.F.) [20°].
*Milling Yellow G (L.) [20°].
Brilliant Yellow S (B.A.S.F.) [60°].
Quinoline Yellow (Ber.) [20°].
*Tartrazine (B.A.S.F.) [30°].
Anthracene Yellow C (C.) [40°].
Phenoflavin (O.) [20°].
Fast Yellow extra (By.) [20°].
*Naphthol Yellow S (B.A.S.F.) [15°].
Picric Acid [15°].

Greens.

Wool Green S (B.A.S.F.) [60°].
Eriochlorine A (G.).

Blues.

New Patent Blue (By.).
Erioglaucine A (G.).
*Indigo Extract [30°].
Fast Acid Blue B (By. [60°].
Alizarin Sapphirole (By.) [40°].
*Azo Acid Blue 6 B (By.)

Violets.

Acid Violet 4 R S (M. L. &
[50.].

Blacks.

Azo Acid Black B, R (M. L. & B
Biebrich Patent Black B O (K.).

Brown.

Acid Brown D (C.).

LIST 3.—*Acid Dyestuffs which give at 20°—40° C. a much fuller Shade on Silk than on Wool.*

Reds.

Chromotrop 10 B (M. L. & B.).
Chromotrop 8 B (M. L. & B.).
Acid Magenta.
Azo Carmine, B X, G.
Cloth Red B.
Wool Red B (C.)
Orseilline 2 B (By.) [60°].
Azo Red A (C.)
Brilliant Crocein 9 B (C.) [70°].
Ponceau 6 R B (Ber.) [60°].
Bordeaux G (By.)
Erythrin X (B.A.S.F.) [60°].
Ponceau 4 R (Ber.) [60°].
Milling Red G. (C.) [70°].
Brilliant Crocein M O O (C.) [70°].

Yellows.

Curcumin W (Ber.).
Brilliant Yellow S (B.A.S.F.).
Milling Yellow O O (C.) [60°].

Greens.

Light Green S F (B.) [70°].
Guinea Green B (Ber.).
Acid Green B (C.)
Patent Green V (M. L. & B.) [70°].
Fast Acid Green B N (C.)
Milling Green (Dahl).
Fast Green Blue (By.).

Blues.

Patent Blue Superfine (M. L. & B.) [60°].
Indigo substitute B S (M. L. & B.).
Cyanol 2 F, 2 B, extra (C.) [60°].
Cyanin B (M. L. & B.) [60°].
Erioglaucene B (G.) [60°].
*Bavarian Blue D B F, D S F (Ber.).
Wool Blue N. extra (By.).
Soluble Blue pure (C.).
Hoechst New Blue (M. L. & B.).
Fast Acid Blue B (By.).
Naphthazine Blue (Dahl).

Violets (dyed at 40°).

Fast Acid Violet 10 B (By.) [70
Acid Violet 6 B (Ber.).
Acid Violet 2 B, 4 B, 6 B N, 3 G (B.A.S.F.).
Acid Violet 6 B (G.).
Acid Violet 4 B G extra (By.).
Acid Violet 4 R S (M. L. & B.).

Blacks (grey on silk).

Naphthol Blue Black (C.) [60°].
Acid Black B (R.H.).
Brilliant Black 3 B (B.A.S.F.).
Biebrich Patent Black A N (K.).

Brown.

Resorcin Brown (Ber.)

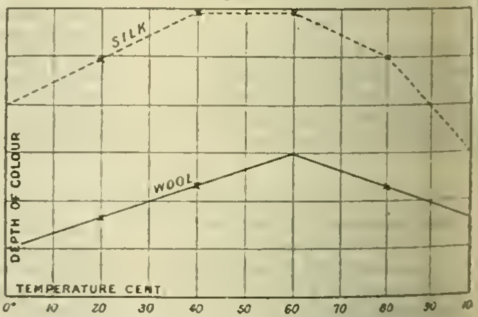
Abbreviations employed in above Lists.

B.A.S.F. = Badische Anilin und Soda Fabrik.
Ber. = Berlin Aniline Co.
By. = Bayer and Co.
C. = Cassella and Co.
Clay. = Clayton Aniline Co.
G. = Geigy and Co.
K. = Kalle and Co.
L. = Leonhardt and Co.
M. L. & B. = Meister, Lucius und Brüning.
R.H. = Read Holliday and Sons
S.C.I. = Society of Chemical dustry, Basle.

It is recommended, when it is desired to dye the wool only, and to leave the silk white, in addition to careful selection of dyestuffs, to pass the pieces after dyeing through a bath of warm water containing bran. This treatment has been found very satisfactory, and it is probable that the action is merely a rubbing-off of the loosely fixed small amount of colouring matter on the silk. By some of the colour makers boiling water only, and also acetate of ammonia, are recommended for the same purpose.

It is not possible from the above results to draw any detailed conclusions as to the influence of the constitution of a colouring matter on its dyeing properties with regard to wool and silk. It will, however, be noticed that most of the nitro and azo dyestuffs are more strongly attracted by the wool than by the silk, whilst a number of the triphenylmethane derivatives and other sulphonated basic colouring matters such as soluble blue, alkali blue, acid violets, &c. tend to dye the silk equally with the wool at fairly high temperatures. One result is, that we are confronted with a narrow choice of orange and yellow dyestuffs for dyeing silk to the exclusion of wool, and we are also greatly restricted in the selection of green, blue, and violet colouring matters suitable for dyeing the wool alone.

Fig. 5.



Effect of Temperature in Dyeing with Imperial Green on Wool and Silk Unions.

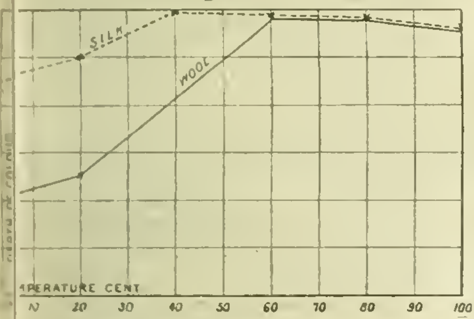
Basic Colouring Matters.

Wool and silk were also dyed in exactly the same man with six basic colouring matters, but without addition to dyebath, with the following results.

Magenta Crystals (M. L. & B.)	Auramine (B.A.S.F.)	Imperial Green (Bayer).	Methylone Blue (M. L. & B.)	Methyl Violet B extra (Ber.)	Bismarck Brown F F G (C.).
Silk, a full red; wool, pale, dull red.	Silk, a little fuller and brighter than wool.	Silk, full bright green; wool, much palei and duller.	Silk, considerably fuller than wool.	Silk, full violet; wool, pale dull violet.	Silk, brighter than wool, about equal in depth.
As at 0	As at 0°	As at 0°	As at 0°	As at 0°	As at 0°
Silk, fuller and brighter than wool.	As at 0°	As at 0°	Silk, a little fuller than wool.	Silk, a little fuller than wool.	As at 0°
Silk and wool equal in depth.	As at 0°	Wool, paler and duller than silk.	Silk, much brighter than wool.	Silk and wool equal in depth.	As at 0°
Both fibres equal and fuller than at 60°.	Both fibres fuller and more orange; silk fuller than wool.	As at 60°	Silk, deeper than wool.	As at 60°	As at 0°
Both fibres equal, paler than 80°, duller than 60°.	Colour destroyed: both fibres very pale.	Both fibres paler than at 80°.	Silk, deeper than wool; both fibres paler than at 80°.	A little paler than at 60°. Silk and wool equat in depth.	Wool, deeper than silk.

results offer several points of interest. It will be that many dyestuffs of this class are more strongly l by the silk than by the wool at all temperatures. he case with Imperial green, the colour diagram for Fig. 5) shows that the wool and silk lines never , but the ordinate of the latter is always greater than that of the former. Many other basic dyestuffs, however, dye solid shades through a wide range of temperature; methyl violet, for example, will dye both fibres equally at all temperatures from 60° to 100° (Fig. 6), the depth of colour and the exhaustion of the dyebath being almost constant throughout this interval.

Fig. 6.



ct of Temperature in Dyeing with Methyl Violet on Wool and Silk Unions.

It will be seen that with Imperial Green both fibres are less strongly dyed at the boil than at 80° C., and this is a general rule for almost all the basic dyestuffs. Another point worthy of note is that the wool is more deeply dyed at a low temperature than with the acid colours.

The basic colours, by virtue of these properties, are well suited for the dyeing of wool and silk union fabrics, and often yield full and bright solid colours, but they are not employed for this purpose to nearly the same extent as the acid dyestuffs, on account of their inferior fastness to light. For dyeing the silk in "shot" effects they are frequently used, and much deeper colours can be obtained on this fibre at a low temperature than with the acid colouring matters; but the considerable alteration of the colour already on the wool must be taken into account when making use of this process. The following lists give the temperature at which a number of basic dyestuffs yield solid shades, and also the names of the colouring matters most suitable for dyeing the silk only, at a temperature of 20°—40° C.

List 4.—*Basic Colours which dye Solid Shades on Wool and Silk.*

Reds.

genta [80°].
sian Red B (C.) [80].
duline Red B, G (By.) [50°].
anine [60°].

Oranges and Yellows.

nin Orange R (C.) [40°—80°].
rsoidine [20°—100°; deepest at
)].
gal Yellow Y (R.H.) [80°].
sphine [80°].
zoflavin (Oehler) [80°].
amine [60°].
flavin T (C.) [40°].

Greens.

Azine Green T O (L.) [80°].
Diazine Green (K) [80°].
Diamond Green (B.A.S.F.) [80°].
Ethyl Green (Ber.) [80°].

Blues.

Seloglaucine (G.) [40°—60°].
Setocyanine (G.) [40°—60°].
Nile Blue (B.A.S.F.) [40°—82].
Night Blue (B.A.S.F.) [80°].
New Victoria Blue B (By.) [80°].
Victoria Blue 4 R (S.C.I.) [80°].
Brilliant Diazine Blue B (K.) [80°].
Basle Blue B. (D. & H.) [80].
Diphen Blue R (Ber.) [60°].
Judazine M (C.) [60°].

Black.

Diazine Black (K.) [80°].

Violets.

Ethyl Purple 6 B (B.A.S.F.) [80°].
Ethyl Violet 5 B (S.C.I.) [80°].
Methyl Violet [60°—80°].
Crystal Violet [60°].
Rosolan powder (M.) [60°].
Hofmann's Violet [60°—80°].
Tannin Heliotrope (C.) [60°].

Browns.

Bismarck Brown, Nut Brown, Vesuvine, &c. [60°—80°].
Tannin Brown B (C.) [60°].

t 5.—*Basic Colours which Dye Silk much more strongly than Wool at Low Temperatures.* (*The best Temperature is 20° C. (cold) unless otherwise stated.*)

Reds.

enta.
anine.
damine.

Oranges and Yellows.

dine Orange N O (L.) [40°].
iuduline O (B.A.S.F.).
phine.

Greens.

Ethyl Green (Ber.).
Solid Green Y Y O (S.C.I.).
Malachite Green.
Imperial Green (By.)
China Green.
Methyl Green.
Victoria Green 3 B N (B.A.S.F.).
Methylene Green (M. L. & B.).
Diazine Green (K.).
Azine Green T O (L.).

Blues.

Turquoise Blue (By.).
Setopaline (G.).
Brilliant Cresyl Blue 2 B (L.).

List 5.—*Basic Colours which dye Silk much more strongly than Wool at Low Temperatures*—continued.

Blues—continued.

Cresyl Blue 2 B S (L.).
Methylene Blue.
Thionine Blue (M. L. & B.).
Brilliant Diazine Blue B (K.).
Ethyl Blue B F (M. L. & B.).
Napthindone 2 B (C.).
Diphen Blue R (Ber.).
Indazine M (C.).
Muscarine J. (D. & H.).
Naphthylene Blue R Cryst. (By.).
New Blue R (C.).

Blacks, &c.

Coal Black II. (M. L. & B.) [dull violet].
Diazine Black (K.) [deep blue].

Violets.

Neutral Violet O (M. L. & B.).
Ethyl Purple 6 B (B.A.S.F.).
Ethyl Violet 5 B (S.C.I.).
Methyl Violet.
Crystal Violet.
Clematine (G.).
Rubramine (Noetzel).
Methylene Violet 2 R A (M. L. & B.).
Rhoduline Violet (By.).
Tannin Heliotrope (C.).

The dyeing of fabrics in the piece offers certain advantages and economies, which I do not propose to discuss here, over the dyeing of the material in the forms of wool or yarn. However, the investigation of the methods to be adopted in the dyeing of union fabrics will need no justification to the minds of dyers, for this has now become an important branch of our industry, and the enormous variety of colouring matters now at the dyer's command enables him to produce almost any desired effect of colour on any class of material. The properties of colouring matters which have been described come into play in the dyeing of "gloria," a wool and silk union largely employed for sunshades and umbrellas, and other plain fabrics consisting of these fibres, and also the production of two colour effects on wool and silk dress fabrics woven in designs. The subject is also one of interest to the garment dyer, whose everyday task it is to dye to the same shade widely differing materials.

The indication of the dyeing properties of colouring matters by means of curves is capable of wide extension in many directions, and serves to bring before the eye at a glance the properties of the dyestuff with respect to the various textile fibres. It is necessary, however, to remember that the dyeing properties of various qualities of the same material often differ very considerably, and it is impossible to do more than assist the dyer to a choice of dyestuffs and methods; the actual details of the process to be adopted in any case should always be determined in the works laboratory with samples of the actual material that is to be dyed.

From a theoretical point of view, there is still a vast field for research in regard to the physical and chemical aspects of the dyeing operation. I cannot but think that an extended experimental study of the numerical relations existing at various stages in the dyebath between the amounts of fibre, colouring matter, and solution under varying conditions of time and temperature, will eventually throw light on that much debated problem, the nature of the dyeing process.

Discussion.

Mr. Ward asked if any feasible explanation could be given of the different behaviours of acid and basic colouring matters at the different temperatures.

Mr. Fairley asked if the amount of dyestuff taken up by the fabric could be estimated by determining the remainder in the dyebath after the fabric had been dyed in a solution containing a known weight of the dyestuff.

Mr. Slatter asked whether in dyeing the wool sample with methylene blue any additions had been made to the dyebath.

Mr. Brown, in reply to Mr. Ward, suggested that the difference was in a large measure due to physical properties of the various dyestuffs, but it must also be remembered that several of the basic dyestuffs undergo decomposition in the dyebath at 100° C.

In reply to Mr. Fairley the author stated that this is the method actually employed for the production of standards for comparison.

In reply to Mr. Slatter: No addition had been made in the case of the basic colours.

Journal and Patent* Literatur

Class. P
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V.—Textiles: Cotton, Wool, Silk, &c. ....
VI.—Dyeing, Calico Printing, Paper Staining, and Bleaching...
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XIX.—Paper, Pasteboard, Cellulose, Celluloid, &c. ......
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XXIII.—Analytical Chemistry...........................
XXIV.—Scientific and Technical Notes..................

I.—PLANT, APPARATUS, AND MACHINE

Magnesia in Boiler Feed Water; Behaviour of
Zeits. Ver. deutsch. Ing.; Thonind. Zeit. **24**, [
1727—1728.

Under the influence of increasing pressure, and c
quently increasing temperature in boilers, double de
position is set up between the calcium carbonate an
magnesium sulphate or chloride present, magnesia
deposited, carbon dioxide liberated, and calcium sul
or chloride produced. The effect of these reactions
different conditions has been investigated by Röhri
Treumann, who employed a gold-lined autoclave
applied heat until the pressure gauge indicated 71, 14
213 lb. respectively per square inch. The results s
that the deposition of MgO is greater from magn
chloride than from the sulphate; but in all cases the
bination of the magnesium salts with those of calciu
found to be more complete the higher the pressure
which the solution had been exposed, and the long
period during which the pressure had been sustained.

When boiled in an open vessel for an hour, a (1 per
solution of magnesium chloride in presence of an ex
calcium carbonate, deposited only 0·8 per cent.
initial magnesium as MgO.—C. S.

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* Any of these specifications may be obtained by
remitting 8*d.*—the price now fixed for all specifications,
included—to C. N. Dalton, Esq., Comptroller of the Patent
Southampton Buildings, Chancery Lane, London, W.C.

PATENTS.

d-proof Vessels and other Articles. F. W. Lefelmann, ue, Westphalia, Germany. Eng. Pat. 1828, Jan. 29, 900.

e vessel to be rendered acid-proof is cleaned, roughened, coated with a boiling mixture of 10 parts of linseed and one part of sulphur, followed by a coating of the o mixture, with which 20 parts of clay have been incorporated. Roughened acid-proof clay plates, about 20 mm. k, are then applied, and another coating of the plaster id on, over which a second layer of clay plates is pressed, uch wise that the joints are not continuous. The vessel s prepared is dried at a gentle heat for several days, is then burned, preferably by hot air.—E. S.

cing, Dissolving, or like Treatment of Liquids or Materials in Liquids : Vessels for Use in the ——. A. J. oult, London. From C. Hromadnik, Munich. Eng. at. 21,912, Dec. 3, 1900.

t vessel is approximately circular in vertical section, is provided with a vertical perforated partition, having perture at its lower part. In this aperture a winged or lle wheel is rotated by means of a horizontal shaft, causing a pressure in one compartment of the vessel, a suction in the other compartment, whereby the liquid used to follow a regular course, passing through the orations in the partition.—R. A.

ating Liquids or Materials in Liquids ; Apparatus for se in ——. A. J. Boult, London. From C. Hromadnik, Munich. Eng. Pat. 21,914, Dec. 3, 1900.

apparatus consists of a vessel, preferably barrel-shaped ith bulging sides, provided with a winged or paddle el at the bottom, and with one or more cross-bars or kwaters, arranged across the vessel near the height of ordinary level of the liquid. The liquid is driven up sides of the vessel by the rotation of the wheel, and is en up by the cross-bars in falling back towards the lle, where the wheel forms a kind of eddy.—R. A.

stallising [Sugar, Ammonium Chloride, &c.] or Freezing Water, &c.] ; Process and Apparatus for ——. P. Naef, ew York, U.S.A. Eng. Pat. 16,971, Sept. 24, 1900.

e apparatus employed the liquid is caused to flow in act with cooled surfaces, while at the same time it ubjected in the process to the action of a cold which is caused to flow through the liquid in the osite direction to the flow of the latter. Means are ided for simultaneously agitating or moving the liquid the gas as they flow through one another, for repeatedly ng the gas in alternation with its flow through the d, and for subsequently separating the crystallised er from the liquid.—R. A.

porators ; [Sea-Water, &c.] ——. F. Simpson, Buenos yres, and A. R. T. Woods, Liverpool. Eng. Pat. 3080, eb. 16, 1900.

evaporating apparatus is arranged so that the steam rated in the evaporating chamber, by means of a coil ed by steam or other vapour, &c., is raised in temperaand pressure, and utilised as a source of heat to assist e further evaporation of the liquid. The increase in emperature and pressure of the steam generated in the ratus may be effected by passing it through a jet or le of the injector type, in the primary steam supply, or eans of a compression pump, which may be worked by primary steam. Apparatus of both these types are ribed in the specification, the steam generated in the ratus being delivered with the primary steam to the end of the heating coil.—R. A.

m Boilers or other Utensils used in Generating Steam ; ompositions for Preventing and Removing Scale or orrosion from ——. J. J. Johnstone, Eldon Lea, nnan, N.B. Eng. Pat. 14,976, Aug. 22, 1900.

ecoction is used, made of 330 lb. of eucalyptus leaves ,100 gals. of water, to which 130 lb. of ammonium ride and 1 oz. of creosote are added.—E. S.

Filtering Liquids ; Apparatus for ——. H. A. Desrumaux, Paris. Eng. Pat. 18,352, Oct. 15, 1900.

The apparatus comprises two or more filtering chambers or compartments, situated in the same horizontal plane, and communicating with a common collecting vessel. Each chamber or compartment is provided with a false bottom, on which the filtering material is placed, an inlet valve, and an outlet valve located above the level of the filtering material, and below the level of the outlet in the collecting chamber. Any one of the filtering chambers can be cleansed when required, by closing its inlet valve and opening its outlet valve, thereby causing a backward current of the liquid to flow through the chamber from the other filtering chambers, or from the collecting chamber.—R. A.

Filtering, Purifying, Softening, or similarly Treating Liquids [Water, "Trade Effluents," &c.] ; Apparatus for ——. H. Desrumaux, Paris, and J. T. Norman, Putney Common, Surrey. Eng. Pat. 20,205, Nov. 9, 1900.

Several filtering chambers are mounted in the same horizontal plane, at the top of a deep settling reservoir, through which the liquid is passed to the filtering chambers. The filtering chambers communicate with each other beneath the filtering material, through a collecting space in connection with a collecting chamber, in which the filtered liquid rises to a suitable outlet. Each filtering chamber is provided with inlet and outlet valves, which enable any of the chambers to be cleansed, by a backward current of the liquid, without stopping the apparatus. Precipitating or softening reagents, &c. may be added to the liquid in the settling reservoir, which may also be provided with a series of depositing blades or surfaces. Several modifications are described.—R. A.

Filtering Liquids ; Apparatus for ——. H. Desrumaux, Paris. Eng. Pat. 22,581, Dec. 11, 1900.

A number of closed filtering chambers, formed separately or by partitioning a suitable vessel or receptacle, are arranged so as to communicate with each other on the outlet side. On the inlet side, the chambers can be put in communication with the inlet pipe for the unfiltered liquid (which is supplied under pressure), or with a drain pipe, which enables a reverse current of the liquid to be passed through any of the chambers for the purpose of cleansing them.—R. A.

II.—FUEL, GAS, AND LIGHT.

Peat ; Utilising ——. Thonind. Zeit. **24**, [126], 1778.

In the process devised by E. Stauber, the wet raw peat is broken down and stirred into a uniform mass, which is delivered into a rotary drum containing a conveying device and connected at one end with a source of heated air, and at the other with an exhaust. The peat is slowly carried forward and at the same time moved up and down ; it is thus brought into intimate contact with the heated air and loses about half of its contained water. The semi-dry peat is next conveyed to a breaker, where it is further reduced in size and rendered more homogeneous ; then dried a second time in a steam-heated apparatus ; and finally moulded and pressed.—C. S.

Peat-Coal and Peat, as Coal Substitutes. Hamb. Börs-Halle ; through Thonind. Zeit. **24**, [123], 1728.

N. Vilén, of Gothenburg, is reported to have introduced a method of converting peat into a smokeless "coal," containing 72 per cent. of carbon, or 87·54 per cent. of combustible matter ; 8·52 per cent. of incombustible gases and only 3·94 per cent. of ash ; the heating power being over 6,000 calories, and the cost 13*s.* 6*d.* to 16*s.* 9*d.* per ton. Under the conditions prevailing in Sweden, viz., an abundance of peat mosses, coupled with the absence of good coal, and a diminishing supply of wood, the question of utilising peat is important for that country, and an agitation for securing reduced freights on peat and its products has been started. The consumption of peat is increasing, and the fuel possesses the advantage of being less corrosive of metal than coal is.—C. S.

Oil Fuel in California. Eng. and Mining J. 1901, **71**, [3], 79.

At the present time there are about 200 locomotives using oil fuel on the Santa Fé and Southern Pacific railways, and this number is still being added to. The oil is stored in bulk, generally in two 30,000-gallon tanks, at the termini, and is fed from the storage tanks into the oil-holders on the locomotive tenders. A pressure of air not exceeding 5 lb. is maintained in the oil-tank on the tender, in order to make the oil flow freely to the burner; a "pop valve" is also provided to guard against dangers of explosion from an accumulation of inflammable vapour. On the Santa Fé system, the burner consists of a double-chambered casting, fixed on the mud ring midway between the frames. The oil from the tender passes through a regulating valve, controlled by the fireman, and issues from the orifice of the upper chamber, which is 3 ins. × $\frac{1}{2}$ in. From the orifice of the lower chamber, which is $3\frac{1}{2}$ in. × $\frac{1}{32}$ in., issues a thin sheet of steam, which comes in contact with the stream of oil, and sprays it into the fire-box. The burner used on the Southern Pacific system has three chambers or passages: an upper one supplying oil, a lower one from which issues a thin sheet of steam, and a central one for a current of air. The burner is set through the rear water space above the mud ring, and the gaseous mixture from it passes into the fire-box through a single orifice.

It is pointed out that apart from the cost of oil fuel as compared with coal, the former possesses other advantages, such as rapidity of fuel supply, absence of manual labour in handling the fuel, absence of cinders, sparks, &c., and ease and control of firing.—A. S.

Lamps; Behaviour of Electrolytic Incandescent ——. W. Nernst and W. Wild. Zeits. für Elektrochem. 1900, **7**, [25], 373—376.

The incandescence rods of these lamps, consisting essentially of the mixed oxides of zirconium, thorium, and yttrium, begin to glow after being heated to 500°—700° C. Tables are given showing the candle power and efficiency of the lamps under varying loads, the dimensions of the rods varying in length from 17—30 mm., and in thickness from 0·32—1·87 mm. The maximum specific luminosity observed was 10—16 Hefner candles per square millimetre.

The life of the thinnest of these filaments consuming on an average about 1·35 watt per candle, may be taken at 180 hours, whilst the thickest rods will last at least twice as long, and it is hoped that this will be increased as further improvements are made in their manufacture.

The energy consumed in these electrolytic lamps is only half as much as in the ordinary incandescent lamps, and about 29 per cent. more than in large arc lamps.—J. S.

Gas Liquor (Leeds); An Analysis of ——. A. W. Cooke.

See page 225.

Spent Oxide; Rapid Method for Determining the Prussian Blue in ——. J. M. Popplewell.

See page 225.

Coal Briquettes; Examination of ——. G. A. LeRoy.

See under XXIII., *page* 285.

PATENTS.

Gas Furnaces, Combined ——, *and their Air Compressors, and Air Blast Burners for such Furnaces.* J. K. Stewart, Chicago, U.S.A. Eng. Pat. 5317, March 20, 1900.

This is a combined gas blast furnace, comprising a muffle furnace, a forge, a crucible furnace, and an air compressor. The blast furnace comprises a metal shell enclosing a continuous chamber, the shell having a continuous firebrick lining, dividing the chamber into separate compartments, each of which is heated by independent gas burners.

The gas burner has a final discharge mout
arranged for attachment to the furnace chamber to
the burner is to supply flame, the mouthpiece having a
for atmospheric air encompassing its discharge mo
gas supply duct, and an air-blast duct, both discharg
immediate juxtaposition into the mouthpiece, with
encompassing air inlet.

The air inlet consists of numerous ducts formed t
the back wall of the mouthpiece mentioned, and conv
towards the axis of the air-blast discharge therethrou

Another claim is for a combined fuel gas burn
mixer, consisting of an air chamber, a gas passage e
ing alongside the same, and having branches ext
transversely therefrom; air pipes leading from t
chamber longitudinally through such transverse b
respectively; air and gas pipe connections leading
into said air chamber and gas passage, respectivel
enlarged flame mouths terminating the gas passa
provided with air inlet ports surrounding said passag

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Fuel, Smoke, and Fire-Gases in Steam Boiler an Furnaces; Apparatus for Effecting more C Combustion of the ——. S. C. Davidson, Belfast. Pat. 3266, Feb. 19, 1900.

The invention relates to furnace fronts and compri
following details:—An air supply chamber placed
the furnace and ashpit doorways and provided, on t
nearest the furnace, with two series of orifices, c
mitting air into the ashpit direct, the other supply
directly over the top surface of the fire, their siz
such that the volume of air entering through the
series is less than that delivered by the first, and
so in constant proportion, irrespective of the pressu
obviate breakage by irregular expansion and cont
that side of the air chamber nearest the fire and as
formed of contiguously arranged segmental plates
aforesaid orifices of the second series are fitted wit
or blowpipes, projecting into the air chamber and faci
the heating of the air delivered to the top of the fire
the orifices of the first series are left simple in o
supply cooler air to the ashpit and thus protect t
bars. The orifices are also arranged so that t
delivered to the top of the fire is directed parallel
or converging downward thereon, to prevent the im
of hot gases on the furnace door when closed,
outblast of flame when the door is opened.—C. S.

Coal Briquettes and the like; Manufacture of ——, *Agglutinant Material for the Same.* A. J. London. (From A. Exbrayat, Levallois-Nouilly, F Eng. Pat. 18,839, Oct. 22, 1900.

The claim is for the treatment of waste material co
cellulose, by means of distillation and subsequent tr
to produce glucose or dextrin, with a view of obtai
agglutinant for replacing the tar or pitch used in th
facture of coal briquettes and the like. The
residue from the treatment of the cellulose mat
incorporated with the blocks.—C. S.

Burner, Hydrocarbon ——, *for Lighting or Heati poses; constructed without the Use of Solder.* ano, and La Compagnie Générale d'Incandesc le Petrole et l'Alcool, both of Paris. Eng. Pat. July 11, 1900.

The burner is designed to give a luminous flame,
the addition of a mixing bell, a non-luminous f
heating purposes or lighting by means of mantle
fuel may be either petroleum or methylated sp
tubular wick is carried in an annular channel, the in
of which is shorter than the outer, which is provide
rack and toothed wheel for raising or lowering t
The wick carrier is attached to a gallery which ser
the reservoir of the lamp, and the lower end of th
slit, so that air which gains access to the reservoir
holes in the gallery can reach and pass up the
cavity within the wick carrier. An outer p

ery supports a glass chimney about the burner, and also antle-prop if the latter be required. The mixing bell is ced over the top of the central cavity. All the joints are pted to be made without solder.—J. A. B.

Gas Generators. P. Leroy, Paris. Eng. Pat. 2709, Feb. 10, 1900.

e apparatus described comprises a generating chamber, ned in a cylindrical shell with refractory lining, which mber narrows towards the base by a parabolic curve. its base is a transverse passage, the ends of which are vided with doors, through which the slag and cinders duced can be removed. In the centre of this passage is ozzle through which the air for the combustion of the in the generating chamber is admitted from a transverse into which air is forced from a compressor. A spray vater may also be injected with the air, if an admixture vater gas in the product is required. A hopper on the lock principle is provided for feeding the generator with , and the gas made, is led away through a lateral outlet the top of the generator to a cleaning chamber or ber. Any ordinary solid fuel may be employed, and vy oil may be injected into the generator above the r of cinders. The gas produced may be carburetted as aves the generator, if it be required for lighting purposes. paraboloid base of the generator is intended to ensure orm distribution of the air in the mass of fuel.
—J. A. B.

and By-Products; Method and Apparatus for Procing ——. P. Naef, New York, U.S.A. Eng. Pat. 2888, eb. 13, 1900. (Internat. Convent. Date claimed July 13, 99.)

s method and apparatus for obtaining gas from fuel for recovering by-products, such as ammonia and tar, the following objects: (1) to recover the by-products out treating all the gas for their recovery; (2) to treat quantities of fuel continuously and without much ar; (3) to produce better tar-oils than are usually ined in gas producers; (4) to obtain gas free from apours; (5) to obtain most of the obtainable ammonia tar with the simultaneous melting of the cinders; o introduce water in the gaseous or liquid state to the rator by improved means; (7) to obtain illuminating ater-gas free from nitrogen, and the separate production roducer gas in the same apparatus; (8) to run off the ers in a molten state; and (9) to produce ammonia the nitrogen of the air as well as from the fuel. orate details and plans are given.—R. S.

and By-Products; Method and Apparatus for Procing ——. P. Naef, New York, U.S.A. Eng. Pat. 2888A, b. 13, 1900. (Internat. Convent. Date claimed July 13, 99).

objects and general principles are the same, with omission, as in the principal patent (see preceding act). The producer gas, however, given off from outlets (in the former case) is led by an exterior to a chamber surrounding fuel feeding pipes at the of the furnace. By this means the fuel is first y coked, and illuminating gas containing much tar oil oes. Lower down the fuel is acted upon by steam and ir blast in two stages as before. The molten cinders away through a lute of liquid slag. Cyanide is also d to be obtained in this apparatus, "the fuel generally aining sufficient alkali" to form the salt.—R. S.

and By-Products; Method and Apparatus for Procing ——. P. Naef, New York, U.S.A. Eng. Pat. 2888B, eb. 13, 1900. (Internat. Convent. Date claimed July 13, 99.)

THER divided application, the stated objects being the , with some omissions, as in the principal patent (see act to Eng. Pat. 2888 preceding). In this case, the ers are discharged in the solid state, a suitable anical device being employed. A portion of the pror gas obtained is led through a tube, wherein it meets a water spray, and the mixture is introduced into the r part of the furnace.—R. S.

Gas and By-Products; Method and Apparatus for Producing ——. P. Naef, New York, U.S.A. Eng. Pat. 2888C, Feb. 13, 1900. (Internat. Convent. Date claimed July 13, 1899.)

THE stated objects are the same, with one omission, as in the principal patent (see abstract Eng. Pat. 2888 preceding). In this case, the lower crucible part of the furnace has a water jacket, and is fitted with electrodes, so that carbides may be produced. Or, the molten slag can overflow into a separate vessel, carbonaceous material added, and electrodes introduced therein to obtain the carbides. Within the furnace, some distance up, another pair of electrodes is passed through the walls, so as to produce cyanides. Two gas-heating devices may be used along with the furnace. Through one, some of the gas from the upper portion of the furnace may be circulated and mixed with steam, and then re-introduced into the furnace. Through the other, the gas withdrawn from the lower outlets is passed to heat the air blast used.
—R. S.

Gas and By-Products; Method and Apparatus for Producing ——. P. Naef, New York, U.S.A. Eng. Pat. 2888D, Feb. 13, 1900. (Internat. Convent. Date claimed July 13, 1899.)

THE objects are again the same, with an omission, as in the principal patent (see abstract to Eng. Pat. 2888 preceding). In this case, the upper part of the furnace is formed with vertical flues within its walls. Gas burners are introduced at the base of these flues, so as to furnish heat to the upper part of the furnace for distillation purposes. The upper and lower parts of the furnace may be separated by horizontal doors, which can be turned on shafts at intervals, to allow the fuel to pass from the upper portion to the lower. Illuminating gas, preferably heated, may be passed, through the upper part of the furnace, entering by the steam or water ducts.—R. S.

Gas and By-Products; Method and Apparatus for Producing. P. Naef, New York, U.S.A. Eng. Pat. 2888E, Feb. 13, 1900. (Internat. Convent. Date claimed July 13, 1899.)

WITH some omissions, like the principal patent (see abstract to Eng. Pat. 2888 preceding). In this case the gas produced, mixed with undecomposed steam, is withdrawn from the furnace some distance above the steam inlets, passed through a gas heater, and re-introduced higher up. This is repeated higher up still. Between the upper and lower parts of the furnace the passage may be contracted by means of a water jacket.—R. S.

Gas and By-Products; Method and Apparatus for Producing ——. P. Naef, New York, U.S.A. Eng. Pat. 2888F, Feb. 13, 1900. (Internat. Convent. Date claimed July 13, 1899.)

(SEE abstract to Eng. Pat. 2888 preceding.) In this case the furnace is provided with a double hopper feeding arrangement, and with a similar discharging arrangement. Each consists of two superposed cylinders with bells closing against the end of each cylinder. The cylinders are preferably water-jacketed.—R. S.

Gas for Illuminating and Heating Purposes. A. H. Arzt, London. Eng. Pat. 4736, March 13, 1900.

A MIXTURE of siliciuretted hydrogen (SiH_4) and hydrocarbon, diluted with air or coal-gas, is made by passing the air or gas over a porous body impregnated with silico-tri-ethyl-formate ($4SiH(OC_2H_5)_3$), and a volatile hydrocarbon containing "a small amount of sodium, amorphous table salt or crude camphor," either of which three bodies is said to split up the silicon ester and liberate "silicic hydrogen." The gas so produced is stated to have hitherto quite unknown qualities for heating and lighting purposes. The porous body is made by drying and calcining in a furnace small lumps of a paste consisting of a mixture of powdered pumice stone, magnesium oxide, and water. Giving pumice the formula $H_2Si_3O_7$, the patentee states that the porous body formed has the formula $MgSi_3O_7$, and possesses peculiar chemical properties, and the valuable quality of completely assimilating into its mass an addition of silico-tri-ethyl-formate. The presence of silicic hydrides in hydrocarbon vapours is said also to prevent their condensation in the gas pipes. The products of decomposition of the material are stated to be (1) a trisilicate of magnesium, which after preliminary heating and washing, yields the body $MgSi_3O_7$, and (2) tetrethylic silicate, $3Si(OC_2H_5)_4$, which may be distilled over and converted into the triethylformate by conducting into it the fumes from magnesium silicon (Mg_2Si), which has been moistened with hydrochloric acid. The reconversion thus of the bodies decomposed to their original state is claimed.—J. A. B.

Acetylene Gas Generators. Sir C. S. Forbes, Bart., London. Eng. Pat. 2855, Feb. 13, 1900.

One or more tubes containing carbide, each supported within an outer tube suspended from the top of a bell or a fixed gasholder, are supplied with water from the tank of the gasholder through holes in the upper part of each outer tube and a channel which opens near the base of the tubes. If gas is evolved at a greater rate than it is consumed, its pressure cuts off the water from the holes in the outer tubes, and so interrupts the supply of water to the carbide. Condensing and purifying apparatus is attached to the generator, which is intended to be portable. A modified apparatus of larger capacity is also described.—J. A. B.

Acetylene Gas: Apparatus for Generating ——. C. T. Morelle, Paris. Eng. Pat. 4786, March 13, 1900.

Attached to the crown of the bell of a gasholder, but either within or without the bell, is a distributing drum comprising a series of cups with hinged bottoms, which are released in succession as the drum is rotated, through a system of rods and levers each time the bell descends. The drum is supplied from a hopper with carbide, which is thus discharged from each cup in turn into the water in the gasholder tank.—J. A. B.

Acetylene Gas; Apparatus for Generating ——. K. G. Gustafsson, Stockholm. Eng. Pat. 20,947, Nov. 20, 1900.

Carbide is supported on a grating in the upper part of a closed chamber, the lower part of which forms an inverted cone and contains water, which is displaced into a superposed reservoir by the gas evolved by the action of the water vapour on the carbide, if that gas is not consumed as rapidly as it is evolved. The surface of the water, and hence the quantity of water vapour liberated to the carbide, is diminished, owing to the conical form of the lower part of the chamber, as the water is displaced by gas. The apparatus is intended for the gradual continuous generation of acetylene, with a minimum of attendance.—J. A. B.

Filaments [Welsbach]; Osmium Illuminating ——. C. Auer von Welsbach, Vienna. Eng. Pat. 7210, April 18, 1900.

Reference is made to patentee's English specifications Nos. 1535 and 13,116 of 1898 (this Journal, 1899, 571). The present invention relates to the process for the production of the osmium filaments in spiral or undulating form. A paste is prepared from a mixture of finely-divided osmium, pure soot, lævulose or burnt sugar, and pure gum-arabic. Filaments made from this paste are given a spiral or undulating form, and after being heated for some time to a bright red heat, with exclusion of air, they are subjected to the consolidating treatment described in the former specifications. A support, consisting of a fine thread or filament of refractory oxides, such as thoria, may be inserted through the spiral.—H. B.

Lighting Devices for Causing the Ignition of Illuminating Gases and Vapours. W. P. Thompson, Liverpool. From A. Simonini, Brooklyn, U.S.A. Eng. Pat. 7596, April 24, 1900.

One form of the lighting device consists of the combination of a preliminary heater, composed of platinum black, and a secondary heater, composed of a mixture of rare earths—such as threads impregnated with a solution of nitrate of cerium, didymium, praseodymium or neodymium, with or without nitrate of thorium.

A second form of the device consists of the combina of the preliminary and secondary heaters described ab with an igniter, such as a platinum wire, which is cap of igniting the gas after receiving an initial heating f the secondary heater.—H. B.

Gas Lamps; Incandescent ——. G. C. Dymond, Li pool. From S. Zielenziger, Berlin. Eng. Pat. 14, Aug. 14, 1900.

In the lamps described and claimed, the space betweet bottom of the chimney and the burner-tube is compl closed, the air requisite for the combustion of the gas b drawn in entirely through the air-inlet of the burner. area of the apertures in the burner-top, at which the burns, is about double that of ordinary incandes burners. Above the glass chimney which surrounds flame rises an elongated chimney, about 25 ins. in le the connection between the lower end of which and glass chimney is effected by means of an annular which makes a practically gas-tight connection. powerful draught induced by the long chimney produ strong inward current of air through the air-inlet o burner, and "the flame resulting will have an illumin power such as is otherwise obtained by compressed gas —H.

Gas Burners; Incandescent ——. C. Carpenter, Lo Eng. Pat. 22,491, Dec. 10, 1900.

If a properly proportioned mixture of gas and air is plied to incandescence burners, the mantles are liab damage by the explosion which occurs when the fla ignited or extinguished. To prevent this, the pat provides the burner with a secondary gas passage, an cock is so bored and arranged that, when in a ce position, it acts as a two-way cock, supplying gas to the ordinary nozzle and the secondary gas passage. burner is thus fed, immediately before igniting or guishing, with an excessive proportion of gas, and a les explosive effect results. When the cock is turned ful the secondary passage is cut off.—H. B.

Carbons: Electric Light ——. H. S. Browne, Lo From J. F. Sanders, Portland, Oregon, U.S.A. Pat. 9260, May 19, 1900.

Lampblack mixed with tar or pitch is heated o contact of air, until volatile matter is expelled material is powdered, again mixed with binding m and more strongly heated, the process being re until the carbon has become hard. It is then again pow and mixed with an "illuminating salt," "as the phates of calcium or magnesium or bismuth or cy of magnesium," which, it is stated, assist in format the arc by volatilisation. Binding material is add the mixture, the mass is heated, powdered, and m hot under high pressure. The carbon pencils are packed in powdered coke or the like, and very st heated. To increase the light-giving properties the carbons, they are placed while warm in a solution of or of potassium cyanide, and are then dried; or the c are made hollow, and packed with the above-mentio other reducing agents.

It is stated that carbons made as described, may b in end-to-end contact, the upper one feeding sim gravity. Preferably, the carbons are made with a " ance core," the material and preparation of wh similar to that of the carbons, but containing a pro of non-conducting material, such as kaolin or carbor For the end-to-end contact system, hollowed carbor be used, having a "resistance tip" replacing the made of fire-clay, carborundum, or the like, mixe sufficient graphite to impart some degree of conduc and sometimes with an "illuminating salt"; or it coated with a conducting substance. Solid carbon as described for the "resistance core," may be use vided with an external metallic coating. Colour are obtained by treating the carbons in solutions of salts, as for a red light, in a strontium salt solut indium or "lithium" salt solutions for a blue or gre respectively.—E. S.

candescence Bodies, Electrical; Heating Bodies for Exciting ——, made of Second-class Conductors. V. F. Feeny, London. From Allgemeine Elektricitäts Gesellschaft, Berlin. Eng. Pat. 13,892, Aug. 2, 1900.

ᴛᴀᴛɪɴɢ bodies or coils are made of refractory material, :h as kaolin, porcelain, magnesia, &c., wound round with itinum wire. According to one method the refractory bstance is mixed with any suitable agglutinant substance, h as dextrin, starch, or the like, and is moulded into ls about 0·5 to 2 mm. thick and 10 to 30 cm. long; the ls, wound with fine platinum wire, are rendered flexible softening them in water and are then wound into spiral m upon a spindle; and finally the coils are dried and sed to bright incandescence by means of a furnace or an ctric current. According to another method, the refracv rod, before being wound round with platinum wire, is nt hard, and after winding with platinum wire is brought ı flexible condition in a blowpipe flame, and is wound rally on a spindle. Such heating bodies can be used in open air.—H. B.

ıht [Electric]; Methods of and Means for Electrically Producing ——. G. C. Marks, London. From The ieneral Electric Co., New York. Eng. Pat. 14,121, ıug. 7, 1900.

the lamps described, an electric arc is produced within ıs tubes, bulbs, &c., between electrodes one of which, least, vapourises at a low temperature—mercury, for mple. As the arc obtained in an atmosphere of mercury our emits a discontinuous spectrum, the light having a greeable colour, there is provided on the surface of the cury electrode a layer of alkali salt, such as iodide or asilicate of lithium, sodium, &c., which will impart such lour to the arc as to correct its tint, or even produce a ıured light if desired. The colour-modifying salt may diluted with a comparatively inert substance, such as ium fluoride. Various constructional forms of lamps, odying the above principles, are described.—H. B.

nps Applicable for Colour Matching or General Lightıg Purposes. A. Dufton, Sheffield, and W. M. Gardner, radford. Eng. Pat. 23,476, Nov. 24, 1899.

: inventors claim:—"The application to, or use in con:tion with, electric lamps or other sources of artificial t, of coloured screens or reflectors, or a combination of ı, so selected as regards colour and tint as to absorb or rcept such coloured rays as are found to be in excess of nal daylight, for the purpose of rendering the light of the e quality as daylight or suitable for matching or viewing urs." Also, in connection with the above screens, c use of copper in the form of a cupric salt, or as an edient of the material when such consists of glass."

—C. S.

hting Apparatus, Intense ——; for Instantaneous 'hotography. J. F. Guimaraes, Bois-Colombes, France. ng. Pat. 611, Jan. 10, 1900.

: invention comprises a movably enclosed chamber, a ımatically controlled flash-light mechanism in said uber, adjustable upper and lower shutters and an ned blue glass actinic screen beneath the lower aperture aid chamber, also a powder holder, ignition tube, tube :r, ball, reservoir, support, catch, and means for enclosing chamber.—C. S.

sh Light Apparatus and Cartridges for Use therewith. Giese, Halle and Saale, Germany. Eng. Pat. 12,647, uly 13, 1900.

: inventor claims the combination of a collapsible ular hood, normally held gathered together above the ı light by cords, with a cartridge enclosed in a destruc: casing, or with a lamp fitted with a cord releasing e actuated by the explosion of the flash powder, the lt being to unfold the hood circularly around a hori:al spindle and to form a circumscribing hollow space for confinement of the smoke rising from the combustion he flash light. The cartridge is provided with priming position to produce ignition under the influence of friction, percussion, or the like; and the lamp, alternatively used, is provided with strips of priming composition, which ignite the powder situated beneath the releasing valve.

—C. S.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Wood Oil [By Destr. Distillation]; Composition of a ——. G. S. Fraps. Amer. Chem. J. 1901, **25**, [1], 26—53.

Tʜɪs oil consists of the low boiling portions of hard-wood tar, treated with caustic potash and again distilled. It was of a brownish-red colour and semi-transparent. It was distilled, and the portion boiling below 140° C, amounting to about 42 per cent. of the whole, was examined apart from the portion boiling between 140° and 210°. The author found that: (1) The wood oil was a mixture of homologous series of different classes of compounds. (2) It contained small quantities of aldehydes, $C_nH_{2n}O$, corresponding to the series of saturated acids $C_nH_{2n}O_2$, of which all up to caproic acid have been found in wood vinegar. Only valeric aldehyde was identified, but acetic aldehyde and propionic aldehyde have been found in wood oil by other observers. Furfural was present in minute quantity. (3) It contained ketones $C_nH_{2n}O$, of which the dimethyl-, methylethyl-, methylpropyl-, and probably methyl-*n*-butyl- and di-ethyl-ketones were detected. (4) It contained also ring ketones, *e.g.*, cyclopentanone. (5) Neither mesityl oxide nor methylcyclopentanone. (6) Only minute quantities of nitriles. (7) The methyl esters of the saturated acids present in wood vinegar (see *supra*); the lower boiling ones in considerable, the higher in very small quantity. (8) Esters of unsaturated acids were present. (9) It contained methyl-, dimethyl-, trimethyl-, and higher furanes. (10) There was no dimethylacetal. Pyridines and alcohols were not present in appreciable quantities. (11) Unsaturated compounds. (12) Toluene and xylene, and probably cumene and cymene. (13) Creosote. (14) There were finally present in minute quantity, phenol ethers. (15) The higher boiling oils, freed from ketones, aldehydes, ethereal salts, and creosote, were separable into two parts, one soluble and the other insoluble in glacial acetic acid. Both parts absorbed bromine readily.—J. A. B.

Propylbenzene; Formation and Preparation of ——. F. Bodroux. Comptes Rend. **132**, [3], 155—157.

Wʜᴇɴ trimethylene bromide acts on benzene in presence of aluminium chloride, symmetrical diphenylpropane is produced, but, at the same time, no doubt from decomposition of part of the diphenylpropane, a quantity of a lower boiling substance (157°—159° C.) is formed, which analysis shews to be propylbenzene, with a very small admixture of isopropylbenzene. The same hydrocarbon is formed, though in smaller quantity, during the action of propylene bromide on benzene in presence of aluminium chloride. The author has repeated Silva's experiments on the decomposition of diphenylpropane by aluminium chloride, but finds that the hydrocarbon, $C_6H_5.C_3H_7$, thus formed is a mixture of approximately equal parts of propylbenzene and cumene.—J. T. D.

Texas Petroleum (Beaumont); Quality of ——. Chem. Trade J., March 2, 1901, 201.

Vᴇʀʏ conflicting reports have been published as to the quality of the oil from the well recently bored at Beaumont, Texas. Samples show a decidedly different appearance from any of the Eastern oils, and it apparently has some of the characteristics of the California and Russian oils. An analysis made at the State University of Texas claims the oil to be of "very high grade, and is of the kind best suited for lubricating purposes." The Emery Manufacturing Co., petroleum refinery, at Bradford, Pa., however, have made a practical examination of the oil, and have issued the following report:—

The oil is of a dark green colour, and has an offensive odour, similar to that of Lima and Canadian oils, with the odour of sulphuretted hydrogen more pronounced. The crude oil has a flash test of 110° F. and fire test of 130°;

gravity at 60° F. is 23·6° B. The oil showed no evidence of congealing at a temperature of 5° below zero; this denotes the absence of paraffin, and that it belongs to a series of oils having an asphaltum base. Four gallons of the crude oil were subjected to fractional distillation, and the gravity of the first 2 oz. of distillate that passed through the condenser was 58 B. The gravity of the first 8 oz. of distillate obtained was 53° B., that of the second 8-oz. sample of distillate from the still being 44·9 B.. Ten 1-pint samples of the distillate were obtained, the gravities of which were as follows: First, 38·9°; second, 33·1°; third, 32·6°; fourth, 31·6°; fifth, 30·8°; sixth, 29·3°; seventh, 28·6°; eighth, 27·6°; ninth, 26·7°; tenth, 25·4°. The first and second 8-oz. samples flashed at the ordinary temperature, and would be called benzine, but could not be used in the arts on account of the low gravity, and on account of the low percentage (1·56 per cent.) of the yield it would be almost unprofitable to collect separately. For the burning oil distillate, the first four pint samples were taken, the gravity being 34° B., and the mixture was found to have a flash test of 85° Abel, or a fire test of about 130° F. While the above oil would pass the grade requirement in the properties of colour and fire test, the gravity and odour place it below the value even of Lima oils. The intense odour of the oil would prevent its use as an illuminant, and the sulphur imparts a very disagreeable smell, which can only be removed with great difficulty and expense. The great bulk of the distillate would be condensed at gravities below 30 B.: on account of its low viscosity it could not be used as a lubricant. Hence the oil can only be used for fuel, and even then its odour would prevent its use as a fuel in a thickly populated centre. From 4 galls. (32 pints) of crude, the following percentages of products were obtained: ½ pint, 53° benzine, 1·56 per cent.; ½ pint, 44·9° benzine, 1·56 per cent.; ½ pint, 44·9° benzine, 1·56 per cent.; 4 pints low gravity and bad smelling illuminating oil, unmarketable, 12·5 per cent.; 25 pints fuel oil, 78·12 per cent.; coke and loss, 6·26 per cent.

Petroleum and Benzene; Deodorisation of ——. Pharm. Post. **33**, [45], 639; after Boll. Chim. farm.

(1) A VOLUME of 4 litres of petroleum is thoroughly shaken with 100 grms. of zinc chloride, and the mixture poured into a vessel containing quicklime. (2) 4½ litres of benzine are allowed to stand for 24 hours with a mixture of 1·25 litres of sulphuric acid and 30 grms. of potassium permanganate; the separated benzine is then washed with a solution of 7·5 grms. of potassium permanganate and 15 grms. of sodium carbonate in 1 litre of water. (3) C. Henry obtains an odourless preparation by mixing 100 kilos. of petroleum with 1·5 kilo. of litharge, 9 kilos. of potassium carbonate, and 20 kilos. of water, and afterwards washing with water. Any dark colour produced, may be removed, in the case of light hydrocarbons, by bleaching with ozone; but with heavy hydrocarbons this method does not succeed, on the contrary, the tint is intensified. Although reducing agents suggest themselves, the best results are obtained by filtration through animal charcoal. This material, when exhausted, may be washed with acetone and used again.

—J. O. B.

[Petroleum]: Distillation Test versus Flash-point Test. K. W. Charitschkoff. Petr. Ind. Tech. Rev. **3**, [95], 595—596.

THE necessity for employing the fractional distillation test for petroleum is urged by the author on the grounds that oil containing fractions of low boiling point smokes after burning three or four hours, the flame also increasing considerably, which is a source of danger. His experiments with five samples of oil, four of which contained 15 per cent., and the fifth 10 per cent. of fractions boiling below 150° C., gave the results shown in the accompanying table.

Smoking began in the third hour with Nos. 1—4, but only in the sixth hour with No. 5, the cause being the diminished viscosity—and consequent more rapid ascent through the wick—as the oil becomes heated in the lamp. The author inclines to limit the importance of the flashing point to affording an indication of the presence of normal fractions (b. pt. 150° to 270° C.); and he favours the introduction of a condition to the effect that the bur qualities should neither increase nor diminish by more t a certain proportion, say, 20 per cent., in a given time.

No.	Specific Gravity.	Flashing Point.	Candle Power.		
			First Hour.	Second Hour.	Thir Hou
		° C.			
1	0·8209	27·0	34·5	35·0	37·
2	0·8219	27·0	34·5	40·0	41·
3	0·8189	26·5	28·0	34·5	34·
4	0·8170	27·5	27·5	34·5	36·
5	0·8179	28·5	28·0	28·5	31·

Oil for Wickless Lamps.—Being of opinion that wick lamps require a special oil, the author has devised a tes apparatus (" kerosene meter ") for determining the suitab of oils for this purpose. With this object he passes oil through a heated glass tube at 300° C., and if no la black is formed, and no decomposition of vapour occ the oil is considered to have passed the test.

The experiments were made with Grosny oil, and req repeating with other kinds before definite requirements be laid down.—C. S.

Tar Distillation: Treatment of Noxious Vapours f ——. J. Craven and W. H. Coleman.

See page 200.

Leeds Gas Liquor; An Analysis of ——. A. W. Co

See page 225.

IV.—COLOURING MATTERS AND DYESTUFFS.

Canarin and Pseudosulphocyanogen (Pseudothiocyano ——. A. Goldberg. J. prakt. Chem **63**, [1], 1 41—48.

THE yellow cotton dyestuff Canarin is formed from pse sulphocyanogen (thiocyanogen) products (obtained sulphocyanate salts) as an alkali salt by treating the with potash or soda lye. The reaction is an obscure and the dyestuff appears to be formed as a by-pro The following table gives the amounts obtained by va methods from 100 grms. of potassium sulphocy (thiocyanate) in tolerably concentrated solution:—

Method.	Pseudosulpho-cyanogen Product.	Canarin precipita the Sodi Salt wi Hydroch Acid
	Grms.	Grms.
Treated with an excess of chlorine	43·3	3·9
Miller's method, treatment with potassium chlorate and hydrochloric acid.	35—40	0·6-
Treated with an equivalent amount of bromine.	32·0	2·0
Treated with twice the equivalent amount of bromine.	58·9	1·9
Treated with three times the equivalent amount of bromine.	40·0	c. 2·0
Treated with 100 grms. of red fuming nitric acid.	30·0	3·5
100 grms. of ammonium sulphocyanate gave with 100 grms. of ammonium persulphate.	4·4	c. 0·3

It follows, therefore, that the solutions originally pre by the action of alkali lye on pseudosulphocyanogen possessed a very low tinctorial power. The sodium Canarin is sparingly soluble and dries to a shining dark brownish-red mass, which, on immersion in swells up and subsequently dissolves in much water, cially if heated. The dilute aqueous solutions tendency to dissociate. An analysis of the C liberated from the sodium salt by hydrochloric acid the formula $H_6C_8N_8S_7O$, or a multiple thereof. Thi duct dries to a mass similar to the sodium salt, g yellowish-red powder and is very stable to reducing

Only one third of the hydrogen is replaceable by alkalis. Canarin can also be obtained with a yield of 30—40 per cent. of the weight of the sulphocyanate, according to Ger. Pat. 101,804, by the action of the equivalent amount of dry alogen at a particular temperature on dry sulphocyanate and treatment of the resulting mixture with alkali lye. Another product of the reaction is a substance having the ormula $H_4C_3N_4S_2O$, with no tinctorial properties, which is ormed to the amount of about one-third of the dyestuff roduced. It would appear according to this method that he following reactions take place:—nKSCN + nCl = KCl + $(CNS)_n$; $(CNS)_{12} + 6H_2O = H_6C_8N_8S_7O + H_4C_3N_4S_2O + COS + H_2S_2O_3$; $2COS + H_2S_2O_3 = H_2O + S + 2CO_2$. The author finds in common with other inves- gators that the pseudosulphocyanogen products obtained s above, contain from 3 to 8 or 9 per cent. of oxygen. he formation of the pseudosulphocyanogen products is e result of several reactions; moreover, water participates erein, and the equation $KSCN + 8Br + 5H_2O = KHSO_4$ $8HBr + CONH$ accounts for the formation of sulphuric id, which, as well as hydrocyanic acid, can be detected as oducts of the reaction. In view of the small yield of anarin obtained, and the fact that sulphur and persulpho- anic acid are present in the pseudosulphocyanogen oduct formed, it follows that this latter is a mixture of o or more substances, as Liebig, in 1844, had already inted out. Laurent and Gerhardt (Comptes Rend. **22**, 0) give $HC_3N_3S_3$ as the formula for pseudosulphocyano- n obtained by the action of chlorine on a potassium anate solution; but Völckel (Annalen **89**, 125) was able to obtain directly a product free from oxygen by s method, and the author bears out this statement. The mer dissolved this product in concentrated sulphuric d, and obtained, after precipitation with water, a product which he assigned the formula $H_2C_4N_4S_4$; but the author of opinion that the substance is not precipitated un- nged, as Völckel states, although hitherto this has erally been assumed to be the case. Moreover, the mula $HC_3N_3S_3$ does not represent the chief constituent the original pseudosulphocyanogen product any more n that of Canarin.—T. A. L.

ligo; History of the Development of the Manufacture of Synthetic ——. H. Brunck. Lecture delivered at the opening of the Hofmann Institute, Berlin, Oct. 20, 1900. (See also P. P. Bedson, page 209.)

the occasion of the inauguration of the "Hofmann- us" under the auspices of the German Chemical Society, aper was read by Prof. A. v. Baeyer on the history of synthesis of Indigo, which was followed by the present lress dealing with the subject from an industrial stand- nt.

n the early days of the coal-tar colour industry, chemical tories were dependent upon contributions from various entific sources, but very soon this condition of affairs s altered, and the creation of laboratories working for benefit of the industry by the cultivation of science led such a development of the industry that from being recipient only it was then enabled to itself enrich and pagate scientific investigation. The work in technical oratories is not, however, confined to the ascertaining of v facts or the discovery of new compounds, but must take into consideration the cost of production, and the elopment of the industrial process necessary therefor; widens and also renders more difficult the problems in ory compared with university laboratories. Processes apable of industrial application are generally never pub- ed, and practically, therefore, only those results and cesses become public for which it is possible to obtain ctive patents. Such a manufacture is that of Indigo, which in Germany alone 152 patents have been taken . Emmerling and Engler's observation that o-nitro- ophenone could be converted into Indigo did not ish a practical process, but the discovery of Ad. Baeyer 880 of the synthesis of Indigo from o-nitrophenylpro- ic acid rendered the manufacture of the dyestuff nically possible. Orthonitrophenylpropiolic acid is a vative of cinnamic acid, which could be made by rkin's reaction" from benzaldehyde, and this substance readily obtained from toluene. Cinnamic acid subsequently was made more cheaply from benzal chloride and sodium acetate, and by nitrating its ester instead of the free acid, 70 per cent. of the latter was converted into the *o*-nitro compound. Difficulties still attended the bromination of the *o*-nitrocinnamic acid and the conversion of the resulting dibromide into *o*-nitrophenylpropiolic acid, but early in 1881 this product was continuously manufactured and Caro discovered that it could be employed for Indigo printing by reduction with sodium xanthate, although this process never came into very general use. In 1882 Baeyer and Drewsen discovered the synthesis of Indigo from o-nitrobenzaldehyde and acetone, and although the formation of Indigo proceeded more smoothly than by means of the cinnamic acid process, the production of *o*-nitrobenzaldehyde either by the nitration of benzaldehyde or the oxidation of *o*-nitrotoluene, with or without previous chlorination, presented such difficulties that the experiments appeared to be without a practical future. Moreover, the cost of production of synthetic Indigo depended not only on the price of toluene but also on the utilisation of the *p*-nitro by-products. In 1893 Kalle and Co. introduced their Indigo salt, *viz.*, the soluble bisulphite compound of *o*-nitrophenyllactic acid ketone, and this product finds application in cotton printing. In 1896 the Farbwerke Hoechst discovered a technically useful process for obtaining *o*-nitrobenzaldehyde from *o*-nitrotoluene by treating the chlorination product of this latter with aniline or sulphanilic acid, converting these derivatives into the corresponding benzylidene compounds and treating with acids (Eng. Pat. 15,890 of 1897; this Journal, 1898, 658). The direct oxidation of *o*-nitrotoluene has also been developed by the Société des Usines du Rhône, as well as by The Badische Anilin und Soda Fabrik, but all these processes are hampered by the consideration that the world's supply of toluene is limited, apart from the fact that they also require the utilisation of the *p*-nitro by-products. With regard to the former statement, the annual production of benzene and toluene is at present about 25,000 to 30,000 tons, of which about 5,000 to 6,000 tons are toluene and about sufficient to satisfy present requirements. Hence for every ton of toluene available for the manufacture of Indigo, there would be produced 4 tons of benzene for which some use would have to be found. According to the best technical methods, the production of 1 lb. of Indigo requires 4 lb. of toluene; and since the total consumption of 100 per cent. of Indigo may be estimated at about 11,000,000 lb., it would be necessary to quintuple the present output of coal-tar hydrocarbons in order to completely replace vegetable Indigo. For this reason some other initial material was sought of which the supply was sufficient and adequate, and in 1890 Heumann discovered that Indigo could be obtained by fusing phenylglycocoll with caustic potash, the initial materials in this case being aniline, acetic acid, chlorine and alkali, which are readily obtained. The yield of dyestuff, however, was unsatisfactory, and the observation also that the Indigo sulphonic acid obtained from phenylglycocoll by the action of fuming sulphuric acid was inferior to that obtained from Indigo itself, led to the abandonment of this method as a commercial process. Heumann, however, had also discovered that the glycocoll of anthranilic acid, *i.e.*, phenylglycocoll *o*-carboxylic acid when fused with potash also yields Indigo, and this is the method employed by the Badische Anilin und Soda Fabrik at the present day. Phenylglycocoll *o*-carboxylic acid is obtained by reacting with monochloracetic acid on anthranilic acid, and this latter is produced from phthalic acid by conversion first into phthalimide, and then by the action of an alkaline solution of bromine into anthranilic acid. With this product as a starting point, naphthalene became the initial material for the synthesis of Indigo. The amount of coal tar treated for its hydrocarbons, which is assumed to be two-thirds of the total world's output, contains from 40,000 to 50,000 tons of naphthalene, of which only some 15,000 tons are separated for consumption at the present time. Hence there remain at least 25,000 tons available for Indigo, which at present are either burned to lampblack or remain dissolved in the heavy oils. The process for the production of phthalic acid by oxidising naphthalene with chromic acid, which had been in use for 20 years was too expensive, and the method now employed consists in heating naphthalene with highly concentrated sulphuric acid in presence of mercury. For the preparation of this acid and the utilisation of the sulphur dioxide evolved in the reaction, the Badische Anilin und Soda Fabrik employ their contact process, which by the direct union of pyrites burner gases is more profitable for the manufacture of sulphuric acid than the lead chamber process. That this operation is of some magnitude is evident from the statement that from the present production of phthalic anhydride, there result annually some 35,000 to 40,000 tons of sulphur dioxide, which must be reconverted into sulphuric anhydride. By this method naphthalene is oxidised to phthalic acid by means of atmospheric oxygen, and a complete cycle of operations is thus established. Simultaneously the production of chloracetic acid was investigated. Large amounts of chlorine are required both for the manufacture of this product, and also for oxidising phthalimide to anthranilic acid. It is necessary to chlorinate nearly 2,000 tons of glacial acetic acid, equivalent to about 130,000 cubic yards of wood. In order to obtain the chlorine necessary, the Badische Anilin und Soda Fabrik have acquired the electrolytic soda process of the Chemische Fabrik Elektron in Griesheim, and purify the product by liquefaction. In the course of experiments on the fusion of the phenylglycocoll o-carboxylic acid, free indoxylic acid was obtained, and this product was introduced commercially under the name "Indophor," and finds application in cotton printing. The Indigo obtained from the aqueous solution of the melt by oxidation with air is crystalline, and in order to obtain it in a condition suitable for the vat, it is converted into a sulphate by means of sulphuric acid, which is then decomposed with water, yielding the Indigo in an easily reducible condition. The author then describes the advantages of synthetic Indigo, and the difficulties met with on its introduction. The value of the Indigo annually produced was about 4,000,000*l.* to 5,000,000*l.*, and at present prices the value may still be about 2,500,000*l.* to 3,000,000*l.* The author is of opinion that ultimately this amount will be provided for synthetically, and up to the present time the Badische Anilin und Soda Fabrik has invested about 900,000*l.* in the prosecution of this trade. "The quantity of Indigo at present now annually produced at Ludwigshafen would require the cultivation of an area of more than a quarter of a million acres (390 square miles) of land in the home of the Indigo plant."—T. A. L.

Azo-Compounds from m-Toluidine. S. Samelson.
Ber. **33**, [19], 3479—3483.

The author has prepared a number of azo derivatives of dimethyl-*m*-toluidine (from *m*-toluidine and methyl iodide), by dissolving this base together with a diazotisable amine in hydrochloric acid, and adding the solution to an alkaline solution of sodium nitrite. In this manner he has obtained from dimethyl-*m*-toluidine and aniline, dimethyl-*m*-toluidine azobenzene, which crystallises from alcohol in shining red needles, melting at 66° C., from *p*- and *m*-toluidine, dimethyl-*m*-toluidine-azo-*p*-toluene, melting at 121° C., and dimethyl-*m*-toluidine-azo-*m*-toluene melting at 74° C., whilst *p*-phenetidine and *p*-anisidine yield the corresponding compounds melting at 137° and 136° C. respectively. All these products yield hydrochlorides, sulphates, and platinichloride double salts. In the preparation of dimethyl-*m*-toluidine-azobenzene sulphonic acid, a solution of dimethyl-*m*-toluidine containing the theoretical quantity of hydrochloric acid for solution is added to diazotised sulphanilic acid. The whole is then made distinctly alkaline with soda-lye, and after some time, the sodium salt of the azo compound separates out. The free acid is hygroscopic, and the barium salt crystallises in microscopic hexagonal brown plates. The substance on reduction yields sulphanilic acid and *p*-amidodimethyl-*m*-toluidine.—T. A. L.

PATENTS.

Black Acid Proof Cotton Dye; Manufacture of a Permanent ——. W. W. Stolaroff, Troloff, Moscow, Russia. Eng. Pat. 2195, Feb. 3, 1900.

The patentee obtains a black cotton dyestuff, which is unaffected by sulphuric acid, soap, light, and other agents, by heating together a mixture of an alkali sulphide, sulphur, and dinitrophenol, the essential feature of the invention being, that at least four atoms of sulphur react with each molecule of dinitrophenol. The following example illustrates the method employed. A mixture of 96 kilos. of crystallised sodium sulphide and 19 kilos. of sulphur is melted in an iron vessel, and mixed with 18·4 kilos. of 1.2.4-dinitrophenol, the temperature being kept at 115°—200° C. until the mass becomes solid. The melt is then dissolved in water, precipitated with an acid, filtered, washed, and dried, or else it can be used directly for dyeing purposes. In place of pure 1.2.4-dinitrophenol, the crude product obtained by treating phenol with nitric acid may be employed. The process may also be carried out in a closed vessel, in which case the formation of the dyestuff is complete at 105°—115 C.—T. A. L.

Violet-Black Azo-Dyestuff for Wool; Manufacture of ——. O. Imray, London. From The Farbwerke vorm Meister, Lucius und Brüning, Hoechst a Main, Germany Eng. Pat. 2772, Feb. 12, 1900.

When 6.2.1.4-nitro-aminophenol sulphonic acid is diazotised and combined with β-naphthol, it yields a monazo dyestuff, which dyes wool directly a deep violet, and thi on treatment with chromium compounds is converted int a black. For the manufacture of the dyestuff, 3·84 kilo of sodium nitroaminophenol sulphonate are dissolved i 100 litres of water, 3·3 litres of hydrochloric acid (30° B. are added, and the solution is diazotised at 10°—15 C The yellow diazo solution is then run into 50 litres of wate containing 0·7 kilo. of caustic soda, 3·3 kilos. of sodiu carbonate, and 2·2 kilos. of β-naphthol. The dyestuff i formed at once, and the liquid becomes bluish violet. It i then heated to 45° C., and stirred at this temperature f some hours, when the remainder of the dyestuff is salte out. In a dry state the dyestuff is a bronzy-brown powde soluble to a violet solution in water, and is little changed l ammonia. The dyestuff is sparingly soluble in alcoh and gives a bluish-red solution in concentrated sulphur acid, which yields a brick-red precipitate on adding water.
T. A. L.

Azo Colouring-Matter [Red], and Lakes from A Colouring Matters; Manufacture and Production ——. J. Y. Johnson, London. From The Badise Anilin und Soda Fabrik, Ludwigshafen, Germany. En Pat. 2784, Feb. 12, 1900. (Second Edition.)

This specification is supplementary to Eng. Pat. 25,511 1899 (this Journal, 1901, 35), wherein the preparation o monoazo-dyestuff from 2·1-naphthylamine sulphonic a is described, and the production of lakes therefrom. T patentees have now found that certain heteronucl β-naphthylamine sulphonic acids when diazotised and co bined with β-naphthol, yield azo-dyestuffs of which barium, calcium, lead, aluminium, and zinc salts practically insoluble in cold water, and therefore eminen suitable for use as colour lakes. The β-naphthylami sulphonic acids which the patentees propose to employ the 2·1′, 2·2′, 2·3′ and 2·4′ acids, the procedure being same as that described in the original patent.—T. A. L.

Aromatic Compounds and Colouring Matters therefr the Manufacture and Production of ——. J. Y. Jo son, London. From The Badische Anilin und S Fabrik, Ludwigshafen, Germany. Eng. Pat. 5 March 16, 1900.

According to Eng. Pat. 20,232 of 1899 (this Journal, 1 818), 1.3.4 6-dinitrodichlorobenzene when condensed p-aminophenol and its sulphonic or carboxylic acid derivat yields dinitro-di-*p*-hydroxydiphenyl-*m*-phenylene dian its disulphonic or dicarboxylic acid derivative respecti The patentees now find that the two chlorine atom dinitrodichlorobenzene can be successively replaced by similar or dissimilar aminophenol radicles, so that possible to obtain asymmetric diphenyl-*m*-pheny diamine derivatives. It must, however, be rememb that o-aminophenol-*p*-sulphonic acid will not react, moreover, the o-aminophenol radicle can only be excha for the first chlorine atom. When only one chlorine has been replaced by an aminophenol radicle, the con

on product reacts with ammonia, forming dinitroamino-
droxydiphenylamines and their sulphonic or carboxylic
ids, or the condensation may be effected in the reverse
der starting with ammonia. All these products when
ated with sulphur and an alkali sulphide, yield fast dark
estuffs for unmordanted cotton. The following is a
pical example:—A mixture of 237 kilos. of 1.3.4.6-
aitrodichlorobenzene, and 46 kilos. of *p*-aminophenol
drochloride is dissolved in 2,000 kilos. of alcohol, the
lution being mixed with 300 kilos. of crystallised sodium
etate in 500 litres of water, and heated to 50°—60° C.,
der a reflux condenser for about four hours. The con-
nsation product which separates out is filter-pressed,
shed with water and drained. It is insoluble in water,
t sparingly soluble in alcohol, from which it separates in
ort red prisms melting at about 228° C. Of the dinitro-
loro-*p*-hydroxydiphenylamine so obtained, 70 kilos. are
ken, and with 52 kilos. of *p*-aminophenol-*o*-sulphonic acid,
kilos. of crystallised sodium acetate, and 750 kilos. of
ohol are heated for two hours in an autoclave to about
0° C. When cold, the precipitate formed is filtered off,
solved in water and reprecipitated by adding salt. The
ulting dinitrodi-*p*-hydroxydiphenyl-*m*-phenylenediamine
lium sulphonate is a brownish-yellow powder readily
uble in water, but sparingly in brine. In order to obtain a
estuff, 15 kilos. of the above sodium salt, 75 kilos. of
stallised sodium sulphide, and 25 kilos. of sulphur are
wly heated at 140°—160° C. until the melt becomes dry
l can be powdered. The product is soluble in water,
l separates as a black precipitate from the solution on
ling salt. It gives bluish-black shades on unmordanted
ton.—T. A. L.

thracene Series, and Colouring Matters therefrom;
Manufacture and Production of New Halogen Deriva-
ives of the ——. J. Y. Johnson, London. From The
adische Anilin und Soda Fabrik, Ludwigshafen, Ger-
many. Eng. Pat. 5459, March 22, 1900.

Eng. Pat. 21,572 of 1899 (this Journal, 1900, 892) it is
wn that by the action of certain halogens on certain
mino-anthraquinone sulphonic acids there result halogen
ivatives of diamino-anthraquinone, the sulphonic acid
up being split off. It is now found that the amino-
hraquinone sulphonic acids, obtained by reducing the
and β-nitro-anthraquinone sulphonic acids of Claus (Ber.
1514), when acted on by chlorine or bromine, yield
ogen aminoanthraquinone sulphonic acids. These pro-
ts are themselves dyestuffs, and give red to brown shades
wool, but by condensing them with certain aromatic amines
y yield new dyestuffs, giving violet to blue shades on
mordanted and mordanted wool. For the production of
moaminoanthraquinone sulphonic acid, 50 kilos. of
minoanthraquinone sodium sulphonate are dissolved in
00 litres of warm water and treated at 70°—80° C. with
kilos. of bromine on the water-bath, until all the
mine has reacted. The brownish-coloured solution is
n precipitated with salt, and gives a pale reddish powder.
a further condensation it is mixed with 10 times its
ght of *p*-toluidine, and boiled until the colour of the melt
first red and later violet) does not increase in intensity.
e melt, when cold, is extracted with ether to remove
oluidine, and the new dyestuff, which forms a bluish-
let powder readily soluble in water, gives violet shades on
ome-mordanted wool.—T. A. L.

nazo Dyes [Blue] derived from Amidonaphtholsulpho
Acids; Production of ——. R. B. Ransford, Upper
Norwood. From L. Cassella and Co., Frankfort-on-Main,
Germany. Eng. Pat. 4677, March 12, 1900.

LUABLE monazo dyes can be obtained by combining the
zo compounds of 1.2.5-aminophenol sulphonic acid or
1.3.4-nitroaminophenol with 1.1′.2.4-aminonaphthol
lphonic acid. These products give dull claret shades
wool, very sensitive to light, but when treated on the
e with copper salts the shades are changed to reddish-
e or dark blue, which show an excellent fastness to light.
instance, 15·8 kilos. of *p*-nitro-*o*-aminophenol are
olved in dilute hydrochloric acid and diazotised at about
C. with 7 kilos. of sodium nitrite. The diazo compound is then run into a solution of 32 kilos. of 1.1′.2.4-amino-naphthol disulphonic acid kept alkaline with sodium carbonate. The solution is heated to 60° C., and the dyestuff is precipitated with salt and 20 kilos. of potassium chloride. It separates, when cold, in small crystals.
—T. A. L.

Black Colouring Matter directly dyeing Cotton; Manufacture of a ——. C. D. Abel, London. From The Actiengesellschaft für Anilinfabrikation, Berlin. Eng. Pat. 7074, April 17, 1900.

It is claimed that a direct black for cotton is obtained by boiling in aqueous solution equimolecular proportions of picric or picramic acid and the dinitro-oxydiphenylamine having the formula 1.3.4 $(NO_2)_2C_6H_3.NH.C_6H_4.OH(p)$ together with sulphur and an alkali sulphide. A mixture of 25 kilos. of dinitro-oxydiphenylamine, 20 kilos. of sodium picramate, 75 kilos. of sulphur, 200 kilos. of crystallised sodium sulphide, and 175 litres of water, is heated under a reflux condenser for 30 hours. The solution is then diluted with water, and the dyestuff precipitated by an acid or by passing in a current of air. It is then filter-pressed and dried, together with sodium sulphide, and gives intense bluish-black fast shades on unmordanted cotton. An equimolecular proportion of picric acid may be substituted for the picramic acid in the above example.—T. A. L.

Black Colouring Matter directly dyeing Cotton; Manufacture of a ——. C. D. Abel, London. From The Actiengesellschaft für Anilinfabrikation, Berlin. Eng. Pat. 7075, April 17, 1900.

The picramic acid of the preceding specification (see above) is replaced by 16·7 kilos. of dinitrophenol—

$$(OH : NO_2 : NO_2 = 1 : 2 : 4),$$

the resulting product giving deep fast bluish-black shades on unmordanted cotton.—T. A. L.

Black Colouring Matter directly dyeing Cotton; Manufacture of a ——. C. D. Abel, London. From The Actiengesellschaft für Anilinfabrikation, Berlin. Eng. Pat. 7076, April 17, 1900.

The patentees find that *m*-dinitro-*o*-cresol, when cohobated with sulphur in an alkali sulphide solution, gives a dyestuff containing sulphur. For instance, 32 kilos. of *m*-dinitro-*o*-cresol, 1.3.5.6.$C_6H_2.CH_3.(NO_2)_2.OH$, 120 kilos. of crystallised sodium sulphide, 45 kilos. of sulphur, and 100 litres of water are boiled together under an inverted condenser for 30 hours. The dyestuff is precipitated by means of a mineral acid or a current of air, and is then filter-pressed and dried either by itself or together with sodium sulphide. In the latter case it is not necessary to add sodium sulphide to the dye-bath. The new dyestuff gives brownish-black shades of remarkable fastness on unmordanted cotton.—T. A. L.

Dyestuffs [Yellow, Orange], and Processes for the Production of Same; New or Improved ——. M. Lange, Amsterdam. Eng. Pat. 21,970, Jan. 26, 1901.

The new products are ketones of 1.1′-dihydroxynaphthalene, the ketonic group probably entering the naphthalene nucleus ortho to one hydroxyl. These products may be obtained by four different processes: (1) By heating carboxylic acids or their anhydrides with 1.1′-dihydroxynaphthalene in presence of condensing agents, such as zinc, stannic, ferric, or aluminium chloride or sulphuric acid; (2) by condensing 1.1′-dihydroxynaphthalene with acid chlorides or bromides of the general formula R.COCl in presence of a condensing agent; (3) by condensing the same product with trichlorides or bromides of the general formula $R.CCl_3$; or (4) by heating the mono- or diacidyl derivatives of 1.1′-dihydroxynaphthalene with one of the above-mentioned condensing agents. As an example of one of the methods employed, 16 kilos. of 1.1′-dihydroxynaphthalene, 20 kilos. of benzotrichloride, and 120 kilos. of dilute alcohol are heated at 70°—80° C. until all the benzotrichloride has disappeared. The dihydroxybenzonaphthone so obtained crystallises from dilute alcohol in long orange-

brown needles, melting at about 122° C., and dyes aluminium-mordanted fabrics brilliant orange shades.
—T. A. L.

Azo- and Nitro-Compounds; Reduction of ——. G. W. Johnson. From C. F. Boehringer und Soehne. Eng. Pat. 19,879, Nov. 6, 1900.

See under XI. A., *page* 259.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Finishing Materials and their Application. Fürth. Färber-Zeit. 1901, **12**, [1], 1—6.

The substances which are sold to finishers under a great variety of fancy names could usually be made by the finisher himself at a much less cost. The principal finishing materials are as follows:—

Starch.—The starch employed may have been prepared from potatoes, maize, rice, wheat, sago, &c.; it is usually boiled with water to a paste, and serves as a stiffening, or, with a subsequent calendering for imparting a gloss to the fabrics. If the fabric is to remain soft, starch should never be used, but it is indispensable for linings, linen goods, &c. Potato starch is found to possess the greatest thickening power, and wheat starch follows next in this respect. Instead of hot water, cold caustic alkalis may be employed for preparing starch paste, the paste being neutralised with sulphuric, or, for linen with acetic acid, since the sodium acetate thus formed gives the material the desired cold, damp feel. The starch pastes made with alkalis come into the market as "Crystalline," "Globyline," &c., at a price far exceeding the cost of manufacture. This product is only to be preferred to ordinary starch paste in the case of delicate fabrics.

Soluble starch prepared by long boiling under pressure or by the action of various substances, *e.g.*, malt or bleaching powder, does not give the material the stiff feel of ordinary starch, nor has it the filling power of dextrin; but, like ordinary starch, it produces a gloss on calendering, and has the advantage of closing the fabric. It is also used for a soft finish, together with dextrin and a little ordinary starch, with or without the addition of wax.

Dextrin.—The best white dextrin should contain 60—70 per cent. of soluble dextrin; if less is present there is an excess of soluble starch. Dextrin should be made by the finisher from starch, by means of sulphuric acid and subsequent neutralisation with alkali. The product always contains dextrose as well as dextrin, and this is advantageous, since dextrose tends to keep the goods soft, whereas excess of dextrin gives a hard feel. A very good mixture consists of 10 parts of dextrin to one part of grape sugar.

China-clay is used for weighting and for filling the pores. For linen it is replaced by talc, which imparts a very smooth feel and heightens the bleach. These substances require a binding vehicle, such as starch, gum, or gelatin.

Magnesium, calcium, and zinc chlorides are only employed for weighting. Their antiseptic nature renders the addition of salicylic acid, otherwise often used, quite unnecessary. Other salts used for weighting are magnesium and sodium sulphates, common salt, and even poisonous lead acetate. All these tend to make the goods hard and like paper, after lying for some time, due to the salts taking up water of crystallisation.

Fats and Oils.—Tallow, palm-nut oil, wax, olive oil, castor oil, and saponified bone oil are sometimes employed in order to give the goods a softer handle. For very soft materials, such as flannels, those oils should be chosen which have a low melting point, *e.g.*, olive oil. Unsaponified fats can only be used in thickened finishes, and such as contain a sufficient amount of starch. For goods with a rough surface the fats must always be saponified.

In finishing flannels with only one rough side, the finish is applied to the smooth side, but if both sides are rough, the pieces are passed through the finishing mixture. To give additional softness to finished flannels, they are "broken" several times over a knife edge attached to the calender, then raised and brushed.

A usual "softening" is saponified palm oil, a peculiarity of which is its power of combining with a very large amount of water. A soap containing only 22 per cent. of this oil is quite hard, whereas an olive-oil soap with less than 60 per cent. of oil is invariably soft.—R. B. B.

PATENTS.

Fibres; Lubricant for ——. R. H. Hutchinson, New York, U.S.A. Eng. Pat. 15,241, Aug. 27, 1900.

Claim is made for the use of a neutral soap mixed with wool-fat, from which the free fatty acids have been removed, and for aqueous solutions of the mixture. This lubricant is specially adapted for oiling wool-fibres before carding, and is stated to have the advantages of cheapness, absence of odour, uniformity of result, and more easy and complete removal from the yarn, since less grease is present.
—C. A. M.

Mercerising or Silk-finishing Cotton. F. Simons, Düsseldorf, Germany. Eng. Pat. 21,397, Nov. 26, 1900.

After treatment with soda in the usual manner, the cotton is passed consecutively through several heated rinsing baths. The soda solution is gradually taken up by these baths, and at the same time the cotton is subjected t stretching, as in the mercerising operation. The rinsing baths will gradually decrease in concentration, and when th first liquor has become sufficiently strong, it is run into th mercerising bath, and the second bath now used as th first, and so on in rotation. The cotton is thus graduall restored to its original dimensions with the use of but littl force, and nearly the whole of the soda liquor taken up b the cotton is recovered.—R. B. B.

Fibrous Material with Metal; Coating ——. R. W James. From J. H. Robertson and J. B. Campbel Eng. Pat. 19,863, Nov. 5, 1900.

See under XI. B., *page* 260.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, AND BLEACHING.

Wool Dyeing; Theory of ——. J. Brandt. Rev. Gén. d Mat. Col. 1901, **5**, [49], 2.

In Gillet's view (this Journal, 1900, 1106) the so-call acid azo dyestuffs are feebly basic compounds, the a group, $-N=N-$ or $-NH-N=$, in their molecul having, in his opinion, a basic function. When such co pounds are combined with the wool fibre, this group, it considered, becomes attached to the acid group in t molecule of the substance of the fibre.

The author disputes this theory. He points out th Chromogen I., the sodium salt of chromotropic acid—th is, of 1.1′-dihydroxynaphthalene 3.3′-disulphonic acid— absorbed by wool from an acid dye-bath, precisely as is acid azo dyestuff.

In an experiment made with the object of proving th five samples of woollen cloth were taken. Four of th (Nos. 1, 2, 3, and 4), were boiled for 20 minutes with 5 p cent. of their weight of crystallised sodium carbonate; c (No. 5) was boiled with 5 per cent. of its weight of s phuric acid. All the samples were afterwards rinsed water till the wash-water was neutral. Each sample w "dyed" with an amount of Chromogen I. (containi 46 per cent. of the pure salt) corresponding with 5 per ce of the pure compound; samples Nos. (1) and (5), with further addition to the bath; (2) with caustic soda suffici to neutralise the salt; (3) with enough sulphuric acid liberate the disulphonic acid; (4) with sulphuric acid excess (5 per cent.) of the quantity required for the la purpose. After being well washed in water and dried, samples were printed with thickened solutions of dia benzene and diazonaphthalene salts, admixed with sodi acetate, and were again washed and dried. With diazobenzene salt, samples 1 and 2 gave a pale pink colo 3, a darker pink; 4 and 5, a deep red (Chromotrope 2 Similarly, the diazonaphthalene salt gave with 1 and brown colour, which is merely the colour of the produc reaction between the diazo compound and the wool c; with 3 it gave a brownish-purple; and with 4 and 5, rk prune (Chromotrope 10 B).

'he combination of chromotropic acid with the fibre stance is only feeble, a moderate soaping removing ost the whole of the acid. This weakness is probably to the presence, in the molecule of the latter, of two roxyl groups, the influence of which is more or less ified in the azo derivatives of the acid by the azo ips in proximity to them.—E. B.

tificial Silk; Dyeing of ——. K. Süvern. Färber-Zeit. 1901, **12**, [1], 6.

rtificial silk made from a solution of cellulose in ammonium solution has been brought into the market r the name "Glanzstoff" by the Glanzstoff-Fabriken n Aachen. This product is suitable for fancy threads or weft in silk, woollen, or cotton fabrics, also for es, upholstery, ribbons, &c., and it may be dyed in the wing ways.

r basic dyestuffs the material is mordanted with tannin artar emetic. In the first bath it is treated with 2—5 ent. of tannin and 1 per cent. of hydrochloric acid for hours at about 50° C.; it is then lifted and fixed in a cold bath for 20 minutes with 1—2·5 per cent. of emetic, and, after rinsing, it is allowed to dry, or care- hydro-extracted. The dye-bath is prepared with per cent. of acetic acid, and the material is turned for a ninutes without further addition; the filtered colour on is then added gradually, and the bath heated to 40° C., if necessary, to exhaust the solution.

substantive colouring matters are employed with the on, for pale shades, of 2 per cent. of soap and 3—5 nt. of sodium phosphate; for medium shades 2 per f sodium carbonate with 5—10 per cent. of sodium sul- are required; and for dark shades double this amount ium sulphate should be added. The pale colours are at 30°—40° C., and the dark colours at 60° C. The olours may be used for topping the substantive colours esh cold bath acidified with acetic acid. Eosines are with the addition of common salt. "Indigo pure" dyed in the hydrosulphite vat, and Turkey red in me manner as for cotton.

ine Aniline Black is obtained by working for some a freshly prepared mixture of solutions of sodium te, potassium ferrocyanide, and aniline salt, after the material is hydro-extracted, steamed for a few s in the ageing machine, and finally treated in a r cent. solution of potassium bichromate at 60° C., ashed, hydro-extracted, and dried.

cotton, the material must be thoroughly wetted out varm water before dyeing. After dyeing, the soft may be improved by a weak, cold soap-bath, followed sing and drying, or by treatment with boiled-off which may be acidified to impart "scroop" to the al. The yarn is dried on rods in a warm room, and rease the lustre it may be carefully lustred or ed.—R. B. B.

Colours" upon Wool and Silk; Formation of ——. F. Reisz. Färber-Zeit. **12**, [2], 17—18.

thor describes a new method of producing ingrain , such as Paranitraniline Red, on animal fibres like nd silk. The process is based upon the fact that thol is freely soluble in the hydroxy-fatty acids, like ic acid, Turkey-red oil, and Oxyol A. The β-naphthol n thus obtained is then converted into a normal soap, ly soluble in water, by the addition of a certain tion of ammonia or borax.

solution is found to be specially adapted for the tion of the oxy-azo dyes upon the animal fibres, as bres evidently show an affinity for naphthol when ed in this form.

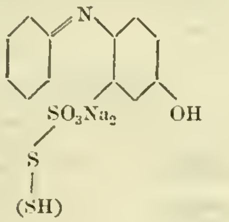
fabrics are steeped in the liquor, wrung out, and ed in the usual way in the coupling bath. The thus produced are found to be not only finer and hades, but also faster to washing and milling ose obtained by the ordinary methods, where the l is dissolved in dilute soda solution. If the dyed goods require to be milled, the further addition of glycerin, 30 grms. per litre, to the preparation, is found to increase the fastness of the colours.

The results of the author's experiments on the best proportions of the ingredients required, are given in tabular form. Turkey-red oil is found to give the best results, and the dyed shades are faster to rubbing than the ordinary Paranitraniline Reds. The strength of this new β-naphthol solution requires to be much less, *i.e.*, from 40 to 60 per cent. than that usually employed for cotton. A $2\frac{1}{2}$—3 per cent. Turkey-red oil-ammonia-soap solution, containing about 8 grms. of β-naphthol per litre, is sufficient for producing a full Bordeaux shade.

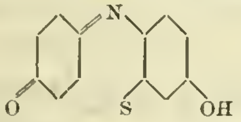
Goods mordanted with this preparation need not be immediately developed in the coupling bath, as they neither turn brown nor deteriorate in properties on being laid aside.—D. P.

Sulphide Blacks. A. E. Sunderland. J. Soc. Dyers and Colourists, 1901, **17**, [1], 3—15.

The first patent for the production of Vidal Black was published in 1893, and for some time this was the only colour of the sulphide class used on a commercial scale. Within the last few years a large number of patents relating to the manufacture of Sulphide dyestuffs have been granted. It appears that when a diamine or monamine (substituted in the para position), or any compound or mixture capable of forming a monamine or diamine, is fused with sodium sulphide and sulphur, a dyestuff is formed which dyes cotton deep black shades, or in some cases green to brown shades, which on oxidation are changed to black. According to Jacek the composition of this Black may be represented by the formula—



this formula corresponding to an ultimate product, a Thionol observed by Bernthsen, which has the composition—



Until further proof is forthcoming, this formula is only put forward as a hypothesis.

The number of products patented is very large, and it is evident that the possible combinations are almost innumerable. A brief summary of the patents is given on pages 244 and 245.

The production of the black depends greatly upon the temperature at which the fusion takes place, and also upon whether the alkali sulphides are in excess or deficient If the action takes place at a low temperature, brown, green, and blue products are obtained, and in some of the Sulphide colours these intermediate products play a considerable part in the quality of the black produced upon the fibre.

The theory of the dyeing with these blacks depends upon the fact that the colour is soluble in an alkaline reducing agent, and if the fabric be impregnated with this solution, on subsequent oxidation with an acid oxidising agent, such as potassium bichromate and sulphuric acid, the colour is oxidised and fixed on the fibre in an insoluble condition.

A list of the Sulphide Blacks at present upon the market is given on page 245.

To ascertain the nature of these Blacks, the author made use of the method recommended by Richardson and Aykroyd for the estimation of Cachou de Laval (this Journal, 1898, 171 and 328), and concludes that Vidal Black M and Immedial Black F F extra represent one

Date and No.	Country.	Maker.	Compound employed.	Method of Preparation.	Colour.
Dec. 3rd, 1893. 23,570.	English	St. Denis	(1) Diamines, such as diamidodimethyl-aniline-azophenine, indamines, azo compounds (diamines). (2) Amidophenol, oxyazobenzene colours, which on reduction give *p*-amidophenol.	Fusion with sulphur and caustic soda.	Black.
1897. 184,893.	„	St. Denis and Vidal.	Dihydroxylamido, hydroxyldiamido, dihydroxyltriamido, hydroxyltriamido.	Heating with ammonia and sodium sulphide.	„
Dec. 19th, 1899. 292,400.	French	St. Denis	Action of sulphur chloride on amines and phenols.	Warming with sodium sulphide and sulphur.	„
7349.	English	„	Phenylenediamine, amidonaphthol with phenols.	Fusion with sulphur and sodium sulphide.	„
3576.	„	„	Mixture amidophenol and *α*-naphthol	„ „	„
5916 (1898). 6,913,694 (1897).	„	Vidal	*p*-Sulphanilic acid, *p*-amidophenol, benzoazocresol.	Fusion with caustic soda and sulphur.	Old Vid Black
1899. 288,477. 288,475.	French ..	„	Amidophenol or cresol......................	Treatment with sodium thiosulphates and fusion with sodium sulphide to 200° C.	New Vi Black
1898. 282,064.	French	„	Phenols, cresols, or naphthols: amidosulphonic acids, oxy, sulpho, or sulphoxyazo in para position with NH_3 or $N = N$.	Fusion with sulphur and sodium sulphide.	Black
May 1899. 289,244.	„	„	Amido-oxydiphenylamine....................	Heating until ammonia is given off with sodium sulphide.	Blue to B
Nov. 1894. 22,693.	English	Bayer	Dinitronaphthalene.........................	Fusion with sodium sulphide, precipitation with HCl, and solution in NaHO.	Black Brow
May 1899. 288,560.	French	„	Alkyl derivatives of dinitro-amidodiphenylamine.	Fusion with sodium sulphide and caustic soda.	Gree
Dec. 1899. 292,621.	„	„	Oxydinitrodiphenylamine....................	Fusion with caustic soda and sodium sulphide.	Blac
1899. 17,740.	English	Read Holliday.	*p*-Amidophenol, with phenolsulphonic acid; nitroso derivatives of amido-azobenzene.	Fusion with sodium sulphide and caustic soda.	Brown Blac
3539. Dec. 1899. 293,905.	„ French.	„	Amidosulphonic acids, got by the action of bisulphite of soda on nitro compounds.	„ „	Blac
..	English	Cassella	Oxydinitrodiphenylamine....................	.. ..	Imme Blac
Oct. 1899. 290,254.	French	„	Condensation of dinitrochlorbenzene with amidophenol.	Fusion with sodium sulphide and caustic soda.	Brown Blac
289,128. May 1899. 289,128. June 1899.	„	Berlin Actienges.	Quinone chloramine......................... Quinone dichloramine	Warming with hyposulphites in presence of an acid.	Blac
April 1899. 287,722.	„	„	Amidocresol sulphonic acid	Fusion with sodium sulphide and caustic soda.	
289,594. 11,656. June 1899.	French English.	„	Nitrochlorbenzene sulphonic acid, with toluylene diamine.	„ „	„
12,763. 290,284. June 1899.	English French.	„	Amidophenol with nitro-oxydiphenylamine ..	„ „	„
12,076. 289,128. Oct. 1899.	English French.	„	Chlor-*p*-amidophenol and quinone chlorimide	Warming with sodium thiosulphate, and then boiling with acid.	„
Oct. 1899. 290,058.	French	Berlin Actienges.	Dinitro-oxydiphenylamine...................	Fusion with sulphur and caustic soda.	„
Sept. 30, 1899. 292,954.	„	..	Mixture of above with dinitrophenol	.. ..	Dyes i from or salt l
March 1900. 5325.	English	Berlin Actienges.	Oxynitrophenylamine sulphonic acid, oxydinitro, nitrodichlorbenzene sulphonic acid amidophenolsulphonic acid.	Fusion with sodium sulphide and caustic soda.	Bla
May 1900. 296,988.	French	„	Oxychlordinitrodiphenylamine...............	„ „	
May 1899. 288,514.	„	M. L. & B.	Oxydinitrodiphenylamine sulphocarboxylic acid.	Fusion to 120°—180° C. with sodium sulphide and caustic soda.	
Sept. 1899. 283,414.	„	..	*p*-Oxymethyl-*m*-amido-*p*-diphenylamine......	.. ..	„
April 1899. 288,135.	„	M. L. & B.	Amidodinitrophenylamine sulphonic acid	Fusion to 120°—180° C. with sodium sulphide and caustic soda.	Bla B
May 1899. 288,525.	„	„	Trinitro-amidodiphenylamine................	„ „	Bl
Oct. 1899. 289,881.	„	Ruch	Phthalic acid and anhydride with amidophenol	Fusion with sodium sulphide and caustic soda.	
March 1899. 5581.	English	Kalle	Hydroxydinitrodiphenylamine carboxylic acid	Fusion with Na_2S_4 and NaHO	
6245. 286,813. Jan. 1900.	English French.	„	Homologues of dinitrophenyloxytolylamine carboxylic acid.	„ „	
11,709. 292,793. May 1899.	English French.	Claus and Rée.	Diphenylamine derivatives, trinitrohydroxydiphenylamine or mixtures.	Fusion with sulphur and caustic soda.	
June 1899. 14,763.	English	„	Amidophenol with nitrohydroxydiphenylamine	„ „	
Dec. 1899. 12,026.	„	„	Mixture of di- and trinitrohydroxydiphenylamine.	„ „	
8398. 283,424. April 1899.	English French.	M. L. & B.	Dinitro-amidodiphenylamine sulphonic acid .	Fusion with caustic soda and sulphur.	
1899. 5039. 1898. 21,832. 22,460.	English	Clayton Aniline Co.	Diamine, aniline, toluidine, dimethylaniline, xylidine, phenol, cresol, &c.	Treat with thiosulphate and oxidise with H_2SO_4 and potassium bichromate.	

e and No.	Country.	Maker.	Compound employed.	Method of Preparation.	Colour.
1007 an. 1899. 295.719.	English French	S. C. I., Basle	Compounds having formulæ— $X.CH_3NH.Y$ $X(CH_2)_2NY$ $HCHNY$ where X = hydroxyl, nitro, amido, or hydroxy derivative of phenyl, tolyl, napthyl, cyanogen, carboxyl, or carbamide. Y = radicle of an aromatic amine, with nitro, hydroxy or thio group introduced.	Fusion with Na_2S and NaHO.	Blacks, various.
96,810.	„	Stoloroff	1, 2, 4, dinitrophenol	Fusing with sodium sulphide and caustic soda from 115° to 200° C.	Black.
98.138.	„	B. A. S. F.	Dinitrodioxydiphenylamine	Fusion with Na_2S and NaHO	„
92 735. n. 1899. 94.191.	„	„	Dinitrophenoxydinitrophenylamine	„ „	„
1.892. 12 299.	German „	Noetzel Istel	Oxydinitrodiphenylamine	Heating with sulphur chloride and sodium sulphide.	„
ril 1899. 5084.	English	Ashworth and Burger.	Heating nitrosophenol and phenol with H_2SO_4, then with sulphur and caustic soda.	„ „	„
98.721.	French	Ruch	Compounds of aniline, &c., diazotised and combined with various phenols.	Fusion with sulphur	Dyes Black with common salt only.

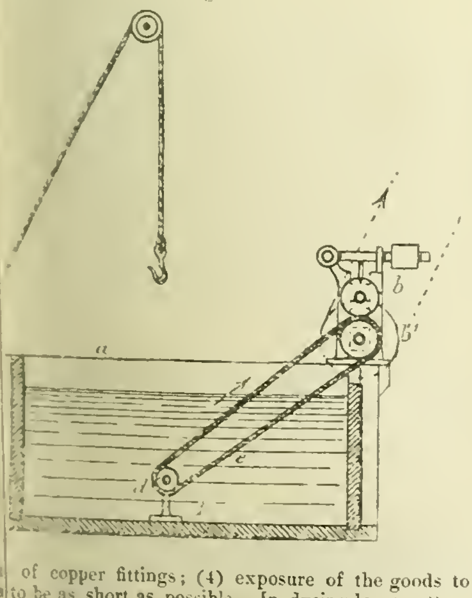
the Thiosulphate Blacks, whilst St. Denis Black and ene Black represent the Sulphide Blacks proper.

Colour.	Maker.
al Blacks V, G, F F Extra	L. Cassella and Co.
n Blacks S W, T B, T G...	F. Bayer and Co., Ltd.
quinone Black............	Badische Anilin und Soda Fabrik.
is Black....................	St. Denis Co.
lack M......................	Vidal Fixed Aniline Dyes Co., Ltd.
n Black.....................	„ „
ol Black (Cross Dye Black)	Read Holliday and Sons, Ltd.
Fast Black..................	Clayton Aniline Co., Ltd.
Black	J. R. Geigy and Co.
Black	Soc. Chem. Ind., Basle.
ne Black....................	Noetzel, Istel and Co.
il Black	Kalle and Co.
ene Blacks*..............	Farbwerke Mühlheim.

* Produced from Sulphogen.

lyeing with the Sulphide Blacks, the chief things efully notice are (1) the quantity of liquor in the (2) the thorough penetration of the goods; (3)

Fig. 1.



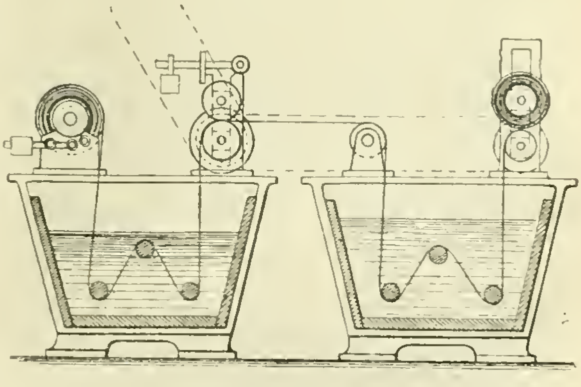
of copper fittings; (4) exposure of the goods to to be as short as possible. In dyeing loose cotton, erial must be kept all the time under the surface of the liquor, and in yarn dyeing the same precaution must be observed. This is effected by using rods bent four times at right angles, so that the portion of the rod bearing the hanks is immersed in the liquor, while the ends rest as usual on the sides of the bath. After dyeing, the loose cotton or yarn is either rinsed or sometimes merely squeezed and hydro-extracted before developing.

For dyeing hosiery, the machine illustrated in Fig. 1 is suitable; it consists of an ordinary wood vat, fitted at one end with a pair of squeezing rollers *b*, *b'*. Over the lower roller *b'*, is passed a travelling apron *e*, the other extremity of which, fastened round another roller *d*, fits into a pair of guiding grooves, fastened inside near the bottom of the vat and reaching to the top of the vat in a slanting direction. This allows the travelling apron to be lifted out of the vat during the dyeing operation, and when dyeing is finished the apron is quickly replaced, and falls by its own weight into position.

For warp dyeing, the ordinary machine will suffice if special precautions are taken that the amount of water shall not exceed about five times the weight of warp, and also that the warp is exposed to air during dyeing as little as possible.

It is only recently that the dyeing of piece goods with Sulphide Blacks has been successfully accomplished. For this purpose either the padding machine or the jigger may be employed, and after washing, the piece is developed in a separate vessel; the arrangement usually adopted is illustrated in Fig. 2.

Fig. 2.



The methods of dyeing recommended by the makers of the various colours differ considerably; the usual additions to the bath are common salt (10 to 200 per cent.), sodium carbonate (5—10 per cent.), and sodium sulphide (2—14 per cent.), but with certain blacks one or both of the last two substances are omitted. The quantity of dyestuff required to produce a black varies from 7 per cent. (Clayton Fast Black) to 30 per cent. (Cross Dye Black and others). For a standing bath the amounts of all the ingredients may be diminished by about one-half If the cotton be mercerised half to two-thirds, the quantity of dyestuff and materials will suffice in the first bath, but the additions for a standing bath must not be diminished.

After dyeing and washing, the black has to be fixed or developed. For this purpose the use of some metallic oxidising agent, such as bichromate of soda or sulphate of copper, generally produces the best result.

Chrome alum and ordinary alum are also useful in certain cases. The following list gives the quantities recommended by the makers for the development of various blacks :—

Immedial Black F F extra..	2 % $CuSO_4$, 2 % $Na_2Cr_2O_7$, 3 % acetic acid.
Katigen Black S W, T G	" "
Vidal Black M	4 % $Na_2Cr_2O_7$, 5 % H_2SO_4.
Anthraquinone Black.......	" "
St. Denis Black.............	5 % $CuSO_4$, 3 % acetic acid.
Amidazol Black............ } Cross Dye Black .... }	2 % $CuSO_4$, 2 % $Na_2Cr_2O_7$, 3 % acetic acid.
Clayton Fast Black	3 % $Na_2Cr_2O_7$, 1 % $CuSO_4$.
Eclipse Black................	1 % $Na_2Cr_2O_7$, 1 % $CuSO_4$.
Thiogene Black	1 % caustic soda.

After developing, the goods should be thoroughly well washed, and in some works they are washed with dilute caustic soda to neutralise any trace of acid remaining.

It is very difficult to dye material which has already been dyed with sulphide colours and developed darker shades with the same sulphide colours. It is best in such cases to top with the direct Cotton dyestuffs. Another defect is the difficulty of obtaining a blue-black, but it is possible that by a process lately patented (this Journal, 1901, 41), *viz.*, the dyeing of Sulphide Blacks and Indigo together in an ordinary hydrosulphite vat, may give the desired result.

It is noteworthy that blacks developed by air oxidation are much less fast to steaming, soap, light, &c., than when metallic salts are employed. When the cotton is intended to be woven with wool, the use of copper and chromium salts is objectionable, the wool being stained after steaming. In this case the developer may be a solution of zinc chloride made alkaline with soda and with the addition of a little sodium peroxide.

The application of Sulphide Blacks in calico printing depends upon the black being kept in solution by means of a compound, such as bisulphite of soda, which, on steaming, is decomposed, and the colour thus fixed on the cotton in an insoluble condition.

The application of these colours to wool and silk has hitherto been unsuccessful.

The tendering of cotton dyed with the Sulphide dyestuffs is generally supposed to be due to the presence of free acid from the decomposition of the colour itself under certain conditions of moisture and heat (see J. Soc. Dyers and Colorists, 1900, 84; this Journal, 1900, 439). The Thiosulphate Blacks are much less dangerous in this respect than the true Sulphide Blacks. The method of distinguishing a Sulphide Black from direct and Aniline Blacks is to boil patterns with sodium thiosulphate, with strong stannous chloride solution, and with alkaline hydrogen peroxide, also to treat with strong sulphuric acid (see also this Journal, 1901, 40). The reactions are as follows :—

Colour.	Hyposulphite of Soda.	Stannous Chloride.	Hydrogen Peroxide.	H_2SO_4 Strong.
Direct Black.	Decolorised.	Decolorised.	Nil.	Blue.
Aniline Black.	Decolorised, but regains colour on washing.	Turned Brown, not oxidisable in washing.	Brownish.	Drab.
Sulphide Black	Nil.	Brown, but regains colour on washing.	Blue Navy.	Green Blue.

The one thing new necessary to the dyer is a means of telling when the dyed cotton is liable to tender. Some methods have been suggested, such as steaming or heat in an enclosed space, but the only satisfactory solution the analysis of the colour.—R. B. B.

Catechu ; Substitutes for ——, *and their Application Calico Printing.* G. Grieder. Färber Zeit. 1901, [1], 7—9.

Catechu, which was formerly largely employed in dyeing and printing of cotton fabrics, has been larg replaced in the former industry by these substantive colo which acquire the requisite fastness by an after treatm with metallic salts, or by coupling with diazotised p nitraniline. In calico printing it has been superseded Alizarins or other colours which are fixed by meta oxides on steaming. In the printing of hosiery fab such as flannelette, it is still employed to a consider extent in Russia, Italy, Germany, and Austria, on acco of its cheapness and fastness.

One of the chief defects of Catechu is the tendency of prepared colour to undergo oxidation before it is used printing, owing to the combined action of the air and copper sulphate present in the colour. A finely divi precipitate is thus produced, rendering the colour gritty unfit for use. Catechu printing colours which have been sufficiently boiled, or do not contain sufficient ac acid, are liable to deposit crystalline catechin, with same result as above. The oxidising agents used developing the colour are also liable to bring a tendering of the fibre, especially if chlorates are emplo These and other defects have led many printers to seel satisfactory substitutes. Among those of recent introdu are Fast Brown J.A. and Fast Brown R.S. (A. Huill which are apparently prepared from natural dyestuffs, have the same defects as Catechu. Another substitu Catechu Brown O.S.C. (O. Starcke and Co.); this y smooth and stable printing colours, and the shade ca varied at will by the addition of colouring matters ca of being fixed with chromium acetate, this being the substance necessary to be added to the thickened co Printing Brown P.M.B. (P. and M. Böhme) gr resembles the colour just described, and yields shades are fast to washing and to acids.—R. B. B.

Wool and Silk Union Fabrics ; Dyeing of ——
R. B. Brown.
See page 226.

PATENTS.

Bleaching Textile Fabrics ; Process and Apparatu ——. H. Hadfield, Furness Vale, Cheshire. Eng. 5066, March 17, 1900.

Cotton piece-goods are subjected to the following ment before bleaching :—After singeing, the piece steeped in rope form for some hours in water, or through hydrochloric acid at 2° Tw., then still in rope they enter a washing machine consisting of a ser rollers, under and over which the cloth is drawn. lower rollers lie in vessels of continually ch water. From this machine the cloth passes th squeezing rollers, but just before entering the rol receives a stream of water, preferably hot. The w and squeezing are then repeated in another machi rope is opened out, and the cloth passes full widt mangle, and through a weak bath of caustic soda an It is again constricted to a rope form, and is deliver a kier provided internally with a number of per steam-pipes, and here it is exposed to the action pressure steam for some hours. After steaming, th is taken back to the washing machine, then opened again passed through the mangle, and through hydr acid at 2° Tw. The pieces are allowed to lie p several hours, again washed, and passed forward machinery for bleaching in accordance with a prior cation (Eng. Pat. 29,688 of 1896; this Journal, 18 Heavy cloths are subjected to a second steaming taking them to the bleaching machine. The feature of the invention is that at no stage is th boiled in, or subjected to, the circulation of large q of liquids.—R. B. B.

stuffs containing Sulphur; Production of Fast Dyeings ith ——. R. B. Ransford, Upper Norwood, Surrey. rom L. Cassella and Co., Frankfort-on-Main, Germany. g. Pat. 1977, Jan. 31, 1900.

after-treatment of cotton dyed with certain sulphur tuffs, with bichromates, is replaced by a treatment with mous or chromic salts, of which chrome alum and m um acetate are the most suitable. The dyed cotton orked, for example, in a bath containing 3—5 per cent. hrome alum for one hour at about 80° C. Even with rs which must be developed by oxidation, *e.g.*, Vidal k, it is claimed that a part of the chromate may be ced by a chromium salt. The object of the replace- is to avoid possible tendering of the fibre, and it is l that the colours are quite as fast as when chromates mployed.—R. B. B.

harging of Dyed Textile Fabrics. J. Y. Johnson, ndon. From The Badische Anilin und Soda Fabrik, dwigshafen-on-Rhine, Germany. Eng. Pat. 3288, b. 19, 1900.

s not hitherto been possible to employ previously red hydrosulphites for discharging purposes, since compounds could only be prepared in compara- weak solutions. However hydrosulphites in the form obtained according to the process described in Pat. 19,762 of 1899 (this Journal, 1900, 900), and especially the double salts such as zinc-sodium hydro- te described in Eng. Pat. 901 of 1900 (this Journal, 43) are well suited for discharging purposes for silk, r cotton dyed with acid, basic, or substantive dyestuffs, ith Indigo, Nitrosamine Red, &c. Zinc hydrosulphite rise to a brilliant white on account of the zinc side which is precipitated on the fibre.

egated discharge effects are produced by adding to charge paste a dyestuff stable to the action of hydro- es.

found to be advantageous to add also sodium bi- e to the printing mass, and an addition may also be of glycerin, acetine, and similar bodies, which act as s for the decomposition products of the colouring s.—R. B. B.

in Products for Directly Dyeing Vegetable Fibres; nufacture and Application of ——. O. Imray, don. From The Farbwerke vorm. Meister, Lucius Brüning, Hoechst a/Main, Germany. Eng. Pat. , March 3, 1900.

nvention is the result of experiments made with the of simplifying the dyeing of Turkey red and other colours on cotton, by furnishing the dyer with a t containing both mordant and dyestuff in a form application. The metallic mordants, *e.g.*, aluminium te, ferrous sulphate, are mixed in the proportions d for the dyebaths with the dyestuffs in the form of , and equimolecular proportions of sulphites, pyro- es, or bisulphites of alkalis, also in the form of , are then added, and the whole thoroughly mixed in mill. The greatest practical interest for dyeing -red is possessed by the products from aluminium sodium bisulphite, and Alizarin (flavo- and anthra-). The requisite amount of lime may be added roducts in the form of calcium acetate or sulphate, be left to the discretion of the dyer as the quantity s upon the water used.

mixture may also be prepared for certain purposes form of a paste by mixing the dyestuffs as pastes tr concentrated solutions of sulphites or bi- of aluminium, chromium, or iron; in this case, r, it is necessary to prepare the mordant solutions olving the freshly precipitated hydroxides in cid.

e application of these products, the fibre is first oiled usual manner, preferably according to the old-red, lled "mixture" process. Bad results were obtained key-red oils, whilst good results followed the use ammonia oils as leave on the fibre for the most insoluble in water.

With chromium mordants, alizarin does not yield useful colours by this method, but with Alizarin Blue and chromium bisulphite, very good colours are obtained. Ferrous or acid ferrous sulphite comes nearer in its behaviour to the aluminium salts, and readily yields the desired formation of a lake.—R. B. B.

Indigo Dye Vats; Hawking Machines employed in ——. W. Turner, Halifax. Eng. Pat. 16,601, Sept. 18, 1900.

The object of the invention is to avoid damage to the cloth in passing through the hawking machine, owing to the pieces becoming wedged between the roller and the stripper. Both the fast and loose rollers are formed with a series of necks a suitable distance apart, and attached to the scray lag are a corresponding number of metal bands or strippers, which pass around the nipping side of the rollers and are again attached to the opposite side of the lags. The metal bands within the necks are nearly flush with the outer peripheries of the rollers, and the bands remain stationary, while the rollers are free to revolve. With this apparatus, the piece on passing through the rollers is automatically stripped off the same and falls to the bottom of the vat, where it is laid in folds and again passed over the scray lags and between the rollers in the usual way.—R. B. B.

Yarn Dyeing Machines. J. Hussong, Camden, New Jersey, U.S.A. Eng. Pat. 19,250, Oct. 27, 1900.

The dye vat is divided into two sections by a transverse partition, which does not extend to the top or to the bottom of the vat. In one section the yarn is supported on a frame which can be raised or lowered as desired. In the other and smaller section is the mechanism for causing circulation of the liquor. This section is divided by a horizontal partition in which one, two, or more openings are provided, and in each opening is mounted a wheel with blades. When the wheels are turned, the liquor passes below the transverse partition, from the larger to the smaller compartment, where it is heated by steam, and is then driven upwards and back into the larger compartment, over the top of the partition. Mounted on the side bars of the yarn frame are a series of slats, so spaced that an opening occurs directly above each yarn-supporting stick, so that the liquor comes in contact first with the yarn immediately above the stick, which is the most difficult part of the yarn to dye. The liquor circulates between the suspended hanks of yarn, and passing down to the lower portion of the vat through a perforated false bottom the circulation is completed.—R. B. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphuric Acid: Seleniferous ——. N. A. Orlow. Chem. Zeit. **25**, [7], 66.

See under XXIII., *page* 280.

Bleaching Powder; Formation and Composition of ——. H. Ditz. Zeits. angew. Chem. **14**, [5], 105—111.

From experiments on the action of heat and of dry and moist carbon dioxide on various samples of bleaching powder, the author concludes that the reaction of chlorine on dry calcium hydroxide would be expressed by the equation $2Ca(OH)_2 + Cl_2 = CaO.Ca(OCl)Cl.H_2O + H_2O$, but that the water so formed would tend to react according to the equation—

$$CaO.Ca(OCl)Cl.H_2O + H_2O = Ca(OH)_2 + Ca(OCl)Cl.H_2O$$

leaving the calcium hydroxide to react again on more chlorine. The presence of water in the lime beyond that required to convert the original quicklime into hydroxide would increase the extent to which this second reaction would occur, and the end-result of these successive reactions could be represented by the general equation—

$$2nCa(OH)_2 + (2n-1)Cl_2 =$$
$$(2n-2)Ca(OCl)Cl.H_2O + CaO.Ca(OCl)Cl.H_2O + H_2O$$

Thus, a sample of bleach might theoretically be produced of any composition between $CaO.Ca(OCl)Cl.H_2O$ (35·32 per cent.) on the one hand, and $Ca(OCl)Cl.H_2O$ (Cl = 48·96 per cent.) on the other.

Neither of these two formulæ can be accepted as the *constitutional* formula of the compound it represents. In endeavouring to fix these constitutional formulæ, the following points must be taken into consideration:—(1.) The compound $CaO.Ca(OCl)Cl.H_2O$ stable at 100° C., gives off oxygen at a somewhat higher temperature, but no chlorine; the residue, $CaO.CaCl_2.H_2O$, gives off its water at a red heat only. (2) The other compound, the molecule of which is probably $2[Ca(OCl)Cl.H_2O]$ gives off, in a stream of pure dry air at 100° C., chlorine and water, and leaves a residue of $CaO.Ca(OCl)Cl.H_2O$ so that probably the two molecules of water are differently held. (3) While $Ca(OCl)Cl.H_2O$ is decomposed by dry carbon dioxide, with evolution of chlorine, $CaO.Ca(OCl)Cl.H_2O$ is practically unaffected by carbon dioxide. The author hopes, as the result of researches now in progress, to be able to establish the constitutional formulæ of the two compounds.—J. T. D.

Hypochlorous Acid on Metallic Chlorides; Action of ——. W. v. Tiesenholt. J. prakt. Chem. **63**, [2], 1901, 30—40.

Foerster and Jorre (J. prakt. Chem. **59**, 85; this Journal, 1899, 272), represent the reaction between hypochlorous acid and sodium chloride by the following equations:—

$$3HClO + NaCl = NaClO_3 + 3HCl;$$
$$3HClO + 3HCl = 3H_2O + 3Cl_2.$$

But the fact that chlorine is one of the chief products of the reaction may be explained in another way. Th. Iseliwanow (J. Russ. Phys. Chem. Ges. 1895, 553) has proved that the liberation of iodine, when hypochlorous acid acts on potassium iodide, is accompanied by the formation of caustic alkali. The reaction between caustic potash and iodine is also known to be reversible. These and other considerations have led the author to the hypothesis, that the reaction between chlorine and caustic alkalis is within certain limits reversible, and that the following reaction occurs: $NaCl + HClO = NaOH + Cl_2$. The liberation of one of the products of this reaction, chlorine is already sufficiently established. It is more difficult to detect the other product, caustic soda, because the usual indicators are bleached by the chlorine or hypochlorite. If however, a solution of sodium chloride and a small quantity of hypochlorous acid are evaporated to dryness, the residue dissolved in water gives a distinct alkaline reaction with phenolphthalein. For the success of the experiment, 2—3 c.c. of a concentrated solution of pure sodium chloride and a few drops of 1 per cent. hypochlorous acid must be spread in a very thin layer on a porcelain dish and heated for some time until completely dry. The first few drops of the ordinary alcoholic solution of phenolphthaleïn added, are bleached, but subsequent drops become deep red. The same result was obtained with potassium and barium chlorides. A blank experiment with sodium chloride and water gave no alkaline reaction. Better results were obtained by distilling off the chlorine and hypochlorous acid under reduced pressure with a current of air free from carbonic acid. For example, 10—20 c.c. of 1 per cent. hypochlorous acid were added drop by drop to 50 c.c. of boiling concentrated sodium chloride solution, the distillation being continued from ½ to 1 hour, with addition of sufficient water to prevent separation of salt. The residue contained alkali equivalent to several drops of decinormal acid. With barium chloride neither distillation *in vacuo* nor evaporation to dryness are necessary. A steady stream of carbonic acid gas is passed through the boiling concentrated solution, to which a drop of hypochlorous acid is added from time to time. When a certain concentration of salt is reached, and starch iodide paper indicates that there is not much more chlorine to come off, a separation of barium carbonate takes place. This also happens if the distillation takes place *in vacuo*; if carbonic acid gas is not used, caustic baryta is obtained instead of carbonate. Calcium chloride works best in very concentrated solution. When 3—4 grms. of the anhydrous granular chloride are dissolved in about 1 c.c. of 1 per cent. hypochlorous acid, an energetic evolution of chlorine begins at once. If carbonic acid be now passed into the boiling solution, copious precipitate of calcium carbonate is obtained. O longer heating without carbonic acid, calcium hydrat separates and the liquid becomes strongly alkaline. Fo control, a concentrated solution of calcium chloride, itse. slightly alkaline, was heated, and carbonic acid passed fo one hour, but only a trifling precipitation of calcium car bonate occurred. Although these results are only qualitativ they support the author's view of the reaction between hyp chlorous acid and metallic chlorides, and between metall hydroxides and chlorine, as expressed by the equatic $2NaOH + Cl_2 \rightleftarrows NaOCl + NaCl + H_2O$. He then appl this hypothesis to the elucidation of the formation a composition of bleaching powder. Lunge (Dinglers Poly J. **237**, 67) gives for its formation the equation Ca(OH $+ Cl_2 = CaOCl_2 + H_2O$, and the Odling-Lunge formula $Ca(OCl)Cl$. The fact that carbonic acid liberates all t chlorine from bleaching powder induced Lunge to give it formula different from that of the hypochlorites and accordance with the equation $CaOCl_2 + CO_2 = CaCO_3$ Cl_2, although he admits that aqueous solutions of bleachi powder contain hypochlorite and chloride. The dry powd he considers cannot consist of such a mixture because that case, since carbonic acid cannot decompose calci chloride, the whole of the chlorine would not be availab Therefore, according to Lunge, the atom of chlorine direc united with the calcium in bleaching powder has differe properties from those of the same element in calci chloride. He also holds that only di- or polyvalent met can form compounds of the bleaching-powder type, t existence of such a compound in Kraut's lithium-blea being impossible (Annalen, **214**, 354, **221**, 108, **219**, 1 **223**, 106). In the author's opinion, the liberation of whole of the chlorine in bleaching powder by carbonic ac may be better explained by considering the reacti between chlorine and lime as reversible, thus: 2Ca(O $+ 2Cl_2 \rightleftarrows CaCl_2 + Ca(OCl)_2 + 2H_2O$, just as in aqueous solution, in which the presence of free hy chlorous acid is indicated by its peculiar odour of 'blea different from that of chlorine. The reversibility of reaction explains why it is impossible to prepare bleach powder containing the theoretical proportion of chlor On passing carbonic acid, the equilibrium is distur and calcium carbonate is formed, setting free hy chlorous acid, which, reacting with the calcium chlor liberates chlorine, and since the latter cannot act u the carbonate the process goes on until the whole the calcium in the bleach is converted into carbonate, the whole of the chlorine liberated. As bearing on question of the identity of reaction in the formation solid bleaching powder and bleach solution, it is remark that in all reactions characteristic of the former, w plays an essential part. The best bleaching pow according to Lunge and Schäppi (Dinglers Polyt. J. 63), is obtained from lime containing 27·8 per cent water instead of the 23·5 per cent. corresponding to formula $Ca(OH)_2$. If the lime be either drier or moi less chlorine is absorbed. Commercial bleaching po contains 16—17 per cent. of water. Bleach solutic only attacked by carbonic acid at 70°—100° C. Bleac powder is decomposed at 70° C. more quickly by moist by dry carbonic acid, and if the powder be first dried sulphuric acid, it is hardly attacked at all. The chl evolved, always contains hypochlorous acid (Annalen, 9 145). A current of moist air passed over heated bleac powder produces calcium chlorate and oxygen, bu chlorine. Dry air at 32°—40° C. gives the same pro together with chlorine, and at 100° C. removes most o available chlorine. These reactions are quite analogo those of the alkalis as observed by Förster and Lunge and Naef (Annalen, **219**, 140), also pre bleaching powder by the addition of hypochl anhydride OCl_2 to calcium chloride (hydrated). I unabsorbed portion of the gas they found free chl and accounted for it by the equation, $CaCl_2 + Cl$ $CaOCl_2 + Cl_2$. The author suggests that the anhy becomes hypochlorous acid by combining with the wa crystallisation of the calcium chloride and in acting o ter produces caustic lime and free chlorine as well as cium hypochlorite. The fact that Lunge and Naef nd no appreciable quantity of calcium hydrate in their duct, though apparently contradictory to the author's w, may, he thinks, be explained by the conditions of the periment being probably unfavourable to the normal ction, and by the ease with which small quantities of stic lime may be overlooked in an analysis. If the thor's views are correct, the reactions of bleaching wder may be equally well explained, whether it has the mula, $Ca(OCl)Cl$, or $Ca(OCl)_2 + CaCl_2$, and the question its composition may therefore be relegated to the vince of molecular weight determinations, like the stion whether the formula of alum is $KAl(SO_4)_2$, or $O_4Al_2(SO_4)_3$. The researches of R. Fresenius, dating n 1861 (Annalen, **118**, 317), indicate that we have to l with an ordinary mixture. On treating bleaching der with successive small quantities of water, he found uch larger ratio of $CaCl_2$ to $Ca(OCl)_2$ in the first act than in the last. Bleaching powder is also hygro- pic, like calcium chloride. As to its being much more le than the solid hypochlorites of calcium and sodium spratt and Smith, Chem. Centr. 1899, I. 405, 1061), latter have only been made from aqueous solutions, and ain much water of crystallisation. In an anhydrous they would probably be much less easily decomposed. ny case the formation of dry bleaching compounds not depend upon the valency of the metal. The pre- tion of lithium bleach by Kraut has already been referred to. Sodium and potassium give, with chlorine, only mixtures of chloride and chlorate. Baryta and strontia, both of which contain water of crystallisation, give much chlorate and little bleach. Lime, on the contrary, containing no water of crystallisation, and easily parting with its water of hydration, absorbs water readily, to form a bleach with hardly any chlorate.—T. A. L.

Aluminium Chloride; Compounds of Ammonia with ——. E. Baud. Comptes Rend. **132**, [3], 134—136.

Ammonia is absorbed by aluminium chloride at the ordinary temperature, with evolution of heat. The mass fuses, afterwards resolidifies, and when the ammonia ceases to be absorbed, the resulting substance has the composition represented by $Al_2Cl_6.12NH_3$. This substance, stable and permanent at ordinary temperatures, loses ammonia at 180° C., becoming $Al_2Cl_6.10NH_3$; and this, in turn, at 380° C. becomes $Al_2Cl_6.2NH_3$, which distils unchanged about 450° C. If the action of the ammonia on the aluminium chloride be carried on at temperatures near the liquefying point of the ammonia, another compound is formed, $Al_2Cl_6.18NH_3$, which, however, readily dissociates into ammonia and the first-mentioned compound.—J. T. D.

Uranium Nitrate. O. de Coninck. Comptes Rend. **131**, [27], 1303—1305.

The author has determined the densities of solutions of uranium nitrate as follows:—

ercentage of Salt.	In Commercial Methyl Alcohol, Rectified.			In Acetic Acid of Sp. Gr. 1·035.		
	Temperature.	Density.		Temperature.	Density.	
		$CH_3OH = 1.$	$H_2O = 1.$		$C_2H_4O_2 = 1.$	$H_2O = 1.$
	° C.			° C.		
1	11·0	1·0084	0·8902	14·0	1·0034	1·0387
2	12·9	1·0125	0·8938	13·8	1·0080	1·0434
3	12·2	1·0198	0·9003	14·8	1·0100	1·0469
4	10·7	1·0272	0·9068	16·9	1·0148	1·0505
5	12·8	1·0317	0·9108	14·6	1·0205	1·0564
6	..	..	..	10·4	1·0265	1·0626
7	..	..	..	11·7	1·0300	1·0662

ght has but little influence on aqueous solutions of ium nitrate; their stability is increased by acidification hydrochloric or acetic acid. Solutions of the same n commercial methyl alcohol, or in dilute ethyl alcohol, nstable, and readily deposit black oxide of uranium.

ranium nitrate dissolves at 11° C. in commercial methyl hol to the extent of about one part in 55; at 13° C., per cent. ethyl alcohol, to the extent of one part in 30; C., in pure acetone, to the extent of one part in 65; ° C., in acetic acid (sp. gr. 1·035), to the extent of one in 5·6.—J. T. D.

mates of Sodium and their Production. F. Mylius and R. Funk. Ber. **33**, [19], 3686—3689.

By the progressive saturation of chromic acid with soda, the authors have obtained the series of crystallised salts shown in the table following. The tetrachromate was obtained by evaporating sodium chromate solution with excess of chromic acid. It forms garnet-red crystals, and, unlike the corresponding potassium and ammonium salts, is stable in contact with water. On saturating chromic acid solution with soda, tetrasodium chromate is obtained, forming large, pale yellow crystals. The following table shows the solubilities of the salts at 18° C., chromic acid and soda being included for comparison:—

The solubility increases considerably with increase of temperature.

Salt.	Formula.	Specific Gravity of Solution.	Percentage of Anhydrous Salt.	Mols. Water to 1 Mol. of Salt.	Mols. Salt to 100 Mols. of Water.
mium trioxide	CrO_3	1·705	62·45	3·34	29·91
m tetrachromate	$Na_2Cr_4O_{13}.4H_2O$	1·926	74·60	8·87	11·27
m trichromate	$Na_2Cr_3O_{10}.H_2O$	2·059	80·60	4·87	20·56
m dichromate	$Na_2Cr_2O_7.2H_2O$	1·745	63·92	8·22	12·16
m monochromate	$Na_2CrO_4.10H_2O$	1·432	40·10	13·47	7·43
m hemichromate	$\frac{1}{2}(Na_4CrO_5.13H_2O)$	1·446	37·50	10·38	9·63
m oxide	$Na_2O.3H_2O$	1·539	39·52	5·30	18·90

—H. B.

lcium Chromate. F. Mylius and J. von Wrochem. Ber. **33**, [19], 3689—3696.

existence of the five following modifications of calcium mate has been ascertained:—

1. α-Dihydrate, $CaCrO_4.2H_2O$ — monoclinic.
2. β-Dihydrate, $CaCrO_4.2H_2O$ — rhombic.
3. Monohydrate, $CaCrO_4.H_2O$ — rhombic.
4. Hemihydrate, $CaCrO_4.\frac{1}{2}H_2O$ — rhombic.
5. Anhydrous $CaCrO_4$.

The α-dihydrate is isomorphous with gypsum. It forms small yellow crystals which effloresce in the open air, and, when in contact with the saturated solution, pass readily into the rhombic β-dihydrate. The monohydrate is the most stable hydrated form of the salt. If supersaturated solutions of calcium chromate (15—20 per cent.) are heated to above 36° C., the salt gradually passes into the anhydrous form. The hemihydrate retains its water of crystallisation firmly, and only parts with it readily at about 400° C.

Each modification has a characteristic degree of solubility in water, the following being the solubilities at 18°:—

——	Specific Gravity of Solution.	$CaCrO_4$ per Cent. by Weight.	Mols. Water to 1 Mol. of Salt.	Mols. Salt to 100 Mols. Water.
α-Dihydrate	1·149	14·3	51·9	1·93
β-Dihydrate	1·105	10·3	75·2	1·33
Monohydrate	1·096	9·6	81·6	1·22
Hemihydrate	1·044	4·4	193	0·51
Anhydrous salt	1·023	2·3	370	0·27

The solubility curves of the various salts with rise of temperature show no breaks indicative of passing from one modification to another. The solubility of the β-dihydrate increases with increase of temperature, while all the others decrease. The anhydrous salt, even after prolonged contact with water, does not pass into the hydrated condition.

—H. B.

Acids, Dibasic, Analogous to Sulphuric Acid; Sodium Salts of ——. R. Funk.

See under XXIV., *page* 291.

Boric Acid, Crude Italian; Analysis of ——. E. Zschimmer.

See under XXIII., *page* 282.

Potassium Permanganate and Alkali Thiosulphates in Neutral Solutions; Interaction of ——. Leonard Dobbin.

See page 212.

PATENTS.

Sulphuric Acid; Processes for Producing ——. A. C. Johnson, Baltimore, Maryland, U.S.A. Eng. Pat. 17,928, Oct. 9, 1900.

The process claimed consists in passing a series of electric sparks through the tower or chamber containing the vaporous constituents of sulphuric acid, and thus effecting their combination and precipitation. A special apparatus for the purpose is described, and claim is also made for the introduction of oxyhydrogen gas, the explosion of which by the electric sparks causes the deposition of the acid-laden particles of moisture.—C. A. M.

Contact Substance in Chemical Operations; Manufacture or Production of Materials with Platinum Surfaces for Use as ——. J. Y. Johnson, London. From The Chemische Fabrik vorm. Goldenberg, Geromont and Co., Winkel-on-the-Rhine. Eng. Pat. 618, Jan. 10, 1900.

The manufacture of contact bodies is claimed, in which a porous or absorbent acid-proof and heat-resisting layer carrying the contact substance is applied to a non-porous or non-absorbent acid-proof heat-resisting support.—J. W. H.

Crystallisable Liquors, Process and Apparatus for Transforming ——, *into Large Lumps having a Large Crystalline Structure.* J. Bock, Ober-Lössnitz, Germany. Eng. Pat. 3275, Feb. 19, 1900.

An improvement on Eng. Pat. 28,113, 1897 (this Journal, 1899, 40), in which the process consists in causing the warm solution to be crystallised, to flow slowly through a long stationary shallow vat, horizontal or slightly inclined. The present invention provides for the ready detachment of the masses of crystals formed in the vat by providing the latter with a double bottom, the internal space of which is expansible, and may be caused to expand by injecting st between the two bottoms.—E. S.

Soda Alum; The Manufacture of ——. F. M. and 1 Spence, Manchester, and H. Spence, Sale, Ches Eng. Pat. 5641, March 26, 1900.

A solution is prepared of sodium sulphate saturat 40°—50° C., which is allowed to cool during agit until a considerable proportion of the decahydrated cry have separated. The mixture of liquor and crystals is run into a solution of aluminium sulphate containin solid salt in suspension. There is thus obtained "a crop of well-defined soda alum crystals," which ma separated from the mother liquor in any suitable way. process may be varied by adding solid aluminium sul to a suitable solution of sodium sulphate or chlorid which either salt may be suspended in the solid state. aluminium sulphate used in the process is prefe obtained by cooling its solution of suitable strength in a manner as to obtain it in crystalline scales, which, their ready solubility, enable the "alum meal" t rapidly formed in the sodium sulphate solution.—E. S

Common Salt (Chloride of Sodium); Vacuum Evapor Apparatus for Separating ——, *from Solutions, cially from Brine.* G. N. Vis, Schweizerhalle, Sw land. Eng. Pat. 9343, May 24, 1900.

The apparatus is an improvement on that described in Pat. 16,738, 1899 (this Journal, 1900, 1111), the im ments consisting "in arranging a constant direct s connection between the boiler and the main reservoir connection communicating with the boiler at a point the heating apparatus of same, and constituting the receiving member of a heat-exchanging apparatu heat-transmitting member of which is fed with ho densed water from the said heating apparatus."—E. S

Crystallisation; Process for Effecting Rapid —— Kaufmann, Aix-la-Chapelle. Eng. Pat. 23,244, D 1900.

The process consists in introducing compressed ai and below the surface of the lye in the crystalliser, t in escaping upwards from the pipes in a finely d condition, serving to stir up the lye and to acceler cooling of the charge. For the purpose of obtaining crystals, a supply of thick lye may be introduced wi compressed air into the mother lye. The air m supplied intermittently, when preferred, by arr suitable valves in the supply pipe.—R. A.

VIII.—GLASS, POTTERY, ENAMELS

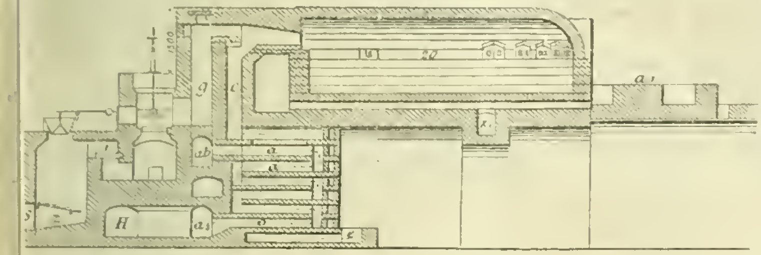
Vitrified Quartz. W. A. Shenstone. Royal Inst. 1 Times, March 9, 1901.

The lecturer said it had long been known fro experiments of Mr. C. V. Boys that fine threads of silica—"quartz fibres"—possessed enormous stre proportion to their size, together with great elastic insulating power, and such fibres were now to be f every well-equipped physical laboratory. Until rec had not been found possible to produce vessels o except of exceedingly small dimensions, but lately a had been elaborated which enabled tubes and other of silica to be made hundreds of times larger th largest produced a dozen years ago. The vitrified or, more properly, vitrified silica, closely resembled appearance. It could be cut and polished, but it w what harder than most glass, and was, in conseque liable to abrasion. Not only was it as transparent to the visible rays of the spectrum, but it also adm passage of the ultra-violet rays, which were to a grea absorbed by glass. Vitrified silica, again, was more than glass; it did not begin to soften till heated 1,000° C., and, again, it was only moderately soften far higher temperature which melted platinum, on most infusible of the metals. But its most re property was its indifference to sudden and great ch temperature, for rods, tubes, and other vessels ight be plunged when red-hot, some even when white-hot, to cold water without being in any way damaged.

lass Furnaces; The Smelting Process, and the Cause and Composition of Chimney Incrustations in ——. Chr. Dralle. Chem. Zeit. **25,** [7], 66—67; [9], 86—87; [10], 103—105.

ᴜᴇ author has made a number of observations at various ottle factories employing the recuperative Nehse-Dralle ough furnace (see illustration) in sizes ranging from a apacity of 40 tons to 140 tons. After passing through the euperator the waste furnace gases are led away through a ain flue H, to a drying kiln for clay, fireclay, &c. The ean temperature of the gases is 700° C. in the lower range air heaters, 560°—420° C. in the main flue, 260°—300° C. the drying plant, and 220°—240° C. at the chimney.

The assumption that a large proportion (up to one-sixth) the sodium sulphate in the charge of glass metal is olatilised and lost is regarded as erroneous by the author, having failed to discover any deposit in the chequer-ork of the regenerators or heating chambers to account r the alleged loss; nor is the Dinas stone of the furnace ch or the firebrick of the regenerator corroded, as would the case were the sulphate volatilised as asserted. On e other hand, analysis shows that sodium sulphate is esent to some extent in the incrustations deposited by e gases on their way to the external air; but whether e sulphate has been volatilised as such, or dissociated and constituted, is unknown, though possibly the SO_2 and SO_3 erated by this sulphate, according to Gross, recombine th volatilised sodium chloride (present as an impurity in e sulphate).



In some cases the sodium sulphate used contains free lphur trioxide, which, in presence of added sodium loride, displaces the acid in the latter, and thus leads to rrosion of the regenerator lining. A case of this kind is observed at Warsaw.

Where fluorspar is employed, a considerable quantity of icon fluoride is liberated, and contributes, along with SO_2 d SO_3, to the formation of the white fumes which are scharged from the chimney.

With regard to the incrustations deposited in the flues, e., the author is of opinion that these are of mixed origin, me portions having been conveyed mechanically by the ses, whilst others bear evidence of volatilisation, and the eater part of the crystalline deposit has evidently resulted om both causes conjoined. Provided the charge of glass etal be properly damped, the amount of this material rried away by the furnace draught will be small and will ainly collect in the conduit *a b* as a tough, dark-coloured, treous mass; in the absence of the above precaution, owever, the loss may be considerable and an obstruction ay be set up in *a*.

The incrustations are divided by the author into two asses, *viz.*, those rich and poor respectively in normal lphates, the former increasing in proportion as the tem-rature of the flues diminishes, whilst the latter class of crustation predominates in the hotter portions of the flues.

An analysis of the first kind of incrustation taken from ar the junction of the main flue with the chimney stack the Stralau Bottle Works, Berlin, about 10 years ago, ve results indicating the following composition:—

NaCl, 0·3 per cent.; Na_2SiO_3, 3·31; Na_2SO_4, 77·19; SO_4, 2·00; $CaSO_4$, 8·16; $Al_2(SO_4)_3$, 2·77; Al_2O_3, 0·82; Fe_2O_3, 1·08; sand, 4·20 per cent.; whilst a sample taken in 1898 gave:—

Na_2SiO_3, 6·95 per cent.; Na_2SO_4, 64·72; $CaSO_4$, 14·64; Fe_2O_3, 1·46; $Al_2(SO_4)_3$, 4·84; Al_2O_3, 6·80 per cent.; chlorine, a trace.

The appearance of these two samples differed considerably, the former being a very light, nearly pure white, felted, and seemingly amorphous mass, whilst the latter was a hard, white to yellowish, acid, homogeneous crystalline crust.

A third sample, from Osterwald, gave:—

Al_2O_3, 13·70 per cent.; Fe_2O_3, 1·08; CaO, 5·73; MgO, 1·38; SO_3, 37·81; Na_2O, 24·97 per cent. The amount of sodium sulphate was therefore 57·22 per cent, leaving only 5·56 per cent. of SO_3 for the other bases.

The presence of such large proportions of Al_2O_3, CaO, MgO, and Fe_2O_3 in these incrustations is probably due to the influence of fluorine (in fluorspar).

The second class of incrustations collect nearer the furnace, *e.g.*, in the conduits *a*, and form crystalline, hard, resonant crusts. In the case of the following analysis of a sample from the Stralau works, the temperature at the point of deposition was between 1,000° and 1,100° C., which accounts for the low proportion of alkalis and the presence of free oxides:—

Na_2SiO_3, 4·22 per cent.; $CaSiO_3$, 2·04; $CaSO_4$, 16·38; CaO, 27·39; MgO, 6·80; Al_2O_3, 10·17; Fe_2O_3, 2·35; sand, 31·24 per cent.

A similar deposit was found in the Osterwald works, and contained: Na_2SO_4, 38·73 per cent.; $CaSO_4$, 15·13; CaO, 3·69; Al_2O_3, 15·87; MgO, 4·80; Fe_2O_3, 1·05 per cent.

Finally, a deposit in the lower flue of the air heaters at the Wirges Glass Works was examined. In this case the temperature at the point of deposition was only 500°—600° C., and the proportion of normal sulphates was therefore higher: Na_2SO_4, 34·99 per cent.; $CaSO_4$, 18·00; CaO, 6·59; Al_2O_3, 4·32; Fe_2O_3, 1·23; residue (sandy granules), 32·77 per cent.—C. S.

Enamelling; Report on Dormoy's Apparatus for Mechanical ——, *without Dissemination of Dust.* A. Livache. Bull. Soc. d'Encouragement, **101,** [1], Jan. 1901, 17—25.

The apparatus is essentially as described in the original patent (this Journal, 1899, 761), save in two points. 1. The strong in-draught is used to raise the surplus enamel powder from the collecting box at the bottom of the apparatus to the hopper at the top. 2. The object is retained on the table not by electro-magnetic apparatus, but by furnishing the table with a number of little balanced levers working on horizontal axes, and so arranged that a counterpoise at one end of each makes the other end project 10—15 mm. above the surface of the grids. The object presses down the projecting ends of the levers on which its weight rests, and is kept from slipping by the surrounding projections. The advantages of the apparatus are: Complete protection of the workers from the enamel dust. Lessening of discomfort from radiant heat, the glass door being between the workman and the hot object. Greater rapidity of work; a given piece of work was done in the apparatus in half the time that was taken to do it by hand; moreover, a number of small articles can be laid on the table at once, instead of each being handled separately. Economy of enamel, since the excess is used again. Less manipulative skill is needed than in the hand process. The workpeople at M. Dormoy's works at Sougland greatly prefer the new process to the old. Several copies of the apparatus have been constructed by M. Dormoy for use in foreign works, and all have given complete satisfaction, not only as affording protection to the workers, but also as producing work of a very high quality.
—J. T. D.

PATENTS.

Glass: Method of and Apparatus for Rolling ——. L. Appert, Paris. Eng. Pat. 4389, March 7, 1900.

A METHOD of rolling glass is claimed in which no point in the glass can have permanent contact with any point in the rolling apparatus, and in which a gaseous atmosphere prevents actual contact at the time of rolling. The apparatus consists of one roller or table to receive the glass from the furnace, two rollers of small diameter to do the work, and a fourth roller or table to receive the rolled sheet; the rollers or table have transverse reciprocating movements.—J. W. H.

Glass Melting Pots or Crucibles. L. M. Règle, Nesle-Normandeuse, France. Eng. Pat. 6926, April 12, 1900.

THE pot claimed consists of two vessels, one above the other; the glass melted in the upper one flows through a hole near its base, into a compartment formed by a partition in the lower vessel; from this back compartment the glass flows through a hole into the front compartment from which it is withdrawn.—J. W. H.

Carboys, Bottles, and other Articles of Glass, Pottery, and the like; The Treatment of ——, *and of Casks and other Vessels of Wood or other Permeable Materials, and of Corks, Bungs, and Stoppers.* B. J. B. Mills, London. From The Société Anonyme des Enduits Archambault, France. Eng. Pat. 21,148, Nov. 22, 1900.

A PASTE consisting of powdered cork, asbestos, and silicate of potash is applied to vessels of glass or pottery as a protection against breakage, acids, &c. A second coating, consisting of asbestos and silicate of potash, renders them fireproof. The pastes are also claimed for use in hermetically sealing bottles, casks, &c.—J. W. H.

Ceramic Ware and the like; Kilns for Firing ——. C. Czerny, Unter-Themenao, and C. Schlimp, Vienna. Eng. Pat. 338, Jan. 5, 1900.

THE inventors claim a kiln consisting of two parallel rows of firing chambers, each provided with air, gas, and other valves, and arranged so that the air for combustion and the products of combustion circulate through the whole series, the chamber in the middle of the circuit being at "full heat," and those on either side of it either being heated up or cooling down.—J. W. H.

Ceramic Ware; Manufacture of Polychrome, Ornamented, Glazed, or similar ——. G. v. dem Borne, Bornhofen, Germany, and W. v. Debschütz, Munich, Germany. Eng. Pat. 23,879, Dec. 31, 1900.

IN the manufacture of ornamental pottery, coloured patterns may be produced by the partial removal by means of the sand blast of the several coloured coats applied. The inventors claim: (1) a process in which this may be done before firing, by hardening the coats with cementing material, such as gelatin, dextrin, lime-soap solution, water glass oxychlorides, &c.; (2) a process in which the article is coated with paper, to be partially removed by a sand blast so that a subsequent glazing is not taken up by the paper protected parts; (3) the use of a protective coating of varnish, wax, or fats for a similar purpose.—J. W. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Trass and Trass Mortar. H. Burchartz. Mitt. königl. Techn. Versuchsanst. zu Berlin, **18**, [4], 203—226.

THE various kinds of trass examined by the author were found to differ but slightly, the maximum specific gravity being 2·395, and the minimum 2·274 (average 2·340); the hygroscopic moisture 2·07—4·36 (mean 2·72) per cent., and the water of hydration 7·33—8·55 (mean 7·88) per cent.

On the other hand, the mortars prepared from these samples exhibited considerable divergence, due to the properties and percentage of the added materials, as well as to the method of hardening employed; and even one the same mixture gave variable results under ident conditions, a mixture of $1\frac{3}{4}$ parts (by volume) of trass, 1 part of "fat" lime, and $1\frac{3}{4}$ parts of Rhine sand, behav as follows:—

—	Tensile Strength.		Compression Streng		
	6 Weeks.	18 Weeks.	6 Weeks.	18 Week	
Minimum......	8·1	16·2	63·2	118·6	Ki p sq.
Maximum	23·6	28·7	168·6	194·6	
Mean..........	14·9	21·4	97·4	149·1	

In general the tensile strength of these mortars is l the compression strength on the other hand being po average ratio 1 : 6 (compared with 1 : 8—1 : 12 in the of Portland cement), and in one instance as low as 1 : This is due to the relative coarseness of the grains of and lime in the mortar. A high percentage of hygros moisture also seems to have an injurious effect on strength of the mortar, though the converse is not al true, one specimen with only 2·07 per cent. of moisture giving the relatively low compression strength 8 and the tensile strength 11·5 after six weeks. The kn weakening effect of an excessive proportion of lime also confirmed in these experiments. As might be expe from the hydraulic character of trass, the mortars st under water showed a greater accession of strength d hardening than those stored in the air, the only conside improvement in the latter being an increase in the pression strength in proportion to the age. It was, furt more, observed that the specimens stored in air did recover their lost ground in respect of hardening, afterwards kept in water; probably owing to the conve of part of the uncombined calcium hydroxide into carbo and even an occasional moistening of the mortars sto air did not bring them up to the same level as those under water.

Nearly all the trass mortars passed the test for imp ability to water, the degree varying with the fineness o sand employed. The conditions of mixing were favourable to impermeability, less water being used th practice.

The results furnished by the needle-test did not r any connection between the initial hardening and strength; in fact, in two cases where hydraulic and " lime respectively were employed, the former, though gi the greatest initial hardening, was finally distanced—in of compression strength—by the latter. —C. S.

Puzzolane; The Question of Pulverising ——. R. l Baumaterialienkunde; Thonind. Zeit. **24**, [124], 17 1750.

THE experiments recorded are considered to show t certain cases, the quality of the mortar is improve grinding the puzzolane down fine, especially where a granular sand is available. Furthermore, it appear the proportion of ground puzzolane in mortars ca increased considerably without impairing the streng the latter, whilst reducing the cost. In most instanc grinding of the puzzolane is expedient as renderin mortar more homogeneous than can be secured by le the materials in a granular condition.—C. S.

Bricks, Artificial; from Lime and Sand. "B." Th Zeit. **24**, [118], 1677—1678.

IN the Schwartz process, just sufficient quicklime (a per cent.) to form enough calcium silicate is used, t the particles of sand together, in addition to whic mixer is jacketted for heating, and is fitted with mea regulating the degree of moisture in the content consequence being that the mass falls together like and can be readily pressed.

At the Pfäffikon works near Zürich, where sand d from the lake is used, the adoption of the above process has enabled work to be carried on reg irrespective of the season. To each cubic metre o.) of dried sand are added 13·3 litres of finely-ground, sh burned quicklime (compared with the 8—12 per cent. rmerly used), which gives a much harder brick than the ger proportion specified, the fracture being good and owing no free particles of lime.—C. S.

PATENTS.

ones; Process for the Production of Artificial ——. H. Schürholz, Westphalia. Eng. Pat. 791, Jan. 13, 1900.

PROCESS is claimed for producing a dry mixture of lime d sand for the manufacture of artificial stone, in which lime in lump form is dipped into water and immediately ced between layers of damp sand; after "slackening," xture is effected in the usual way.—J. W. H.

ment, Gypsum, and the Like; Process for Burning ——, nd Apparatus therefor. W. Lessing, Westphalia, and). Rheinfeld, Elberfeld. Eng. Pat. 5922, March 29, 900.

e material, after a preliminary heating in a revolving nace, falls down a vertical shaft against a column of ne, by which it is completely burnt without caking taking e. The heat present in the burnt material is abstracted a current of the cold air which feeds the flame or is le to generate steam whilst the product travels through lving cylinders. The products of combustion are also le to give up their heat, either to unground raw material o steam-raising apparatus.—J. W. H.

X.—METALLURGY.

ments [Metals]; Modification of Chemical Properties ——, by Addition of Minute Quantities of Foreign ubstances. G. Le Bon.

See under XXIV., *page* 290.

ils; Relation between the Expansibilities and Fusing oints of ——. Lémeray. Comptes Rend. **131**, [27], 291—1293.

product of the coefficient of expansion and the absolute erature of the melting-point is constant for all metals; olumes of different metals which are equal at absolute are also equal at their respective melting points. law *may* apply to other substances also, but the or's reasoning permits him apply it only to those substances which are elementary and non-crystalline. experimental verification is, of course, only possible ugh a limited range of temperature, but shows no ter discrepancies than is the case with the law of Dulong Petit; the discrepancies appear to be connected with variations in atomic volume of the metals.—J. T. D.

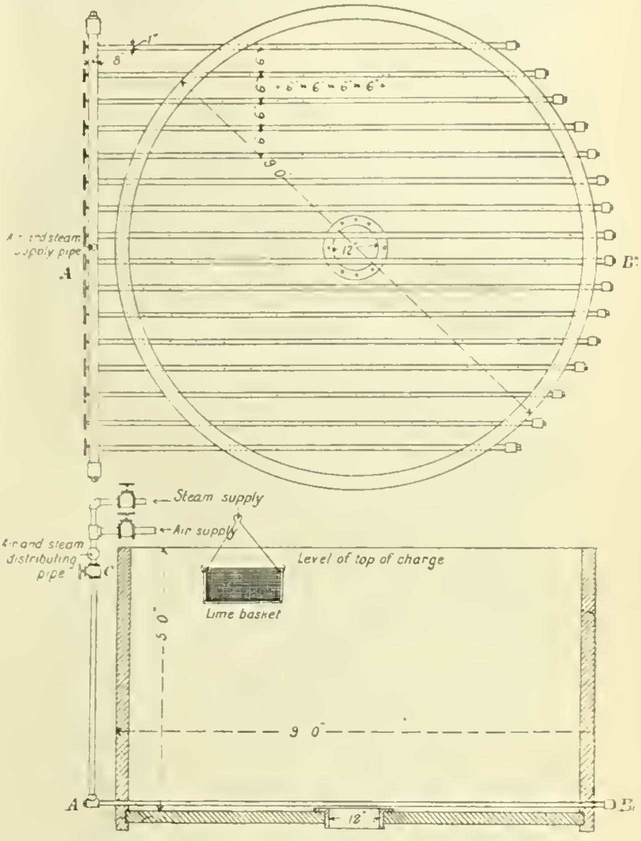
h Temperatures by Means of the Combustion of luminium; Process for the Production of ——. H. oldschmidt. J. für Gasbeleucht. **44**, [2], 26—29. ee also this Journal, 1898, 543 and 619; also 1900, 98.)

mixture, known as "thermite," consists of aluminium an oxide, such as ferric oxide, which when ignited, ts so as to yield alumina and the metal of the oxide, st a temperature is attained which far exceeds that uced by the oxyhydrogen blowpipe, and is second to that of the electric furnace.—J. A. B.

niding Slimes [Gold Ores]; Agitation Process for ——. C. S. Hurter. Eng. and Mining J. 1901, **71**, [3], 2.

author gives a description of an agitation process sed by V. B. Sherrod and C. A. Stephens, by means of h 80 per cent. of the total values of gold and silver in grade slimes can be recovered at a cost not exceeding l. per ton. The slime in question, or, more accurately king, the dust, 96 per cent. of which will pass through 0-mesh screen, is drawn by means of a fan from the , after the latter has passed through the finishing rolls, before it goes to the screens. The current of air passes down through the rolls and through the roll pit. From the fan the dust passes to a "cyclone settler," from which it is drawn off into bins.

The agitator used is a mixture of steam and compressed air. The agitation tank shown in the accompanying diagram will take a charge of 3—3½ tons of pulp, and 6 tons of cyanide solution. The steam and air pass from their respective supply pipes into a 3-in. distributing pipe, and thence into 1-in. pipes that pass through the tank as close to the bottom as possible. These pipes are placed 6 in. apart, and have $\frac{1}{16}$-in. perforations on the underside at intervals of 6 inches. The pipes are provided at both ends with removable plugs, to allow of their being readily cleaned. The air is delivered to the 3-in. distributing pipe at a pressure of about 60 lb. per sq. in., and the steam at a pressure of about 30 lb. The actual power required is not more than $\frac{1}{10}$ h.p. per ton per day, as only enough steam and air are used to keep the pulp in a state of gentle agitation. The dust is sluiced from the bins into the agitation tanks by means of the cyanide solution, as it was found that if the dust were shovelled into the tanks it settled to the bottom in a mass, which could not be got into proper circulation in the cyanide solution. A bucket of coarse wire screen containing about 60 lb. of lime is suspended at the surface of the cyanide solution; it is stated that with this large excess of lime, not only is any acidity neutralised, but subsequently, in the settlers, the slimes deposit more quickly and completely.



After about 24 hours' treatment in the agitation tank, 94 per cent. of the total values are dissolved. The mixture of pulp and solution is passed through a set of wire settling tanks, 4 ft. × 4 ft. × 6 ft., then through a series of three upward filtering tanks, and the solution passed finally through four precipitation boxes filled with zinc shavings. In this way 70—75 per cent. of the total values in the pulp are recovered. The slimes left in the settling tanks are sluiced by means of a water jet into a circular decanting tank 12 ft. × 5 ft. After standing 12 hours, the clear solution is drawn off and mixed with the main portion of the liquid from the settling tanks, before it passes to the filtering vessel. With this supplementary settling, the amount of values recovered is increased to about 80 per cent.

The cost of treatment by this process, per ton of pulp, is as follows:—Cyanide, 1 lb., 0·31 dol.; lime, 20 lb., 0·18; zinc, 1 lb., 0·12; "tramming," 0·04; power, 0·1 h.p., 0·04; labour, 0·175; extras, repairs, smelting, &c., 0·135; total, 1·00 dol.—A. S.

Iron Hardened by Overstrain; Tempering of ——. J. Muir. Proc. Roy. Soc. **67**, 461—466.

The author finds that by straining a piece of steel, or even wrought iron, to a point just beyond its elastic limit and heating it to any temperature above 300° C., its hardened condition can be partially reduced in a manner similar to tempering. A semi-mild steel (0·35 per cent. C. and 1·0 per cent. Mn), after being strained at its yield point of 38 tons to an elongation of 0·13 in. on a 4-in. length and put aside in its then semi-plastic condition to rest, was found to regain within two days a considerable proportion of its elasticity. The recovery progressed for two weeks, and was perfected by heating to 200° C., although a few minutes at 100° C. would have been nearly as effective. When cooled after this treatment and again tested, the elastic yield point was at 49 tons, or an increase of 11 tons per sq. in. After an elongation as before of 0·13 in., the metal was again semi-plastic and would have elongated and probably broken at a slightly increased load. By again heating it to 200° C. and cooling, the metal bore a stress of 60 tons, or a further increase of 11 tons per sq. in., but the yield point, with fracture, was reached at 60½ tons.

The same original steel after annealing at 750° C. gave a fresh and lower primary yield point at 29 tons, the elasticity gradually recovering as before. By heating to 300° C., however, the increase of yield point was only about 7½ tons, or to 36½ tons, and, moreover, by repeated straining and heating, three more yield points were obtained, each about 7½ tons above its predecessor, the final one taking place with fracture at 59½ tons. Thus in the original steel the yield point was raised in two stages of 11 tons each, and in the same metal annealed at 750° C., in four stages of 7½ tons each. When annealed at lower temperatures down to 600° C., the stages ranged between these two figures, approaching the 11 tons stage as the latter temperature was reached.

It was found that, in the case of an annealed steel hardened by overstrain and heated as described, the same temperature brought the yield point to approximately the same stress, no matter what the original hardness of the specimen might be; and that the harder the material was made by tensile overstrain—that is, the higher the yield point was raised by permanent stretching—the lower was the temperature which could be shown to produce a slight tempering effect.

In the ordinary method of relief polishing and etching by nitric acid for microscopical examination, a new method of staining steel, by rubbing with ordinary moistened cocoa, was used.—A. W.

Cast-Iron; Coppering of ——. E. Dessolle. L'Ind. Electro-chim. 1900, **4**, 97; through Chem. Zeit. Rep. 1901, **25**, [3], 27.

The object, cleaned with the aid of file and chisel, is given a thin coat of copper in the (hot) alkaline bath. Pittings and hollows are then filled up with easily fusible alloy, the projecting portions of which are then trimmed off. The alloy adheres to the copper, and the whole is then coated finally in the acid copper bath, through which the electrolyte is circulated rapidly.—W. G. M.

Steel; Magnetic Properties of Hardened ——. H. Kamps. Stahl u. Eisen, 1901, **21**, 156; through Chem. Zeit. Rep. 1901, **25**, [7], 57.

The work of Curie is examined by the author. In order to determine the magnetic properties of hard steel for permanent magnets, a knowledge of the maximum intensity of the induced magnetism, the intensity of the residual magnetism, and the coercive force suffices. The methods employed in measuring are described. The influ of temperature and of the manner of hardening is tre of, from which it is shown that the steel should be dened at a temperature as little above the transform point as possible, and that, as far as may be, prolonga of the period of heating before hardening should be avoi The maximum values for the coercive force and for permanent magnetism are obtained with steels contai 1·1—1·2 per cent. C. Boron, silicon, and manga appear to exert no influence. Nickel, chromium, copper improve the magnetic properties; but for mag tungsten- and molydenum-steels are best.—W. G. M.

Copper; Effect of Small Amounts of Arsenic on ·. E. A. Lewis. Chem. News, 1901, **83**, [2145], 3.

The author gives the results of some experiments as t influence of small amounts of arsenic on the strengt copper. Six test samples were prepared by melting, in case, 8 lb. of copper and adding varying small amoun arsenic.

——	Arsenic added.	Arsenic found Copper.
	Per Cent.	Per Cent.
1	2	1·80
2	1½	1·37
3	1	0·94
4	¾	0·75
5	½	0·53
6	¼	0·24

Photomicrographs of the cast test-pieces were taker latter then rolled down to a thickness of ⅛ in., an sheets placed in cold water whilst still red hot, to them. The reheating of the metal before rolling practically no effect upon the arsenic present. The pieces all rolled well, particularly Nos. 2 and 3.

The following were the results of the tensile tests:—

——	Arsenic.	Break.	Limit of Elasticity.	Elon
	Per Cent.	Tons per Sq. In.	Tons per Sq. In.	Per
1	2	17·83	11·52	2
2	1½	18·83	10·09	2
3	1	18·02	9·01	2
4	¾	18·31	8·91	2
5	½	18·38	9·52	2
6	¼	16·92	10·25	2
Ordinary sheet copper.	..	13·40	7	2

It appears, therefore, that the presence of a small a of arsenic in copper intended for rolling is an adv except when the copper is to be used for electrical pu (See also A. Gibb, page 184.) There is no advan having more than 0·5 per cent. of arsenic present author concludes from the micrographical examinati arsenical copper consists of crystals of metallic surrounded by an eutectic, which is probably arse copper or a solution of arsenide of copper in copper.

Zinc-Lead Ores; Ellershausen Process for the Tr of ——. E. Villejean. J. de Pharm. Chim. 1 97—103.

This process has been devised primarily for the tr of poor zinc-lead ores (containing 20—30 per cent 15—20 per cent. of Pb, and 0·1 per cent. of Ag) little lead to be of value to the lead smelter, and much to allow of the accompanying zinc to be p extracted. It is conducted in two stages: first, th taneous extraction of zinc, lead, and silver by volat and secondly, the chemical separation of the l silver in the metallic state from the zinc in the sulphide. (1) The ore, in fragments the size of is mixed with carbon, limestone, and oxide of i smelted in a furnace with hot blast, under such c hat the lead and zinc, with nearly the whole of t re volatilised, the residual silver passing, together with ›pper and gold, into the matte. At the mouth of the furnace re fans, about 1·5 metres in diameter, with copper blades, evolving at about 500 revolutions a minute; these fans raw through them the fume-laden gases from the blast urnace. In passing, the gases are churned up with cold ·ater injected into the fans at high pressure. All the solid articles are thus caught by the water, which is then run › reservoirs, and, after cooling and settling, is re-injected ito the fans until a saturated solution of zinc sulphate is roduced. The greyish deposit collected in the reservoirs ›nsists chiefly of lead sulphite ($67\frac{1}{4}$), zinc sulphide ($16\frac{1}{4}$), ılphite ($6\frac{1}{2}$), and oxide ($2\frac{3}{4}$), with lime ($2\frac{1}{3}$), and oxides ; iron (1), antimony ($\frac{3}{4}$), and arsenic ($\frac{1}{2}$), and silver 220 grms. per ton)—the numbers in brackets giving ıe results of analysis of one sample, by way of example. he deposit is collected by means of a filter-press, ıd freed from its 35 per cent. of water with the aid waste heat from the blast furnace; it is then, little little, introduced into crude caustic soda brought to ıllition in iron boilers, until no further reaction is served to take place, by which time the whole of the ad will have been reduced to the metallic state, and will ıve carried down with it all the silver present to the ›ttom of the bath. The zinc, as sulphide, forms a slag th the excess of free caustic-, and carbonate and sulphate soda present; this slag is utilised to precipitate the ıuors from the reservoirs when saturated with zinc sulate, the resulting precipitate of zinc sulphide, hydroxide, d carbonate being separated and treated by roasting for e production of oxide, and the residual sodium sulphate ing recovered and reconverted by the Leblanc process o crude caustic soda. The following equations are conlered to express in a general way the reactions in the iling soda:—

$$7PbS + 4Na_2Co_3 =$$
$$Na_2SO_4 + 3(Na_2S.PbS) + 4Co_2 + 4Pb.$$

$$7PbS + 8NaOH =$$
$$Na_2SO_4 + 3(Na_2S.PbS) + 4H_2O + 4Pb.$$

$$PbS + 2PbO = Pb_3 + SO_2.$$

$$2PbS + Na_2SO_4 = Na_2S + 2SO_2 + 2Pb.$$

—W. G. M.

inc; Extraction of ——. L. Belloc. Elettricità, Milan, 1900, **19**, 593. Science Abstracts, 1901, **4**, [1], 74.

ıE author gives a description of a patent taken out by ınova and Bertani for the production of zinc white, and ›o of three patents, two by Canova and Bertani and one Casaretti and Bertani, for the production of zinc in the ·ctric furnace. The last-mentioned process is being worked the Società Elettro-metallurgica Lombarda, and it is ıimed that 1 kilo. of zinc is produced per 2 h.-p. hours, e coal consumed in the furnace being 15 kilos. per 100 los. of ore.—A. S.

Bismuth Sulphide; Action of Hydrogen on ——. H. Pélabon. Comptes Rend. **132**, [2], 78—80.

ısMUTHOUS sulphide (see I. below), or mixtures of the lphide with the metal (see II. below), were sealed up th hydrogen, and heated to a temperature (610° C.) ›ove the melting point of either solid. Bismuth was nilarly heated with hydrogen sulphide (see III. below). ı every case, a state of equilibrium was reached after a ·ry few minutes. The tubes were suddenly cooled, and om the analysis of the contents, the ratios of the mass of ·drogen sulphide to that of the total gas (r), and of the ass of bismuth sulphide to that of the sulphide and metal gether (R), were determined. The author's figures are ven in the accompanying table.

If these figures be plotted, they appear to lie on the same rve; and it is seen that as R increases from zero to the nit 1, r increases from zero, at first more rapidly, afterırds less rapidly than R, and tends to a limit at 0·893.

It the temperature be below the melting-point of the lphide, but above that of the metal, no definite result is ached when hydrogen sulphide acts on the metal, for the coating of sulphide formed stops the reaction; but when hydrogen acts on the sulphide a limit is reached, and the value of r is found to be, as theory indicates, independent of the relative masses of metal and sulphide. At 440°, r had a value of 0·616; but at this low temperature, equilibrium was not reached till after about four days.

I.		II.		III.	
r.	*R.*	*r.*	*R.*	*r.*	*R.*
0·840	0·514	0·515	0·143	0·080	0·012
0·893	0·898	0·672	0·283	0·168	0·025
0·898	0·940	0·785	0·429	0·262	0·039
0·890	0·976	0·841	0·595	..	..
0·891	0·988	0·878	0·782	..	..
0·895	0·992	..	..	..	..

—J. T. D.

Metals and Other Substances; Transparency of ——, *to Radium Rays.* T. Mizuno.

See under XXIV., *page* 291.

Gold Sodium-Chloride; The Assay of ——. Messrs. Johnson and Sons.

See page 210.

Copper in Pyrites; Determination of ——, *by Precipitation with Aluminium and Subsequent Electrolysis.* O. N. Heidenreich.

See under XXIII., *page* 283.

Copper; Analysis of Commercial ——. P. Truchot.

See under XXIII., *page* 283.

Copper; Electrolytic Estimation of ——. O. Reinke. Woch. für Brau. 1901, **24**, [2], 14.

See under XXIII., *page* 283.

Zinc Blendes; Determination of Fluorine in ——. F. Bullnheimer.

See under XXIII., *page* 282.

Lead in Galena; Determination of ——. Willenz.

See under XXIII., *page* 284.

PATENTS.

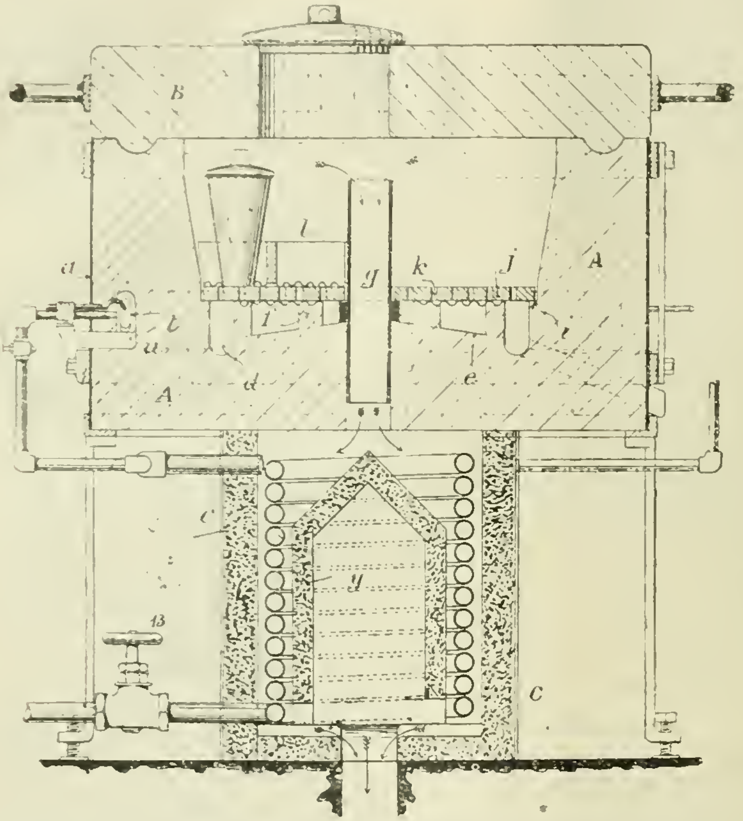
Blast-Furnace for Smelting Dusty and Fine Granular Iron Ore. C. Goedecke, jun., Bradford. From C. Goedecke, Minden, Germany. Eng. Pat. 8184, May 3, 1900.

A BLAST furnace for smelting dusty ore, &c., without a preliminary compression treatment, is claimed, in which the internal diameter increases, such increase commencing at or near the bottom of the furnace, or at or about the tuyères, and continuing towards the top to a distance convenient therefrom, the object being to reduce the loss of material by the blast by the decrease in pressure of the same as it rises into and through the increased area of the furnace.—A. W.

Assay-Furnace. D. Laird, Forfar. Eng. Pat. 21,195, Nov. 23, 1900.

THE general arrangement, construction, and combination of parts comprising the improved furnace for assaying and cupellation purposes, is claimed for use with hot air under pressure and liquid fuel or gas, as shown by the accompanying illustration. The pot or cupel chamber A is constructed of refractory material encased in sheeting a, and has an inclined hearth e, with corrugated ribs f, radiating in horizontal curves, and with an annular trough d, connected with a shute to drain and carry away the slag. Through the centre of the hearth is a tube or funnel g, to which is attached a collar. A perforated plate j, supported by the collar and the annular ledge i, forms the bed for carrying the crucibles or cupels, a skeleton frame l, with spacing ribs, being provided to separate and support them in position.

Below the furnace is a chamber C, through which the hot gases pass when the lid B is in position and the furnace at full work. The gases are directed by the conical roof of the core *y* in the chamber, down an annular space occupied by a coil of piping, through which the air under pressure is supplied from a blowing engine, connected with the valve 13, to the combustion chambers *t*. These are arranged in passages leading to the space between the inclined hearth *e* and the plate *j*. The fuel is supplied through suitable valves, and, in the case of oil, drips into a pan *u* containing asbestos, which is then ignited. The air supply from the coil is turned on, and gradually gets hotter and intensifies the heat of combustion. The flame and gases are deflected inwards by the curved ribs *f*, giving a rotary motion to them, and at the same time freely circulate through the perforations of the plate up and around the crucibles.—A. W.



Ores containing Metallic Sulphides; Process of and Apparatus for Oxidising or Roasting ——, and for the production of Gases suitable for the Manufacture of Sulphuric Acid. A. W. Tangye, Northwich. Eng. Pat. 817, Jan. 13, 1900.

The finely divided ore is passed in at one end of a long horizontal revolving cylinder, suitably lined, and made to travel to the exit at the other end. Air, heated to a high temperature in a separate regenerative furnace or gas superheating apparatus, enters the cylinder at the ore exit end and passes through in the opposite direction, by which means the ore is warmed, heated, and gradually roasted to completion, the addition of external heat to the chamber or the use of high air pressure being unnecessary. The revolving furnace is lined differently and in different zones to prevent the formation of fluxings and scale, the ore receiving the full heat of the entering gases in its passage along the bottom of the chamber. If desired, the ore be made to fall through the hot gases by providing sui internal projections for carrying it to the top of the cyli In combination with the revolving cylinder is a dust cha and easily removable spout, with or without the ad of a vortex chamber, whereby the dust escaping wit effluent gases is brought back automatically to the cyli the spout being arranged so that the latter can be re cleared of any scale formed on its walls.

The effluent gas, if not suffici rich in sulphur compounds, is d off from the dust chamber by and re-circulated through the gas heating apparatus and reduced with the hot-air supply the cylinder.—A. W.

Stirrers, Rotary; for Ro Furnaces. W. P. Thom London. From L. T. W Keswick, U.S.A. Eng. Pat. Jan. 16, 1900.

The stirrer consists of a ve hollow, central column or sha radial arms with rabbles, and h an axial stationary water tube ing nearly to the bottom o column. There is also an int diate tube between them, forms annular spaces on both of itself. This tube is pro with horizontal pipes, which e down the centre and to the e each of the radial arms in level. The water passes dow central tube, upwards in the in annular space, between it an intermediate tube, to the pi the radial arms, through pipes to the outer end of the back again in the space be the pipes and the heated su to be cooled, into the outer a space in the central column upwards to the exit pipe.—A.

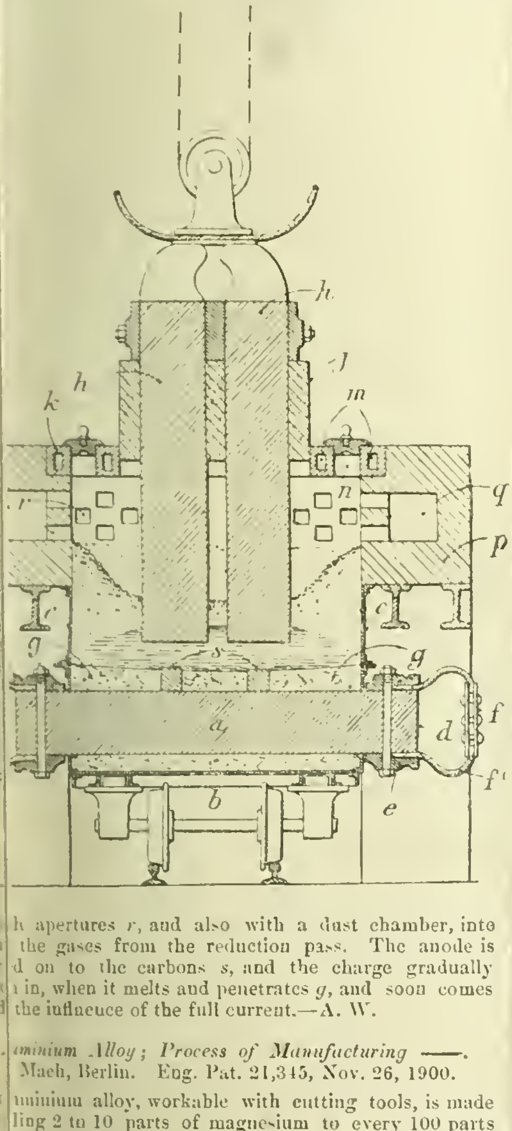
Steel and other Metals; O ment of Hardening or Tou ing Compounds for M with ——. R. C. Baker, Lo Eng. Pat. 1810, Jan. 29, 1

The process is for obtaining the boride or boron compo a metal, such as any of the borides of iron, capable of used as a hardening or toughening agent, simultan with the production of calcium carbide, by subje mixture of calcium borate (boracite), carbon, and c material containing the metal, or the metal itself, to sufficient to effect the reaction, carbonic oxide gas evolved.—A. W.

Manganese, Ferro-Manganese, and Alloys of Mang Apparatus for Production of ——. A. Simon, Bo Eng. Pat. 17,190, Sept. 27, 1900.

A lower oxide of manganese or of ferro-man dissolved in fused calcium fluoride, to which may be or not, other more fusible fluorides, is electroly treated, the object of the fusible fluorides being t the temperature of decomposition and minimise t by volatilisation. The treatment is in combinatio reduction by carbon, and is conducted in an electric f which is described and claimed.

The furnace consists essentially of a crucible or h mounted on a carriage *b*, and provided with raised The cathode is formed of horizontal carbons *d*, arra the base of the crucible and traversing the casing. carbons are connected with the main circuit *f* by connections *f*f^1, held on by plates *e*. A layer of pu coke or anthracite *g* is laid on the carbons, with primers *s* to start the current. The anode consists al carbons h, capable of vertical adjustment by levers, The upper part of them is enclosed in a casing of j, sliding in a horizontal frame k provided with ging openings n and channels m for water circulation ol the anode. A channel q is provided in the brick- p and communicates with the interior of the crucible



h apertures r, and also with a dust chamber, into the gases from the reduction pass. The anode is d on to the carbons s, and the charge gradually i in, when it melts and penetrates g, and soon comes the influence of the full current.—A. W.

minium Alloy; Process of Manufacturing ——. Mach, Berlin. Eng. Pat. 21,345, Nov. 26, 1900.

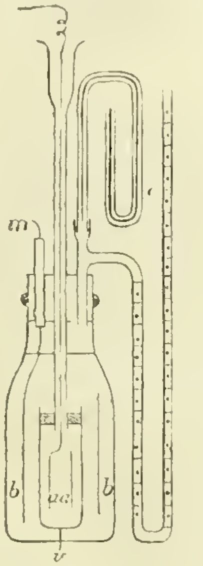
uminium alloy, workable with cutting tools, is made ling 2 to 10 parts of magnesium to every 100 parts lted aluminium according to a previous patent (this al, 1900, 353) and then suddenly chilling the alloy, cast, in running water, acid, or mercury.—A. W.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

re Manometer and its Applications in Electro-mistry.—A. Job. Zeits. für Elektrochem. 1901, 7,], 421—423.

onstruction of this instrument (compare this Journal, 69) is shown in the accompanying illustration. aa are the cylindrical electrodes, v is a porous cell, and c pillary tube. The author recommends that the cell be made as small as possible, keeping in view the maximum current that is to be used, and he also prefers a long capillary tube which may be bent as shown in the figure. It is possible to dispense with the upright bent tube and cotton wool filter of the Bredig and Hahn apparatus by placing a thin layer of petroleum on the surface of the caustic soda solution. The figure shows that the gas from one of the electrodes escapes into the air through a wide tube, whilst only the gas liberated at the other has to pass through the capillary tube and thus cause a pressure in the manometer.



This modification of the ampère manometer may be used for investigating the amount of electrolytic oxidation or reduction, as, for example, in Oettel's experiments on the electrolysis of chlorides. For such a purpose, two similar instruments are placed in series, one being charged with caustic soda solution and the other with the solution to be investigated. The first instrument shows at each instant the amount Q of oxygen (or hydrogen) liberated by the current per second, whilst the second instrument indicates the amount q which does not take part in the oxidation. The velocity of the reaction is therefore $Q-q$, and the current yield of oxidised substance $Q-q/Q$.—J. S.

Cathodic Depolarisation; Disturbance of ——, by Potassium Chromate. E. Müller. Zeits. für Elektrochem. 1901, 7, [27], 398—405.

The author suggested (Zeits. für Elektrochem. 5, 470) that the effect of adding small quantities of potassium chromate to certain solutions undergoing electrolysis might be due either to the formation of a film of hydrated chromic oxide on the cathode, or to the formation of an alloy of chromium with the metal acting as cathode. In the former case, the film would act as a diaphragm in the same way as the film of lime which is deposited during the electrolysis of calcium chloride solutions (this Journal, 1898, 666 and 769).

Further experiments have been made and these confirm the first hypothesis. At the same time, it is pointed out that, although the addition of chromate has a very marked effect on the processes occurring at the cathode, a catalytic action in the neighbourhood of the anode is not necessarily excluded. The author considers that electrolysis in the presence of chromate forms an ideal diaphragm process. —J. S.

Secondary Batteries; Resistance of ——, and the Distribution of the Resistance between both Electrodes. F. Dolezalek and R. Gahl. Zeits. für Elektrochem. 1901, 7, [30], 429—433, and [31], 437—441.

Independent of its low value, the resistance of a lead accumulator is always greater than that which corresponds with the conductivity of the acid between the plates. The authors describe an improved method for measuring the resistance of secondary batteries, and the precautions to be observed. The conclusion arrived at is that the increased resistance of the negative plate during discharge is practically negligible whilst that of the positive plate during discharge is entirely responsible for the increase. Of much greater practical importance, however, is the loss of potential due to the changes of concentration of the acid at the electrodes; and also, especially in the case of large negative plates, the resistance of the grids. Compared with these, the true resistance of the accumulator, composed of the resistance of the acid, together with the resistance between acid and plates, is of minor importance.—J. S.

Cuprous Oxide-Alkali-Zinc Batteries; Treatment of ——. [" *Cupron Batteries* "]. E. Jordis. Zeits. für Elektrochem. 1901, **7**, [34], 469—471.

In places where secondary batteries are not available for electro-chemical work on a small scale, the author recommends the use of the cuprous oxide-alkali-zinc batteries. Some improvements in the construction and treatment of this battery are described, which render it more suitable for electro-chemical work.—J. S.

Accumulators; Present and Future of ——. E. J. Wade. Electro-Chemist and Metallurgist, 1901, **1**, [1], 14—16.

The author points out that future improvements in accumulators will be of an electro-chemical and not of a mechanical nature. With respect to the zinc-alkali-copper oxide combination, the difficulty is in preventing the copper oxide from passing into solution whilst charging. With regard to the zinc-acid-lead peroxide cell, the difficulty is in maintaining an efficient deposit of zinc and in preventing it from passing back into solution by local action on open circuit.

In both these combinations the fundamental weaknesses that bar the road to success are electro-chemical in their origin, and, as in the lead accumulator, improvement will have to come through electro-chemical means.—J. S.

Hydrogen and Oxygen; Commercial Electrolytic Manufacture of ——. U. Schoop. Zeits. Elektrotechn. Wien, 1900, **18**, 411; Science Abstracts, 1900, **4**, [1], 76.

The author discusses the difficulties met with in the construction of a suitable apparatus for the technical electrolytic manufacture of hydrogen and oxygen, and gives a description of patents dealing with this subject. In the author's apparatus, which is constructed without a diaphragm, lead electrodes are used, with dilute sulphuric acid as electrolyte. It is claimed that 1·5 ch. m. of hydrogen and oxygen are produced per 11 h.p. hours (see also this Journal, 1900, 1120).—A. S.

Conductivities of some Double Salts, as Compared with the Conductivities of Mixtures of their Constituents. C. F. Lindsay. Amer. Chem. J. 1901, **25**, [1], 62—69.

In the course of work on the differences between the conductivity of a double salt and the sum of the conductivities of its constituents, some measurements indicated that the conductivity of a double salt was not exactly the same as the conductivity of a mixture of its constituents, having the same concentration as the double salt. To investigate this point, trials were made with three double salts, *viz.*, the double chloride of potassium and cadmium ($KCl, CdCl_2$), the double sulphate of potassium and nickel ($K_2SO_4, NiSO_4$), and the double sulphate of ammonium and magnesium $[(NH_4)_2SO_4 . MgSO_4]$. The double salts were prepared and solutions of the desired degree of concentration were made up and standardised, and solutions were similarly made up and standardised of each constituent salt, and the volumes of the latter solutions which would contain those salts in the proportion in which they occurred in the double salt were calculated. These volumes of the two solutions were mixed and diluted to a known volume. The concentration of the solutions was certainly known within 0·1 per cent. Some of the same water was used in preparing the solutions, while the same cell, thermostat, thermometer, Wheatstone bridge, and resistance box were used in the two sets of measurements, which were therefore made under as nearly as possible identical conditions. The results obtained, showed that the conductivity of a double salt in concentrated solutions is slightly less than the conductivity of a mixture of the constituents having the same concentration as the double salt. This conclusion was confirmed by determining the conductivity of a solution of the mixed salts, evaporating nearly to dryness, whereby some double salt was formed, and dissolving the residue and making up to the original volume. The conductivity was then found to be less than that of the solution before evaporation. It would seem that the double salt, when once formed, does not dissociate in exactly the same way or to the same extent as the mixture of the constituents which have never united to form the double salt.—J. A. B.

PATENTS.

Electric Conductors; Impts. relating to the Insulation
——. H. H. Lake, London. From N. Tesla, New Yo
U.S.A. Eng. Pat. 14,550, Aug. 14, 1900.

A method is described and claimed for insulating elec
conductors, which consists in imparting insulating propert
to a material surrounding or contiguous to the conduct
by the continued action thereon of a gaseous cooling ag
(atmospheric air, oxygen, carbon dioxide, ammonia, il
minating gas, or hydrogen). The inventor refers to
original observations of Faraday on the improved insulat
properties of water and aqueous solutions when rende
solid by freezing, and proposes to utilise this means.
inventor observes (1) that when the leakage of the elec
charge, ordinarily taking place, is rigorously prevented,
proves itself to be a much better insulator than has heretof
appeared; (2) that its insulating properties may be
further improved by the addition of other bodies to
water; and (3) that the dielectric strength of ice or ot
frozen aqueous substance increases with the reduction
temperature and corresponding increase of hardness;
(4) that these bodies afford a still more effective insulat
for conductors carrying intermittent or alternating curre
particularly of high rates, surprisingly thin layers of
being capable of withstanding electromotive forces of m
hundreds and even thousands of volts.—J. C. R.

Batteries [Alkaline-Copper, Cadmium]; Reversible G
vanic Cells or so-called Storage ——. T. A. Edis
New Jersey, U.S.A. Eng. Pat. 20,960, Nov. 20, 190

The type of battery used is one employing copper oxid
depolariser, in alkaline solution, the voltage of which
44 volts."

The claims are for a reversible galvanic cell, in wh
copper oxide is employed as a depolariser, being forme
the cell by the electrical oxidation of finely divided coppe
such a density as "to prevent the formation of a copper
soluble in alkaline solutions"; "making the finely divi
copper" by "reducing carbonate of copper by hydroge
then converting the metallic copper so produced by hea
the black oxide, and finally electrically reconverting the bl
oxide into metallic copper, which is then used in the
A reversible galvanic cell, characterised by the employm
of finely divided cadmium as the active element in
alkaline solution. The process of producing the fi
divided cadmium by electroplating from a cadmium p
on to a fine platinum wire, using a weak solution of sulp
of cadmium as the electrolyte. A reversible galvanic
characterised by the employment of nickel or nickel-coa
plates for carrying the elements and sheets of asbestos
other suitable material interposed between the elements
moistened with the alkaline solution so as to form a
battery of the reversible type. For electrolyte, a 10
cent. solution of pure sodium hydroxide is used. W
the battery is discharged, the copper oxide is reduced to
metallic state, whilst the metallic cadmium is oxidise
cadmous oxide (Cd_2O). Upon recharging, the oxid
cadmium is reduced to the metallic state, whilst the co
is oxidised to "copper oxide (Cu_2O)." In the char
and discharging, water is respectively decomposed
regenerated, leaving the liquid in exactly the same condi
and quantity after each discharge.—J. C. R.

Electrodes and other Carbonaceous Articles; Metho
Graphitising ——. P. M. Justice, London. From
International Acheson Graphite Company, Niagara F
U.S.A. Eng. Pat. 21,216, Nov. 23, 1900.

Use is made of an electric furnace. Amorphous carbon art
(electrodes, anodes, motor and generator brushes, ba
carbons, and the like) are subjected to the action of a
temperature, produced by a powerful electric current, w
the articles are embedded or surrounded by carbonac
materials. The electrodes or other articles to be graphit
are arranged with their longest dimensions at approxim
right angles to the flow of the electric current pa
through them. An example of a run of a furnac
supplied thus:—The current is started with a voltag
210, the ampères registering 1,400. A more or less

ease of ampères occurs, until after about five hours, n the amperage will register 3,600 with the voltage tered, after which the volts, by means of a regulator, gradually lowered as the ampères continue to increase, l at the end of the operation (which is ordinarily about nours), the instruments show a voltage of 80 and an èrage of 9,000. After a sufficient interval of time has sed to permit proper cooling of the furnace charge and les contained therein, the outer coverings are removed, the articles taken from the furnace, when they will be d to be converted, more or less completely, into soft hitic carbon.—J. C. R.

tric Accumulators; A Process for Chemically Consoli-ting the Active Material of ——. T. Müller, Berlin. g. Pat. 22,606, Dec. 11, 1900.

ocess is claimed for chemically consolidating the c material of electric accumulators, by using suitably ed plumbiferous combinations of anthracene as a nt or binding agent for the oxides, salts, or other onents of the said material.

e anthracene is dissolved in boiling acetic acid, to ice a concentrated solution. After cooling, an oxide lt of lead is added to the solution, in sufficient quantity turate it. The product is filtered, and the syrup-like compound diluted with alcohol or ether, added to the ound intended for the formation of the active mass, horoughly kneaded until a paste is produced for filling es or trellises in the usual way. It is said to dry ly.—J. C. R.

ine; Apparatus for the [Electrolytic] Production of —. M. Meslans, Paris. Eng. Pat. 21,557, Nov. 28, 00.

electrolysing apparatus, as described in the claims, is racterised by the use of a diaphragm or partition of (such as copper), separating the anode and cathode and arranged so as to allow of the passage of the it through the electrolyte, whilst effecting the separa- f the gases, the said partition being electrically con- l with the positive pole of the anode and rendered ically inactive from the commencement of the operation c formation on its surface of a layer of insulating le," such as copper fluoride. There are "one or more cells, having no insulating joints, and only exposing fluorine gas up to the time of its discharge from the atus, walls consisting entirely of metal (such as copper) led with diaphragm, and a cathode cell having insulat- oints or washers, of a material having an organic et as base (such as caoutchouc), each cell being pro- with a discharge pipe, the cells having an expelling ' There is "a circulation arrangement for cooling the or anodes, a tank for cooling the cathodes, and a erator." The electrolyte used is "a mixture of lrous hydrofluoric acid and a metallic fluoride."

—E. S.

and Nitro-Compounds; Reduction of ——. G. W. nson, London. From C. F. Boehringer und Soehne, ldhof, near Mannheim, Germany. Eng. Pat. 19,879, v. 6, 1900.

and nitro-compounds are reduced by mixing them tin and hydrochloric acid in such proportions that ous chloride is formed, and then subjecting this tion bath, in the cathode space of an electrolytic cell, action of an electric current of high density, whereby n is precipitated.—J. C. R.

(*B.*)—ELECTRO-METALLURGY.

ls in Cyanide Solutions; Electromotive Force of ——. B. Christy. Trans. Amer. Inst. of Mining Engineers, , (1—83).

author gives an outline of the development of the ra electro-chemical theory and describes the methods oyed in the study of the electro-chemical behaviour of us metals in cyanide solutions (see this Journal, 1899,

ong the conclusions arrived at are the following:— lifferences of electromotive force of metals in dilute cyanide solutions do not give much support to the so-called "selective affinity of dilute cyanide solutions for gold," the only common metal that shows any indication of such favourable action being copper.

It is probable that, in the absence of external electromotive forces, an aerated cyanide solution containing less than 0·00065 per cent. is without action on metallic gold. For all practical purposes an aerated cyanide solution of less than 0·001 per cent. is without action on metallic gold.

—J. S.

Lead from Solutions; Electrolytic Deposition of Metallic ——, *and Formation of Spongy Lead.* [*Electrolytic Lead Plating.*] L. Glaser. Zeits. für Elektrochem. 1900, **7**, [24], 365—369, and [26], 381—386.

The results obtained by the author show that metallic lead in the solid form can be deposited on the cathode from solutions of lead nitrate or lead acetate. The formation of spongy lead, like the formation of spongy zinc, is due to separation on the cathode of less soluble basic salts, which prevent uniform crystallisation from taking place. The addition of any substance which is capable of dissolving or reducing the basic salts or $Pb(OH)_2$ prevents the formation of spongy lead. Among the substances mentioned are a slight excess of acid, small quantities of ammonium persulphate, and the simultaneous evolution of hypochlorous acid in the electrolyte. Pyrogallol and hydroquinone act as reducing agents.

In alkaline solutions the formation of spongy lead takes place when hydrogen, either primary or secondary, is liberated along with the lead cathions which are present in very minute quantity (secondary formation of spongy lead). An addition of hydroxyl ions diminishes the number of the lead cathions, and it is also possible to obtain compact coherent lead from alkaline solutions.

The author was able to obtain a uniform deposit of lead, 1 mm. thick, on an iron tube 40 mm. diameter and 30 cm. long. The iron tube was in two halves connected up by flanges.

When a lead plate containing 5 per cent. of metallic silver was employed as anode in a solution of lead nitrate saturated with lead chloride, a compact deposit of lead, free from silver, was obtained on the cathode. The electrolyte may also be slightly acidified with hydrochloric acid. The presence of chlorides favours the deposition of solid lead, since traces of hypochlorous acid are produced at the anode.

Similarly, the separation of silver and lead may be effected in a lead acetate bath. In neither case is the acid of the lead salt destroyed, and since the E.M.F. required is very low (about 0·05—0·20 volt), it is possible that the electrolytic separation of lead and silver may become a technical process.—J. S.

Plates [Amalgamating]; Electro-silvered versus Plain Copper ——. E. Halse. Inst. Min. and Metall., Jan. 16, 1901.

The author relates his experience in substituting silver-plated for plain copper plates at one of the mills of the Columbian Mines Corporation, Ltd., and from the figures it appears that the former catch about 15 per cent. more of the gold than the latter, whilst the increase above the blankets is 16·72 per cent., the summarised figures in the latter case rising from 75·17 per cent. to 91·89 per cent., with an intermediate percentage of 84·39 in the case of the upper plates being silvered and the lower ones plain copper. Consequently there was so much less to be recovered by the blankets and the arrastra. The advantage of the silvered plates is further shown, in cases where the lower plates are copper, by the small proportion of the gold, from about one-half to 1 per cent., caught on the latter, the amount on the lower plates, with copper throughout, being over 4 per cent.

The amalgamated copper plates, even when coated with prepared silver amalgam, tarnished rapidly, and all the remedies tried, *viz.*, lime or cyanide in the boxes, nitric acid, iron bars, &c., failed except for a small temporary advantage. They tended in some cases to retard amalgamation after a time, and the use of cyanide further introduced the possible chemical loss of gold. All this including the tarnishing, was avoided by the substitution of electro-silvered plates, which furthermore consumed less mercury for amalgamation. The anticipation that the first bullion from them would show a lower fineness in gold was not realised, the actual experience being that there was an increased fineness. The silver also increased in the bullion, and the amount of the latter in the amalgam rose from about 46 to 52 per cent.

The plates work well with low grade ore and with tailings. They should be well amalgamated in the first instance as follows:—Carefully washed with a solution of wood ashes, or, preferably, a mixture of the latter and fine sand, the mercury rubbed in with a mixture of ammonium chloride and wood ashes, allowed to stand with this mixture for 12 hours, when the silver amalgam appears in patches, and the operation completed by rubbing in fresh mercury. For some months they require no attention, a little mercury being rubbed in after the daily clean up. Later on they require washing with a solution of ammonium chloride occasionally, until, as in the present instance, at the end of 15 months, they are washed daily. Certain oxidised low grade tailings were found to tarnish and harden them, but dilute sulphuric acid remedied the first fault and "sweating" with water at 200° F. overcame the second. Their original high cost is soon saved in economy of labour.—A. W.

Aluminium; Galvanic Deposits on ——. B. Setlik. Chem. Zeit. 1901, **25**, [5], 46.

To obviate the drawbacks attending the use of aluminium vessels, numerous attempts have been made to cover the metal with a layer of another metal. It is only with difficulty, however, that an adhesive deposit can be obtained, and it frequently will not stand polishing, or peels off in places when the electro-deposit attains a certain thickness. This appears to be due to the porous character of the metal into which water, acids, and other chemical reagents penetrate, and remain, in spite of careful cleansing, subsequently producing bubbles and peeling on the surface. The small quantities of nitrogen, carbon, and sodium, particularly the combined presence of the last two, have a prejudicial influence.

Well-rolled aluminium plate can be galvanised better than cast pieces. In most of the methods proposed, the aluminium is first coated with a layer of copper, but when this is covered with a layer of another metal, both deposits frequently peel off during the polishing. A preliminary treatment of the aluminium with solutions of mercuric salts or with silver amalgam is recommended by many, but neither has any special advantage according to the author.

The main point to be observed is the thorough cleansing of the metal with suitable reagents. The best method is said to be to first remove all grease by means of a 10 per cent. solution of sodium hydroxide and to wash the article thoroughly with hot water. It is then immersed for a few seconds in dilute hydrofluoric or hydrochloric acid, again thoroughly washed, and transferred to the galvanising bath. Before the immersion in hydrochloric acid, it may be treated with a mixture of 2 parts of sulphuric acid (66° B.) and 1 part of nitric acid (36° B). Göttig (Elektrotechn. Zeits. 1891, **15**, 88) has recommended the coating of the aluminium with copper by rubbing it with a mixture of copper sulphate and metallic zinc in the form of powder; but of all the known methods he considers the best to be the treatment with a solution of copper chloride in alcohol (1 : 10). Fairly good results can also be obtained by rubbing the aluminium with a 5 per cent. solution of copper sulphate.

For the galvanic bath the formula proposed by Lanseigne and Le Blanc has proved satisfactory, *viz.*: Copper cyanide, 300 grms.; potassium cyanide, 450 grms.; and sodium phosphate, 450 grms., in 5 litres of water. The most suitable strength of current is 1·7—2·0 volts.

According to the same authorities, the aluminium may be directly coated with silver by means of a bath consisting of silver nitrate, 20 grms.; potassium cyanide, 40 grms.; and sodium phosphate, 40 grms., in 1 litre of water. A nickel bath consisting of nickel chloride, 70 grms., and nickel phosphate, 70 grms., in 1 litre, gives a dark coating. It is advisable to have a preliminary layer of copper.

Weil and Levy (German Pat. 100,889) have described method of simply immersing (or galvanising) the aluminiu in an ammoniacal solution of nickel or cobalt salts. In th author's hands this has not proved satisfactory. T method of silvering aluminium protected by Nauhar (German Pat. 100,786) resembles that of Lanseign Mannesmann's aluminium tubes are covered with a lay of copper before galvanising, either by a fusion process by deposition. The aluminium is coated with zinc by in mersion in a boiling solution of zinc nitrate. It is th treated with a second bath consisting of a solution ferrous or cuprous chloride in water (1 : 6) at 50° C., a finally coated with copper in a boiling solution of dil copper sulphate, to which calcium chloride is added to t extent of 2 per cent.

The author asserts that aluminium purified as describ above can be readily coated with copper by boiling it with slightly acid solution of copper lactate. The deposit white and adheres well, but care must be taken not oxidise the copper by continuing the boiling too lo Copper lactate is readily obtained by decomposing calciu lactate with copper sulphate, decanting the solution from calcium sulphate, and evaporating it to 36° B. After bei coated with copper in this solution, the aluminium artic receive a further electrolytic deposit of copper.—C. A. M

PATENTS.

Electrodes; Electrolytic and like ——, and Electrical sistances. H. A. Kent, London. Eng. Pat. 2409, Feb 1900.

Glass or porcelain plates, rods, and the like for electro are rendered conductive by means of a surface of platin —J. C. R

Nickel or its Allied Metals, or Alloys of these Meta Electrolytic Deposition of ——. M. Kugel, Ber Eng. Pat. 2994, Feb. 14, 1900.

A process for the electrolytic production of tough, roll nickel and its allied metals characterised by the electrol the temperature of which is above 30° C., being maintai acid by the addition of a strong mineral acid which is chemically changed by the current (perchloric, perbro sulphuric). The addition of a highly concentrated solut of a salt of a light metal, *e.g.*, magnesium, which salt is changed by the current, in order to facilitate the maint ance of an even acidity without the addition of fresh a The addition of nitric acid, halogen acids, and all *orga* acids is said to be unsuitable.—J. C. R.

Thermo-electric Batteries. W. J. Crawford and T. Turley, Memphis, Tennessee, U.S.A. Eng. Pat. 18, Oct. 23, 1900.

A thermo-electric battery of annular or ring forr described, one of the elements claimed consisting of alloy of 2 parts by weight of antimony, 1 part by we of zinc, and "2 per cent. of aluminium." Details soldering or joining up the couples, assembling them, working, are described. With a ring composed of couples, and $5\frac{1}{4}$ ins. in diameter and $\frac{1}{2}$ in. in thickne current of 2 amps. at 1·8 volts may be obtained wit using artificial cooling means to cool the outer ends, with a simple small vapour burner for heating the ends.—J. C. R.

Fibrous Material with Metal; Coating ——. R. James, London. From J. H. Robertson and J. B. C bell, of Brooklyn, New York, and D. R. Case, of Br Rhode Island, U.S.A. Eng. Pat. 19,863, Nov. 5, 19

The process consists in treating a body or base of fil material, either in the form of a single thread or of a w knitted, or knotted fabric, which may bear any configur or ornamentation, with metallic salts (preferably by sa tion), then reducing the salts to a metallic state, depositing a surface coating of metal thereon by electro —J. C.

XII.—FATS, OILS, AND SOAP.

nd Tallow of Stillingia Sebifera. M. Tortelli and Ruggeri. L'Orosi. **23**, 289—297. Chem. Centr. 1900, [26], 1295.

eeds of *Stillingia sebifera* (*Croton sebiferum*) con-1·2 per cent. of fat, of which 22·0 per cent. occurs low in the capsules, and 19·2 per cent. as oil in the ls. In the following table are given the constants ained by the authors for stillingia oil obtained by pressing and by extraction with ether. Specific y of the oil, 0·9432 at 15° C., 0·9370 at 27° C., 7 at 100° C.

on ification number (mgrms. KOH)	210·4
d value (calculated to oleic acid)	6·15
bl's (Relative) iodine number	160·6
sol te rise of temperature (Maumené)	136·5°
ative rise of temperature, compared with water	267°
ubility of the oil in absolute alcohol	48·9 per 1,000
ractive index (Zeiss-Wollny) (t = 35° C.)	75°
at ry power (200 mm. tube, t = 16° C.)	−18·6°
d fication point of insoluble fatty acids	12·2° C.
ting point of insoluble fatty acids	14·5° C.
ine number of insoluble fatty acids	161·9
ine number (absolute) of liquid fatty acid	178·1
onification number of insoluble fatty acids	214·2
ecular weight of insoluble fatty acids	274·1
value of acetylated fatty acids	195·6
onification number of acetylated fatty acids	224·3
yl value of fatty acids	28·7
ner value	94·4
hert value (for 5 grms.)	0·93
aponifiable matter	1·45 per cent.
rption of oxygen	12·20 per cent.

rrying out the Maumené test, Jean's thermelæometer d. The oil was diluted with twice its volume of a ss mineral oil, and a maximum value of 65·5 l; that is, an absolute rise of temperature of − 20) = 136·5°. For the determination of the alues, see this Journal, 1900, 1643. The drying of the oil was ascertained by Livache's method. does not appear to give any of the characteristic eactions.

esults of these experiments show that stillingia oil hes linseed oil in character, but is distinguished e latter by its strong specific action on polarised A. S.

Wood Oil [Tung Oil]: Attempts to Deodorise F. Ulzer. Chem. Rev. Fett- u. Harz Ind. 1901, , 7—8.

of this oil for varnishes has not been general in on account of its unpleasant odour. The author e several experiments with the object of removing

ment with Alcohol.—The oil was repeatedly shaken te alcohol (20 and 40 per cent.) with the object of extracting the malodorous constituent, the oily arated, and the alcohol expelled by heating for a e in a current of carbon dioxide. This treatment sed a slight diminution in the unpleasant odour.

ment with Sodium Bisulphite.—The oil was boiled ours under a reflux condenser with twice its volume hite solution (10° B.), and then washed with distilled The odour had not perceptibly decreased.

nent with Animal Charcoal and with Magnesium —These also failed to give satisfactory results.

nent with Superheated Steam.—In the first experi- am at 130° C. was blown through the oil for eight This caused a considerable decrease in the odour, oil partially solidified when completely cold. By of steam at 165° C. there was a notable decrease lour after five hours, and it was quite different odour of the original oil, recalling rather that of il. After standing for 12 hours, however, this deodorised oil gave a crystalline deposit, and again acquired the characteristic odour of the original oil, though this was less pronounced than at first. This restoration of the odour did not occur so rapidly when air was excluded, from which fact the author considers it probable that the malodorous substance is produced by atmospheric oxidation.

Sesamé Oil; Detection of ——. New Reaction. Tambon.
See under XXIII., *page* 285.

Cotton-Seed Oil; Halphen's Reaction for ——.
E. Wrampelmeyer.
See under XXIII., *page* 285.

Beeswax; Analysis of ——. G. Buchner.
See under XXIII., *page* 286.

PATENTS.

Gelatin and Oil; Apparatus for Extracting ——. R. Haddan, London. From E. R. Edson, Cleveland, Ohio, U.S.A. Eng. Pat. 21,469, Nov. 27, 1900.

The fish or other material is introduced into a receptacle with a conical top and bottom, where it is treated with the required quantity of (hot) water. This receptacle is heated by means of an annular chamber containing hot water, which is brought to the boiling point by means of a coil. Within the receptacle there is a central core, the object of which is to prevent the material from caking. The scum, rising to the surface of the liquid, flows over the edge of the receptacle on to the water in the heating chamber. Here the heavier portion subsides, whilst the lighter flows into a trough, whence it is conducted away by pipes. The oil next rises, together with more scum, the latter of which is removed as before. The oil is then also conducted on to the water in the heating chamber, the last portions being driven over by means of air introduced by a pipe which passes through the central core and opens with projecting arms at the bottom of the vessel, below the core. The residual aqueous solution in the receptacle is suitable for the production of various grades of gelatin, and can be removed as required by means of a siphon tube at the top or outlet at the bottom. Various modifications and combinations of the different parts of this apparatus, with their respective valves, &c. are claimed.—C. A. M.

Fatty Substances; Process for Saponifying ——, and Converting Oleic Acid into Solid Fatty Acids. P. Magnier, P. A. Brangier, and C. Tissier, Billancourt, France. Eng. Pat. 3363, Feb. 20, 1900.

The fatty substances are treated with sulphuric acid, and the resulting products mixed with water and subjected to the simultaneous action of an electric current, pressure, and heat. The fat must be in a liquid condition, and when solids like tallow are used, they should first be dissolved in oleic acid or an oil. The amount of sulphuric acid required may be reduced to about 6 per cent. by heating the fats to about 80° C., and adding the acid gradually at the same time. From five to six times the weight of water is added to the product and the mixture heated in an autoclave at a temperature sufficient to raise the pressure to 3, 4, or 5 kilos. per sq. cm., after which the electric current is passed through so as to decompose the water. At the end of the process the fatty acids float on the surface, whilst the glycerin and sulphuric acid remain in the lower liquid.
—C. A. M.

Fats or Fatty Acids; Process of Manufacturing Oxidising Agents from ——, for Converting Hydrocarbons into Fats or Fatty Acids. S. von Graeve, Düsseldorf, Prussia, and A. Reinecken, Düsseldorf. Eng. Pat. 3716, Feb. 26, 1900.

The process claimed consists of conducting nitric acid into heated animal or vegetable fats so as to oxidise them. The volatile acids (caproic, caprylic, &c.) are allowed to escape, and the residual fatty acids, which are in a higher state of oxidation, are mixed with the hydrocarbon and continually stirred, whilst alkalis or alkaline earths are introduced at a temperature of 60°—100° C.—C. A. M.

Saponaceous Products; Manufacture of ——, from Petroleum or other Mineral Oils. S. Dyson, Elland, Yorkshire, and J. Gaskell, London. Eng. Pat. 23,539, Nov. 25, 1899.

A FATTY acid or a glyceride of a fatty acid, such as oleic or stearic acid, olein or stearin, is mixed with a mineral oil and saponified at a temperature of from 110° to 150° F., whilst continually stirred. Separate claims are made for the different proportions of the constituent fatty acids or glycerides, as also for the different uses of the saponified product, *viz.*: soft and hard soap, petroleum jelly, and emulsion, sheep wash (in conjunction with carbolic acid solution), insecticide, and lubricant.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

Uranium Red. V. Kohlschütter. Annalen. **314**, [3], 311—338.

THE following method was used for the preparation of uranium red:—140 c.c. of a solution containing 11 grms. of caustic potash in 1,000 c.c. of water were added, with shaking, to 100 c.c. of a solution of 50 grms. of uranyl nitrate in 1,000 c.c. of water. The reaction was performed in a filter flask, the side tube of which was loosely closed in order to create a slight pressure. When the alkali had all been added, the liquid above the yellowish green precipitate still contained uranium and was distinctly acid. A rapid current of sulphuretted hydrogen was then led through until the orange-yellow precipitate had partially settled. In order to avoid the separation of sulphur, air was at once aspirated through the liquid until the water from the pump no longer blackened lead paper. The precipitate was transferred to a flat hardened filter, and there freed from liquid as far as possible. The moist cake was then stirred up with water and warmed on the water-bath for 30 minutes with a solution of potassium carbonate. The liquid above the blood-red deposit was drawn off, replaced by water, the deposit filtered on a hardened filter, washed with slightly alkaline water, and dried on a porous plate over caustic potash. The dried substance was a brittle glassy mass, which frequently splintered when touched with a sharp object, and at once fell to fine splinters when moistened with water or alcohol. This powder was washed with alcohol, carbon bisulphide, alcohol, and finally ether, in order to remove admixed sulphur. When ground, a bright carmine-red powder was produced.

Uranium red dissolves in acids with evolution of sulphuretted hydrogen and deposition of sulphur; in the solution the uranium is present solely in the form of trioxide. On heating, water is evolved; no sulphuretted hydrogen is produced, but later sulphur sublimes. The atoms of uranium, sulphur, and potassium are contained in the ratio 5:2:5. If carbon dioxide be led through a suspension in water of the still moist uranium red, the yellow intermediate product is regenerated. Sulphuretted hydrogen and prolonged washing with water effect the same change. The yellow substance dries to hard brick-red lumps with a moss-green shimmer; it contains U:S:K = 5:2:4. When uranium red is decomposed by acids, half the sulphur is evolved as sulphuretted hydrogen, the other half is deposited as sulphur; no oxysulphur acids are formed. The following formula is assigned to the red compound:—$5UO_3.2K_2O.HS_2K.5H_2O$; the yellow compound, from which the red is produced by a process analogous to salt formation, is $5UO_3.2K_2O.H_2S_2$.aq.

The ammonium and sodium red compounds were obtained in a similar manner to the potassium compound; the former loses ammonia on exposure to air. The barium compound is more stable. It may be obtained by adding baryta water to the uranyl nitrate solution until precipitation commences, filtering off the slight precipitate and passing sulphuretted hydrogen through the filtrate. The red cipitate is filtered, washed by decantation, and t further in a similar manner to the yellow potassium pound. Excess of sulphur is removed by warming caustic potash, the colour is thus spoiled, but the carmine shade is reproduced by treatment with ca acid. The barium compound is stable towards ca acid, sulphuretted hydrogen and water; it is thus su for use as a pigment. The almost black, hard obtained on drying, fall to a powder of crystalline appe when moistened with water. The formula of the pound, after drying at 100° C., is $5UO_3.2BaO.H_2S_2$. it is thus similar in composition to the yellow pota compound.—A. C. W.

Molybdenum Blue. P. Klason. Ber. 1901, **34**, [
158—160.

THERE are several blue oxides of molybdenum know by the auto-oxidation of a dilute solution of amm molybdenyl chloride, the author has obtained two one soluble and the other insoluble in water. The these colouring matters, which is formed when the chloride is exposed, in presence of a large quant water, to the action of the air for a short time, forms deep blue aqueous solution, but is absolutely insol ammonium chloride solution; when dried over phos pentoxide it has the composition $Mo_2O_5 + 18MoO_3 + 2$ The insoluble compound forms, together with a quantity of molybdic acid, the sole product obtai exposing a solution of 150 grms. of ammonium moly chloride in about 2·5 litres of water to the action of for a whole summer; when dried over phosphorus oxide, it has the composition $Mo_2O_5 + 24MoO_3 + 24$
—T. I

(*B.*)—RESINS, VARNISHES.

Exudation Resins, VII. M. Bamberger and E. Vi
Monatsh. für Chem. **21**, [9], 1900, 949—956

PINORESINOL (Monatsh. für Chem. **15**, 505 and 1 this Journal, 1895, 45, and 1897, 1024) obtained fr excrescent resin of the black fir or pine, was dry dist the same way as lariciresinol (Monatsh. für Chem. 2 this Journal, 1901, 50), 323 grms. giving about 15 of a crude distillate consisting of an oily and an portion. The latter showed the reactions of an a reducing ammoniacal silver and colouring Magenta- ous acid dark-bluish violet. On saturation with po bicarbonate, oily drops separated, smelling of meth When the aqueous distillate is distilled *in vacuo*, a is left, probably a polymeric modification of the al but this was not further investigated. The gase ducts of the pinoresinol distillation smell of coal- contain about 9 per cent. of carbonic acid, whils other constituents, 0·5 per cent. is absorbed by chloride, and about 0·6 per cent. by bromine wat oily portion was re-rectified *in vacuo* (18 mm.) a the following fractions:—A. 0°—45° C., small qu an aqueous distillate. B. 45°—135° C., about C. 135°—160° C., 18 grms. D. 160°—200° C., E. 200°—300° C., 45 grms., the residue left in weighing 20 grms. The fraction B. contains some of guaiacol and creosol, the former being identifi boiling point (208° C.), benzoyl derivative (m. pt and picrate (m. pt. 86° C.), and the latter by it point (218°—222° C.), picrate (m. pt. 96° C.), and mination of the methoxyl present. C contains e isoeugenol. The fractions D and E were again under ordinary pressure and collected at 270 – 285°—310° C., and at 310°—340° C. The first yellow, somewhat viscous liquids, which in alcol tion, turn ferric chloride green, whilst the third is by ferric chloride, but becomes darker on expos On ultimate analysis these distillates give numb sponding to the formula of pinoresinol, $C_{19}H_{20}O_6$, cular weight determinations of the three fracti that they are not polymers of this substance. Th possibly contain the methyl ester of propylpyro their constitution still remains to be determined.
—A

PATENTS.

Copal and Amber; Substitute for ——. E. and M. haal, Feuerbach, near Stuttgart. Eng. Pat. 4615, arch, 10, 1900.

inventors state that when common rosin (colophony) eated with oxygen at a temperature below its melting t, the melting point of the material gradually rises, t finally acquires the property characteristic of copal amber of not being wholly soluble in turpentine or a oil until it has been melted. In this state it may be as a substitute for the more expensive resins. The or one of its metallic compounds, or a mixture thereof glycerin, glucose, &c., such as is used in the arts, ely powdered, and heated in a current of ozonised en, alone or diluted with indifferent gases, at a steadily temperature, always below the melting point, until nelting point remains constant. The product is then to be used instead of copal, or it may be again ered and again submitted to the action of the gas, or be combined with a metallic base or converted into er as may be desired.—F. H. L.

Varnish; Manufacture of ——. H. H. Lake, don. From R. A. Worstall and C. F. Hackathorn, veland, U.S.A. Eng. Pat. 20,725, Nov. 16, 1900.

INDRICAL pot still, set in brickwork over a furnace er, is connected at its top with a condensing worm, bears a valve at the exit of the pipe. From the of the still projects a draw-off pipe, bent into the of an inverted siphon, and closed by means of a This pipe, and also the stem of the valve, pass the brick setting; but the siphon and the valve protected with asbestos, are inside the furnace. The ff pipe opens over a pan which is carried on a y, and stands, when in use, over a fire. The pan is l with the proper quantity of linseed oil and is heated t 220° C.; the resin is placed in the still, and heated becomes sufficiently fluid to run out. The valve is pened, the melted resin falls into the hot oil, and the e is well stirred together. During the process, vapours se in the worm, are drawn off, separated from the s portion, and the spirit is employed to dilute the l varnish. By this method of operating, both under- er-heating of the resin are avoided, and the volatile which usually escapes uncondensed, replaces its ent volume of turpentine.—F. H. L.

(C.)—INDIA-RUBBER, &c.

PATENTS.

, *Flexible Material which cannot readily be ctured; Manufacture of Sheets of* ——. L. F. rnier. From V. E. Belledin. Eng. Pat. 15,443, 30, 1900.

See under XIV., *page* 266.

Percha; Substitute for ——. A. J. Boult, London. P. A. Ralli, H. Mayer, and L. Toch, New York. Pat. 23,603, Dec. 24, 1900.

UNE is made of from 1 to 2 parts of dry powdered th from 3 to 2 parts of rosin oil, to which 2 per cent. l acetate are added to increase the binding power. 5 per cent. of rubber may also be introduced for purposes.—F. H. L.

I.—TANNING, LEATHER, GLUE, SIZE.

kins; Treatment of Pickled, India ——. Leather Manufacturer. Dec. 1900, **11**, 249—252.

skins, which have been pickled with a mixture of alt, and sulphuric acid are treated with a "drench" ed of whitening, soda-ash, salt, and water, in order ralise the sulphuric acid that has been left in the skins, after which they may be bated with a manure bate if desired.

In tanning these skins by the chrome process, 6 lb. of chromic acid, together with 5—8 lb. of salt are used for every 100 lb. of pelt weighed wet from the drench; if desired, potassium bichromate may be substituted for the chromic acid, in which case 6 lb. of potassium bichromate, 3 lb. of hydrochloric acid, and 5—8 lb. of salt are suitable amounts to use; the skins are immersed in either of the above solutions until they are struck through a yellow colour in the thickest portions of the skins, when they are "horsed up" over night; they are then struck out on the putting-out machine, when they are ready for the reducing bath. After striking out it is to be recommended to dip the skins in a solution of sodium thiosulphate and hydrochloric acid; the solution being of sufficient strength to change the yellow colour of the skins to a slightly darker hue. When the skins have been dipped, they are placed on a hurdle and allowed to remain for several hours before completing the reduction. The amount of sodium thiosulphate and acid required to complete the reduction depends upon the weight of the skins, the amount of water the vessel in which the reduction is to be performed will contain, also as to how dry the skins have been struck out after chroming; it will generally be found that the amount of sodium thiosulphate required will be about $2\frac{1}{2}$ times the amount of the potassium bichromate employed in the first bath together with the addition of about twice that amount of acid.

The goods are drummed or paddled in the reducing bath until they have assumed a greenish colour throughout; it is a good plan to leave the goods in the reducing bath overnight when they may be well washed in an alkaline solution in order to neutralise any free acid remaining in the leather; the goods are now well struck out and fat-liquored in the usual manner, after which they are ready to be coloured.

A patent process of colouring specially recommended is carried out by dissolving in 30 galls. of water in the tray, 10 lb. of potassium permanganate for each 100 lb. of leather; the skins, after pleating are passed through this solution, afterwards being dyed in a logwood infusion and blacked by dipping in a solution of iron, which is usually made from copperas or "nitrate of iron," the goods being then thrown over a "horse" where they are left some little time in order to allow the black to set, when they are rinsed in water, struck out either by machine or hand, lightly oiled, and finished in the usual manner.—M. C. L.

Bateing Process; Impts. in ——. Leather Trades Rev. **34**, [773], 21. (See also this Journal, 1899, 990.)

J. T. WOOD and Messrs. Popp and Becker, having carried out a long series of investigations in connection with the bateing and puering process, have now put upon the market a substitute for the dung bates, under the name of "Erodin." This substance is now being used both in this country and in Germany with perfectly satisfactory results. Moreover, it works out slightly cheaper than the old dung method. Its composition is uniform, and consists only of the working bodies contained in dung. On the other hand, dung varies greatly in composition, and contains much undesirable matter, besides being prejudicial to health and comfort. Erodin contains no putrefactive organisms, such as are found in dung. Skins may therefore be left in the bate for a longer period without risk of "run" grain. This is especially valuable in hot weather. Skins are not discoloured, as they frequently are with dung. In pickling goods for export, this is a great advantage.

The drenches are also free from all filth, and are not so liable to "turn." In the use of erodin no radical alteration is necessary in the present method of working.

For 100 lb. of wet skin, washed ready for bateing, 1 lb. of erodin is required. The strength of the bate must not fall below $\frac{1}{2}$ oz. per gall. In using erodin, a large cask or tub is cleaned and steamed out, and placed near the bateing paddle, the requisite quantity of erodin is weighed out and put into the tub with 50 times its weight of water, and the whole by means of a steam pipe brought to a temperature of 104° F., then thoroughly stirred, and the pure culture of *bacillus erodiens* added to the mixture, which must not be allowed to fall below 87° F. A little steam must be added night and morning, and at the end of the third day the liquid is ready for use, in exactly the same manner as a preparation of dung. It must be diluted with water until of the required strength, and put into the puer wheel.

—J. G. P.

Leather; Currying of Bark-tanned and Mill Lace ——. Leather Trades Rev. **34**, (773), 19.

For the manufacture of laces for fastening belts together, East India kips are largely used. A pack of, say, 25 tanned kips are soaked back, and laid in pile to mellow down, and when sufficiently mellowed are sleeked on the flesh with a sharp sleeker to cleanse them from the loose flesh, and to stretch. They are then cut to the required size, according to the length of lace which the butt will make. These butts are now shaved to even substance, then scoured well both on flesh and grain. They should then be treated with sumac in a drum and afterwards sleeked out and hung up to sam for a few hours. They are then ready for stuffing, which is generally done by hand.

To prepare them for the stuffing, they are laid on a large table, sleeked out with a stone sleeker tightly on the grain, and rubbed over on the grain side with a thin coat of light sod oil, then turned over and sleeked on the flesh side, and stuffed with dubbin, and afterwards hung up until quite dry. After this, a series of re-greasing processes takes place, in which the butts may be put in a shallow vat, after having rubbed them on both flesh and grain with a coating of light sod oil. This may be repeated at the end of about three weeks, after which the goods are allowed to lie for a second period of three or four weeks. They are then taken out, redried, and the excess of grease sleeked off, after which they may be cut into laces.—J. G. P.

Leathers; Bookbinders' ——. Hide and Leather, Jan. 1900, from Current Literature, Dec. 1900.

Vellum proper, manufactured from calf, sheep, or lambskins, makes an elegant white binding, but has the objection that it is easily soiled by use and dust, it also curls up and warps in a warm climate or in a heated library.

Sheepskin makes too soft a leather to give satisfaction as a binding and under the influence of gas fumes, it crumbles and eventually turns to powder; in the form of half roan or buck, coloured sheep bindings present a handsome appearance on the book shelf, and if books are not in frequent use, one is sometimes justified in adopting this form of binding, it being far less expensive than morocco. Pigskin, though extremely hard and durable, is found to warp badly.

Calf leather, as a binding, has always been a great favourite, though it is the most unserviceable of all kinds of leather. On account of its brittleness, books bound in this material are always breaking at the hinges, whilst on the exceedingly smooth surface of the leather, every scratch is instantly observable. Out of every 100 calf-bound volumes in any well-used library, there will not remain 10 which have not had to be rebound or repaired at the end of 20 or 30 years; heavy volumes bound in calf will break by their own weight without being used. The objections to Russia leather, once a favourite binding, are its stiffness and want of elasticity, the tendency it has to desiccate and lose all its tenacity, and its heavy cost.

Morocco leather makes a most suitable binding possessing both toughness and durability combined with softness and flexibility; this leather possesses a very tenacious fibre and the author states that he has never found a real morocco binding broken at the hinges. The three greatest sources of danger to books are too much heat, excessive moisture, and the fumes from coal-gas.

The use of buckram as a binding material has been almost entirely abandoned by American binders; morocco cloth has no advantage over plain muslin or book cloth; "leatherette" possesses neither elegance, permanence, nor cheapness; "feltine" or "fibrette" are made of paper, tear easily, and are unfit for use as bindings. Book corners made of vellum on account of their being more durable leather, can be recommended.—M. C. L.

Tanning Extracts; Notes on the Absorptive Influen the Materials used in the Determination of Total So Matter in ——. A. B. Searle. A Paper read b the Paris Conference of the I.A.L.T.C. Through Leather Trades Rev. **34**, [776], [778], 82, 116.

It is known that if a solution of a tanning extract, w is perfectly clear to the unaided eye, be filtered thr ordinary filter-paper the amount of dissolved matter i filtrate will be appreciably less than that in the same vo of liquid before filtration, and that the filter-paper r exceeds its function as a straining medium, and has reta probably by a force akin to adhesion, some of the so matter which ought to have gone into the filtrate.

In order to overcome the difficulties arising from source, the Internat. Assoc. of Leather Tr. Chemist 1897, directed that the first 150 to 200 c.c. of the fil should be rejected, and that a subsequent portion be t for the determination of the total soluble matter.

This method, though satisfactory to a certain e falls far short of a desirable method, as it rests o assumption that the paper used for filtration reaches, a time, a state of saturation for the particular solutio assumption the correctness of which it is exceed difficult to prove.

The clearest filtrate was obtained by the use of a pl filter of Schleicher and Schüll's "Extra Hard" No. 60

The author tried also filtering through sand, but alt the absorptive power of sand does not exceed 1·5 m per 50 c.c. of the solution, the method was not satisfa and could not be used for extracts showing low percen of matter in suspension.

Specially prepared "tanned" paper was even unsatisfactory.

In order to determine the actual amounts of subst absorbed by paper 605 "Extra hard," the following e ment was carried out. Ten grammes of a sample of quebracho extract was dissolved in boiling water, and up to 1 litre, in accordance with the regulations laid by the I.A.L.T.C.

	Per C
1. Standard method, 200 c.c. filtrate rejected, 50 c.c. collected, contained..............	90
2. As before, but 5 grms. kaolin shaken up with solution before filtration.................	87
3. As before, but kaolin soaked in another portion of the solution before use, drained on the filter, and the extract then passed through, 1st 50 c.c.	90
4. Same as 3, but 50 c.c. not collected until 150 c.c. had passed through..............	90
5. Pleated filter-paper, otherwise exactly as in 1	90

The above results show that a folded filter-paper, filtering much more rapidly, and exposing a much superficial area to the liquid, does not absorb any mo the ordinary form of filter. In other words, the abs is not directly dependent upon the surface-area filtering material.

The following table gives the results obtain filtration through a 19 c.m. pleated filter paper, "Extra hard," each successive quantity of 50 c.c collected separately, and evaporated to dryness to total soluble. In one case oakwood extract was another quebracho extract.

——	Oakwood Extract.	Qu 1
	Grms.	
G.—1st quantity of 50 c.c. evaporated.....	6·82	
2nd „ „ „	6·83	
3rd „ „ „	6·86	
4th „ „ „	6·89	
5th „ „ „	6·86	
6th „ „ „	6·87	
7th „ „ „	6·85	
8th „ „ „	6·87	
9th „ „ „	6·90	

s a matter of interest, an experiment was made of -ing 200 c.c. of the same two extracts through a succion of fresh filter-papers, and taking samples of the ıtion at each stage. The results were as follows:—

—	Oakwood Extract.	Quebracho Extract.
	Per Cent.	Per Cent.
passing through 1st paper	91	90
" " 2nd "	90	89
" " 3rd "	88	87
" " 4th "	86	86
" " 5th "	81	79
" " 6th "	73	71

number of experiments were also carried out using ı, without satisfactory results.

e most satisfactory results have been obtained by the f Schleicher and Schull's No. 605 "Extra hard" , 19 cm. in diameter, and so folded, or pleated, that it 8 lines of contact with the glass of the funnel.

—J. G. P.

ing Materials; Japanese ——. Paul von Schroeder. Deutsche Gerber Zeit. 54, 6—15, 1901.

the chief tanning materials in common use in Japan,

Kashiwa (*oak bark*).—This is divided into three nt varieties, called after the province from which it is ed, either Chichibu, Yashiu, or Oshiu.

Nobune.—This is a bark of a root which grows in ovince of Mimasaka.

Dokuye.—A wood growing mostly in the neighbourf Tokio.

Valonia, also called *Dungori*.—This grows in the es of Mimasaka and Bezu.

hiwa.—This material, which is the bark of *Quercus* ı, also occurs in North China and Manchuria. The results from several samples are as follows:—

—	Chichibu.	Yashiu.	Oshiu.
	Per Cent.	Per Cent.	Per Cent.
	14·50	14·50	14·50
; substance	14·64	10·76	13·96
non-tannins	3·55	2·93	3·74
e matter	67·31	71·81	67·80
	100·00	100·00	100·00

e barks are much prized by tanners, they give a ght colour to the leather, and are also much used for ouring of fishing nets and sails for fishing boats. ırvest of the three different varieties is about tons yearly. The strength of the bark varies with of the tree. It seems to reach its maximum at 8 and 10 years.

ne.—This material is the bark from the root of *ırya strobilacea*, ("nobunoki") which belongs to *andaceæ*. It grows in a semi-tropical climate, and l as high as 300 metres above the sea level. The m the root is of a reddish-grey colour, and contains verage 15½ per cent. of tannin. The leather tanned s material is of an intense red colour, and would on ount not be suitable for European use.

ıye Aleurites cordata, or the Chinese tongue tree. e is found in China, Japan (Tokio), also in Ceylon, ır, and the West Indies, and frequently in different f the United States. The tree is chiefly cultivated unt of its fruit, which yields the drying oil known ese wood oil. This oil is used largely in Japan for and for the manufacture of oil paper, and for Japanese umbrellas. The tree grows to a height of 5 ft.; and the bark, which contains upwards of ent. of tannin, is valuable not only for its tannin , but is also for use as a dyestuff, giving a reddish It is used very largely in some parts of Japan, but n of its colour would not find a market in Europe.

Dungori (*Valonia*).—This is the fruit or acorn of *Quercus serrita*. It grows chiefly in Japan and in South Manchuria. An analysis gave the following results:—

	Per Cent.
Tanning substance	21·60
Soluble non-tanning matters	9·02
Insoluble matter	54·88
Moisture	14·50
	100·00

The results show this material to be almost equal in strength to the valonia, which is imported to Europe from the islands of the Grecian Archipelago. This material is much used in China and Japan for the manufacture of heavier kinds of sole leather.

Other trees, notably *Quercus dentata*, *Quercus vibrayeana*, *Quercus acuta*, are also valuable from the tanner's standpoint for their barks.

Kibushi, a Japanese Sumac.—The leaves of this material are not used for tanning, but the gall apples, which are produced on the twigs and leaves of this plant, contain a large quantity of tannin, varying from 50—60 per cent. in strength. This material is used largely.

Yasha is the fruit of the *Alnus firma*. It contains from 20—27 per cent. of tannin.

Shibuki, the name given to the bark from the *Myrica rubra*, or the red myrtle, contains from 10—11 per cent. of tannin.

Zakuro, the bark of the *Punica granatum*. It contains about 22 per cent. of tannin.

Mangrove bark, called in Japan *Tangara*, is exported in small quantities from China, and used in some districts.

Betel-nuts, called in Japan *Biurogi*, are also imported. These nuts are the fruit of the *Areca catechu*. One tree will carry from 200 to 800 nuts, which contain as much as 18 per cent. of tannin.

Several other plants are mentioned, but they only appear to be used in small quantities in the districts where they are very plentiful.—J. G. P.

Tanning; Micro-organisms and Antiseptics in ——. F. Jean. Rev. Chim. Ind., Jan. 1901, 21—28.

MICRO-ORGANISMS in the tannery fall into three divisions: (1) bacteria; (2) ferments; and (3) moulds; and into two classes: (*a*) useful; (*b*) injurious.

In the soaking of skins, the time required depends on the mode of drying of the skins. Eitner has shown that a skin dried at 60° C. can never be properly softened even by "stocking."

Presence of lime in dried skins also prevents proper softening.

Split sheep skins (linings) dried out in the lime should be treated with a weak solution of sulphurous acid. This removes the lime and enables the skin to be softened in water in the usual way.

Putrid soaks are dangerous and a nuisance, they also cause loss of weight. An analysis of such a soak used for arsenicated China skins gave the following results per 1,000 c.c.:—

	Grms.
Free ammonia	0·68
Combined ammonia	0·17
Soluble albuminous matter	7·860
Earthy matter and sulphide of arsenic	2·826
Arsenic in solution	0·270
Sulphuretted hydrogen	0·300

A microscopical examination showed enormous numbers of small motile bacteria, cocci, and streptococci, the latter in smaller proportion. Arseniuretted hydrogen was detected in the gases evolved.

In liming, micro-organisms play an important part. Procter has shown that sterilized skin cannot be unhaired by treating in a sterile lime. Old limes contain bacteria and their products and free ammonia, and in consequence are more active than new limes. A series of limes used for arsenic kips gave, on analysis :—

——	New Lime.	Middle Lime.	Spent Lime.
Soluble lime	1·6	1·7	1·1
Soluble by trozen	0·74	0·84	0·66
Ammonia	..	0·098	0·36

After liming, light skins for soft leathers are passed through an infusion of dogs' dung at 35—37 C. The skins are padded in it in a wheel fitted with a cover for about 12 hours. According to Wood, the chemical constituents of the dung, consisting principally of organic acids, bases and earthy salts, act in conjunction with enzymes secreted by the bacteria in the bate, on the more easily soluble portion of the hide fibres.

The production of ammonia progresses regularly during the fermentation, but when the free ammonia reaches 0·2 grm. per litre, the bate is not fit for further use. It may, however, be kept in use by daily saturating the excess of NH_3 and precipitating the lime introduced by the skins; this may be done by means of phosphoric acid.

After bateing, skins are often subjected to a further fermentation—the bran drench. This has an acid reaction, due to lactic and acetic acids produced by the action of *Bacillus furfuris* on glucose; the glucose being formed from the starch of the bran by an unorganised ferment *Cerealine* which is contained in the bran.

According to Wood the action of the drench consists in dissolving the lime remaining in the skin and in the distention of the skin by the gases produced in the fermentation, bringing them into the best condition for the absorption of the tannin.

In the next process—tanning proper—the bacteria are naturally of quite a different class to those growing in alkaline liquors, and are adapted to acid media, they act along with yeasts and moulds upon the non-tannins, only the moulds attacking the tannin.

The conclusions of Collin and Benoit are not borne out by practice, and it is generally agreed that in the ordinary mode of tanning, some fermentation of the liquors, *i.e.*, production of organic acids by bacteria, is necessary. In the case of quick tanning processes, where fermentation of the liquors does not take place, it has not yet been proved that the leather produced is equal in quality to that tanned by the longer processes; the proposal to treat both the skins and the tan liquors with antiseptics is therefore not justified. Sterilization of raw skin is found very difficult to carry out.

In a series of experiments made with formalin in the tan yard, skins sterilized with it did not plump properly in the liquors and tanned out hard. As even the strongest liquors swarm with bacteria, it is clear that the leather must contain germs and spores capable of development under suitable conditions, and which may cause a fermentation or "heating" of the leather in the warehouse.

A sample of a sound and of a heated piece taken from the same skin gave the following results :—

——	(A.) Sound Leather.	(B.) Damaged Leather.
Water	17·25	16·40
Ash	1·43	1·44
Ether extract	1·00	..
Water extract (cold)	13·30	5·98
Acidity as H_2SO_4	0·735	0·294

The samples reduced to powder and extracted with alcohol gave :—

——	(A.)	(B.)
Dry extract	14·4	8·94
Tannin	4·46	1·08
Gallic acid	2·60	1·39
Acidity as H_2SO_4	0·845	0·705

Examined microscopically, the sound leather macer in sterile water showed a few micrococci, the dam leather a large number of straight rods, chains, and m cocci.

Stored leather is affected by moulds, which, if not rem from the surface, penetrate to the centre of the skin. author proposes to add to the last layers a $\frac{3}{1000}$ or formalin solution or a small quantity of mercuric i dissolved in potassium iodide, and is of opinion that this means, heating and mildew in the finished lea would be avoided.

Lastly, the moulds on the surface of tan liquors w destroy tannin, may be prevented by floating on the su of the pits a mixture of rosin oil with 20 per cent. of cam oil.

Mould on crust leather is prevented by rubbing leather with a cloth impregnated with camphor oil, o adding 20 per cent. of this oil to the cod oil used in o off the leather.—J. T. W.

Tanning Materials : Determimation of Tanning M in ——. T. Körner.

See under XXIII., *page* 286.

Leather ; Determination of Mineral Acids in ——. H. R. Procter and A. E. Searle.

See under XXIII., *page* 287.

Leather ; Lactic Acid in the Manufacture of ——. Alan A. Claflin.

See page 210.

Lime for Tanners' Purposes ; Analysis of ——. G. W. Flower.

See page 224.

PATENTS.

Tanning Liquids ; Manufacture of ——. A. Tho and E. Blin, Paris. Eng. Pat. 2479, Feb. 7, 190

The tan-liquor at 3°—4° B. leaving the diffusing t cooled; from 1 to 3 kilos. of the sulphates of "quinq alkaloids (quinine, quinidine, cinchonine, cinchonidi then added for each 1,000 kilos. of tanning acid p The mixture is agitated strongly for about five m (preferably cold as the action is then more rapid) then allowed to stand, when the coloured or foreign o matters, as well as a certain quantity of the tanning m are precipitated with the alkaloids. The use of n acids for decolorisation may thus be dispensed with.
—W. G

Elastic Material which cannot readily be Punc Manufacture of Sheets of Flexible ——. Tavernier, London. From V. E. Belledin, Paris. Pat. 15,443, Aug. 30, 1900.

Cowhide, in the condition for making parchm immersed for 24 hours in cold crude petroleum, a for 12 hours in mineral or fatty oil, after which it i When the hide is to be thickened, it is placed for 20 in a solution of potassium or sodium silicate o 33° B. strength. When used to protect pneumati in tyres, strips of it are moulded into trough form a into a circle. They are then hardened by immer 6—12 hours in benzine, and to close the pores sterilise them, are dipped in a bath of chloride of 33°—50° B. After drying, they are immersed an hour in a solution of caoutchouc, whereby the made to adhere to the tyre cover, and are, m rendered capable of being vulcanised with the cover
—W.

Adhesive Compound. V. M. Bouthillier, Montreal, Eng. Pat. 4986, March 16, 1900.

Ten parts of gelatin or isinglass are mixed with 4 water, 1 part of commercial potash or carbonate of and ½ part of alum, and heated to 100° C. until t is melted, after which it is cooled, dried, and pu The potash is used as a solvent for the glue.—W. C

· and Products therefrom; Process of Making ——. L. Kelsey, Guildford, Conn., U.S.A. Eng. Pat. 17,966, ct. 9, 1900.

glue-stock is pumped first through a heater and then vertical tubes with perforations at the bottom, set in oling chamber. The glue, as it reaches the bottom of tubes should be in the form of a jelly; it is forced ugh the perforations in this condition, and so emerges e shape of a continuous pencil, which may be exposed pid drying or hardening influences. The expansion to jelly after passing the perforations causes the pencils ve a serrated surface, which facilitates drying, as also equent solution in the glue-pot. By adapting the shape e pertures, the pencils may be made to have a smooth ce and any cross-section desired. By this process, glue be made without difficulty at all seasons of the year, when made, is in a particularly convenient form for -W. G. M.

XV.—MANURES, Etc.

noniacal Salts as Nematodicides. A. Lonay. Bull. Assoc. Belge des Chim. **14**, [7], 317—319.

experiments carried on by C. Sehreiber, of the State ultural Station at Hasselt, show that ammoniacal salts e crystalline condition are superior to gas liquor for oying nematode worms on beet; and he recommends mmonium sulphate should be applied for several years cession, as a substitute for nitrate of soda manure, to infested with these parasites, the quantity employed as large as possible compatible with the development crop. As much as about 350, 700, and 1,400 lb. per ns been used without injurious results to the plants. —C. S.

erphosphate; Preparation of ——, for the Market. C. Elschner. Chem. Zeit. 1901, **25**, [7], 68—69.

: the discovery of the phosphate deposits of Florida e introduction of that phosphate into Germany, there een an increasing demand in that country for superhates containing from 17 to 19 or 20 per cent. of -soluble phosphoric acid. Great importance is also ied to the physical condition of the superphosphate. ist be finely sieved, and free from lumps, must not n sufficient acid to destroy the sacks, and, above all, be dry.

e fresh superphosphate from the decomposition cellar res a considerable period before its constituents comto form crystalline compounds, and this process is rated by drying in kilns. It is not merely the loss of on storing and kilning which produces the dryness, t is noteworthy that a fresh superphosphate, gently and containing 11 per cent. of water, answers the ements of the market less than one containing 1 to 2 ent. more water which has been stored for some Freshly prepared and dried superphosphate is very ptible to the influence of pressure, but gradually nes crystalline and granular on keeping, and loses its acy to cake. It should therefore always be stored, if or a few days, before sending out. In certain parts of ny, however, the percentage of water is still made the criterion.

author obtains a consistently good superphosphate good Florida phosphates by treating them with warm (40°—60 C.) of 53° B. at 17° C. in such proportion he superphosphate shall contain from 4 to 5 per ot free phosphoric acid. In order to allow for the ilarities frequently met with in one and the same gnment, he decreases the acid in inverse proportion to mount of substance (sand, silicate, &c.), insoluble in of course taking into account the fact that at higher ratures the fluorine compounds are more completely posed.—C. A. M.

sphoration Scoriæ; Notes on the Treatment of ——, relation to the Determination of their Phosphoric d. P. Palmans. Bull. Assoc. Belge des Chim. **14**, , 312—317.

iac, having reported that the percentage of phosacid obtained by the method prescribed for use on Thomas scoriæ in the Belgian State laboratories—conversion of the silica into the gelatinous state with nitrohydrochloric acid, or nitric acid of sp. gr. 1·2, with an addition of water and application of heat—fluctuates according to the concentration of the resulting solution, in fact, varying directly with the volume obtained, the author examined the method anew, and found that the cause of such irregularities must be ascribed to an imperfect elimination of silica at the outset. In the event of a little silica remaining in solution, he recommends that the precipitation with phospho-molybdate be carried out at 80° C., since this temperature ensures the reduction of the sources of error to a minimum.—C. S.

PATENT.

Superphosphate; A Process for Converting Acid ——, into Alkaline or Basic Superphosphate. J. Hughes, London. Eng. Pat. 19,574, Nov. 1, 1900.

Superphosphate, preferably such as contains 13 to 14 per cent. of phosphoric anhydride, is intimately mixed with so much slaked lime as may suffice to give the mixture a distinct alkaline reaction. The calcium phosphate contained in the mixture is stated to be soluble in one-tenth per cent. solution of citric acid, and its manurial use is claimed "as a special phosphatic fertiliser for land which is either deficient in lime or contains an excessive quantity of organic vegetable matter."—E. S.

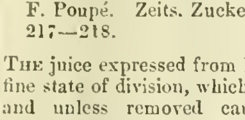
XVI.—SUGAR, STARCH, GUM, Etc.

Saccharose; Presence of ——, in Panama Wood. G. Meillère. Bull. Soc. Chim. 1901, [3], **25**, 141—142.

The presence of a carbohydrate in Panama wood (*Quillaia smegmadernos*) has often been observed, and it has hitherto been supposed to be identical with lactosine, isolated from various Caryophyllaceæ by Meyer. The author has now prepared this carbohydrate from Panama wood, and, after purifying it from a trace of saponine, he finds that it is in every way identical with cane sugar; this observation, however, in no way excludes the possibility of the occurrence of lactosine in other saponaceous plants.—J. F. B.

Beet Juice; Apparatus for the Removal of Air from ——. F. Poupé. Zeits. Zuckerind. in Böhmen, 1901, **25**, [4], 217—218.

The juice expressed from beet pulp contains air in a very fine state of division, which is retained for a very long time, and unless removed causes erroneous values for the polarisation and the specific gravity to be obtained. For the purpose of getting rid of this enclosed air, the author makes use of a thick-walled filter flask of about $\frac{3}{4}$ litre capacity; about 600 c.c. of the juice is placed in this flask, which is closed by means of a stopper through which passes the tube T, reaching nearly to the bottom of the flask. The side tube B is closed by means of a piece of rubber tube fastened in a clamp. The tube T is first freed from juice by sucking through B, which is then clamped, and the flask inverted, the drainings from the walls of T slowly collecting in the bulb C. The tube T is then connected with an air pump, which is allowed to act for 5—10 minutes, after which time the juice is perfectly air-free. As the surface of the juice in the flask becomes covered with a thick scum and a deposit of particles of beet and fibre forms above the stopper, it is best to run the juice out of the flask by means of the tube B.—T. H. P.



Beet Juice; Determination of Purity of ——, by Krause's Method. F. Ehrlich. Zeits. Ver. deutsch. Zucker-Ind. 1901, 3—16.

The author has made a number of experiments to determine the influence of various factors, such as temperature and time of digestion, fineness of pulp used, &c., on the purity of beet juice as given by Krause's method. His results lead to the following conclusions:—

1. The temperature of digestion has an important influence on the quotient of purity, since with increase of temperature, the density of the juice obtained, increases, whilst the polarisation remains constant (between 80° and 100° C.) so that the quotient of purity diminishes.

2. The fineness of the pulp seems to have no effect on the result.

3. As the time of digestion of the pulp increases, the amount of dry substance in the juice also increases, the quotient consequently diminishing. The introduction of a minimum or maximum time is hence to be recommended.

4. The quotients obtained by Krause's method (at 90°) are, in general, 5 to 7 units lower than those yielded by the old method.

5. To facilitate working and obviate the de-aëration necessary in Krause's method, some modification of it is desirable which assumes the volume of the marc to be known, as is the case in the Lewenberg-Sachs-Le Docte method.—T. H. P.

Sugar Commission Appointed for fixing Normal Standards; Notes on Recent Work of the German ——. A. Herzfeld. Zeits. Ver. deutsch. Zucker-Ind. 1900, [539], 1126—1128.

The Brix tables, at present in use, are based on determinations made by Balling in 1839, and the later values established by Brix and Gerlach have never been generally employed. It is likely, however, that the tables worked out by the commission will shortly be adopted by the German excise. Taking the specific gravities and corresponding percentages of cane sugar by weight, and calculating from the former, the Brix degrees (*i.e.*, per cent. of cane sugar) by the older table, it appears that the new values are throughout somewhat higher than the old. For example:—

Degrees Brix according to Commission, Table 4.	Corresponding Specific Gravity calculated $s\frac{20°}{17·5°}$.	Degrees Brix according to Mategczek and Scheibler $s\frac{20°}{17·5°}$.
10	1·03947	9·99
20	1·08231	19·95
30	1·12842	29·92
40	1·17794	39·90
50	1·23113	49·89
60	1·28812	59·88
70	1·34886	69·83
80	1·41357	79·76
90	1·48189	89·66
100	1·55376	99·50

—H. T. P.

Bone-Black [for Sugar Works]; Sulphides in ——. F. Stolle. Zeits. Ver. deutsch. Zucker-Ind. 1901, 22—23.

The author shows that the generally accepted belief in the presence of calcium sulphide in bone-black is erroneous. Fresh bone-black contains no calcium sulphide and when the bone-black is heated, the calcium sulphate which is always present is not reduced to sulphide but gives up part of its sulphur which combines with the iron formed from the reduction of ferric oxide, ferrous sulphide being produced. In the case of bone-black containing an artificially increased quantity of calcium sulphate, it is possible for some of the latter to be reduced to sulphide, but this cannot occur with bone-black used in sugar refining, owing to the periodic removal of the calcium sulphate from the black. The diminution of the carbon content of bone-black must be ascribed mainly to interchange with carbon-forming bodies and to combustion of the organic bodies.—T. H. P.

Raffinose; Preparation of the Octabenzoyl Ester of ——. F. Stolle.

See under XXIV., *page* 292.

PATENT.

Vapours of Sugar Factories especially, also Vapour other Factory Plants; Process for Utilising ——. Steffen, Vienna. Eng. Pat. 1804, Jan. 29, 1900.

The claims in this patent are for an improved proces utilising for power purposes, low-compressed [low-press vapours of any kind, more especially of the boiling cesses customary in sugar factories. It consists "in jecting these vapours in surface-condensers (vaporisers a partial condensation at as high a temperature as poss and effecting the condensation and cooling of the remai vapours at a lower temperature in the usual jet-conder connected with air-pumps"; the liquids evaporated the vaporisers boil at low temperatures, producing compressed vapours which perform work in suit machinery and on being expanded to a low pressure liquefied by cooling in so-called cold condensers are a returned to the vaporisers. The cooling-water from cold condenser is used subsequently as injection-water the connection between the vaporiser and the jet conde is so adjusted that the highest temperature and pres are obtained in the vaporiser whilst lower pressures temperatures are attained in the jet-condenser.—T. H.

XVII.—BREWING, WINES, SPIRITS, E

Pentosans; Behaviour of the ——, of Seeds during mination. A. Schöne and B. Tollens. J. für I wirthsch. 1901, 43, 349; through Woch. für Brau, **18**, [5], 62—63.

It is well known that the assimilatory processes of p are accompanied by a considerable accumulation of p sans, but it was doubtful whether they are also prod during processes of pure oxidation without assimilatio in the germination of seeds. Some years ago Cross, B and Beadle recorded a considerable increase in the qua of pentosans during the germination of barley, but results apparently related to rather prolonged pe of germination and not to the ordinary conditions of ma Later, Tollens and Glaubitz studied the question fron point of view of malting and found that the quant pentosans certainly did not decrease during the pr In the present investigations the authors have studie germination of barley, wheat, and peas, and determine quantity of pentosans before and after germination (days), taking into account the loss of grain substance occurs. The results show throughout a small, but di increase of this class of carbohydrates and therefore in that the pentosans do not belong, like starch, to the re materials which are consumed by respiratory oxid In fact it is quite probable that the slight incre pentosans observed, results from the oxidation o starch with elimination of carbonic acid.—J. F. B.

Yeast, Mould Fungi, and Bacteria; Influence of B Acid upon ——. C. Wehmer. Chem. Zeit. 190 [5], 42, and [6], 59—60.

According to certain investigators, 0·05 per ce butyric acid prevents the development of yeast, and 0·1 per cent. altogether stops the production of a (Spiritusfabrik, p. 455, Neale, Maercker, &c.). The however, finds that its influence is largely dependen the nature of the culture medium. He has made, s side, comparative experiments with the wort from a dis mash, and with a solution of sugar containing nutrien in which the results were very different. In the case malt wort, which was pitched with 1 per cent. of yeast, an addition of 0·05 to 0·1 per cent. of butyric ac almost without influence on the fermentation. On inc the amount to 0·25 per cent., the duration of the ferme was increased by about one day, and its intensity dimi Even with 0·5 per cent. there was still a vigorous f tation, and only when the proportion of butyric acid r 1 per cent. did it practically cease, though even the gas was evolved.

The influence of butyric acid on the yeast in a solu sugar containing peptone and nutrient salts was muc onounced, less than 0·25 per cent. being sufficient to stop l fermentative phenomena.

The reproduction of the yeast was influenced more than ıe fermentation. On adding 0·25 per cent. of butyric id to the malt-wort, the increase of the yeast was retarded, hilst with 0·5 per cent. and more, all reproduction)udding) was stopped, except in the case of film-producing asts.

Mould Fungi and Bacteria are both stated to be sensitive the influence of small amounts of butyric acid (Thol and hers). In experiments similar to those described above, e author found that the development of mould fungi was evented by the addition of fractions of a per cent., but at 1 per cent. did not prevent bacteria developing in the lt-wort. Hence it has a smaller bactericidal action than tic acid.

In the sugar solution, however, 0·2 to 0·3 per cent. was fficient to exclude bacteria.

As regards the practical application of these results, the thor states that, speaking generally, the presence of tyric acid in the wort is more injurious to the yeasts and uld fungi than to the bacteria. Although it requires er 1 per cent. to completely check the action of the ıst, yet bacteria cannot be excluded by the addition of as ch as 1 per cent. In this respect it differs from lactic d, which, when added in the proportion of 1 per cent., vents the development of bacteria, without interfering to marked extent with the fermentation.—C. A. M.

ertase. W. Issaew. Zeits. ges. Brauwesen, 1900, **24**, [52], 797—799.

e author prepares very active solutions of invertase, by extraction with water of yeast, the cells of which have n more or less plasmolysed by "auto-fermentation."

intner showed (this Journal, 1899, 1040) that the autouentation of yeast is considerably assisted by the ence of large quantities of certain salts, and the first eriments of the author were conducted on this basis. it was subsequently found that the addition of cane ır had exactly the same favourable effect as the salts, st the sugar could afterwards be removed entirely by ıentation. The activity of the extracts so obtained measured by the velocity of the inversion of a 10 per . solution of cane sugar at 52° C. It was found that ıo case was the inversion of the sugar complete, but the end-point was practically constant in all cases. employment of more than 15 per cent. of cane sugar ı the yeast during plasmolysis had no further effect in menting the extraction of invertase, but the extraction ubstances coagulable at 52° C. was increased. With)ortions of sugar up to 10 per cent., the extracts remain r at 52° C., but with larger proportions a coagulate is ıed, which, however, does not include any of the rtase.

he duration of plasmolysis and of fermentation may be ı 24 to 48 hours each, the longer period affords rather e active extracts.

lasmolysis for 24 hours and fermentation for 24 hours led stronger extracts than were obtained by Osborne's ıod (this Journal, 1899, 777), by treating the yeast with hol for 24 hours and then extracting with water at C. for six days.

he extraction of fresh yeast with water for 48 hours led an extract which inverted cane sugar down to the e end-point, but at a much slower rate than the extract ı plasmolysed yeast.

revious contact of the yeast with water for 24 hours had effect upon the extraction of invertase by plasmolysis. extract prepared from a top-fermentation "Weissbier" t was far less active than those from bottom-fermenta- yeasts, which result may be due to more favourable litions in the manner of development of the latter type. —J. F. B.

ıase; *Simple Method for Exhibiting the Action of* —. R. Albert. Ber. 1900, **33**, [19], 3775—3778.

upport of the enzyme-, as opposed to the living protonic theory of zymasic action, the author brings forward nple method for robbing yeast of its vital function, without destroying its fermentative power. To this end, washed and pressed yeast (250 grms.) is squeezed through a hair sieve into a mixture of absolute alcohol (three litres) and ether (one litre). After 4—5 minutes the liquid is decanted and sucked off, the yeast washed with ether (half litre), and dried in thin layers on filter-paper. The yellowish-white powder thus obtained contains no living cells, as proved by repeated inoculation and long culture in beer-wort, which remained sterile. When sown in 20 per cent. saccharose solution, however, it induced fermentation in one hour at ordinary temperatures. At 38°—40° C., action begins in 30 minutes, rapidly increasing and becoming at last quite violent. In quantitative experiments (2 grms. yeast powder, 2—4 grms. cane sugar, 10 c.c. of water), the following quantities of CO_2 were evolved in 24. 48, and 72 hours respectively: Using 2 grms. of cane sugar, 0·51, 0·62, and 0·72 grms. With 4 grms. of cane sugar, 0·36, 0·56, 1·11 grms. From these figures it appears that the yeast powder is about five times as active as press-juice prepared in the ordinary way. Even with yeast so treated, fermentation takes place inside the cells, and, the latter being unbroken, water fails to extract from them an active juice. But by simple trituration with sand, at first dry, afterwards with the addition of water, followed by filtration aided by a water-pump, an active liquid may be obtained. This juice is rather weak; but the active principle may be concentrated by precipitation with alcohol, and re-solution in five times its weight of water.—H. T. P.

[*Brewing*]; *Saccharometer Readings.* H. Pfahler. Allgem. Zeits. f. Bierbrau. **28**, [29], 339—341.

To show the differences between the readings furnished by the saccharometers of Balling, Marek, and Windisch, the author gives the following comparative table :—

Saccharometer. Reading	Specific Gravity	These Specific Gravities correspond to :—		
at 17·5° C. according to Balling.		Saccharometer. Reading. Marek.	Specific Gravity at at 15° C.	Saccharometer. Reading, Windisch.
6·0	1·0240	6·0965	1·02442	6·17
7·0	1·0281	7·1092	1·02835	7·18
8·0	1·0322	8·1144	1·03263	8·18
9·0	1·0363	9·1116	1·03673	9·17
10·0	1·0404	10·1014	1·04083	10·16
11·0	1·0446	11·1078	1·04503	11·16
12·0	1·0488	12·1068	1·04923	12·16
13·0	1·0530	13·0983	1·05343	13·15
14·0	1·0572	14·0826	1·05764	14·14
15·0	1·0614	15·0601	1·06184	15·11
16·0	1·0657	16·0535	1·06614	16·11
17·0	1·0700	17·0399	1·07044	17·09
18·0	1·0741	18·0421	1·07454	18·02
19·0	1·0788	19·0371	1·07924	19·06
20·0	1·0832	20·0252	1·08365	20·08

In the case of a brew where 1,550 kilos. of malt furnish 100 hectolitres of wort of 10° Balling, the percentage of extract would work out, according to the Balling reading, at 67·12 per cent., whereas with the Marek reading it would be 67·86 per cent., and with the Windisch reading 68·11 per cent. (making allowance for the difference in temperature). —C. S.

Worts; The Albumose Contents of —. A. Zeidler and M. Nauck. Woch. für Brau. 1901, **18**, [8], 101—107.

The questions to which the authors have turned their attention are, what conditions favour the highest proportions of albumoses in wort, and do the worts richest in albumoses yield beers with superior permanency of head? The experiments, the results of which are tabulated in the paper, relate to the conditions of germination on the one hand, and to the treatment in the brewing house on the other. The results obtained led to the following conclusions :—

In order to obtain a wort rich in albumoses, the conditions should be arranged so as to produce a green malt with acrospire and rootlet as long as possible consistent with proper modification; to keep the depth of the wort in the hop-copper as low as possible; to curtail the time of boiling; to increase the temperature of the sparging water as far as other circumstances will permit; and to avoid slow mashing processes, especially at low temperatures.

As regards the effect of the proportion of albumoses upon the permanency of the head, the authors could detect no differences in the head-retaining qualities of any of the bottled beers prepared in the course of these experiments, whether rich or poor in albumoses. On the other hand it is proved that, if the albumoses be removed from beer by precipitation, all foaming properties are entirely destroyed. All the beers which contained higher proportions of albumoses had a decidedly milder and smoother flavour than those poor in albumose, and the superiority was more marked the greater the proportion of albumose; differences of less than 5 per cent. were difficult to recognise.—J. F. B.

Fruit Juices, Fermented; Presence of Methyl Alcohol in ——. J. Wolff. Comptes Rend. **131**, [27], 1323—1324.

The authors have fermented the juice of black currants, plums, mirabelles, cherries, apples, green and purple grapes. The unfermented juice contained no methyl alcohol, save that of black currants; in this case fermentation greatly increased the amount. 100 volumes of the 90 per cent. alcohol prepared from these juices contained of methyl alcohol, in the case of—

Black currants		Above 2
Plums		About 1
Mussel plums		" 1
Mirabelles		" 1
Cherries		0·5 to 1
Apples		0·2 to 0·3
Grapes	without stalks	Traces to 0·03
	with stalks	0·15 to 0·4
	skins	0 15 to 0·6
White sugar (wine-yeast)		0·0

The influence of the grape-stalks is to be noted, as also the amount of methyl alcohol proceeding from the skins. Thus good cognacs contain practically no methyl alcohol, while it is always found in "Eaux-de-vie de marc."

Rums, whiskeys, and the commercial alcohols contain no methyl alcohol.—J. T. D.

Beer; Discussion on Presence of Arsenic in ——.]
Nottingham Section, *page* 208.

Beer; Detection of Arsenic in ——. A. H. Allen.
See under XXIII., *page* 281.

Beer; Detection and Determination of Arsenic in ——.
E. W. T. Jones.
See under XXIII., *page* 281.

Manufactured Products [Beer, &c.]; Discussion on the Occurrence and Detection of Arsenic in ——.
See page 188.

Beers, Brewing Materials, and Food; Detection of Arsenic in ——. W. Thomson and J. P. Shenton.
See page 204.

Wine; Detection of Orseille, Cochineal, Phytolacca, and the Colouring Matter of Beet in ——. J. Bellier.
See under XXIII., *page* 284.

Wine; Detection of Orseille in ——. R. Truchon.
See under XXIII., *page* 284.

Wine; Source of Error in the Detection of Salicylic Acid in ——. H. Pellet.
See under XXIII., *page* 284.

Malic Acid; Determination of ——. A. Hilger.
See under XXIII., *page* 288.

Barleys for Brewing and Distilling; Valuation of ——.
W. Frew.
See page 221.

PATENTS.

Alcohol and Pressed Yeast; Production of ——, *by tl Aid of Sugar-Forming Organisms.* E. A. Barbet, Pari Eng. Pat. 1228, Jan. 19, 1900.

This patent refers to improved processes for the conversic of starch into sugar by the action of acids, with subsequei treatment by pure cultures of saccharifying fermen (mucedineæ) and for the production of alcohol by pu yeast. The starch material is first partially saccharified l heating with a dilute acid, the syrup obtained being partial neutralised so that it passes through the filter presses clea The filtered liquid, which is almost colourless, is then sow with a sugar-forming ferment such as *Amylomyceæ Roux mucor* or *Koji*, together with a pure yeast. The sacchari cation and fermentation thus take place simultaneousl the wort being protected against bacterial attacks by tl energy of the double reaction, so that open vats may employed.—T. H. P.

Spirits; Method of Distilling and Treating ——. J. Carroll, New York. Eng. Pat. 19,126, Oct. 25, 1900.

This method consists in distilling the spirit and passing t vapours, preferably mixed with air, through a coil, in whi they are subjected to superheating. By this means a chan is produced in the vapours of such a nature that the co densed liquors have all the characteristics of time-ag spirit.—T. H. P.

Liquid Fermentation Apparatus. L. Béchaux, Porrentr Switzerland. Eng. Pat. 19,340, Oct. 29, 1900.

This invention consists of a fermentation vat or tun, havi a conical bottom or a suitably inclined flat bottom, connec with a lower extraction chamber provided with two coc one above the other, so arranged that the deposit forn during fermentation will fall into the extraction chaml from which it can be removed, when it reaches a cert height shown by a gauge tube, by means of the cocks.
—T. H. P

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Proteids; Composition of the ——. A. Kossel and . Kutscher. Zeits. physiol. Chem. **31**, 164—214; Ch . Centr. 1901, **1**, [2], 123—127.

The authors give the results of an investigation as to e constitution of the proteids. They classify in the follov manner the different ways in which the nitrogen is c bined:—

1. The urea-forming group (combined with dian - valeric acid in arginine).

2. The group of diamido acids (diamidovaleric d, diamidocaproic acid).

3. The group of mono-amido acids (leucin and h o- logues, aspartic acid and homologues, tyrosin, phenylat o- propionic acid, amidothiolactic acid and its disulphide)

4. The ammonia-forming group (still unknown).

Tables are given showing the quantitative results obt on decomposition of the proteids with sulphuric acid.

The proteids of wheat and maize flour, soluble in alc ol, yield no lysin on decomposition, but the gluten case wheat flour does. The authors confirm the earlier le ments of Ritthausen as to the composition of wheat gl n and agree with that writer as to the incorrectnc o Morishima's assertion that only one substance, artol i present in wheat gluten (see this Journal, 1899, 701).
—A .

Water-Nut (Trapa Natans); Composition of —— A. Zega and D. Knez-Milojkovic. Chem. Zeit. 1901 25, [5], 45.

The fruit of the water-nut is extensively used as foo l the poorer classes in Servia, and also as swine fodder. Tl plant commonly grows wherever there is standing te , m the beginning of April to the beginning of November. e nut has a hard shell of triangular appearance, provided h four sharp thorns. The kernel, which is white, is ered with a thin brown skin, and was found by the hors to have the following composition, including the n:—Water, 37·19 and 39·71; nitrogenous substances, 34 and 8·01; fat, 0·71 and 0·80; carbohydrates, 18·99 l 18·94; woody fibre, 1·36 and 1·27; ash, 1·41 and 4; and P_2O_5 and *undetermined*, 0·56 per cent. The starch nules were, for the most part, elliptical and round, the er measuring 36—38 μ in diameter, but there were also ny irregular granules, some of which resembled the nut lf in form. The starch gelatinised at about 76° C. The is eaten either in the green or ripe condition, and in the er case either raw or cooked. The taste of the raw nut aid to resemble that of chestnuts.—C. A. M.

aragin as a Food (Fodder); Nutritive Value of ——. . Rosenfeld. Zeits. Ver. deutsch. Zucker-Ind. 1900, 539], 1055—1079.

ppears, from one series of experiments, that asparagin s not favourably influence the metabolism of the ogen compounds; nor does it exert any specifically vourable action. Indeed there is some evidence to r that in course of time the organism would become tuated to the new food. In another series, however, stinct assimilation of nitrogen was observed, confirming finding of other investigators, that albumin constitutes tter nutrient for carnivoræ than amides in general, and ragin in particular.

a further series of experiments, where the food was ed with hay, the results are very different, and show ly enough, in spite of certain irregularities, a very ced assimilation of nitrogen from asparagin, exceeding found in the case of albumin. The author assumes that condition for the utilisation of asparagin in the animal nism is to be found in the simultaneous supply of us foods; and suggests two possible explanations for ame:—

It is possible that in the voluminous food mass, fer- ation phenomena are induced, analogous to those ning in the digestive tract of the herbivoræ.

Or the crude fibre contains resorbable substances, able fectuate the synthesis of albumins from amides.

—H. T. P.

ee from the Comoro Islands; Composition of ——. G Bertrand. Comptes Rend. **132**, [3]. 162—164.

berries of *Coffea Humblotiana*, which grows sponta- sly in the island, differ from ordinary coffee-berries, in they contain no caffeine. The extraction of a kilo. of offee gave no trace of caffeine, while 8 to 19 grms. d have been obtained from an equal quantity of *Coffea bica*. The following comparative analyses are given:—

——	C. Humblotiana.	C. Arabica.
r	11·64	9·74
eal extract	10·68	5·76
ohic extract	8·42	12·10
. } Reducing	0·80	0·29
{ Non-reducing	4·20	4·86
nitrogen	1·50	1·95
	2·80	3·66
ne	0·00	1·34

ne author points out the possible utility of chemical position in establishing specific difference or identity.

—J. T. D.

trin in Cocoa and Chocolate; Detection and Ap- oximate Determination of ——, *by Polarisation.* Welmans.

See under XXIII., *page* 288.

ilk; Determination of Lactose in ——. A. Scheibe.

See under XXIII., *page* 287.

; Detection of Formaldehyde and Milk Sugar in ——. E. Riegler.

See under XXIII., *page* 285.

(B.)—SANITATION; WATER PURIFICATION.

Water; Purification of ——, *particularly as regards the Separation of Lime and Magnesia.* K. Schierholz. Oesterr. Chem. Zeit. 3, 537—541. Chem. Centr. 1901, **1**, [2], 139.

In effecting the softening of water by the addition of lime and sodium carbonate, the author points out that in order to attain the greatest possible separation of the lime and magnesia, it is necessary that there be present an excess of 50—80 mgrms. of caustic lime and 100—200 mgrms. of sodium carbonate per litre.

The fact that magnesia is separated almost completely from its compounds and from very dilute solutions, at the ordinary temperature, by the addition of quicklime, may be applied in various directions:—

1. *Determination of Magnesia in Waters, Ashes, Minerals, &c., with Simultaneous Separation of the Alkalis.*—For this purpose, after separation of the lime by ammonium oxalate, the liquid is heated with excess of pure lime until all the ammonia is evolved, then filtered and the filter washed with lime water. The precipitate contains the whole of the magnesia, together with some calcium hydroxide, whilst the filtrate contains the alkalis together with some dissolved lime.

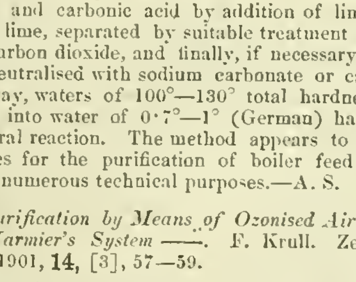
2. *Determination in Waters of the Alkaline Earths not Combined with Carbonic Acid.*—This determination is of importance, as it affords a measure of the sodium carbonate necessary for the softening of the water. If the carbonic acid and magnesia present in the water be removed by lime, then the other acids, formerly combined with lime and magnesia, will be present as calcium salts. The amount of these acids can be calculated from the difference between the total, and free lime present in the water.

3. *Purification of Water.*—The water is freed from magnesia and carbonic acid by addition of lime, then the dissolved lime, separated by suitable treatment with oxalic acid or carbon dioxide, and finally, if necessary, the water exactly neutralised with sodium carbonate or caustic soda. In this way, waters of 100°—130° total hardness may be converted into water of 0·7°—1° (German) hardness, and with neutral reaction. The method appears to offer great advantages for the purification of boiler feed water and water for numerous technical purposes.—A. S.

Water Purification by Means of Ozonised Air, Abraham and Marmier's System ——. F. Krull. Zeits. angew. Chem. 1901, **14**, [3], 57—59.

Until recently ozone has not been used on a large scale for the sterilization of drinking water, the chief difficulty in the way being the production of ozonised air in large quantities. A process (Abraham and Marmier's) is described by the author, which overcomes this difficulty. Air is ozonised by means of a silent electric discharge in a specially constructed cell or chamber, the construction of which is shown in the accompanying drawing.

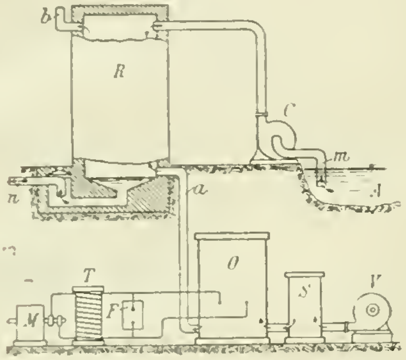
Fig. 1.



The chamber is air-tight and about $2\frac{3}{4}$ metres high. The electrodes *e*, composed of cast-iron hollow plates, are hung side by side in this chamber, and are isolated from each other by the thick sheets of plate-glass *i*. It will be seen that the electrodes are so placed that there is plenty of air-passage between them. It being essential that the chamber shall not become heated during the discharge, water is passed through the hollow electrodes. To prevent a short-circuit being made, two insulated cisterns are provided, one feeding the + electrodes and the other the − electrodes. To insure further insulation, the cooling water is caused to enter the electrodes in drops and to leave in drops. A passage o pierces all the electrodes except the last one. The air enters at the opening Z, passes through or around the electrodes in the direction of the arrows, and the ozonised air leaves by the orifice D.

A plant for sterilizing water by means of ozone is shown in the following drawing:—

Fig. 2.



Air is forced into the drying chamber S by the fan V, and then passes into the ozoniser O. The ozonised air is conducted by the pipe *a* into the bottom of the purifier R, where it bubbles through the water which is to be sterilized. The water enters at the top of the purifier, being raised by the pump C from the source A, and leaves by the pipe *n*. M supplies the alternating current, the transformer T brings the pressure up to 40,000 volts, and the other knobs at F, the author states, are "to prevent the pressure from becoming excessive with consequent piercing of the glass plates in the ozonizer," which he alleges he has found to occur in practice.

The alleged advantages of the process are many. Ozone, being only slightly soluble in water, does not affect the taste of the same, but all living matter in the water is killed, and dissolved organic compounds, which are not removed by filtration, are destroyed. The process compares favourably with others as regards effectiveness and simplicity. Towns which obtain their water from a distance, can augment the supply by taking water from a river near at hand, passing it through a sand filter, and then treating it with ozonised air.—W. P. S.

Lime; Solubility of ——, in Water at Different Temperatures. A. Guthrie.

See page 223.

PATENTS.

Water; Apparatus for Filtering and Purifying ——. G. Green, Yorkshire. Eng. Pat. 5607, March 26, 1900.

The apparatus consists of a horizontal cylindrical shell or casing, the end plates of which are cut away at the top, to afford communication between the interior of the shell and two sludge chambers or traps formed between the said end plates and the outer end covers. Both end-plates are formed, at a suitable height from the bottom, with a series of slots, which are inclined towards each other from the vertical, and are adapted to receive a series of flat grid bars, between the adjacent edges of which the filtered water passes. A sheet of perforated zinc is placed over the bars, and supports the filtering media. Suitable supply and discharge valves are provided for the water. To cleanse the filter, water is supplied through a supplementary val in the bottom of the casing, and, in passing upwar through the filtering material, washes the sludge, &c. ov into the chambers or traps at the ends, from which it c be drawn off through valves provided for that purpose.

—R. A.

Sewage; Precipitation of ——. E. Springborn, Londor Eng. Pat. 3036, Feb. 15, 1900.

The sewage is treated in a settling tank with from 2 to oz. per gall. of a mixture of two parts each of charcoal a quicklime with one part of sulphur. Either the charco employed is previously impregnated with a saturat solution of sodium chloride, or of potassium chloride, or one of these with a corresponding sulphate, and is th dried; or about 5 per cent. of the weight of the charcoal added to the original mixture described. The supernata liquid above the precipitate formed, is run off into a suital tank, and is filtered through peat charcoal. If the precipita is intended for use as fuel, from 2 to 5 per cent. by weight added to the precipitating mixture described, of pitc asphalt, or the like.—E. S.

Refuse or Waste Carbonaceous Materials; Destructi Treatment of ——. E. J. Duff, Liverpool. Eng. Pa 10,267, June 5, 1900.

The refuse material, either alone or enriched with co coke-breeze, oil, &c., is treated in a gas producer, so as furnish a more or less combustible mixture of gases, whi are then scrubbed, cleaned, and cooled; and, if necessa treated with weak sulphuric acid to remove ammonia.

—C. S.

(*C*.)—DISINFECTANTS.

PATENT.

Formaldehyde Generators. R. P. Kuhn, Alexandr Virginia, U.S.A. Eng. Pat. 19,599, Nov. 1, 1900.

The several forms of generator claimed consist, essentia of a base supporting a casing and burner pan, above latter of which is an oxidising chamber containing platinised diaphragm. A draught cone may also be plac above. The casing is perforated with air inlets below diaphragm, and means are provided for "muffling the fla of the burner pan after the diaphragm has been heated the degree desired."—A. C. W.

Errata.

This Journal, 1899, 1148, col. 32, 3 lines from bott *for* "1889, 862," *read* "1898, 862."

Also, this Journal, 1901, 146, col. 1, line 16 from *for* "1899, 862 and 1148," *read* "1898, 862, and 1 1148."

XIX.—PAPER, PASTEBOARD, Etc.

PATENTS.

Paper for Copying Purposes and Ink for Use thereu E. W. Brown, Forest Gate, Essex. Eng. Pat. 3807, 27, 1900.

The object of this patent is to prepare a hygrosc paper whereon either pen or machine written script ca copied without the necessity for first damping the surfac is done at present; and also to produce a typewriter for use therewith. On the one side paper is coated w layer of gelatin mixed with some hardening material as alum (free from iron), formalin, &c., and over applied a film of varnish, wax, or similar waterp material. The other side is treated with a hygroscopic such as calcium or magnesium chloride, with or wit glycerin, and with potassium ferri- or ferrocyanide, ta gallic acid, sulphate of iron, or other substance w will be chemically affected by ordinary writing ink. W the cyanides of potassium are employed, a little chlorid lime is added. The prepared sheets are given a coati gum or other adhesive round their edges.

These papers yield copies from pen written script by ntle pressure alone; for type-script an ordinary iron riting ink, emulsified or not with olive oil, is employed to pregnate the ribbons of the machine.—F. H. L.

brous Compositions; Manufacture of ——. H. H. Lake, London. From The National Packing Company, New York. Eng. Pat. 23,722, Dec. 28, 1900.

IE object of this patent is the production of a hard tough aterial which shall not be acted upon by hot or cold ter or oil. It consists in slaking lime, preferably in hot ter, and adding meanwhile, a waterproofing ingredient, h as tallow. The resulting material is dried, pulverised, d mixed with a fusible cementing substance (preferably in an equal quantity) also in a fine powder. Finally mixture is incorporated with a finely divided fibrous terial, such as waste paper or asbestos.—C. A. M.

lluloid-Like Products; a Method of Producing ——. E. Zühl, Berlin. Eng. Pat. 20,723, Nov. 16, 1900.

METHOD for producing celluloid-like products, in which camphor . . . . . is fully or partially replaced by following substances :—Methylnaphthylketone, dithylketone, methylhydroxynaphthylketone, dihydroxyaphthylketone."—A. C. W.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

ax : Behaviour of ——, *on Distillation with Methyl lcohol.* E. Polenske. Arb. Kais. Ges.-A. **17**, 564—68. Chem. Centr. 1901, **1**, [1], 15.

ADDING (this Journal, 1898, 606) was the first to point that on distilling borax with methyl alcohol, boric acid ses over into the distillate. The author found that -59 per cent. of the total boric acid distils over in this , and that by far the greater portion passes over during earlier part of the distillation. $NaBO_3$ with 5 molecules nethyl alcohol of crystallisation ($NaBO_3 + 5CH_3OH$) be obtained from the residue by the addition of ether. ax, on distilling with methyl alcohol, is not decomposed tly into boric acid and Na_2O; $NaBO_3$ is first formed, this is split up further, till the residue has the comtion $5Na_2O.4B_2O_3$. The latter, alone, is stable in ence of methyl alcohol vapour. The alkaline distillation lue ($5Na_2O.4B_2O_3$) is not a uniform substance, but is rently a mixture of $NaBO_3$ and Na_2O. The stability he residue towards methyl alcohol vapour is due to the ss of Na_2O, for if the $NaBO_3$ present be isolated by allisation from methyl alcohol, it can be further mposed by distillation with methyl alcohol.—A. S.

rocyanic Acid, Official ——; *Preparation of* ——. Prunier. J. Pharm. Chim. 1901, **13**, [2], 61—64.

author advocates for the revised French Codex the titution of Clarke's process for that of Pessina (action lute sulphuric acid upon potassium ferrocyanide). The wing method of preparation is recommended :—30 grms. rtaric acid are dissolved in 100 c.c. of water in a 500 c.c. , closed by a cork, fitted with a thistle funnel and a cal delivery tube about 1 metre in length, or a reflux enser. A solution of 10 grms. of potassium cyanide in c.c. of water is introduced, and the flask cooled in a m of water. The flask is now closed with an ordinary , and left until the precipitate of potassium hydrogen ate has subsided, when the supernatant liquid is ed. With a cyanide of good quality (80 to 90 per . of true cyanide), the solution thus obtained will contain it 2 per cent. of hydrocyanic acid. When a purer tion is required, the liquid can be distilled and the llate collected in a known volume of cold water.
—C. A. M.

um Peroxide; Some Properties of ——. G. F. Jaubert. Comptes Rend. **132**, [1], 35—36.

UM peroxide was prepared by passing pure dry oxygen pure sodium contained in a silver boat in a hard glass tube, arrangements being made for the collection of the volatilised portions of the peroxide formed. Thus prepared, sodium peroxide has a yellow colour; on heating, it darkens till it becomes brown, and, on cooling, regains its original colour. It can be easily melted in a silver crucible to a dark brown liquid; the crucible is strongly attacked. Pure sodium peroxide does not deliquesce in the air; it increases in weight very rapidly (10 grms. gained 8 grms. in four days; ultimately, after four months, nearly 12 grms.), becoming converted into carbonate, losing all its available oxygen, and changing from yellow to white.
—J. T. D.

Sodium Peroxide Hydrates; New Mode of Preparation, and Properties of ——. G. F. Jaubert. Comptes Rend. **132**, [2], 86—88.

SODIUM peroxide, as is well known, is decomposed with evolution of oxygen when thrown into water; but if it be exposed, under a bell-jar, to air deprived of CO_2, and kept moist by a neighbouring dish of water under the jar, it absorbs large quantities of water without evolving any oxygen. Under such conditions, the quantity of water absorbed by the peroxide can by far surpass the amount theoretically necessary for the decomposition of the latter In one experiment, 10 grms. of the peroxide absorbed 22·25 grms. of water; this corresponds roughly to $Na_2O_2.10H_2O$ but the mass was at this stage becoming pasty.

The hydrate, $Na_2O_2.8H_2O$, prepared in this way, is a pure white snowy mass, easily soluble in water. If the solution, saturated at the ordinary temperature, be cooled to 0° C., the hydrate separates in pearly scales similar to boric acid. It dissolves in acids without sensible elevation of temperature, giving remarkably stable solutions of hydrogen peroxide. It can be kept for many months at the ordinary temperature, but at 30°—40° C. it begins to give off oxygen, and deliquesces, and at 80°—100° C. decomposition is rapid and complete.

The author recommends the preparation in the laboratory of this hydrate of sodium peroxide as a source of pure 30—35 volume hydrogen peroxide solution for analytical work.—J. T. D.

Sodium Peroxide; Properties of ——. De Forcrand. Comptes Rend. **132**, [3], 131—133.

THE author draws attention to his work (this Journal, 1900, 167); most of Jaubert's results (see preceding abstracts) were there anticipated. Sodium peroxide free from potassium peroxide is, however, white, not yellow, when cold, and it does deliquesce in the air. The use of the hydrated peroxide as a source of extemporised hydrogen peroxide, suggested by the author, has been found convenient by many chemists. Jaubert's method of preparing the hydrate leaves in it any solid impurities of the peroxide. It is easy to prepare the pure hydrate from the commercial peroxide, by dissolving the latter in 4 parts of water, avoiding rise of temperature above 40° C., then rapidly cooling to 0° C., when pearly plates of the pure hydrate separate.—J. T. D.

Mercury; New Organo-Metallic Compounds of ——. A. and L. Lumière and Chevrotier. Comptes Rend. **132**, [3], 145—146.

SODIUM phenoldisulphonate, treated with mercuric oxide, yields a white amorphous powder, containing about 40 per cent. of mercury, and very soluble in water (22 parts in 100 at 15° C.). The solution has no metallic taste, but resembles ordinary sodium salts in this respect: it can be heated under pressure to 120° C. without decomposition; it is not precipitated by caustic soda, hydrochloric acid, or ammonium sulphide; it does not coagulate albumin in the cold, and has no irritant action on the skin or the tissues. Yet very minute quantities destroy bacilli, and prevent the putrefaction of blood, urine, or mutton-broth.—J. T. D.

Cerium. G. P. Drossbach. Ber. **33**, [19], 3506—3508.

IN view of the oft-repeated statement that cerium consists of at least two elements, the following experiment is quoted. 250 grms. of commercial cerium carbonate were dissolved in hydrochloric acid, potassium sulphide solution was added to precipitate heavy metals, and from the clarified solution the cerium was incompletely precipitated by means of alkaline bleaching powder solution, using 90 per cent. of that required for complete precipitation. The deep yellow precipitate was pressed and washed: with careful work it contained but little didymium, and some lanthanum and yttrium. It was treated with hot oxalic acid solution and hydrochloric acid, whereby it was quickly converted into oxalate (with evolution of CO_2), from which impurities, such as iron, lime, &c., were easily washed out. The oxalate was decomposed by a large excess of sodium carbonate solution, and the washed carbonate was dissolved in nitric acid. The colourless solution showed distinct absorption bands of Di when examined in thick columns, but not in the usual cells. It is noteworthy that a highly dispersive train of prisms is not so useful for this purpose as a simple spectroscope, as groups of weak absorption lines shown by dilute solutions may escape detection by the former though not with the latter. The cerous nitrate solution was evaporated with addition of ammonium nitrate, and the double nitrate was crystallised out, leaving all the Di in the mother-liquor. The double nitrate was now submitted to fractional crystallisation during a period of seven months, in course of which over 200 crystallisations were made. The La and Yt earths were completely removed at the third crystallisation. All the fractions obtained, however far apart in the series, were undistinguishable from cerium preparations made carefully by older methods, and the illuminating powers of mantles made from them were the same. No fraction gave a pure white, but always a pale yellow oxide on ignition.

The double sulphate method of separating yttrium and cerium earths—is only successful if the latter do not preponderate too much; otherwise the following process may be used. The freshly precipitated oxalates are dissolved in concentrated K_2CO_3 solution—which, contrary to published statements, dissolves all cerium and yttrium earths very readily. On pouring the solution into a considerable quantity of hot water, the carbonates of the cerium group are thrown down, while the yttrium group remain in solution. After settling, the clear liquid should be quickly decanted off.—H. B.

Thorium; Hydride and Nitride of ——. C. Matignon and M. Delépine. Comptes Rend. **132**, [1], 36—38.

Thorium chloride was prepared (*a*) by passing a dried mixture of chlorine and carbon monoxide over thoria heated in a porcelain tube, (*b*) by the action of carbon tetrachloride on thoria at a red heat. The second method is much the more rapid, but the product contains oxychloride, and the resulting metal (prepared by acting on the chloride with sodium) is contaminated with thoria. The authors were, however, able to use this metal (74 per cent. of thorium) in their work.

At a red heat, thorium combines readily with hydrogen. The product is not decomposed by water, but is readily acted on by hydrochloric acid, with evolution of twice the amount of hydrogen that would have been yielded by the metal it contains. This, and analysis by other methods, fix its formula as ThH_4. It is dissociated, with explosion, when strongly heated.

Thorium acts on nitrogen only at a much higher temperature than on hydrogen. The nitride is not dissociable at a red heat, is decomposed by hydrochloric acid forming a quantity of ammonium salt, which leads to the formula Th_3N_4. It is slowly decomposed by cold water, more rapidly by hot, according to the equation—

$$Th_3N_4 + 6H_2O = 3ThO_2 + 4NH_3.$$

Both of these substances burn when heated in oxygen, but without brilliant incandescence.—J. T. D.

Guaiakinol. L'Union Pharm. **41**, 529. Pharm. J. 1901, **66**, [1597], 132.

Neutral bromo-guaiacolate of quinine, $C_{20}H_{24}N_2O_2.2HBr.C_6H_4OHOCH_3$, has been introduced, under the name of "*guaiakinol.*" It forms fine crystalline yellow scales, easily soluble (1 : 1·25) in water. It is said to be pract cally non-toxic, and when applied in aqueous or alcoholi solution, is stated to be readily absorbed by the skin.—A. S

Guaiacol Cacodylate. A. Astruc and H. Murco. J. Pharm. Chim. **12**, [6], 553.

Guaiacol cacodylate, $As(CH_3)_2O_2.C_6H_4OCH_3$, forms white crystalline salt, showing a prismatic formation und the microscope. It is hygroscopic, and contains abo 1 mol. of water of crystallisation. Barbary and Reb have stated that the compound is soluble in alcohol and i glycerin, but the authors point out that these so-calle solutions give reactions identical with those of pu guaiacol. They found that the compound is extreme unstable, being split up into its components by treatme with water or ether or by heating at about 70° C.—A. S.

Cinnamo-Cacodylic Acid. A. Astruc and H. Murco. J. Pharm. Chim. **12**, [6], 555.

Cinnamo-cacodylic acid forms white prismatic crysta melting at 79°—81° C., and undergoing no loss in weig when heated to 100° C. It is sparingly soluble in eth glycerin, and fatty oils, and readily soluble in alcohol. is completely decomposed by water, which also precipitat cinnamic acid from the alcoholic solution of the compound —A. S.

Cascarilla Oil. G. Fendler. Archiv. der Pharm. **238**, 671; Pharm. J. 1901, **66**, [1596], 79.

Cascarilla oil, the essential oil of cascarilla bark, is sa by the author to have the following composition:—

	Per Cent.
Cascarillic acid	2·00
Palmitic acid	0·0
Stearic acid	0·
Eugenol	0·30
Cresol	Trac
A terpene (b. pt. 155°—157° C.)	10·00
l-Limonene	8·80
Cymene	13·20
A sesquiterpene (b.pt. 255°—257° C.)	10·50
A sesquiterpene, $C_{15}H_{24}$ (b.pt. 260°—265° C)	33·00
An alcohol, $C_{15}H_{23}OH$	11·00
High-boiling oxygenated fraction	10·00
A resin	1·10
	100·00

The free acids in the higher boiling fraction of the oil w converted into lead salts, and the lead cascarillate isola by extraction with ether, in which it is soluble. The f cascarillic acid forms a yellow oily liquid, with an od resembling that of butyric acid. It has the specific grav 0·9324 at 20° C.; solidifying point, −15° C.; and boi point, 270° C.—A. S.

Lemon Oil; Preparation of ——. J. F. Child and J. White. Chem. and Druggist, 1901, **58**, [1096], 15

The authors state that the *ecuelle* process for the paration of lemon oil is practically non-existent in Si, and that the greater portion of the oil is obtained by h pressure. Two methods are in use: (1) The *scor* process, in which the lemons are cut in half; and (2) *spugna*, or sponge, process.

The Scorzetta Process.—This is really a sponge pro, but only about one-half of the oil is extracted from peel, the latter being afterwards manufactured into ca lemon peel. The lemons are halved, the pulp rem, and the pieces of peel steeped in water for 2—4 hours, which they are ready for pressing.

The Spugna or Sponge Process.—The lemons are longitudinally into three pieces, a small piece of pulp l left in each piece of rind. The pieces of peel are soak water and finally pressed, the expressed oil being abs by a sponge.—A. S.

Lemon Oil; Properties of ——. J. F. Child and J. W Chem. and Druggist, 1901, **58**, [1096], 160.

The authors have examined samples of the pure oil, they had themselves seen expressed from the lemon ie samples varied considerably in physical characters. ccording to the British Pharmacopœia, pure lemon oil ould have an optical rotation of not less than + 59°; the nits for the oils examined were, however, + 55° and + 68°. general, the oils produced at the beginning of the season ve a high rotation, and those at the end, a low rotation. the oil be stored in large vessels, it loses its fine lemon vour, and the authors recommend, therefore, that it be eked direct in sheet-tin containers for export.

It is pointed out that although commercial cedrat oil is ually a mixture of lemon oil with a small proportion of of limes, &c., yet there is a genuine cedrat oil, with an ical rotation of 78°—80° in a 100 mm. tube, made for in perfumery.—A. S.

calyptus Oil containing 60 *per Cent. of Geranyl Acetate.* H. G. Smith. Paper read before the Royal Soc. N. S. Wales, Nov. 7, 1900. Chem. News, 1901, **83**, [2145], 5.

e author describes the oil of *Eucalyptus macarthuri*, ich is somewhat analogous to that obtained from *rwinia fascicularis* (see this Journal, 1900, 848). It tains 60 per cent. of geranyl acetate and 10·64 per cent. free alcohol, calculated as geraniol. It also contains esmol, the fraction which distils between 266° and ° C., crystallising into a solid mass in the receiver; this stance is not present in the oil of Darwinia. The fresh es and branchlets of *E. macarthuri* (collected in ober) yield, by steam distillation, 0·112 per cent. of oil, ch has the specific gravity 0·9245 at 15° C., optical tion + 3·6° in a 100 mm. tube, and forms a clear solu- with two volumes of 70 per cent. alcohol. The crude contains neither eucalyptol nor phellandrene, and is rely different in appearance and constituents from nary eucalyptus oil. The geranyl acetate present in the s completely saponified in the cold by alcoholic potash ½ hours. The geraniol isolated from the oil formed a urless oil, sp. gr. 0·885 at 20° C.; b. pt. 224°—225° C. corr.). The author suggests that the fact that geranyl ate can be completely saponified in the cold might be e use of in the quantitative determination of this ester n it is present, together with other esters, in essential —A. S.

nine Flowers; Essential Oil of ——. V. A. Hesse. er. 1901, **34**, [2], 291—296. (See also this Journal, 399, 296, 396, 513, 1153; 1900, 770.)

eply to Jeancard and Satie (this Journal, 1900, 770), author has previously stated that the quantity of orange soms used in the preliminary treatment of the enfleurage s too small to influence materially the properties of the nine oil obtained. The added gum-benzoïn remains nd when the extract of the pomade is rectified in steam. divergent results of Jeancard and Satie are ascribed to apparent omission to purify their jasmine oil by steam llation, and to the presence of vaseline in the oil. eline is completely removed only with great difficulty, is indeed somewhat volatile with steam (see below).

large quantity of jasmine pomade was prepared from not previously perfumed and containing only a small tion of gum-benzoïn. In a portion of this pomade the ntial oil was estimated; 1,000 kilos. of jasmine flowers led 1,684 grms. of volatile oil. It had previously been d, and the result was now confirmed, that 1,000 kilos. smine flowers yield, by extraction, 178 grms. of volatile Thus, during the 24 hours' enfleurage, the blossoms pro- nine times as much oil as they contained when plucked. he oil obtained from the above pomade had the specific ity 1·015 at 15° C., and optical rotation + 3° 20′ (100 .); the esters were 71·6 per cent., calculated as benzyl ate. Thus the oil obtained from pure jasmine pomade exactly the same properties as the oil formerly isolated a good commercial pomade. Consequently the pre- nary treatment of the fat in the latter case had not rially altered the properties of the oil.

sample of jasmine pomade prepared from vaseline out any addition of gum-benzoïn or essential oils was cted with alcohol. In spite of repeated freezing the ct still separated vaseline oil in drops. On distillation steam an oil of the following properties was obtained:—

Specific gravity at 15° C., 0·975; optical rotation, + 2°; esters, 58 per cent. (as benzyl acetate). The oil did not give a clear solution in 90 per cent. alcohol, whilst oil obtained from ordinary pomade is soluble in 80 per cent. alcohol. The alcoholic solution deposited drops of vaseline on standing; thus pure jasmine oil cannot be obtained in this manner, on account of the solubility of vaseline in alcohol and its volatility in steam. From 1,000 kilos. of blossoms, 1,053 grms. of volatile oil were obtained—a smaller yield than is obtained by using ordinary enfleurage fat.

The volatile oils obtained from the pure jasmine pomade and from the vaseline pomade had both a distinct fluorescence. By means of the method described by Hesse and Zeitschel (see page 289), it was shown that the oil contains 0·242 per cent. of methyl anthranilate. A second basic substance, unsaponifiable, was also isolated; it had an odour similar to pyridine. Essential oil of jasmine from a good technical pomade was found to contain 0·3 per cent. of methyl anthranilate.—A. C. W.

Sweet Orange Oil. K. Stephan. J. prakt. Chem. 1900, **62**, [23], 523—535. (See also this Journal, 1900, 771—772, 1111.)

The essential oil of the rind of the sweet orange (*oleum auranti dulcis*) contains at least 90 per cent. of *d*-limonene (Wallach, Annalen, **227**, 289). C. R. A. Wright found an alcohol, $C_{10}H_{16}O$, which boiled at 216°—218° C. (Chem. News, **27**, 260). Semmler found citral (Ber. **24**, 202), Flatau and Labbé, on the other hand, citronellal and an aldehyde of lower boiling point (this Journal, 1898, 600). Recently Parry has demonstrated the presence of linalool (Chem. and Druggist, 1900, 462, 722).

In order thoroughly to investigate the constituents of this oil a large quantity must be examined; 42 kilos. were fractionated under 14 mm. pressure, the second fraction, 64°—100° C., which still contained much limonene, was repeatedly fractionated; finally 530 grms. were obtained tolerably free from the terpene. The residue from the original fractionation is 3 per cent. of the oil. The 530 grms. were shaken with sodium bisulphite solution; the crystalline compound was washed with alcohol and ether until odourless, and then decomposed by dilute soda solution. The separated aldehyde was normal decyl aldehyde; by oxidation with silver oxide it was converted into normal capric acid. No trace of citral was found. It is probable that the oil examined by Semmler (see above) was adulterated with oil of lemons—an adulteration which could not, at that time, be detected. Also, no citronellal was detected; Flatau and Labbé gave no analytical proof of the presence of this aldehyde.

The oil, freed from aldehyde, was saponified by alcoholic potash. After driving off the oil and alcohol, the residue was evaporated to dryness in an atmosphere of carbon dioxide. The potash salts were extracted by absolute alcohol; the separated acid, after washing with dilute hydrochloric acid to remove traces of a fluorescent nitrogen compound, was found to be normal caprylic acid. The saponified oil was dried and treated with phthalic anhydride. The non-esterified portion was then fractionated; from the fractions boiling between 91° and 106° C., pure *d*-linalool was obtained by repeated fractionation. It was identified by oxidation to citral and conversion into *l*-terpineol. The portion boiling between 106° and 120° C. solidified in a freezing mixture; the crystals were *d*-terpineol, for which $[\alpha]_D$ was found to be + 95° 9′, a rotation higher than any hitherto observed. The terpineol formed a nitrosochloride by treatment with amyl nitrite and hydrochloric acid. The terpinylnitrolpiperidide melted constantly at 154°—155° C., whilst the corresponding *i*-terpineol compound melts at 159° C. After standing several days, phenyl isocyanate united completely with the *d*-terpineol to form the urethane, which had the correct melting point, 111°—112° C. The alcohols, which do not combine with phthalic anhydride, consist of almost equal parts of *d*-linalool and *d*-terpineol.

The phthalic esters were saponified, the alcohols distilled with steam, and fractionated; the principal quantity came over between 98° and 101° C., and was similar in odour to citronellol; it was, however, found to be normal nonyl alcohol.

The oil from which the terpenes had been removed had a distinct fluorescence; this was probably due to the presence of 0·01—0·001 per cent. of methyl anthranilate.

The waxy residue, which constitutes 3 per cent. of the original oil, may be purified by boiling with alcohol. It then melts at 67 —68° C. By saponification, a saturated acid was obtained: the analysis of the barium salt agreed nearly with the composition of cerotic acid, $C_{27}H_{54}O_2$. From the liquid an oil was extracted, which gave a substance melting at 138° C.; this was apparently an analogue of the phytosterols. A yellow crystalline sulphur compound was also isolated from the residue.

The quantitative composition of oil of sweet oranges is:—Terpenes, 96 per cent.; oxygen compounds, 1 per cent.; residue, 3 per cent. The oxygen compounds approximately consist of *n*-decyl alcohol, 5·7 per cent.; caprylic acid esters ($C_{10}H_{17}OOC_8H_{15}$), 8·5 per cent.; nonyl alcohol, 7 per cent.; *d*-terpineol, 39·4 per cent.; *d*-linalool, 39·4 per cent. It is noteworthy that among the important odoriferous constituents are three open-chain compounds — decyl aldehyde, nonyl alcohol, and caprylic ester.—A. C. W.

Bordeaux Turpentine. A. Tschirch and G. Brueniug. Archiv. **238**, 618. Pharm. J. 1901, **66**, [1596]. 79.

Bordeaux turpentine is composed of 6—7 per cent. of pimaric acid, $C_{14}H_{22}O_2$; 8—10 per cent. of pimaric acid, $C_{20}H_{30}O_2$; 48—50 per cent. of α- and β-pimarolic acids, $C_{18}H_{28}O_2$; 28—29 per cent. of volatile oil; 5—6 per cent. of bordoresin; and traces of succinic acid, bitter principle, and colouring matter. The three acids constitute about 64 per cent. of the total oleo-resin, and are soluble in caustic soda solution. The pimarinic acid can be isolated by means of the soluble double salt which it forms with ammonium carbonate. The ethereal oil consists of two main fractions, the greater portion distilling readily, whilst the lesser fraction, about 15 per cent. of the whole, distils less easily and tends to resinify.—A. S.

Opium; Chinese Extract of ——. J. Calvert. Pharm. Record, **30**, 322. Pharm. J. 1901, **66**, [1594], 27.

The author describes the method employed by Chinese experts in San Francisco for the manufacture of extract of opium. The balls of Turkey opium are softened in tepid water, then deprived of leaves, heated in a shallow brass pan over a charcoal fire, and kneaded into a soft mass with a wooden pestle. The mass is spread over the surface of the pan, the heating continued until the greater part of the moisture has evaporated, then the pan is inverted and the drying finished by the direct heat of a small fire. The hard crust is removed from the surface in layers as it forms, and toasted on a gridiron at a low temperature, over a charcoal fire until crisp. The dry material is infused several times with warm water; the first two infusions are strained, mixed with egg albumin, and boiled, the liquid being frequently skimmed, and fresh infusion added as the volume diminishes. When the liquid is sufficiently concentrated, the source of heat is removed, and the extract stirred in a current of air. 18 lb. of finest opium yield, on an average, 10 lb. of extract. It is stated that the direct heat by causing the decomposition of the caoutchouc, destroys the stickiness of the opium, and it is claimed that the yield of morphine is not lessened by this crude treatment.—A. S.

Antipeptone; Reputed Non-Existence of ——. F. Kutscher. Ber. 1901, **33**, [18], 3457—3460.

The substance left from the digestion of albumin with trypsin, after removal of coagulable proteids, albumoses, and crystallisable amido compounds was precipitated with alcohol, and termed "antipeptone" by Kühne (Zeits. Biol. **22**, 435, &c.). Kühne's results were confirmed by Siegfried and by Balke. In previous communications (Zeits. physiol. Chem. **25**, 195; **26**, 110), the author stated that he had obtained a substance apparently identical with Kühne's antipeptone, but that he found that it consisted of a mixture of various amido compounds and hexone bases (arginin, &c.). His results were called in question by Siegfried (this Journal, 1900, 1141). From quantitative experiments he has now come to the conclusion that Kühne's trypsin antipeptone is identical with the syrup obtained by the action of hot sulphuric acid on albumin In his opinion the two substances isolated by Siegfried ar *intermediate*, and not final products of trypsin digestion.

He asserts also that fibrin contains no anti-group ir Kühne's sense, and is therefore incapable of yielding a antipeptone.—C. A. M.

Antipeptone and Amphopeptone ——. M. Siegfried Ber. 1901, **33**, [19], 3564—3568.

The author here replies to Kutscher's criticisms (se previous abstract). He points out that Kutscher did no follow Balke's directions (Zeit. Physiol. Chem. **22**, 255) since he digested the fibrin for over five weeks, instead o four days, and yet assumed that the two products wer identical.

As regards his method of purifying antipeptone by mean of boiling alcohol (Zeit. Physiol. Chem. **27**, 338) he state that this was abandoned because he feared that the antipep tone might possibly be partially decomposed, whilst at th same time he had found a satisfactory method of obtainin a pure preparation.

He does not, he asserts, entirely share Kühne's view nor does he claim that his preparations are identical wit those of Kühne, though he considers that they are product of trypsin giving a biuret reaction, the existence of whic was recognized by Kühne, though he did not obtain the in a pure condition.

The author's conclusion is that antipeptone offers grea resistance to the further action of trypsin, but that in very active digestion it, too, will be digested. This, how ever, only modifies Kühne's view, and does not displace it.

Amphopeptone:—In experiments made for the author b P. Mühle, fibrin and Witte's peptone were digested wit pepsin in the presence of hydrochloric and sulphu acids, and attempts made by the author's method to obta Kühne's amphopeptone as a definite compound. Th following equation is suggested as indicating the relationshi between this amphopeptone and the α-and β-antipepton previously described, although it is not asserted that th represents the change which occurs in the actual digestion·

$$C_{21}H_{34}N_5O_9 + H_2O = C_{10}H_{17}N_3O_5 + C_{11}H_{19}N_3O_5$$

—C. A. M.

Tropine; Detection of ——; New Reactions. S. Vrev Chem. Zeit. Rep. 1901, **25**, [8], 172.

See under XXIII., *page* 285.

Carvone in Essential Oils; Determination of ——. J. Walther.

See under XXIII., *page* 289.

Methyl Anthranilate in Essential Oils; Determination ——. A. Hesse and O. Zeitschel. Ber. 1901, **34**, [296.

See under XXIII., *page* 289.

Cinnamic Acid in Presence of Benzoic Acid; Detection ——. A. Jorissen. Chem. Zeit. Rep. 1901, **25**, 1

See under XXIII., *page* 285.

Apiol; Detection of ——, New Reaction. A. Joris Chem. Zeit. Rep. 1901, **25**, [8], 14.

See under XXIII., *page* 285.

Salicylic Acid, Salicylates, and Phenol; Determinatio ——. F. Telle.

See under XXIII., *page* 288.

Camphorated Oil; Analysis of ——. J. F. Liverseeg

See under XXIII., *page* 289.

PATENTS.

Bromo-Compounds, [Tannin-Gelatin]; Manufacture New ——. C. D. Abel, London. From Actien-Ge schaft für Anilin-Fabrikation, Berlin. Eng. Pat. 5 March 17, 1900.

In the process claimed, bromine is added to an alcoh solution of tannic acid, and then gelatin solution. A shing, drying, powdering, again washing and drying, the duct is odourless and tasteless, and contains about 20 : cent. of bromine. It is said to be insoluble in the ces of the stomach and thus to be very suitable for dicinal use. Organic bromo-compounds so made are imed as new articles of manufacture.—A. C. W.

lo-Compounds, Organic [*Tannin-Gelatin*]; *Manuacture of New* ——. C. D. Abel, London. From Actien-Gesellschaft für Anilin-Fabrikation, Berlin. Eng. Pat. 5123, March 17, 1900.

e process claimed consists in adding an alcoholic solution odine to an aqueous solution of tannic acid, and then a tion of gelatin, washing and drying the precipitate. product is then powdered and washed with water or acted by chloroform or carbon bisulphide; it is stated e tasteless and to contain 22·5 per cent. of iodine, on ch account it is suitable for an internal remedy. Such nic iodo-compounds are claimed as new articles of ufacture.—A. C. W.

nylglycine Carboxylic Acid, Derivatives thereof and itermediate Products relating thereto. H. H. Lake, ondon. From Farbwerk Mühlheim, vormals A. Leonrdt and Co., Mühlheim-on-Main, Germany. Eng. Pat. 63, March 27, 1900.

he action of hydrocyanic acid and formaldehyde upon anilic acid, the nitrile $CO_2H.C_6H_4.NH.CH_2.CN$ is ned. The nitrile, on hydrolysis by caustic soda, yields ylglycine carboxylic acid; on treatment with alkyl es, esters are formed, which, by careful saponification, ice the acid esters of phenylglycine carboxylic acid. ral esters are obtained by the vigorous action of ifying agents on the nitrile. The nitrile, by the action lphuric acid, yields an amide; by the action of onium sulphide, a thio-amide. The amides, or their s, may be converted into phenylglycine carboxylic acid ydrolysis. These processes are claimed and also the e and its esters, the acid amides and thio-amides and esters, as new articles of manufacture.—A. C. W.

lphenylglycine-o-carboxylic Acid; Neutral Esters of —. H. E. Newton, London. From the Farbenfabriken mals F. Bayer and Co., Elberfeld, Germany. Eng. t. 6,628, April 9, 1900.

process is claimed for the production of neutral esters etylphenylglycine-o-carboxylic acid, which consists in ng the acid with alcohols and dehydrating agents ochloric acid gas) at a temperature below 50° C., and ng into cold water or removing excess of alcohol by ation *in vacuo* at the lowest possible temperature.
—A. C. W.

ocarbons; Process to render Sulphurised —— *ible in Water.* S. Fränkel and A. König, Vienna. g. Pat. 19,406, Oct. 30, 1900.

claim is for the process for rendering sulphurised carbons (the mineral oil containing sulphur from ichthyol is produced) soluble in water, "by mixing with soaps or alkali salts of fatty, oleïc, or resin acids."
—A. C. W.

XXI.—PHOTOGRAPHY.

oto-Chemical Induction." R. Abegg and C. Immerwahr. Monatsh. f. Chem. 1901, **22**, 38.

ix and Luther have shown that when a halogen coml of silver is exposed to light for long periods of time, te of chemical equilibrium will be finally reached is defined for every degree of intensity of the light manifestation of a certain potential (gas-pressure, ., strength of solution) in the halogen liberated. tate of equilibrium is not attained in practical photoy, firstly, because the exposure is too short; secondly, e the halogen disappears partly by diffusion, and by combination with the emulsifying material of the film. The sensitiveness of a plate is measured by the photo-chemical effect produced by a certain exposure; and as the limit of the action is reached when the halogen exhibits its equilibrium potential, it follows that everything which reduces the actual halogen potential below its equilibrium value increases the photo-chemical effect, or the sensitiveness of the film. For this reason a substance like gelatin, which is readily oxidisable, should, and as a matter of fact does, yield a more sensitive emulsion than such a body as collodion, which is indifferent towards halogens; because the free halogen that would interfere with the action of the light is brought to a lower potential by combining with the gelatin in part. When, as in practice, silver bromide is emulsified in gelatin, the ideal process outlined above is complicated by two opposing forces: on the one hand, diffusion of bromine into the atmosphere is retarded by the colloid, which tends to reduce sensitiveness; on the other hand, bromine combines with the colloid, which tends to increase sensitiveness. Since, however, the second action is far more important than the first, a gelatin plate is highly sensitive; but that the former process is somewhat inhibitory the following experiment shows.

A uniformly coated gelatin plate was cut in two and placed in a stereoscopic camera, one half with the film towards the lens, the other half with its glass in front. Before the film exposed (*i.e.*, the former) plate was fixed a sheet of glass not touching the film, in order to equalise the intensity of the light which reached each portion of the sensitive stratum. The whole was given a short exposure to a brightly lighted wall, and both halves were then simultaneously immersed in a very weak, slow, developer. The glass-exposed plate gave a distinctly weaker image, which appeared and grew almost equally throughout the entire thickness of the film; the film-exposed plate developed more rapidly, but the image was confined at first to the outer surface of the film, and it penetrated but slowly towards the glass. The concentration of the deposit upon the front surface of the film-exposed plate, and its regular distribution through the film of the glass-exposed plate were shown clearly by the microscope; and by measurement it was found that the former contained 410,000 granules of silver per sq. mm., as against 325,000 in the latter. These results correspond with theory: in the film-exposed plate the light is strongest where diffusion is most easy; as the light penetrates and becomes weaker, so the film becomes less sensitive by the obstacles opposed to the escape of the halogen, therefore the action is essentially confined to the immediate surface. In the glass-exposed plate, on the contrary, the light is strongest where the film is least sensitive; and as the light becomes weaker, so the film becomes more sensitive, therefore the action is roughly equal all through the emulsion. It may be objected to this experiment that the developer was at once in contact with the bulk of the latent image in the film-exposed plate, whereas it had to penetrate the gelatin further to reach that in the glass-exposed plate. The authors endeavoured to remove this source of error by using a developer so weak and slow in action that the time of development should be very long in proportion to the time required to wet the film throughout: a more rapid developer produced greater differences between the two halves. It might be possible to avoid this objection by stripping the film from the glass-exposed plate, reversing it on to another glass support, and developing it from what was originally the underneath side. An experiment in which a film-exposed plate had a sheet of glass in mechanical contact with it, showed no falling-off in sensitiveness; to impede the escape of bromine, therefore, the impervious surface must be in physical contact with the film.

It is important to observe that this diffusion of the halogen is a process requiring time, and that it is consequently greater as the period of [photographically correct] exposure increases. When the foregoing experiment was repeated under such practical conditions (a weaker source of light) that the exposure rose to 30 seconds, there was scarcely an appreciable difference between the two halves of the plate. This circumstance explains the notable difference in photo-chemical effect between a continuous and an intermittent exposure of equal length, which has been remarked by Abney and Englisch. During a continuous exposure, the bromine is constantly escaping at a regular speed; during an intermittent one, in each interval of darkness the liberated bromine has an opportunity of re-combining with the altered silver compound, and thus it tends partially to reverse the action that has already taken place. Since, however, the speed of reaction between the halogen and the altered compound has a limiting value, any increase in the length of the periods of darkness during a discontinuous exposure, will decrease the photo-chemical effect, as those authors have proved; yet it will only decrease that effect to a fixed minimum. Conversely, if the source of light be very powerful, so that the pressure of the halogen set free is high, its speed of diffusion will be raised, and less reversal will occur during the intervals. In cases of photographic over-exposure, there is no distinguishable difference between a film-exposed and a glass-exposed plate.

Further experiments on these phenomena, which the present authors denominate "photo-chemical induction," are in progress.—F. H. L.

Ammonium Persulphate; Photographic Reduction by Means of ——. Luppo-Cramer. Brit. Jour. Phot. **48**, [1901], 89.

The presence of gelatin alters entirely the chemical reaction which takes place when silver nitrate solution is added to one of ammonium persulphate; a great evolution of heat takes place, and oxidation of gelatin occurs, without any intermediate formation of silver peroxide. Other substances, such as starch, gum arabic, and albumen have the same effect. In the absence of silver, the action of ammonium persulphate on gelatin is very slow indeed, several hours being required for solution. Nyblin's hypothesis, that by the action of persulphate on silver, a "substance is formed which has the power of dissolving gelatin," receives some confirmation from these experiments, the substance in question being silver persulphate. With a collodio-bromide negative, however, reduction takes place in exactly the same way, although more slowly, so that it would appear that the principal reaction still needs some other explanation than that of Nyblin.—J. W. H.

Developers [Photographic]; Action of Sodium Sulphite in ——. R. E. Liesegang. Chem. Zeit. Rep. 1901, **25**, 8. From Phot. Alm. 1901, **21**, 105.

The fact that a solution of sodium sulphite has a solvent action on silver bromide, and, to a greater extent on silver chloride, and especially so in warm weather, explains, to some extent, the formation of "veils" on plates and metallic stains on prints and dishes on abnormal treatment. After a plate had been immersed in a normal developer for 10 hours, all unexposed silver bromide was dissolved, and, besides chemical development, a certain amount of physical development had taken place.—J. W. H.

Gelatin Dry Plates, "Fogging" of ——. A. Zucker. Chem. Zeit. **25**, [5], 45.

The "fogging" of dry plates may be due to various causes, but usually indicates that the sensitising of the silver bromide by means of ammonium hydroxide has been carried too far. The temperature and meteorological conditions have a great influence on the sensitising process. A highly sensitised plate has to have its emulsion carried to the very verge of "fogging," so that a moment's longer treatment would fog the whole.

As regards "outer-fogging," which begins from the edges of the plates and gradually spreads to the interior, the author remarks that this usually occurs in old plates packed in cardboards. This decomposition of the silver bromide takes place without the action of light, but, apart from this, the long-continued action of red light may also produce "fogging" in very sensitive plates. It is noteworthy that the parts of the plates most affected are those on which the separating papers lie. According to Eder, "fogging" almost invariably occurs on the original edges of the plates, whilst the edges of the plates subsequently cut from it do not show the phenomenon. The author, however, confirms Hertzka's conclusion that the reverse is the case. In his opinion the "fogging" is primarily formed in the emulsion itself through different influences, for non-sensitive emulsio hardly show the phenomenon. The less gelatin an emulsi contains, the more likely it is to "fog." The pressure the paper accelerates the process. Such factors as i purities of the packing paper, quality of the gelatin (Wild and phosphorescent phenomena (Schmidt), may acceler the "fogging," but cannot, in the author's opinion, regarded as its cause.—C. A. M.

Gelatin-chloride Prints; Development of ——. Brit. Jo Phot. 1901, **48**, 70.

By development instead of printing out, the range qualities and possibilities of gelatin-chloride paper is grea increased. The time of development in the gallic a bath determines the colour of the resulting print, red to being produced by short development, and tones from br to greenish-black by carrying the operation further (in cases, of course, altering the time of exposure to su An acid bath gives redder tones than an alkaline one; latter can be most conveniently made by the addition sodium acetate. Any spots of reduced silver may removed after fixation by means of a tuft of cotton wool —J. W. I

Halation in Micro-Photography; Prevention of — G. C. van Walsem. Chem. Zeit. Rep. 1901, **25**, 8. F Int. Phot. Monat. Med. 1900, **7**, 217.

The author backs the plates with aurantia-magenta lodion, prepared by dissolving: Aurantia, 0·5 g Magenta, 0·1 grm., in 100 c.c. of 2 per cent. collodion, adding 4 c.c. of castor oil. The exposure must be incre 2½—3 times.—J. W. H.

PATENTS.

Lighting Apparatus, Intense ——, *for Instanta Photography.* J. F. Guimaraes. Eng. Pat. 611, Ja 1900.

See under II., *page* 237.

Photographic [Matt-Surfaced] Emulsions. B. J. B. London. From A. Lumière et ses Fils, Lyons. Pat. 3736, Feb. 26, 1900.

The matt surface is obtained by adding 35 or 40 grm powdered and levigated kieselguhr to the litre of ord emulsion. This produces as good an effect as double weight of pumice, while the kieselguhr has no delet action upon the sensitive silver salts.—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc

Gases; Sensitiveness to Explosion of Mixtures of — *thin Layers. III.* F. Emich. Monatsh. für 1900, **21**, [10], 1061—1078.

In a former communication (this Journal, 1898, 90 author showed that a relationship existed betwe inflammability of thin layers of explosive mixtu gases, and the distance between the electrodes; a subsequently established that in the case of mixtu hydrogen or methane with oxygen, or of hydroge chlorine, the inflammability was greatest when a proportion of the heavier constituent was present.

In the present paper he describes the experiments he has made with the object of determining the c this influence. In the first place he shows that no relationship can be established between the tempera ignition and the thickness of the layer in which ign an explosive mixture first occurs. An addition of (which has the opposite influence to oxygen) in gr increasing quantities to the explosive mixture was f first slightly lower and then to raise the tempera ignition, though in either case its influence in this was only trifling.

The greater inflammability of thin layers contai excess of oxygen, may be due to the slighte conductivity of the latter, but on this assumptio difficult to account for the retarding influence rogen. Hence the excess of oxygen possibly takes part the process of combustion, as *e.g.* in the equation—

$$\begin{matrix} H_2 & & O\text{——}O & & H_2O & & O \\ & + & & = & & + & | \\ H_2 & & O\text{——}O & & H_2O & & O \end{matrix}$$

s chlorine mixed with hydrogen behaves in an analogous mer to hydrogen with oxygen, experiments were made etermine whether chlorides would be reduced by hydro- with the liberation of chlorine, but these gave negative lts.

he influence of ozone on the explosion was found to be pronounced. A mixture of 40 parts of hydrogen and arts of oxygen, containing 30 per cent. of ozone, was mmable in a layer of about only half the thickness of same proportions of hydrogen and ordinary oxygen. maximum inflammability (minimum distance between electrodes) was reached with a mixture of about equal s of hydrogen and oxygen, but when the latter contained er cent. of ozone, its ratio under the same conditions over 60 per cent.

explanation of this, it is suggested that the presence of atoms may accelerate the reaction, or that the reaction be as follows :—

$$H_2 + O.O_2 = H_2O + O_2.$$

this assumption, experiments were made on the nce of an electric current (avoiding explosion) and of ontgen rays, with the idea that free atoms might also oduced in those cases. In neither instance, however, here any perceptible influence on the inflammability of xplosive mixture.

support of the view that the slight heat-conductivity excess of oxygen or chlorine is not in itself sufficient plain their influence on the inflammability, the author attention to the following facts :—

Notwithstanding the difference between the heat-conivities of chlorine and oxygen, the respective mixtures ese with hydrogen are so far analogous that the st inflammability is reached when the proportion of gen is approximately half of that required for the lete combustion.

The inflammability of mixtures in which the comn is complete, and of those which are most readily d are in the same ratio in the case of both gases, —

$$65:48 = 1{\cdot}35$$
$$87:63 = 1{\cdot}38$$

ich 65 represents the inflammability of the typical re of hydrogen and oxygen, 87 that of the typical re of hydrogen and chlorine, and 48 and 63 the tive inflammability of the most easily ignited mixtures.

The inflammability of an explosive mixture containing arbon monoxide is considerably increased by the ice of a small quantity of water-vapour, which might ly influence the conditions of dissociation, but not the onductivity.

The composition of the most readily inflammable re of marsh gas and oxygen can be calculated from ta obtained with the other explosive mixtures, which not be possible if the phenomenon depended on heattivity alone.

The increase in the inflammability of mixtures con ozone, is greater than might be expected from the ial energy.—C. A. M.

PATENTS.

plosives ; Factories for the Manufacture of ——. eoeke, Kingsbury. Eng. Pat. 1888, Jan. 30, 1900.

plosive factory in which the drying, heating, cooling, ising, or other operations required in the manufacture losives, can be effected in one and the same receptacle t removal of the material therefrom in the course of icture.—G. W. McD.

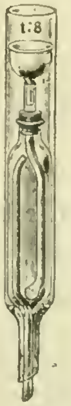
Nitro-Explosives ; Manufacture of ——. W. D. Borland, London. Eng. Pat. 4593, March 10, 1900.

In the manufacture of nitro-compound explosives, the application and use of emulsions are claimed, and also the application and use of warm moist air for removing the volatile parts remaining in the explosive. The emulsions consist of methylated spirits, 1,000 parts; acetone, 10 parts; camphor, 5 parts; paraffin, 5 parts; benzoline, 30 parts. It is claimed that by the introduction of the oily matter in the form of an emulsion, special conditions of porosity and hardness of grain are obtained. About 120 galls. of this emulsion are used per ton of powder.—G. W. McD.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

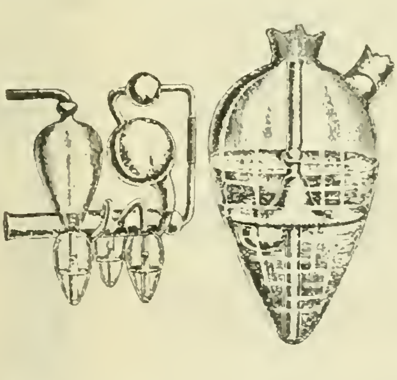
Apparatus for the Extraction of Liquids ——. C. A. Neufeld. Zeits. Untersuch. Nahr. Genussmittel, 1901, **4**, [1], 15—16.



The apparatus shown in the figure is based upon the same principle as that of Bremer (Forschungsber. üb. Lebensmittel, 1894, **1**, 20), but is capable of extracting a far greater quantity of liquid (up to 300 c.c.), by means of a specifically lighter solvent. It consists essentially of an inner and outer glass vessel. The former, which holds about 300 c.c., receives the liquid to be extracted. It has fused into it an outlet tube for the removal of the excess of solvent, and is closed by a stopper, through which passes a funnel, the end of which expands into a rose with fine openings. The solvent, condensed by the Soxhlet's cooler, falls into this funnel and rises to the surface of the liquid, whence it passes through the outlet tube into the extraction flask below.—C. A. M.

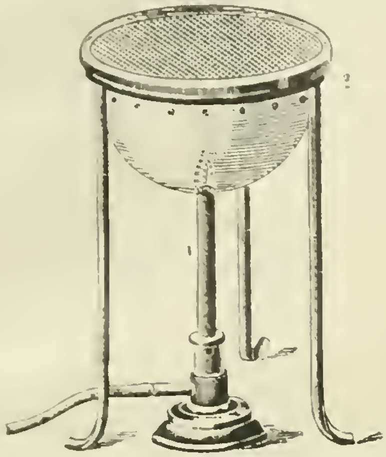
Geissler's Potash Bulbs ; Modification of ——. J. Wetzel. Ber. 1900, **33**, [18], 3393—3394.

It is well known that in the elementary analysis of certain organic substances, *e.g.*, nitro-compounds, the gas is evolved too rapidly, so that there is incomplete absorption of the carbon dioxide. To obviate this the author has devised the apparatus shown in the figure, the novelty in which consists of three movable glass funnels, one in each absorption vessel. From 5 to 10 bubbles are retained by these until they unite into a larger bubble and pass into the next vessel. The gas is thus kept in contact with the potash for a much longer time. An experiment is described which shows that the absorption is more complete in this apparatus than in the ordinary bulbs.—C. A. M.



Heat Economiser ; New ——. H. Zollna. Chem. Zeit. 1901, **25**, [7], 69.

The apparatus shown in the figure is recommended for economising heat (25—30 per cent.) and time in evaporating liquids, &c. on a wire gauze. It consists of an asbestos hemisphere with a top of wire gauze, kept in position by two brass rings. At the bottom there is an opening for the



Bunsen burner, and the products of combustion escape through the holes in the side.

INORGANIC CHEMISTRY.—QUALITATIVE.

Ammonia; Use of Corrosive Sublimate (Mercuric Chloride) for the Detection of ——. A. Ferraro. Boll. Chim. Farm. **39**, 797. Chem. Centr. 1901, **1**, [3], 203.

The detection of ammonia by means of mercuric chloride cannot be considered quite trustworthy, as the mercuric compound frequently contains alkali salts, and consequently gives, in the cold, even with waters free from ammonia, precipitates consisting of mercury hydroxide or oxychloride or an unstable double carbonate of mercury and calcium. In order to make the test reliable, the author recommends that the mercury precipitate be well shaken with acetic acid in the cold. If the precipitate consist of mercury ammonium chloride, it will dissolve only very slowly and on addition of much acetic acid. The precipitates or turbidity formed in waters free from ammonia, will, on the other hand, dissolve immediately in a few drops of acetic acid.—A. S.

Chlorates and Bromates; Detection of ——*; New Reaction with Strychnine.* Fages. Annales de Chim. Analyt. **5**, 441.

Although the red colour reaction given by strychnine nitrate with potassium chlorate is well known, its practical application has not hitherto been recognised, since, for the purpose of detecting the alkaloid, it is of little use, not being sufficiently delicate; a good reaction is only obtained when the alkaloidal salt is present in considerable excess. On the other hand, the author finds it to be delicate and useful when applied as a test for chlorates and bromates. The reagent is prepared by dissolving in the cold, 0·81 grm. of strychnine in 24 c.c. of nitric acid, (sp. gr. 1·334). The reagent should be freshly prepared, and not kept more than 24 hours. In applying the test, care should be taken that the reagent is in excess, 1 c.c. being employed for 1 or 2 drops of the solution to be tested. If the salts tested for be present in any quantity, an intense red colour will be produced in a few seconds; only bare traces be present, the colour may not develop fc 10 to 15 minutes. One drop of a solution containin 0·0001 grm. of chlorate will give a deep-red reaction in fiv minutes. Hypochlorites, chlorine, and hydrochloric aci retard the reaction, or discharge the colour formed. Ferr chloride, in excess, has the same effect. Other chlorides on interfere when present in great excess. Nitrites also preve the reaction, unless the solution has previously been treat with nitric acid. Iodates and perchlorates give no reactio and do not interfere with that of chlorates or bromat Permanganates are decolorised and then no longer inte fere with the reaction, so that the red colour produced aft the tint of the permanganate has been discharged, is eas observable. The red compound is not dissolved on agitati the aqueous solution with carbon bisulphide, with eth with chloroform, or with petroleum spirit.—J. O. B.

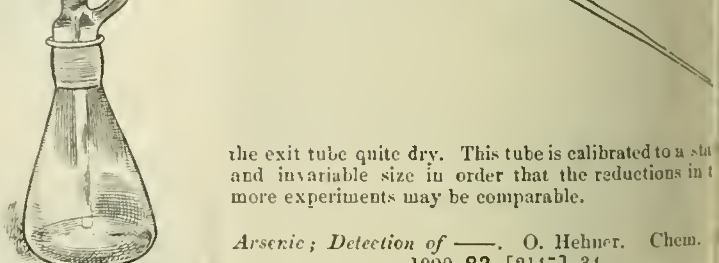
Sulphuric Acid; Seleniferous ——. N. A. Orlow. Chem. Zeit. **25**, [7], 66.

Referring to the codeïne test recommended by Schlagd hauffen and Pagel (this Journal, 1900, 440), the auth deprecates this reagent for the detection of traces selenium, the colour reaction being also produced by ir salts, oxidising agents, &c., and, according to Sergejef, pure sulphuric acid.

On the other hand, he regards sulphur dioxide as perfectly reliable reagent, 0·3 per cent. of selenic a dissolved in sulphuric acid giving the red precipit at once in the cold, whilst 0·03 per cent. gives it afte few hours in the warm, and 0·003 per cent. furnishe rose-red coloration, a precipitate being finally deposi from the liquid.—C. S.

Marsh's Test; New Apparatus for ——. C. T. Ty Chem. and Druggist, March 23, 1901, 493.

This apparatus is designed for Marsh's test for arse In it the usual double-perforated cork, or I.R. bun avoided, which, used once for an arsenical article, afterwards condemn an arsenic-free one. The flas marked at 200 c.c. The hydrogen in its exit, bub through a 10 per cent. solution of lead acetate in the b so that sulphuretted hydrogen, if present, is absorbed, arseniuretted and phosphoretted hydrogen are not. gas then passes through the potash tube, so that it e the exit tube quite dry. This tube is calibrated to a sta and invariable size in order that the reductions in t more experiments may be comparable.



Arsenic; Detection of ——. O. Hehner. Chem. 1900, **83**, [2147], 34.

The author states that in the Marsh-Berzelius test it aluminium and sodium hydroxide, minute quantit arsenic are not evolved as arseniuretted hydrogen. perfectly pure zinc and boiled hydrochloric acid, a as 0 005 mgrm. of arsenious acid gives a distinct but with aluminium and sodium hydroxide, no ind of a mirror could be obtained even with 0·2 mg arsenious acid in about 25 c.c. of solution. The admits that it is possible that, just as with pure zinc, di iples of aluminium may vary as to their sensitiveness he test, but it is necessary, therefore, after absence of enic is proved, to test every batch of new material, for sitiveness, and to prepare from every batch a set of idard mirrors.—A. S.

enious Oxide Micro-Sublimate. [Reinsch's Test]. heridan Delépine. British Med. J. [2089], 84. Pharm. ourn. 1900, **66**, [1597], 105.

MALL thimble-shaped copper cone, $\frac{5}{8}$ in. in diameter $\frac{1}{2}$ in. high, is inserted into a thin iron plate through a ral hole, the open end of the cone having a rim which on the edge of the aperture. When required for use, copper cup is heated, then cooled, the pieces of kened copper foil from Reinsch's test are dropped in, op of the cone covered with a $\frac{7}{8}$ in. cover glass, and again applied. If arsenic be present, a sublimate of $)_3$ will be obtained on the cover glass, ready for oscopical examination.—A. S.

nic in Manufactured Products; Discussion on Occurrence and Detection of ——. (London Section.)

Pages 188—200.

nic in Beers, Brewing Materials, and Foods; Detection of ——. W. Thomson and J. P. Shenton.

See page 204.

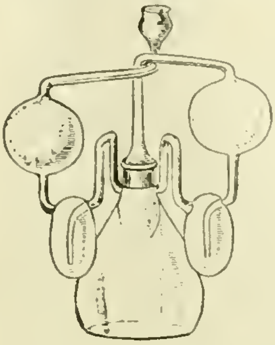
: Detection of Arsenic in ——. A. H. Allen. lyst, 1901, **26**, 10—13. (See also this Journal 1901, 3.)

uthor lays stress on C. Estcourt's reminder that beer ning sulphites will not give an arsenical mirror with 's test. The sulphites become reduced and may about the complete conversion of arsenic into sulphide evolution flask, and so remove it from the sphere of . The sulphites are best removed by adding an ing agent such as hydrogen peroxide, bromine water, assium permanganate to the acidulated beer. The being thus oxidised to the arsenic state some time s before the liquid will evolve arsenical hydrogen in 's apparatus. This inconvenience the author over- by adding a few drops of a reducing agent such as is chloride.

author finds Reinsch's test to be the most satisfactory detection of arsenic in beer. The hydrochloric acid yed is purified by distilling off about one-tenth, this n containing the minute trace of arsenic originally t. 100 c.c. of the beer are taken, and, to eliminate tes, boiled for a few minutes with hydrochloric acid romine water. The arsenic is then reduced to the us condition by adding a small quantity of a solu- f cuprous chloride. On now introducing about m. of copper-foil and boiling, any arsenic is deposited copper. The boiling is continued for 30 minutes, lume of liquid being kept constant. If the copper rkened, it is dried in the water-oven, cut into strips ated in a narrow tube, when a characteristic deposit enious oxide, in the form of microscopic octohedra ahedra will be obtained if the original deposit on the was due to arsenic. The definition of the crystals is ed by filling the sublimation-tube with water. A le detail in the report of the Commission to the Man- Brewers' Central Association is the direction to the upper part of the sublimation tube before heating pper. This precaution results in the deposition of crystals of arsenious oxide than would otherwise be ed.—J. L. B.

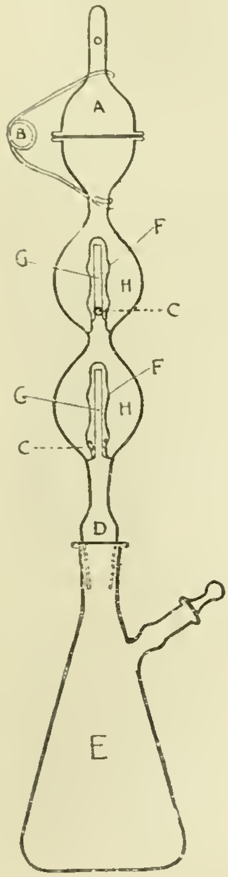
c Test, Gutzeit's; Apparatus for the Application —. W. Kirkby. Pharm. J. 1901, **66**, [1596], 80.

uthor states that his experiments show that, in e apparatus, a 5 per cent. solution of normal lead will remove the whole of the hydrogen sulphide ie gas evolved, without retaining the smallest trace of any arsenic present. The apparatus recommended is shown in the accompanying diagram. The gas is generated in the flask, and traverses five bulbs, of which the three lower ones are half filled with a 5 per cent. solution of normal lead acetate. After leaving the last bulb, the gas passes to a small thistle funnel, which is covered with a filter-paper cap bearing a dried drop of mercuric chloride solution (1 in 20). For the purpose of making comparative determinations, the apparatus should be of a standard size, and definite quantities of the different reagents should be added. (See also this Journal, 1900, 1145.)—A. S.



Arsenic; Marsh-Gutzeit Test for ——, and Apparatus. C. T. Tyrer. Chem. and Druggist, **58**, [1102], 389.

THE hydrogen is generated in the flask E, and passes up the tubes G and out by the holes C in the inverted tubes F. A little 10 per cent. solution of lead acetate, in which arseniuretted hydrogen is insoluble, is contained in the chambers H, and the lead or silver paper is placed below the funnel-shaped cap A. B is a piece of copper wire. The illustration is one-third of the actual size of the apparatus as employed. (See also W. Thomson, page 206.)



INORGANIC CHEMISTRY.—QUANTITATIVE.

Arsenic in Beer; Detection and Determination of ——. E. W. T. Jones. Chem. News, 1901, **83**, 25.

Detection of Arsenic.—250 c.c. of the beer are evaporated in a porcelain dish to about 100 c.c., 25 c.c. of pure hydrochloric acid added, then a piece of pure fine copper gauze, 1 in. by $\frac{1}{4}$ in., introduced into the boiling liquid, and the boiling continued for 15 minutes. If the copper is not darkened, the proportion of arsenic present is certainly less than $\frac{1}{40}$ grain per gallon. If the gauze is stained, it is washed with hot distilled water, then with alcohol, and dried. It is then rolled up and heated in a glass tube, about 3 ins. long, of elliptical cross section, and which is drawn out so that the gauze can rest in the wider portion, and the sublimate be concentrated in the narrower part. In this way, unmistakable octahedral or tetrahedral crystals of arsenious oxide are obtained without the least difficulty, when $\frac{1}{20}$ grain per gallon is present. For glucose, syrups, jams, &c., 50 grms. are made up to 100 c.c. with hot distilled water, and then examined in a similar manner. The copper gauze is prepared by heating to redness, removing the black oxide with nitric acid, washing, and drying

Determination of Arsenic.—The author uses a method, based upon that proposed by Clark (this Journal, 1893, 549). 250 c.c. (or more) of the beer are evaporated to about 100 c.c., 25 c.c. of pure hydrochloric acid added, a piece of pure bright copper gauze, 1 in. by 3½ ins., introduced in the shape of a loose roll, and the liquid kept gently boiling with occasional stirring for, say, an hour, distilled water being added from time to time to make up the volume; considerable concentration is, however, advantageous before making up the volume with water. The gauze is removed, washed with hot distilled water, and the first washings returned to the dish, together with another roll of copper gauze; the boiling of the solution is then continued. The stained copper gauze is placed in a small beaker containing 5 c.c. of normal sodium hydroxide solution, diluted so that it just covers the roll, and three or four drops of a 10-volume solution of hydrogen peroxide are added. The dark coating of the copper is gradually dissolved, and, when the copper is quite bright, it is removed and washed, the washings being collected in a separate beaker. This process is repeated until the copper gauze, when removed from the boiling solution, is no longer stained. The alkaline solution of arsenate and the washings are mixed, heated for about an hour, the precipitated copper filtered off, 7 c.c. of normal sulphuric acid added to the filtrate, and then a little pure sulphurous acid solution, till the liquid smells of SO_2. The solution is boiled to expel all traces of free sulphur dioxide, treated, whilst hot, with its own bulk of saturated sulphuretted hydrogen water, and then sulphuretted hydrogen passed through the warm solution. The beaker containing the solution is let stand uncovered overnight in a warm place, then the arsenic trisulphide filtered off through a very small filter, and washed free from saline matter. The precipitate is dissolved in hot, very dilute ammonia water, the solution evaporated to dryness in a small flat capsule, and, after cooling, two or three drops of hot distilled water are added, and then, drop by drop, very dilute hydrochloric acid (1 drop of acid to 10—15 c.c. of water) to the faintest acidity with litmus. The solution is evaporated to dryness, 2 or 3 c.c. of sulphuretted hydrogen water added, again evaporated to dryness, the residue washed with a few c.c. of distilled water, then boiled with carbon bisulphide to remove sulphur, washed with alcohol, and finally with water. The capsule is then dried, cooled in a desiccator, removed to the balance with a pair of cold forceps (not with warm fingers), and weighed to the tenth of a mgrm. The residue in the capsule is treated with hot ammonia water, which dissolves the arsenic sulphide, and leaves, attached to the capsule, any trace of copper sulphide. After washing, the capsule is dried, cooled, and again weighed; the difference between the two weighings gives the amount of arsenic trisulphide.

Blank tests should be made with pure beer.—A. S.

Arsenic from Antimony, &c.; Separation of ——. M. Rohmer. Ber. 1901, 24, [1], 33—38.

The method of separation proposed by Piloty and Stock (this Journal, 1897, 764), is only applicable to the separation of arsenic from antimony and has the drawback of yielding an arsenic sulphide which cannot be directly weighed owing to the amount of sulphur it contains. The method which the author recommends is based upon the fact that arsenic is volatilised rapidly and completely in a mixed current of hydrochloric acid gas and sulphur dioxide, provided a little hydrobromic acid has previously been added to the solution. Without this addition the reduction is very slow and often incomplete (Bunsen, Ann. d. Chem. 192, 321).

The solution containing the arsenic is strongly acidified with hydrochloric acid, and introduced into a round-bottomed 500 c.c. flask with a long neck, together with 1 grm. of hydrobromic acid (about 1·5 grm. KBr or 1 grm. of Br and sulphurous acid), and concentrated hydrochloric acid, to fill the flask about one-third full. The flask is closed with a cork through which pass a short delivery tube, and a tube passing to the bottom of the flask and connected with a T-piece outside, the two arms of which are connected with
flasks generating hydrochloric acid gas and sulphur diox
respectively. The delivery tube leads into a receiver c
taining about 300 c.c. of water, which is kept thoroug
cool in a freezing mixture. The flask is inclined at
angle of 45° and the distillation continued for about
minutes or down to 10 c.c., whilst a strong current of hyd
chloric acid gas and a weak current of sulphur dioxide
passed through. Under these conditions 0·15 grm.
arsenic is completely expelled by one distillation.

For the gravimetric determination of the arsenic,
distillate is diluted with 200 c.c. of water, and boiled un
a Liebig's condenser for 20 minutes, whilst a current of car
dioxide is passed through the liquid by means of a
glass tube introduced through the inner tube of the coc
A current of hydrogen sulphide is then passed into the
liquid for an hour, and the precipitate collected in a weig
Gooch's crucible, where it is washed with alcohol, then
10 minutes with boiling carbon bisulphide to elimi
sulphur, and again with alcohol, dried at 105° C.,
weighed.

For a volumetric determination, the distillate, or an ali
portion, is mixed with 1½ volumes of water, and boiled i
beaker covered with a clock glass to expel the sul
dioxide, after which it is titrated with N/20 iodine solut

Antimony, if present, is best determined volumetric
in the same way, after boiling the residual solution to e
sulphur dioxide, and adding tartaric acid. For a g
metric determination, the residual solution is boiled, and
antimony precipitated with hydrogen sulphide. As
sulphur in the precipitate cannot be completely washed
with hot carbon bisulphide, the author recommends hea
the precipitate for two hours at 225°—230° C. in an a
sphere of carbon dioxide.

Tin, when present, remains in the flask in the tetrav
form, and it should also be possible to determin
volumetrically in the presence of antimony.—C. A. M.

Arsenic and Antimony in Cupreous Materials; L mination of ——. Allan Gibb.

See page 184.

Zinc Blendes; Determination of Fluorine in F. Bullnheimer. Zeits. angew. Chem. 14, [5], 101—

After many trials, the author has found the following
tation of the methods of Fresenius and Penfield applica
the determination of fluorine in blendes and other sulp
containing substances. The substance (2·5 grms. if o
fluorine content) is finely powdered, intimately mixed
powdered quartz (3—5 grms.) and placed in an Erlen
flask of 300—500 c.c., with a mixture of 20 grms. of ch
anhydride and 100 c.c. of concentrated sulphuric acid a
Through the rubber cork of the flask pass a thermo
an entrance-tube for air, and an exit-tube for the ev
gases. The latter is connected with a U-tube cont
glass wool, to retain any sulphuric acid mecha
carried over, and this in turn with a Winkler's tube,
in water, and containing a few drops of sulphur
reddened by chromic acid; this allows of the conden
of any traces of sulphuric acid which may have e
the U-tube, while the chromic acid is a test of the
pleteness of the oxidation of the sulphide in the decom
flask. This is followed by the absorption appara
single Drehschmidt wash-bottle containing 80
potassium chloride solution. The apparatus having
set up and found tight, the powdered mixture is p
the flask, the acid added, the flask closed, a slow stre
purified air driven through the apparatus, and the
cautiously heated to 80° C. When action begi
burner should be removed, lest the temperature r
high; and only when the action slackens (indicated
cessation of the tumultuous evolution of gas), shoul
replaced, and the mixture heated to 150—160°
which temperature it should be maintained for abou
hours. The absorption flask is now disconnected, 80
alcohol added to its contents, and after standing fo
time, the acid set free ($3SiF_4 + 2H_2O = 2H_2SiF_6 +$
$2H_2SiF_6 + 4KCl = 2K_2SiF_6 + 4HCl$) is titrated b
normal soda or ammonia, using phenolphthalein as in
A blank titration should be made upon a mixture of

f the potassium chloride solution and 80 c.c. of alcohol. 'en experiments with artificial mixtures of fluorine-free lende and calcium fluoride, containing from 0·5 to 4 per ent. of fluorine, showed errors varying from +0·19 to -0·37; on the average, the results were 0·15 per cent. om the truth.—J. T. D.

oric Acid, Crude Italian; Analysis of ——. E. Zschimmer. Chem. Zeit. 1901, **25**, [5], 44—45 and [7], 67—68.

ommercial Valuation.—In practice it is customary to termine the water and the substances insoluble in alcohol d to represent the remainder as boric acid. The author, wever, has found that the results thus obtained by fferent chemists may differ widely, in some cases by as ch as 6 or 7 per cent. on the proportion of boric acid. is difference he has discovered to be mainly due to errors the determination of the water, the results of the Italian emists being, he asserts, invariably too low. He has en unable to obtain good results by the distillation-gravitric method, but has found the volumetric method of termining boric acid applicable to the analysis of the de material.

In the Italian method it is usual to dry the crude substance two hours at 45° C., and then for an additional two rs in the exsiccator. The author finds that although bulk of the water is expelled in this way, and constancy weight apparently obtained, a single drying of this kind unreliable. For in two experiments, given in detail, crude substance, after being dried for four hours at C., and 12 hours over sulphuric acid, yielded over 1 per t. more on continuing the drying at 50° C.—C. A. M.

ali, Titration of Free —— ; in Presence of Hypochlorites, Chlorates, and Chromates. H. von Huber. Zeits. für Elektrochem. 1901, **7**, [27], 396—398.

order to determine the alkalinity of a solution containing ochlorites, chlorates, and chromates, the author proceeds ollows:—The hypochlorite or free hypochlorous acid is t destroyed by the addition of neutral sodium sulphite neutral sodium thiosulphate. The chromate is next noved as barium chromate by the addition of barium oride. If the precipitate of barium chromate is not too at, the solution may be titrated directly, but if too much ium chromate is present, the precipitate is filtered off and titration made on an aliquot portion of the filtrate.

—J. S.

oper in Pyrites; Determination of ——, by Precipitation with Aluminium and Subsequent Electrolysis.). N. Heidenreich. Zeits. anal. Chem. 1901, **34**, [1], 15—17.

HEN copper is to be determined electrolytically in the sence of much iron it is usual to first separate the latter precipitation with hydrogen sulphide or sodium thio-sulte, in order to obviate the disturbing influence of the ferric phate. In place of these reagents the author recommends use of aluminium in the following manner:—From 2 to grms. of the ore are dissolved in an Erlenmeyer flask h Lunge's solution, and the liquid evaporated to dryness porcelain dish. The residue is taken up with dilute rochloric acid and again evaporated, this process being ce repeated, to expel all nitric acid. It is finally treated h 5 c.c. of dilute hydrochloric acid and 10 c.c. of water, oduced without filtration into a 500 c.c. flask, and ted to 100 c.c. An excess of aluminium foil is next oduced, and a funnel placed in the neck of the flask, ich is then gently heated on a sand-bath. The copper speedily reduced, and as soon as the liquid becomes ourless is filtered off together with the excess of minium, washed with hot water until free from chlorine, d, and ignited in a porcelain dish, 9 cm. in diameter. e residue is treated with nitric acid in slight excess, and dish, covered with a clock-glass, heated on the water-h until the whole of the copper has dissolved. The ution is then transferred to a platinum dish, and after introduction of a little nitric and sulphuric acid, trolysed in the usual manner.

Small quantities of cobalt, nickel, and zinc, have no influence on the results, since they are only partially precipitated by aluminium, and when they are precipitated are not separated from an acid solution by electrolysis. When lead (which in small quantities is also without influence) is present, it is deposited, as usual, in the form of peroxide, on the positive pole.

The method is stated to be rapid and the results tabulated by the author show that it is very accurate.—C. A. M.

Copper; Analysis of Commercial ——. P. Truchot. Ann. Chim. anal. appl. **5**, 444; Chem. Centr. 1901, **1**, [3], 204.

THE author points out that Hollard (this Journal, 1900, 563) has not taken into consideration the presence of manganese, which is a frequent impurity of copper.

The presence of this metal would invalidate the results for lead, nickel, and cobalt. In order to avoid such an error, the author determines the lead in the following manner: 5—10 grms. of either the copper or ore are dissolved in 25—50 c.c. of dilute nitric acid, with addition of bromine or hydrogen peroxide towards the end of the operation. The solution is filtered, electrolysed by means of a current of 0·8—1·2 ampère, and, after 15—18 hours, the separated lead collected, dissolved in hydrochloric acid, the solution evaporated with sulphuric acid, and the residue mixed with water and filtered through the filter previously used. The filter is washed well with water containing sulphuric acid, then the residue treated with ammonium acetate solution, and the lead in the filtrate again separated by electrolysis from nitric acid solution. In this way, pure lead free from manganese is obtained.

For the determination of nickel, cobalt, and manganese, the solution obtained after the electrolysis, is evaporated with sulphuric acid; the arsenic, antimony, and tin are precipitated by sulphuretted hydrogen from hydrochloric acid solution; the iron is separated by a double precipitation with ammonium carbonate; the manganese is precipitated as phosphate from a strongly ammoniacal solution, and the nickel and cobalt are then determined electrolytically.—A. S.

Copper; Electrolytic Estimation of ——. O. Reinke. Woch. für Brau. 1901, **24**, [2], 14—15.

THE inconveniences and sources of error which accompany the gravimetric estimation of the cuprous oxide precipitated from Fehling's solution by reducing sugars are enumerated by the author.

The best method hitherto proposed is the reduction of the oxide to metallic copper by electrolysis. The following procedure has been worked out by the author:—The cuprous oxide obtained is collected on a double filter, washed, and dissolved on the filter in 25 c.c. of warm nitric acid, sp. gr. 1·152. The solution is passed direct into a weighed platinum dish, as devised for electrolytic purposes by Claassen, the filter is washed with hot water, so that, when 25 c.c. of strong ammonia, sp. gr. 0·91, are afterwards added, the total volume of liquid is 120 c.c. The dish is then placed on the electrolytic stand, an electrode, connected with the positive pole of the battery, is immersed in the liquid, and the dish is covered with a watch-glass which has a hole in the centre and is cut into two halves to allow of ready manipulation. The current is passed until no copper can be detected in solution; the ammoniacal liquor is then washed out by means of a siphon and replaced by water. When all the ammonia is removed, the current may be stopped; the dish is then washed and dried. The concentration of ammonia and nitric acid stated above and a current strength of 12 ampères have been found by experiment to be most convenient and accurate. The results do not vary by more than 2 mgrms. in two determinations of the same sugar solution.

Another very accurate method for the estimation of the cuprous oxide is that of Müller. The cuprous oxide is filtered off on a folded filter and rapidly washed. The filter and precipitate are then placed in a flask containing 100 c.c. of a solution of iron-ammonium alum with a little sulphuric acid in a flask with an atmosphere of carbon dioxide. The quantity of iron reduced to the ferrous state is then titrated at 15° C. with a solution of permanganate, of which 1 c.c. is equal to 0·01 grm. of copper. The accuracy of this method is not affected by the presence of impurities in the precipitated cuprous oxide: it is therefore applicable to many kinds of impure sugar solutions which cannot be treated gravimetrically.—J. F. B.

Cyanides and Cyanates; Determination of ——, in the presence of one another. J. W. Mellor. Zeits. anal. Chem. 1901, **34**, [1], 17—21.

In estimating the proportion of cyanide and cyanate, especially in commercial potassium cyanide, the author determines the amount of the former in terms of silver nitrate, and of the latter by a method essentially the same as that of Allen (Comm. Org. Anal. **3**, 484) in terms of nitric acid.

(1) 20 grms. of the commercial salt are dissolved in about 100 c.c. of water, and any carbonate present precipitated by means of a solution of calcium nitrate (free from chloride).

Barium nitrate cannot be used, on account of the insolubility of barium cyanate. The precipitate is filtered off and washed, and the filtrate and washings made up to 200 c.c. One c.c. of this solution is equivalent to 0·1 grm. of the sample.

(2) 10 c.c. of the solution are treated with an excess of ammonium hydroxide solution and a few drops of a solution of potassium iodide. It is then titrated with N/10 silver nitrate solution, of which *m* c.c. will be used.

(3) To about 10 c.c. of the solution, silver nitrate solution is added until no further precipitation takes place. The precipitate, consisting of a mixture of silver cyanide and cyanate, is collected on a filter and washed with ice-cold distilled water. It is then heated to about 50° C., with about 5 c.c. of N-nitric acid, which decomposes the whole of the cyanate. The filtrate is titrated with N-sodium hydroxide solution. Assuming that *n* c.c. were required, we have—

a. One grm. of the sample contained 0·0405 (5—*n*) grm. of potassium cyanate.

b. One grm. of the sample contained 0·013 *m* grm. of potassium cyanide.

c. One grm. of the sample contained 0·0052 *m* grm. of total cyanogen.

The presence of sodium cyanide introduces a considerable error in the calculation of total cyanogen into potassium cyanide. But since the sodium salt possesses at least an equivalent power of extracting gold, the author considers that this error is not of very great practical importance.

Chlorides, when present, are estimated by fusing a weighed quantity of the sample in a porcelain crucible with a mixture of potassium nitrate and sodium carbonate (1 : 5). The mass is dissolved in boiling water acidified with nitric acid, and the chlorides determined in the usual way.

The following analysis of a commercial sample of potassium cyanide, which was proved to contain no sulphides, thiocyanates, or formates is given:—Insoluble constituents, carbon 4·35, ash 1·07; CO_3, 4·69; SO_4, traces; Cl, traces; CNO, 4·04; total cyanogen, 32·51; K, 49·90; Na, 1·59; loss (probably water), by difference, 1·85 per cent.—C. A. M.

Lead in Galena; Determination of ——. Willenz. Ann. Chim. anal. appl. **5**, 401; Chem. Centr. 1900, **2**, [26], 1290.

For the determination of lead as sulphate in presence of lime, the author proceeds in the following manner:—1 grm. of the ore is dissolved in nitric acid (sp. gr. 1·4), the solution concentrated, then evaporated with 5—6 c.c. of strong sulphuric acid, 50 c.c. of water added, and the whole heated on the water-bath for 15—20 minutes. After cooling, the supernatant liquid is decanted through a filter, the residue washed by decantation, once with 1 per cent. sulphuric acid, and three times with cold water, and then dissolved in 25 c.c. of warm, faintly ammoniacal, 33 per cent. solution of ammonium acetate. The solution is passed through the filter, the latter washed with boiling 5 per cent. ammonium acetate solution, and the lead in the filtrate precipitated by 5—6 c.c. of concentrated sulphuric acid. If, in presence of very much lime, calcium sulphate separates together with the lead sulphate, the clear liquid is decanted as far as possible, the residue treated with 1—2 c.c. of concentrated sulphuric acid, made up to 250 c.c. with water, heated for about one hour on the water-bath with vigorous agitation, and then the lead sulphate treated in the usual manner.

If the ore contain antimony, it is dissolved with addition of Rochelle salt, and in the filtrate, after adding 10 c.c. of concentrated sulphuric acid, the copper is precipitated by adding sodium thiosulphate to the boiling liquid.—A. S.

Gold Sodium Chloride; Assay of ——.
Messrs. Johnson and Sons.
See page 210.

ORGANIC CHEMISTRY.—QUALITATIVE.

Wine; Detection of Salicylic Acid in ——, Source of Error in the. H. Pellet. Ann. Chim. anal. appl. **5**, 418. Chem. Centr. 1900, **2**, [26], 1293.

Ferreira da Silva has pointed out that under some circumstances, ether, like petroleum spirit, will extract from wine a substance which gives the salicylic acid reaction, although not containing that acid. The substance in question is, however, insoluble in a mixture of equal volumes of ether and petroleum spirit. In using the method of Pellet-De Grobert, therefore, the ether should be replaced by such a mixture.—A. S.

Wine; Detection of Orseille in ——. R. Truchon. Ann. Chim. anal. appl. **5**, 444. Chem. Centr. 1901, **1**, [3], 208.

If wine containing Orseille be treated according to the author's method (see this Journal, 1900, 1030), using, however, only 1 c.c. of sulphuric acid (1:10), and then the piece of wool treated with ammoniacal water, the wool is coloured violet, whilst with pure wine it is coloured a dirty green.—A. S.

Wine; Detection of Orseille, Cochineal, Phytolacca, and the Colouring Matter of the Beet in ——. J. Bellier Ann. Chim. anal. appl. **5**, 407—413. Chem. Centr 1900, **2**, [26], 1296.

The wine is first examined in the usual manner for coal-tar colouring matters by means of mercury silver acetat and magnesia. It is then tested with a reagent prepare by mixing together 5 grms. of mercuric oxide, 10 grms. o ammonium sulphate, and 15 c.c. of ammonia (sp. gr. 0·920) and making up to 50 c.c. with water. 10 c.c. of wine ar agitated with 1 c.c. of the reagent. Pure wines becom colourless, yellowish, or sometimes grey; very acid wine give a bluish or greenish tinge. Wines which have bee coloured artificially give a red filtrate. Very acid wine require a larger addition of the reagent.

A method is also given for distinguishing the individua colouring matters. The four colouring matters named i the title may be detected by means of a reagent prepare by warming 40 grms. of ammonium sulphate and 20 grm of mercuric oxide with a little water, till a white mass i formed, and then diluting to 100 c.c. 10 c.c. of wine ar boiled with 1 c.c of the reagent, and then filtered. Orseill and cochineal give a red, phytolacca and the colourin matter of beet, a colourless or yellowish filtrate. (See als this Journal, 1900, 1150.)—A. S.

"Saccharin" and Salicylic Acid or Mixtures of the Tw Compounds; Detection of. E. Riegler. Ann. scient. d l'Univ. v. Jassy, **1**, 202. Chem. Centr. 1901, **1**, [1], 6

A few grms. of the substance under examination a dissolved in 10 c.c. of water, which has been render faintly alkaline, and a solution of *p*-diazonitraniline adde drop by drop, with agitation, until the coloration whi forms at first, disappears. The liquid is then shaken with ether, and the lower layer withdrawn, and replaced 20—30 drops of a 10 per cent. solution of caustic so On agitation, coloured rings are formed: green in presen of saccharin, red in presence of salicylic acid and reddis brown in presence of the two compounds together; in t last mentioned case, after repeated agitation, the ether coloured green and the aqueous solution red. If the caus soda solution be removed and replaced by ammonia, t ethereal solution is decolorised, whilst the ammoniac solution becomes bluish-green in presence of sacchar deep red in presence of salicylic acid, and violet in presen of the two compounds together.—A. S.

otton-seed Oil; Halphen's Reaction for ——. E. Wrampelmeyer. Zeits. Untersuch. Nahr. Genussmittel, 1901, **4**, [1], 25—26.

EFERRING to Soltsien's communication on this subject this Journal, 1899, 611), the author states that he has ound that the use of amyl alcohol as recommended by alphen gives more certain results in a shorter time than oltsien's modification. He applies the test in the following anner :—The oil (10 c.c.) is placed in a test tube 2·5 cm. diameter and about 15 cm. in length, with a mark at c.c., and an equal volume of amyl alcohol added, followed about 2 c.c. of a 1 per cent. solution of sulphur in carbon sulphide. The tube is closed with a cork through which sses a short tube about 1·5 m. in length and about $\frac{3}{4}$ cm. de, and is heated for 15 minutes in a boiling water-bath. this method dark-coloured oils containing only 5 per cent. cotton-seed oil yielded an unmistakable characteristic l coloration. (*cf.* This Journal, 1899, 865; and 1900, 4).—C. A. M.

samé Oil; Detection of ——. New Reaction. Tambon. J. Pharm. Chim. 1901, **13**, [2], 57—58.

E oil (7—8 c.c.) is mixed in a stoppered tube with half quantity of a reagent prepared by dissolving 3— grms. of pure, crystallised glucose in 100 c.c. of hydroloric acid. The tube is well shaken, heated over a spirit ap until its contents just boil, then shaken again and owed to stand. When as little as 1 to 2 per cent. of sesamé is present, a rose-coloration, soon changing to cherry-, is obtained, and when 10 per cent. is present, the reaction urs almost immediately. The coloration is also given by fatty acids, but not by certain olive oils which produce olour when tested with the analogous reagent of cane sugar hydrochloric acid. A further advantage possessed by author's reagent is that the colour does not speedily ome black as in the older test, but remains unchanged 2 or 3 weeks.—C. A. M.

-maldehyde and Milk Sugar in Milk; Detection of ——. E. Riegler. Pharm. Centralh. **41**, [50], 769—781.

e reaction is based on the fact that aldehydes in dilute ution give a rose to red colour with phenylhydrazine rochloride and caustic soda solution.

etection of Formaldehyde in Milk.—2 c.c. of the milk mixed with 2 c.c. of water, and a few particles, about grm., of white crystalline phenylhydrazine hydrooride, and is shaken until the latter is dissolved. c.c. of 10 per cent. caustic soda solution is then added, the mixture shaken for 30 seconds. In the presence ny considerable quantity of formaldehyde, an immediate tint is produced; if only traces be present, several utes may elapse before the red colour is evident. mal milk gives no colour in the cold, when thus treated, standing for two hours.

etection of Milk Sugar.—To 1 c.c. of milk a little stalline sodium acetate, as much as will lie on the point knife, and about 0·10 grm. of phenylhydrazine hydrooride, and 2 to 3 c.c. of water are added, and the mixture eated over a spirit lamp to boiling; 10 c.c. of 10 per . soda solution is then added, the mixture set aside and sionally shaken. During the agitation the mixture soon uires a rose tint, which passes in about a minute to a red ur.—J. O. B.

iol; Detection of ——. New Reaction. A. Jorissen. Chem. Zeit. Rep. 1901, **25**, [8], 14.

Belgian pharmacopœia gives a very inaccurate deption of apiol; substances of very varying character answer to that description. The following is a characstic reaction :—Chlorine water is added to a dilute holic solution (1 capsule to 5 c.c. of alcohol) until rbidity appears; a few drops of ammonia are then ed, when the mixture acquires a fine brick-red colour, h lasts a short time.—A. C. W.

otoxin Reaction; New, ——. St. Minovici. Pharm. entralh. **41**, 744; Pharm. J. 1901, **66**, [1598], 135.

following reaction is stated to be capable of detecting rt in 5,000 of picrotoxin, either directly or in chloroformic, alcoholic, or aqueous solution. In the latter cases, however, the solution must be previously heated, on the water-bath, to 80° C. To the substance containing picrotoxin or to two drops of the solution of picrotoxin in a glass dish, two drops of sulphuric acid are added, and, after a minute, a drop of a 20 per cent. solution of anisic aldehyde in absolute alcohol. In presence of picrotoxin, the sulphuric acid gives a saffron colour, whilst, on the addition of the anisic aldehyde solution, there is formed an indigo-violet coloration, gradually changing to blue.—A. S.

Cinnamic Acid in the Presence of Benzoic Acid; Detection of ——. A. Jorissen. Chem. Zeit. Rep. 1901, **25**, [8], 11.

CINNAMIC acid accompanies benzoic acid in certain benzoïn resins; it is occasionally found in more or less considerable quantity in officinal benzoic acid. By suitable oxidising agents, cinnamic acid is converted into benzaldehyde; if it be suspended in a 5 per cent. solution of uranium acetate exposed to direct sunlight, the oxidation takes place within a few minutes, the liquid then smells of benzaldehyde and contains a brownish precipitate.—A. C. W.

Tropine; Detection of ——. New Reactions. S. Vreven. Chem. Zeit. Rep. 1901, **25**, [8], 12.

CADMIUM potassium iodide gives with tropine in slightly acid solutions, a crystalline precipitate consisting of well-formed hexagonal tables, which melt above 200° C. to a clear liquid. The double salt is relatively very soluble; the precipitate is only produced in concentrated solutions. With phosphomolybdic acid in slightly acid solution, tropine gives a yellowish precipitate, seen under the microscope to consist of matted needles. On heating, the compound turns green and then decomposes without melting. These reactions distinguish tropine from the four chief mydriatic alkaloids of the solanaceæ; the latter give amorphous precipitates with cadmium potassium iodide, or crystalline precipitates quite different in appearance to the tropine product. With phosphomolybdic acid they give only amorphous precipitates. —A. C. W.

ORGANIC CHEMISTRY—QUANTITATIVE.

Dissolved Substance in a Solution; Determination of ——. H. Lasne. Ann. Chim. anal. appl. **5**, 402. Chem. Centr. 1900, **2**, [26], 1294.

IN determining the dry substance or extract by Laborde's method of heating in the air bath at 60° C., inconvenience is caused by spirting of the liquid and condensation of water in the neck of the flask. The author avoids these difficulties by introducing into the flask a tube drawn out to a capillary, which must be so fine, that by opening the tube a variation of pressure of only 1 cm. is caused. The liquid is introduced into a weighed flask, provided with the capillary and with another bent tube, which is connected with an air pump. The apparatus is placed in the water bath at 35° C., and gradually heated to 60° C. With 10 c.c. of liquid, the evaporation is complete in less than two hours.

Glycerin can be determined in a similar manner. For this purpose the flask containing the liquid is heated for $1\frac{1}{2}$ hours in the air bath at 150° C., and then for $\frac{1}{2}$ hour at 180° C. Instead of air, carbon dioxide is drawn through the apparatus. The glycerin which distils over is collected in two wash-bottles containing some water, and is then determined by one of the usual methods.—A. S.

Coal Briquettes; Examination of ——. G. A. Le Roy. Ann. Chim. anal. appl. **5**, 404—407. Chem. Centr. 1900, **2**, [26], 1298.

THE determination of moisture should be carried out at a temperature not exceeding 95° C. The tar used as binding material does not, up to the present, appear to have been paid particular attention, although upon its character and quantity, the solidity of the briquette and the behaviour of the latter on burning, as regards cohesion, are dependent. The author extracts the tar by a mixture of equal parts of carbon bisulphide and petroleum spirit. The sample of the briquette is powdered and mixed with 5—10 parts of coarse sand. The apparatus used is similar to a Soxhlet extractor, but is enclosed by a water jacket, in order that the liquid may be kept cool. The solvent is distilled off from the extract, and the residue dried at about 50 C. and weighed. Coal briquettes usually contain about 8 per cent. of tar.

—A. S.

Prussian Blue in Spent Oxide: Rapid Determination of ——. J. M. Popplewell.

See page 225.

Beeswax: Analysis of ——. G. Buchner. Chem. Zeit. 1901, **25**, [3], 21—22, and [4], 37—39.

Acid and Saponification Values.—In the determination of the acid and saponification values, one of the chief sources of error is the use of too weak alcohol. For the preparation of the alcoholic alkali, absolute alcohol should be used, and the wax should be treated with alcohol of 96 per cent. strength.

Detection of Stearic Acid.—The following modification of Fehling's test is recommended:—3 grms. of the wax are boiled with 10 c.c. of 80 per cent. alcohol for a few minutes, after which the tube is immersed in cold water and shaken so that a thick paste results. After standing for an hour it is filtered, and the filtrate mixed with a large excess of water, or with an alcoholic solution of lead acetate or calcium chloride, which make the test more sensitive. Normal waxes give only a faint opalescence, though after some hours they often show an amorphous deposit, especially in the case of soft African waxes. A wax is regarded by the author as pure in this respect when it shows no deposit of stearic acid after 1—2 hours.

Detection of Glycerides.—The saponification residue is evaporated to expel the alcohol, then mixed with water and filtered, and the filtrate tested with potassium bisulphate in the usual way (acrolein). When considerable quantities of glycerides are present, this test can be used directly on the wax.

Neutral Substances are tested for by Weinwurm's method, *resins* by Storch's reaction, and *wool-fat* by the cholesterin test.

Extreme Limits of the Values for Pure Wax.—The author considers that, given negative results of the qualitative tests, waxes may be pure which give values falling within the following limits:—Acid value, 17·5—21; ether value, 70—78; and saponification value, 87·5—99.

Ghedda Wax.—This is a very plastic, aromatic wax, derived from British India. It gives very abnormal figures, and the author has frequently met with a sample giving results such as:—Acid value, 5·33; ether value, 88·35; and saponification value, 93·68.

African Waxes.—These also yield somewhat abnormal figures. One sample obtained from Afrat, near Mogadore, gave the following results:—Specific gravity at 15° C., 0·961; melting point, 64°—65° C.; solidification point, 61° C.; iodine value, 11·65; acid value, 19·92; ether value, 79·43; and saponification value, 99·35. In the stearic acid test, a slight amorphous deposit was obtained after the filtrate had stood for 24 hours.

Chemically Bleached Beeswax.—Under certain circumstances the acid value of the waxes may be raised at the expense of the ether value. For example:—

Acid Value.	Ether Value.	Saponification Value.	Ratio.
23·10	73·93	97·03	3·20
23·50	73·17	96·70	3·10
26·23	72·22	98·45	2·75
25·00	70·00	95·00	2·80
26·00	69·00	95·00	2·70

—C. A. M.

Tanning Materials; Determination of Tanning Matter in ——. T. Koerner. Leather Manufacturer, Dec. 1900, **11**, [12], 241—248.

At a meeting of the American Association of Official Agricultural Chemists, held in Washington, U.S.A., on November 16th, 1900, a paper was read by the referee of the Association, Mr. Oma Carr, giving particulars of experiments which had been carried out with a view to tl improvement of the official method of the Association f the analysis of tanning materials.

Soluble Solids.—The conclusions drawn from experimen as to the best method of determining the soluble solids a (1) that if the filtration is performed without the additi of an "assistant," the insoluble matters are not entire removed; (2) that the absorption of the tannin by t filter paper is largely dependant upon the length of ti the solution is in contact with the paper; (3) that ace acid modifies the basic nature of the filter paper; (4) tl it is possible to secure concordant results by the addition lead acetate and acetic acid, afterwards filtering throu paper; (5) that as the method stands it gives low figu for oakwood, and high for quebracho, and this will hold go in comparison with any materials so differing.

Hide Powder.—The Vienna powder generally us because of its close adherence to the limits of insolubil and absorption adopted by the Association, has recen shown such a wide departure from these limits as to f wholly without the range of allowable variation; it has a been noticed that many of the samples of Vienna h powder recently received contained small quantities of ac

It will be seen that inasmuch as the moisture content the wet pressed hide is variable with the physical condit thereof, a definite statement of the dry hide present in wet cake must be made; the results are concordant for a definite quantity of powder, but the fineness of sc powders permits great loss in squeezing, and the actual powder present in the solution is thereby variable.

Volume of Solutions for Drying.—Owing to the sensit ness of tanning materials to heat and oxidation wh drying, it is believed that the use of volumes yielding 0· 0·5 grm. of residue would give more concordant resu The experience of the referee is that residues of 0·4 g may be dried to nearly constant weight on the steam l in five hours, afterwards drying in an air or water oven half-an-hour; it is therefore to be recommended to sul tute 50 c.c. wherever 100 c.c. are stipulated in the offi method.

Fairly concordant results were obtained by eight diffe members of the Association making analyses of the s samples of oakwood and quebracho extract, the anal being done by the official method of the Association. quebracho is a severe trial on the accuracy of the me owing to the large amount of tanning matter present the extreme fineness of the insoluble matter; variatio the amount of non-tanning matters may be largely a buted to variations in the character of the hide powder

It was eventually resolved that the following be amended method of the Association.

1. *Preparation of Sample.*—Barks, woods, leaves, extracts, and similar tanning materials should be gr to such a degree of fineness that they can be thoro extracted. Fluid extracts must be heated to a temperatu 50° C., well shaken and allowed to cool to room temper

2. *Quantity of Material.*—In the case of barks and s materials, use such quantity as will give about 0·8 gr total solids per 100 c.c. of the solution and extra Soxhlet or similar apparatus at steam heat for non-st materials. For canaigre and substances containin amounts of starch, use a temperature of 50 to 55 C near completion, finishing the extraction at steam hea the case of extracts, weigh such quantity as will le residue of 0·8 grm. on evaporation of 100 c.c. of the so dissolve in 800 c.c. of water at a temperature of allow to stand 12 hours and make up the quant 1 litre.

3. *Moisture.*—Place 2 grms., if it be an extract, in bottomed dish not less than 6 cm. in diameter, add of water, warm slowly until dissolved and contin evaporation until dry.

All evaporations called for after evaporation to on the water-bath, shall be done by one of the fo three methods, the soluble solids and non-tanning r being dried under as nearly identical conditions as p

(*a*) For 24 hours at a temperature of 100° C.
(*b*) For 8 hours at 100° to 110° C. in air oven.
(*c*) To constant weight *in vacuo* at 70 C.

4. *Total Solids.*—Shake the solution and without filtering, mediately remove 50 c.c. with a pipette, evaporate in a eighed dish and dry; the dishes should be flat-bottomed d not less than 6 cm. in diameter.

5. *Soluble Solids.*—Filtration shall take place through uble-pleated filter paper, the first 150 c.c. passing through all be rejected, and the 50 c.c. next passing through shall collected, evaporated, and dried. When a clear filtrate ay not otherwise be obtained, the use of 10 grms. of rytes previously washed in a portion of the solution is rmissible. Evaporation during filtration must be guarded ainst.

5*a*. *Optional Method.*—(*a*) To 100 c.c. of the solution d 10 c.c. of a solution of lead acetate, 4 grms. per litre, ding the reagent drop by drop from a burette and stirring anwhile. Now add 10 c.c. of a solution of acetic acid, grms. of glacial acid per litre, stirring. Throw on uble-pleated filter, reject until clear and evaporate and y 50 c.c.

(*b*) On another portion of 100 c.c. repeat the foregoing, cept that 20 c.c. of lead acetate solution shall be used. Residue from (*a*) shall be multiplied by 1·2, and from (*b*) 1·3, to bring back to the original 100 c.c. Add to the rected weight of the residue from (*a*) the difference ween (*a*) and (*b*), and calculate the found residue to uble solids. This corrects for dilution and removal by d.

. *Non-Tanning Matters.*—Prepare 20 grms. of hide der by washing in a No. 7 beaker with from 800 to 00 c.c. of water, stir well and let stand one hour, filter magma through linen, squeeze thoroughly by hand, ove as much moisture as possible by means of a press, gh the pressed hide and take approximately one-fourth moisture determination. Weigh this portion carefully dry to constant weight. Weigh the remaining three-rters, which must contain between 12 and 13 grms. of hide, add to 200 c.c of the solution and shake 10 utes. Throw on funnel with cotton plug in stem, rn until clear, evaporate 50 c.c. and dry. The weight this residue must be corrected for the moisture con-ed in the wet pressed hide. The shaking must be done ome form of mechanical shaker. The machine used by ggists, and known as the milk-shake is recommended.

. *Tanning Matters.*—The amount of these is shown by difference between the soluble solids and the non-ains.

. *Testing the Hide Powder.*—(*a*) Shake 10 grms. of der with 250 c.c. of water for five minutes, strain ough linen, and squeeze the magma thoroughly by hand; eat this operation three times, pass the last filtrate ough paper until clear, evaporate 50 c.c. and dry; if this due amount to more than 5 mgrms., the powder must be cted.

) Prepare a solution of pure gallotannic acid by dis-ing 5 grms. in 1,000 c.c. of water. Determine the total ds by evaporating and drying 50 c.c. of this solution. at 200 c.c. of this solution with hide powder, exactly as aragraph 6. The powder must absorb at least 95 per t. of the total solids. The gallotannic acid used must completely soluble in water, acetone, alcohol, and acetic er, and shall not contain more than 1 per cent. of sub-ces not removed by digesting with yellow mercuric le on the steam bath for two hours.

) Any analysis made with a powder which does not l the conditions of the preceding paragraphs shall not eported as by this method.

. *Testing the Non-tanning Filtrate.*—(*a*) For tannin. t a small portion of the clear non-tanning filtrate with a drops of a 1 per cent. solution of Nelson's gelatin. A diness indicates the presence of tannin, in which case eat 6, using 25 instead of 20 grms. of powder,

) For soluble hide. To a small portion of the clear -tannin filtrate add a few drops of the filtered tanning tion. A cloudiness indicates the presence of soluble , in which case repeat 6, giving the powder a more ough washing.

). *Temperature of Solutions.* — The temperature of tions shall be between 16° and 20° C. when measured filtered.

All dryings shall be in flat-bottom dishes not less than 6 cm. in diameter.

Schleicher and Schull's No. 590, 15 cm., shall be used for all filtrations.—M. C. L.

Leather; Determination of Mineral Acids in ——.

Paper read before the Paris Conference of the I.A.L.T.C. H. R. Procter and A. B. Searle. Leather Trades' Rev. **34**, (773), 19.

It has been found that none of the various methods which have been proposed for the estimation of sulphuric and other mineral acids in leather are as satisfactory as could be desired. The extraction of acid by water or alcohol has been shown to be incomplete. The method of boiling up the leather with an alkaline earth, such as magnesia or quicklime, also fails to extract the whole of the acid, unless the mass be ignited. Even then a double determination is necessary. The authors suggest a modification of Hehner's process, used for the determination of sulphuric acid in vinegars.

A convenient quantity of the leather, about 3 grms., is placed in a platinum dish of about 100 c.c. capacity, and covered with an excess (20 c.c.) of decinormal sodium carbonate. After evaporation to dryness on the water-bath, the residue is ignited over a Bunsen burner at a low red heat. When all the carbonaceous matter has been destroyed, the residue is allowed to cool, and is then warmed with 30 c.c. of decinormal hydrochloric acid until as much as possible has been dissolved. The liquid is then filtered and titrated with decinormal sodium carbonate, with Methyl Orange as indicator. The total volume of standard alkali used, both before and after ignition, less the volume of standard acid employed, when multiplied by 0·0049, gives the amount of mineral acid present, expressed in terms of sulphuric acid, in the quantity of leather used for the determination. The exact nature of the mineral acid present must be ascertained by the usual qualitative tests. In leathers, however, it will generally be found to be sulphuric.

The authors found, in specially prepared leathers, that the above process agreed in every case satisfactorily. In a portion of a book leather which had become very rotten, 1·96 per cent. of sulphuric acid was found. In a piece of pig skin, from a chair in a Glasgow restaurant, 2·61 per cent. of sulphuric acid was found.

By the above method organic acids cannot be determined.

—J. G. P.

Lactose in Milk; Determination of ——. A. Scheibe.

Zeits. anal. Chem. 1901, **34**, [1], 1–14.

Gravimetric Estimation.—The author advocates the following method:—To 25 c.c. of the milk, diluted with 400 c.c. of water, are introduced successively 10 c.c. of the copper sulphate portion of Fehling's solution (69·28 grms. per litre), 3·5 to 4 c.c. of N-sodium hydroxide solution, and 20 c.c. of a cold saturated solution of sodium fluoride. After 30 minutes the liquid is made up to the mark and filtered, and 100 c.c. of the filtrate boiled with 50 c.c. of Fehling's solution for six minutes in a deep porcelain basin. The separated cuprous oxide is collected in a filter tube containing asbestos, reduced in hydrogen, and the weight of copper calculated into lactose with the aid of Soxhlet's table (J. prakt. Chem. 1880, 266; *cf.* Kjeldahl, this Journal, 1895, 896).

Polarimetric Estimation.—75 c.c. of the milk are treated with 7·5 c.c. of sulphuric acid (20 per cent. by weight) and 7·5 c.c. of a solution of mercuric iodide prepared by dissolving 40 grms. of potassium iodide in 200 c.c. of water, shaking the solution with 55 grms. of mercuric iodide, diluting to 500 c.c., and filtering from the undissolved salt. The milk is then made up to 100 c.c. and filtered, and the filtrate polarised in a 40 mm. tube at 17·5° C. With a Schmidt and Hänsch half-shadow apparatus, fitted with a double quartz compensation wedge, one sugar degree corresponds to 0·16428 grm. of lactose in 100 c.c. When a polarimeter giving the actual angle with sodium light is used, the reading should be made at 20° C., when 1° = 0·4759 grm. of lactose in 100 c.c. A correction is necessary for the volume of the precipitate. In the case of whole milk (2·8 to 4·7 per cent. of fat), this may be made by multiplying the percentage of lactose obtained by 0·94; or by 0·97 in the case of skim milk. Or, as is essential with cream and colostrum, the volume of the precipitate may be determined in the following manner:—

a. The rotatory power of 10 grms. of pure lactose is determined when dissolved in 75 c.c. of water, mixed with 7·5 c.c. of 20 per cent. sulphuric acid, and 7·5 c.c. of the mercuric iodide solution, and diluted to 100 c.c. The grms. of lactose thus apparently found correspond to M_1 in the equation.

b. Ten grms. of lactose are dissolved in 75 c.c. of the milk with the aid of heat. When cold 0·5 c.c. of concentrated ammonium hydroxide is introduced, followed after 10 minutes by 7·5 c.c. of 20 per cent. sulphuric acid and 7·5 c.c. of mercuric iodide solution, and the whole made up to 100 c.c. and filtered. The filtrate is polarised, and the result obtained with 75 c.c. of the milk subtracted from this result, the difference corresponding to the apparent weight in grms. of lactose added to the milk. This is represented by M_2 in the equation.

c. The volume of the liquid + the volume of the precipitate (= PV) = 100 c.c.; M_2 corresponds to this volume. The volume of the liquid = 100 − PV, which corresponds to M_1 or—

$$100 : M_2 = (100 - PV) : M_1$$

$$PV = \frac{100M_2 - 100M_1}{M_2}$$

d. The actual percentage of lactose in the milk is obtained by multiplying the apparent amount by $\frac{100 - PV}{100}$.—C. A. M.

Dextrin in Cocoa and Chocolate; Detection and Approximate Determination of ——, by Polarisation. P. Welmans. Zeits. öffentl. Chem. **5**, 478—483. Chem. Centr. 1901, **1**, [1], 65.

The detection of dextrin in cocoa powders and chocolates may be effected by using the aqueous liquid obtained in the author's method for the determination of the fat (see this Journal, 1900, 1151). 10 c.c. of this liquid, filtered, if necessary, are mixed with 40 c.c. of 96 per cent. alcohol; the presence of dextrin is indicated by the immediate formation of a milky turbidity.

The quantitative determination of dextrin by means of the polariscope is based upon the fact that although dextrin is not precipitated by lead acetate alone, it is quantitatively precipitated by that substance in presence of ammonia. Therefore, since ammonia is without influence on the other sugars, if the polarisation of the aqueous extract be determined before and after addition of ammonia, there are obtained *a*, representing the amount of dextrin and sugar, and *b*, the amount of sugar. Then $\frac{a + b}{2}$ gives the amount of added dextrin, as commercial dextrin mostly shows a rotatory power equal to twice that of sugar. The gravimetric method of double inversion and precipitation with Fehling's solution does not give such good results as the method described above.—A. S.

Aldehydes; Volumetric Determination of ——. New Method. M. Ripper. Monatsh. für Chem. 1900, **21**, [10], 1079—1085.

25 c.c. of an aqueous solution of the aldehyde (about 0·5 per cent.) are mixed with 50 c.c. of a solution of hydrogen potassium sulphite (12 grms. per litre), and the flask tightly closed and put aside for 15 minutes. In the interval the bisulphite solution (50 c.c.) is standardised by N/10 iodine solution, with which subsequently the uncombined sulphurous acid is also determined. The difference gives the amount of bisulphite which has entered into combination with the aldehyde.

The amount of the latter is then obtained by the formula—

$$A = \frac{I \times \frac{M}{2}}{126\cdot73} = \frac{I \times M}{253\cdot06}$$

in which A represents the amount of aldehyde, I the iodine corresponding to the combined sulphurous acid, and M the molecular weight of the aldehyde in question.

From this the following factors are obtained:—

Formaldehyde = I × 0·11827.
Acetaldehyde = I × 0·17348.
Benzaldehyde = I × 0·41788.
Vanillin = I × 0·59923.

It is not advisable to use concentrated solutions of th aldehyde and bisulphite, since the hydriodic acid forme in the titration would then have a reducing action upo the sulphurous acid.

The method is said to yield reliable results in all case in which the aldehyde is soluble in water, or can be brough into solution by the addition of a little alcohol.

In the case of the four aldehydes mentioned above, te analyses are described in detail, to show that the results a in close agreement with those obtained by recognised reliab methods.—C. A. M.

Malic Acid; Determination of ——. A. Hilger. Zei Unters. Nahr. und Genussmittel, 1901, **4**, [2], 49—50.

The author's method is based upon the fact that palladiu chloride in a neutral or slightly alkaline solution is reduc by malic acid, whilst tartaric, succinic, and acetic aci have no action upon palladium salts under these conditio

In determining the acid in wine, 100 c.c. are evaporat to one-third of the volume on the water bath to expel t volatile constituents, and basic lead acetate added until t reaction is slightly alkaline. The precipitate, which w contain the whole of the malic acid, is washed four or fi times with cold water, and dissolved in a little boiling dilu acetic or nitric acid. The solution is heated to the boili point and rendered alkaline with sodium carbonate, whilst current of carbon dioxide is passed through the boili liquid for about 10 minutes. It is then filtered from t basic lead carbonate, and the filtrate concentrated to least 100 c.c., again neutralised with hydrochloric aci mixed with 10 c.c. of a 5 per cent. solution of palladiu chloride in a 500 c.c. flask, and boiled for 10 minutes soon as the evolution of carbon dioxide has ceased, t liquid is again slightly acidified with hydrochloric acid, a the heating continued on the water-bath until the palladiu agglomerates at the bottom of the flask, after which t metal is collected in an Allihn's filter tube, washed, dri heated in a current of carbon dioxide, and weighed. T lead precipitate may also be decomposed with hydrog sulphide, but it is then necessary to completely evapor the solution.

One grm. of malic acid reduces 0·294 grm. of palladi chloride. Of the other constituents of the wine, the vola substances, glycerin, glycolic acid, tannin, colouring matt and sugar have also a more or less reductive influen Red wines should be decolorised with animal charc before the concentration.—C. A. M.

Salicylic Acid, Salicylates, and Phenol; Determinatio ——. F. Telle. J. Pharm. Chim. 1901, **13**, [49—56.

The author asserts that on adding an excess of bromin an aqueous solution of salicylic acid or a salicylate, dibr salicylic acid is precipitated—

$$C_6H_4(OH)CO.OH + 4Br = C_6H_2Br_2(OH)CO.OH + 2$$

(See this Journal, 1899, 714.)

Instead of using an aqueous solution of bromine liberates the bromine by adding a standard solutio sodium hypochlorite to a solution of potassium bro acidulated with hydrochloric acid.

Salicylic Acid.—1 grm. is dissolved in sodium hydro solution, and the volume made up to 500 c.c. 25 c. this solution are mixed with 5 c.c. of a 10 per cent. sol of potassium bromide, and 10 to 15 drops (not mor hydrochloric acid, and titrated with standard hypochl until the liquid, after shaking, retains a faint yellow The end point may be made more apparent by the add of 5 c.c. of chloroform (which dissolves the first trac free bromine in excess) with some alcohol to preve emulsion.

The hypochlorite solution which should contain a 3·55 grms. of available chlorine per litre (= 8 grm mine, and 3·45 grms. of salicylic acid) is standardised Gay-Lussac's chlorometric solution, or by a solution arsenious anhydride containing 4·95 grms. per litre, ssium bromide being used as indicator.

alicylates of Sodium, Lithium, and Magnesium.—These dissolved in water (1:500) and titrated as above.

ismuth Salicylate.—1 grm. is treated with 25—30 c.c. water, boiled for 10 minutes after the introduction of c. of sodium hydroxide solution (30° B.), cooled, diluted 250 c.c., and filtered. 25 c.c. of the filtrate are then ted as before. In the author's experience there is a t variation in the composition of different samples of commercial salt.

henol. -The determination is made in precisely the e manner as with salicylic acid, the results being lated in accordance with the equation—

$$C_6H_5.OH + 6Br = C_6H_2Br_3.OH + 3HBr.$$

henyl Salicylate.—In calculating the results of the iod as applied to this compound, six molecules of the rbed bromine are assigned to the phenol, and four to alicylic acid.—C. A. M.

vone in Essential Oils; Determination of ——. J. Walther. J. Pharm. Chim. 1901, **13**, [1], 32—33.

VONE is the principal constituent of oil of cumin, in h it is dextrorotatory, and of oil of *M. crispa*, in which lævorotatory. According to the following method for estimation of the ketone, it is transformed into the e, and the residual hydroxylamine determined. 2—5 . of material, a measured volume of concentrated oxylamine hydrochloride solution, 2 grms. of sodium bonate, and 25 c.c. of alcohol, free from aldehydes, are luced into a flask connected to an inverted condenser. heating for 30 mins. and cooling, water acidulated hydrochloric acid is added; the washings are made 500 c.c. In 50 c.c. of filtered liquid the excess of oxylamine is now estimated: the solution is made al to Helianthin by means of caustic soda. Phenoldein is then added; hydroxylamine is neutral to this ator, so that the quantity of soda now required to ice the coloration is proportional to the amount of oxylamine salt present. 1 c.c. of $\frac{1}{10}$ N. soda corres ls to 0·15 grm. of carvone. The results are said to be satisfactory; with pure carvone, almost theoretical es were obtained. When of good quality, the essential f cumin and *M. crispa* contain about 50 per cent. of ne. The oxime is readily purified, it melts at 69°— .—A. C. W.

yl Anthranilate in Essential Oils; Determination of —. A. Hesse and O. Zeitschel. Ber. 1901, **34**, [2], —300. (See this Journal, 1899, 604; 1900, 770, 848; o Hesse, page 275.)

use of a large excess of mineral acid to separate yl anthranilate from essential oils results in the attack e remaining constituents of the oil and makes it unle for further examination. By means of the method lescribed, 0·1 per cent. of the ester can be estimated, t the other constituents remain unattacked. The oil is ved in 2—3 parts of dry ether, the solution cooled at to 0° C., and then a cold mixture of 1 vol. of strong uric acid with 5 vols. of ether is added, drop by drop, continual stirring, until no further precipitate forms. recipitate is collected on a filter and washed with dry until odourless. If the small quantity does not permit solation of the free ester, the precipitate is dissolved in , the solution filtered and titrated with semi-normal h, phenolphthaleïn being the indicator. The solution n saponified by boiling with excess of alcoholic potash) minutes. The quantity of methyl anthranilate may lculated from the acid value of the ester sulphate. If recipitate contains principally the sulphate of methyl anilate or analogous compounds, the amounts of potash in the two operations will be as 2:1. If less potash quired in the saponification than is given by this ratio, onifiable bases are indicated (see Hesse, page 275); nay be extracted by ether from the alkaline solution. The anthranilic acid is isolated by evaporating, acidifying with acetic acid, and extracting by ether; it is identified by determining the melting point alone, and also after grinding with pure anthranilic acid.

If a large quantity of the sulphate precipitate is obtained, it is weighed, dissolved in water, and an aliquot part of the solution taken for the titration and saponification. A few drops of sulphuric acid are added to the main portion of the aqueous solution, which is then shaken once with petroleum spirit to remove resins. Sodium carbonate solution is added, the precipitate dissolved in ether and methyl anthranilate hydrochloride precipitated by means of dry hydrochloric acid gas. The hydrochloride is purified by solution in methyl alcohol and precipitation by ether. Other bases forming soluble hydrochlorides may be found in the ethereal solution. The filtrate from the original sulphate precipitate is washed with water to remove excess of sulphuric acid; the ether is then removed.

Control experiments made with weighed quantities of methyl anthranilate and a synthetic oil, containing linalool, linalyl acetate, geraniol, benzyl acetate, benzyl alcohol and indol, gave good results. Oil of néroli bigarade was found to contain about 0·6 per cent. of the ester. The larger quantity found by Walbaum (this Journal, 1899, 604), is said to be due to the use of large quantities of dilute sulphuric acid for the extraction, by which non-basic constituents are extracted.—A. C. W.

Camphorated Oil; Analysis of ——. J. F. Liverseege. Chem. and Druggist, 1901, **58**, [1096], 167—169.

Optical Rotation.—For estimating the quantity of camphor in camphorated oil by means of the observed optical rotation, the following formulæ may be used:—

$$(1)\ \left.\begin{array}{r}\text{Grms. of camphor}\\ \text{per 100 c.c. ....}\end{array}\right\} = \frac{\text{rotation in 200 mm. tube.}}{1·1}$$

$$(2)\ p = \frac{L - o}{(108 - o)\ 0·01\ S + 0·00043\ L}$$

where p = percentage by weight of camphor; L = optical rotation of the sample in 200 mm. tube; o = optical rotation of the olive or other oil used in the preparation of the liniment; and S = specific gravity of the olive oil.

In the following table are given a number of determinations of the values of o and S for the various oils which may be met with in commercial samples of camphorated oil.

Oil.	Rotation in 200 mm. Tube. (O).	Specific Gravity (S).	$(108 - o)\ 0·01\ S$
	°		
Olive oil A..........	+ 0·2	0·917	0·988
„ B..........	+ 0·4	0·915	0·984
„ C..........	+ 0·5	0·917	0·987
Colza oil............	− 0·1	0·915	0·989
Sesame oil A........	+ 0·5	0·925	0·995
„ B........	+ 0·9	0·922	0·988
Arachis oil A........	− 0·1	0·916	0·991
„ B........	0	0·917	0·990
„ D........	+ 0·1	0·917	0·989
Cotton-seed oil A....	− 0·1	0·928	1·004
„ B....	0	0·940	1·016
„ C....	0	0·939	1·015
„ E....	0	0·922	0·996
Mineral oil A	+ 1·0	0·904	0·968
„ B	+ 1·0	0·897	0·960

By experiments with liniments made with various oils according to the B.P. directions, the author found that, using the mean values given above for o and (108 − o) 0·01S, the formula (2) gave the amount of camphor correct to within 0·3 per cent.

Loss in Weight on Heating.—Leonard and Smith (Analyst, **23**, 281) state that the quantity of camphor can be determined by heating 3—5 grms. of the liniment in a flat-bottomed dish for two hours at 120° C., and then adding 0·15 per cent. as a correction for the gain in weight of olive oil. Dowzard (Chem. and Druggist, **56**, 338) recommends that the sample be heated to 105° C. for two hours, and 0·3 per cent. subtracted to compensate for the loss in weight of olive oil. The author considers that the best method is to heat on the water-bath for two to three hours, and, without making any correction, to take the loss in weight as equal to the amount of camphor present in the sample. He points out, however, that the method is quite unsuitable for camphorated mineral oil, which loses weight continuously.

For the identification of the oil used in the preparation of the liniment, the following figures should be determined.

Specific Gravity.—In three tests, 1 per cent. of camphor increased the density of olive oil by 0·00035, 0·00039, and 0·00045 respectively. With other oils, the results varied between 0·00035 (sesame oil) and 0·00058 (mineral oil). The following formula was used to calculate the specific gravity of the oil before the addition of the camphor:—

Specific gravity of oil = specific gravity of camphorated oil − percentage of camphor × 0·0004.

Iodine Value (Hübl).—The small amount of iodine absorbed by the camphor may be neglected; consequently the iodine value of the liniment multiplied by 100 and divided by the percentage of oil present, will give the iodine value of the oil used in the preparation of the liniment.

Saponification Value.—Five grms. of the sample are used for the determination of this figure, which is calculated in the same way as the iodine value. The result is expressed as grms. of KOH per 100 grms. of oil.

"Titre" of Fatty Acids.—The fatty acids set free in the determination of the saponification value are washed with hot water, separated, and heated for some time to remove moisture. The titre is then determined in the usual way.

Valenta Test.—It was found that each per cent. of camphor lowered the turbidity temperature by 2° C.; therefore:—

Turbidity temperature of oil = turbidity temperature of liniment + percentage of camphor × 2.

The results obtained in the above manner by examination of the camphorated oil agree closely, in most cases, with the numbers obtained by direct analysis of the olive or other oil.

	Numbers calculated from results of Camphorated Oil Analysis.			
	Specific Gravity.	Iodine Value. (Hubl.)	Potash absorbed.	Valenta Test.
		Per Cent.	Per Cent.	° C.
Olive oil	0·917	84	19·4	95
Arachis oil A........	0·918	91	19·5	87
" B........	0·917	88	19·4	103
Sesamé oil	0·925	116	19·8	74
Colza oil	0·915	103	17·3	126
Mineral oil..........	0·901	14	0·04	..

	Numbers obtained by Direct Analysis of Oil.			
	Specific Gravity.	Iodine Value. (Hubl.)	Potash absorbed.	Valenta Test.
		Per Cent.	Per Cent.	° C.
Olive oil	0·917	84	19·3	94
Arachis oil A........	0·916	90	19·5	98
" B........	0·917	85	..	104
Sesame oil	0·925	..	19·3	78
Colza oil	0·915	103	17·3	*
Mineral oil	0·897	..	0·04	*

* Not dissolved at 114° C., the boiling point of the mixture.

Sesamé oil is indicated by a high specific gravity and iodine value; arachis oil by high "titre" of fatty acids and somewhat high iodine value; colza oil by high iodine value and low saponification value and "titre" of fatty acids. Mineral oil can be readily detected in many ways.

The author concludes by giving the results of the analysis of a number of retail trade samples of camphorated oil, and he states that when a sample has been prepared with olive oil, and gives about 21° of rotation in a 200 mm. tube, the observed rotation less 0·2 gives the percentage of camphor with only a very small amount of error.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES

Chemical Properties of Elements: Modification of t —— by Addition of Minute Quantities of Forei Substances. G. Le Bon. Comptes Rend. **131**, [18 706—708.

Mercury does not oxidise in air at the ordinary temper ture, nor does it decompose water, cold or hot. But if strip of cleaned magnesium be left in a cylinder of mercu (under the pressure of a few cm. of mercury column) for few hours, or if it be shaken for a few seconds with t mercury and a little 1 per cent. hydrochloric acid, t mercury attacks the magnesium slightly. This mercu though it may contain only 1/14,000 of its weight of ma nesium, rapidly oxidises in air, and if the film of bla oxide be scraped aside it is rapidly renewed; such action may be continued for over an hour. Moreover, t magnesia containing mercury will decompose water in t cold.

Magnesium will not oxidise in dry air nor decompo water in the cold. But the magnesium withdrawn from t mercury in the previous experiment rapidly decompo water in the cold, becoming of course oxidised.

Aluminium does not oxidise in air, does not sensi decompose water in the cold, and is not attacked by su phuric or nitric acid. It is known that aluminium, wh shaken with mercury in presence of bases [alkalis?], for an amalgam, containing a notable quantity of mercu which decomposes water. If aluminium be shaken w mercury alone for a couple of minutes, it takes up so lit mercury that its surface is not perceptibly changed. Ye a slip be now hung up vertically in the air, it oxidises rapidly that it is almost covered instantly with "sprout of aluminium, which ultimately may attain a centimetre length; while the temperature rises to 102° C. Or if a be thrown into water, it decomposes it energetically, action continuing till the aluminium is completely oxidis

The author refrains from formulating at present hypothesis to account for these facts.—J. T. D.

Radio-active Lead. K. A. Hofmann and E. Strauss Ber. **34**, [1], 8—11.

The radio-activity of the lead compounds obtained by authors from pitchblende, bröggerite, &c. (this Jour 1901, 76) is due to a substance which they have succe in isolating but which cannot be identified with any kn element. In its analytical behaviour it closely resem lead, being precipitated as a brown-black sulphide f dilute acid solutions, and yielding a sulphate whic insoluble in dilute sulphuric acid. The iodide is yell the chloride is more readily soluble in pure water than chloride is; the hydroxide is soluble in caustic potash s tion, and from such a solution the sulphide is precipit by yellow ammonium sulphide. Its spark spectrum sl a distinct line in the violet. It affects the photogra plate in the dark, this property disappearing after months, but again appearing when the substance is exp to kathode rays. The chloride and sulphate exhibit a blue fluorescence when under the influence of kathode and the substance so treated becomes as radio-active a most active thorium and uranium preparations. The centage of SO_4 in two preparations of the sulphate found to be 41·35 and 42·00 respectively, that in P being 31·71; and in $Bi_2(SO_4)_3$, 40·86. Special precau were taken to ensure the absence of bismuth. The val appears to be higher than that of lead, as the sul liberates iodine from an acidified solution of potas iodide, and from the hydrochloric acid solution an sulphate, containing 22·34 per cent. of SO_4, was obta Probably the supposed new element can take both th and tetravalent forms and therefore has an atomic weig something over 260.—H. B.

Radio-active Substances. F. Giesel. Ber. **33**, [19 3569—3571.

Referring to the statement of Hofmann and Strauss Journal, 1901, 76) that they have met with radio-activ and rare earths, the author points out that chemical me not yet delicate enough to be relied upon for separating radio-active impurities from such a small quantity as grms. of mineral. Only by working upon very large ntities of pitchblende of the greatest activity has it been sible to distinguish radium from barium, and even when king in this way it has not been possible to learn thing definite about polonium and actinium. Insoluble hates, such as $BaSO_4$ and $PbSO_4$, carry down the radio-ve substances with them very readily.

he author confirms Walkhoff's observation that the from radium, like Röntgen rays, cause irritation and nate destruction of the skin. They also affect the s of living plants, the chlorophyll disappearing and ing a yellow to brown colour at the affected spot.—H. B.

on Bromide ; Compounds of Phosphorus Chlorides h ——. Tarible. Comptes Rend. **132**, [2], 83—85.

on bromide reacts readily with either chloride of phosus, forming compounds with the formulæ $PCl_3.2BBr_3$ $PCl_5.2BBr_3$ respectively. These are crystaline comds, readily decomposed in the cold by water, chlorine, nmonia gas.—J. T. D.

's Analogous to Sulphuric Acid ; Sodium Salts of ibasic ——. *VI.* R. Funk. Ber. 1901, **33**, [19], 96—3703.

um Manganate.—According to Gentele (J. prak. Chem. 58) this forms bluish-green crystals, containing 10 mols. ter. The author, however, has been unable to obtain ydrate.

dium Selenate forms two modifications, one containing mols. of water and the other anhydrous. From his ility determinations, the author concludes that, in on, the hydrated variety becomes anhydrous at about ', without the formation of an intermediate hydrate.

dium Tellurate.—There appears to be only one modifi- of this salt ($Na_2TeO_4 + 2H_2O$). The author has unable to obtain a decahydrate.

dium Molybdate.—The normal salt with 2 mols. of becomes anhydrous at 100° C. There is also a decaate, which is stable in solution below + 10° C., and s into the dihydrate at + 10° to 11° C. The solution C. contains 30·63 per cent. of anhydrous salt, which ses with the temperature to 45·57 per cent. at C.

dium Tungstate.—The normal salt crystallises with ls. of water, which it loses on heating. There is also ble modification with 10 mols., obtained by shaking ormal salt with cold water (below + 6° C.). The ity of the decahydrate in terms of anhydrous salt is : 5 C., 30·60 per cent. ; + 5° C., 41·02 per cent. of the dihydrate: − 3·5°, 41·67 per cent. ; and 0° C., 49·31 per cent.

nparative Solubility.—The following table shows the arative solubility of these salts at 18° C. :—

alt.	Formula.	Specific Gravity of Solution.	Per Cent. of Anhydrous Salt.	Mols. of Salt to 100 Mols. of Water.
ate.....	$Na_2SO_4 + 10H_2O$.	1·140	14·46	2·1
te	$Na_2SeO_4 + 10H_2O$	1·315	29·00	3·9
tate ...	$Na_2WO_4 + 2H_2O$.	1·573	42·00	4·4
date...	$Na_2MoO_4 + 2H_2O$.	1·437	39·40	5·7
ate....	$Na_2CrO_4 + 10H_2O$	1·432	40·10	7·4

the solubility of the decahydrates the following s were obtained :—

Salt.	Formula.	Per Cent. of Anhydrous Salt.	Mols. of Salt to 100 Mols. Water.
te..........	$Na_2SO_4 + 10H_2O$...	4·78	0·60
e..........	$Na_2SeO_4 + 10H_2O$..	11·74	1·26
ate..........	$Na_2CrO_4 + 10H_2O$..	24·07	3·52
ate	$Na_2WO_4 + 10H_2O$..	36·54	3·52
tate	$Na_2MoO_4 + 10H_2O$.	30·63	3·86

From this it appears that the molecular solubility is smaller in proportion to the "strength" of the acid. The solubility curves of these different salts run parallel. As regards the stability of these decahydrates it is remarkable that they can only exist at a low temperature when the element in the acid part of the salt has a high atomic weight, but the limits of temperature do not depend upon the atomic weights. Thus—

Salt.	Atomic Weight.	Transition Temperature. with loss of H_2O.
		° C.
$Na_2WO_4 + 10H_2O$................	W = 184	6
$Na_2MoO_4 + 10H_2O$	Mo = 96	11
$Na_2CrO_4 + 10H_2O$	Cr = 52·1	19
$Na_2SeO_4 + 10H_2O$...............	Se = 79·1	32
$Na_2SO_4 + 10H_2O$................	S = 32	32

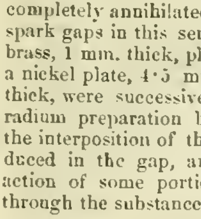
—C. A. M.

Crystallisation ; General Method for Inducing ——, *in Substances Crystallising with Difficulty.* A. Rümpler. Ber. 1900, **33**, [19], 3474—3476.

This method has reference more particularly to substances which, although soluble in water, are insoluble in alcohol. It consists in adding to the aqueous solution, alcohol in quantity just insufficient to produce precipitation. The liquid is then placed in an exsiccator over quicklime. The latter absorbs water but not alcohol. The result is that the liquid slowly increases in alcoholic strength, and a very gradual separation of the dissolved substance is induced. Operating in this fashion with various colloidal bodies, more or less crystalline deposits were obtained. Thus, from Merck's peptone, after several recrystallisations, well-defined crystals were obtained, several mm. in diameter, which yielded the biuret reaction distinctly. Again, arabic acid, from gum, furnished a conglomerate mass, consisting of minute crystalline needles.—H. T. P.

Metals and other Substances ; Transparency of ——, *to Radium Rays.* T. Mizuno. Electrician, 1901, **46**, [1181], 399.

The author found that the transparency of metals and other substances to radium rays can easily be shown, qualitatively, by means of a spark method. To each of the poles A and B of an induction coil are attached two wires forming the alternative spark gaps 1 and 2. The spark gaps are formed by spark micrometers, so that the spark lengths can be finely adjusted at will. If the spark gap 1 be enlarged to just beyond its critical spark length, that is, to such a length that the spark is just unable to spring across, whilst the spark gap 2 is disposed just below its critical length, and then the radium preparation be brought into the neighbourhood of gap 1, vivid sparks will be produced there, whilst the sparks in gap 2 will be either completely annihilated or very much enfeebled. With the spark gaps in this sensitive condition, plates of ebonite and brass, 1 mm. thick, plates of glass and lead, 2 mm. thick, a nickel plate, 4·5 mm. thick, and a copper plate, 6 mm. thick, were successively placed below gap 1, and then the radium preparation brought below the plate. In spite of the interposition of these substances, sparks were still produced in the gap, and these were evidently due to the action of some portion of the rays which passed freely through the substances.—A. S.



Sugars ; Some New Derivatives of ——. W. A. van Ekenstein and C. A. Lobry de Bruyn. Zeits. Ver. deutsch. Zucker-Ind. 1900, [539], 1129—1132.

The following formal and benzaldehyde derivatives were obtained in the course of the authors' researches on sugars :—

1. *Tribenzal-d-sorbite,* formed from its constituents by condensation with hydrochloric acid, is readily separated

from the mono- and dibenzal derivatives, by reason of its much lower solubility in acetone. It melts at 185° C., and is optically active—$[\alpha]_D = + 30°$ in 0·4 per cent. solution in chloroform.

2. All three isomeric nitrobenzaldehydes yield condensation products with *d*-mannite; whereas dulcite gives negative results, and *d*-sorbite furnishes only the *p*-compound. In general, reaction proceeds far more slowly than with benzaldehyde, requiring several days for its completion. The products are crystalline, colourless, or pale yellow.

—	Ortho.		Meta.		Para.	
	M. Pt.	$[\alpha]_D$	M. Pt.	$[\alpha]_D$	M. Pt.	$[\alpha]_D$
	° C.	°	° C.	°	° C.	°
Mannite	214	– 59	247	– 30	162	– 16
Sorbite	..	..	..	..	150	– 58

The specific rotatory power determinations were made in 4 per cent. chloroform solution.

3. The mono-benzal derivative of *l*-gulonic acid is beautifully crystalline and yields crystalline sodium and potassium salts. Its melting point is 174° C.; $[\alpha]_D = -67°$ in 1 per cent. methyl alcohol solution.

4. *l-Idosaccharic acid* furnishes a dibenzal compound, having melting-point 211° C., and $[\alpha]_D = -27$ in 4 per cent. methyl alcohol solution.

5. The diformal derivatives of *d*- and *l*-idite have been previously described (*ibid.*, 1900, II., 518); but by some mischance were erroneously set down as triformalidites.

6. *Xylotrioxyglutaric acid* gives a beautifully crystalline monoformaldehyde derivative, suited for the isolation of the acid and for identification of xylose. The compound is readily obtained by oxidising xylose with nitric acid, and treating the product with formaldehyde and hydrochloric acid. It crystallises well from dilute alcohol, is optically inactive, and furnishes crystalline acid and neutral salts. Melting point, 242° C.

7. *l-Gulonic acid* yields a formal compound. Melting point. 177° C. $[\alpha]_D = -88°$ in 1 per cent. alcoholic solution.

8. *Diformal-l-idic acid.*—Melting point, 226° C. $[\alpha]_D = -54°$ in 0·4 per cent. methyl alcohol solution.

9. *l-Gulose* gives a yellowish benzylphenylhydrazone melting at 124° C., and crystallising well from methyl alcohol $[\alpha]_D = -24°$ in 5 per cent. methyl alcohol solution.

—H. T. P.

Raffinose; Preparation of the Octabenzoyl Ester of ——. F. Stolle. Zeits. Ver. deutsch. Zucker-Ind., Jan. 1901, [540], 33.

The octabenzoyl ester of raffinose, $C_{18}H_{25}(C_7H_5O)_8O_{16}$, prepared by the Schotten-Baumann method, separates from solution in glacial acetic acid as a white crystalline powder melting at 98° C. A glacial acetic acid solution containing 0·6956 grm. of the ester in 50 c.c. gave a rotation of + 4·1 sugar degrees in a 200 mm. tube at 18·6° C.—T. H. P.

Osmosis of Liquids through a Membrane of Pig's Bladder. G. Flusin. Comptes Rend. **131**, [27], 1309—1310.

The rates of passage of liquids through a membrane of pig's bladder vary, as in the case of india-rubber, in the same sense as the absorptive powers of the bladder for them. The table gives the rates of osmosis at 12° C. in cb. mm. per hour per sq. cm. of membrane, and the volumes in c.c. absorbed in five minutes' immersion by 100 grms. the bladder.—J. T. D.

—	Rate of Osmosis.	Capacity for Absorption.
Water	4,674	121·9
Methyl alcohol	1,748	28·7
Amyl alcohol	646	7·2
Amyl acetate	532	6·8
Chloroform	456	5·5
Benzene	268	5·0
Ether	0	3·2
Ethyl alcohol	..	3·0

Alcohols; New Method of Synthesis of ——. M. Guerb
Comptes Rend. **132**, [4], 207—210.

When an alcohol of the ethylic series is heated with sodium derivative of the same or another alcohol, t following reaction may occur:—

$$2C_mH_{2m+2}O + C_nH_{2n+1}NaO = C_{m+n}H_{2(m+n)+2}O + C_mH_{2m-1}NaO_2 + 4H.$$

The author has previously obtained in this way a diam alcohol and isovaleric acid from amyl alcohol and sodi amylate; he has now applied the reaction to œnanth alcohol and its sodium derivative, and has obtained not a 14-carbon alcohol and 7-carbon acid, but also a 21-car alcohol and 14-carbon acid, derived, no doubt, from reaction of the 14-carbon alcohol first formed upon some the unattacked sodium œnanthylate.—J. T. D.

Bacterial Decomposition of Formic Acid. W. C. Pakes and W. H. Jollyman. Proc. Chem. Soc. 1 **17**, [232], 29.

The authors, as the result of various observations, were to analyse the gases produced from sodium formate solution by certain bacteria. These experiments show hydrogen and carbon dioxide are evolved, sodium hydro carbonate remaining in the medium in which the sod formate was dissolved. The total amount of car dioxide, that is, the amount evolved as a gas, and tha combination, was found to be equal in volume to amount of hydrogen evolved. It is therefore possibl express the reaction by a very simple equation, ei $H.CO_2Na + H_2O = NaHCO_3 + H_2$ or $H.CO_2H = CO_2 +$ One of the chief reasons why the addition of sodium for to media containing dextrose is of such advantage is the alkali formed from the decomposition of the soc formate neutralises the acids produced by the decompos of the sugar; the fact that the medium continues to neutral or alkaline allows the bacteria to grow for a lo period than when the medium becomes increasingly aci

Many bacteria had no action upon the formate, and it found that none of the more commonly occurring y had any action upon the salt.

Bacterial Oxidation of Formates by Nitrates. W. C. Pakes and W. H. Jollyman. Proc. Chem. Soc. 1 **17**, [233], 39—40.

In previous communications the authors have describe actions of a group of bacteria upon solutions conta sodium formate, and of another group upon solu containing sodium or potassium nitrate.

Many of the bacteria which decompose the format also found to decompose the nitrate, such, for instan the *B. coli communis*, *B. enteritidis* of Gärtner, an *Pneumobacillus* of Friedländer, each of which co formic acid into carbon dioxide and hydrogen, and re nitric to nitrous acid.

If any of these bacteria be cultivated in a mediun taining both formate and nitrate (1 per cent. of eac will be found that no gas will be evolved. After the of several days the fluid will be found to contain s hydrogen carbonate and sodium nitrite. When the m contains an excess of sodium formate as compared wi sodium nitrate, gas is evolved which, upon analysis, to consist of carbon dioxide and nitrogen.

When the same bacteria are cultivated in media cont *d*-glucose and sodium nitrate, a similar effect is pro gas is evolved which consists of carbon dioxide and nit or carbon dioxide, nitrogen, and hydrogen, the latter found if the sugar is in excess as compared with the n

The authors have not yet been able to determine w a similar result would be obtained when the organism did not act upon both, but they have succeeded in sh that the *B. pyocyaneus* (which does not decompose fo acts in a medium containing both salts almost as formate were absent; they have not as yet been able a bacterium which decomposes formate, but which d reduce nitrates.

rium Sulphate; Solubility of ——, in Solution of Sodium Thiosulphate. Leonard Dobbin.

See page 218.

Non-Explosive Vessels for Inflammable Liquids.
Pharm J., Feb. 23, 1901.

: Fabrik Explosionssicherer Gefässe, Limited, of Salz-ten, Westphalia, has invented a simple contrivance, by ıns of which it is claimed that any barrel, can, or other el intended for storing or transporting paraffin, benzene, its, or any other liquid of an inflammable nature, is lered safe against explosions caused by the gases which ımulate in such vessels. The invention consists prin-lly of a cylinder of wire-gauze mounted between two ı concentric cylinders of perforated metal, so that it is ained in an annular chamber, one end of which is pletely closed. The whole is inserted into the barrel, ther vessel, so that no liquid can be poured into or out ıe vessel without passing through the wire-gauze which rates the interior of the vessel from the outer atmosphere ıe same way as the flame in the case of a Davy miner's). Thus, if a naked light is brought into the vicinity of a :l containing ether, the issuing vapour will ignite, but, ad of causing an explosion, will burn quietly at the e until extinguished by means of a rag, the gauze pre-ng the flame from igniting the bulk of the vapour in the ior. The cap, which is screwed on to the open end e gauze cylinder while the liquid is being stored, is ided with a fusible plug, so that should the vessel be :cted to excessive heat, the plug is blown out by the ure of the vapour, which then takes fire at the hole, oes not explode. It is claimed that by means of this ıtion methylated spirit, benzoline, &c., may be sold ıut danger, and that if it were generally adopted restric-ns to the time of the sale, the quantity stored, &c., t be withdrawn.

𝔑𝔢𝔴 𝔅𝔬𝔬𝔨𝔰.

Schokoladen Fabrikation. Von Dr. Paul ffeerer. Zweite, gänzlich neubearbeitete und erweite Auflage. M. Krayn's Verlag, Berlin, W. 1901. ice M. 7.50.

volume, with frontispiece, prefaces, table of contents, 280 pages of subject-matter, an appendix, bibliographic list of engravings, and alphabetical index of subject-er. The text is illustrated with 99 engravings and llustrated tables, and it is subdivided into 16 chapters, h treat of the following subjects:—I. Geographic nsion, History, and Culture of the Cocoa Tree. II. ription of the Cocoa Tree and its Fruit; the Harvest; Ripening or "Rotting" (Development of Brown Pig-). III. The Cocoa Beans. IV. and V. Trade Varieties ocoa Beans, &c. VI. Chemical Constituents of the ıs:—(i) The Water; (ii) Fat; (iii) Cocoa-red or ıent; (iv) Theobromine; (v) Albumin; (vi) Starch; Cellulose; (viii) Sugar and Vegetable Acids; (ix) eral or Ash Constituents. VII. Cocoa Husks or ls. VIII. Additions made to Chocolates. Manufac-: of Cocoa Preparations. IX. Manufacture of colates. X. Cocoa Powder, &c. XI. Preserving and king. XII. Transport. XIII. Motive Power. XIV. ngement of a Cocoa Works. XV. Chemical and oscopic Investigation of Cocoa Preparations. XVI. mercial Enactments with regard to Chocolate and a Preparations. Appendix, with analyses and recipes naking cocoa and chocolate preparations.

mercial Organic Analysis. A treatise on the roperties, Modes of Assaying, and Proximate Analytical camination of the various Organic Chemicals and oducts employed in the Arts, Manufactures, Medicine, :. With concise Methods for the Detection and termination of their Impurities, Adulterations, and oducts of Decomposition. By Alfred H. Allen, I.C., F.C.S., Past President of the Society of Public Analysts, &c. Third Edition. Vol. III. Part I. Tannins, Dyes and Colouring Matters, Writing Inks. Revised and edited by T. Merritt Matthews, Ph.D. J. and A. Churchill, 7, Great Marlborough Street, London. 1901. Price 18*s*.

This volume contains reviser's preface, table of contents, list of errata and addenda, and subject-matter covering 573 pages. The work is completed by an alphabetical index of subject-matter. It also contains some illustrations. The main subjects treated of in the work are as follows:—Tannins or Tannic Acids. I. Description and General Properties. II. Extraction. III. Constitution. IV. Reactions. V. Gallotannic Acid. VI. Tannin-yielding Materials. VII. Qualitative Recognition of Tannin Materials. VIII. Analytical Methods for Determining Tannic Acid and Tannins. IX. Examination of Tan Liquors, &c. X. Detection of Sumac Adulteration. Dyes and Colouring Matters. Constitution, Classification, and Analysis. Writing Inks. I. Constitution. II. Analysis. III. Chemical Examination of Ink-Marks.

Ausgewählte Methoden der Analytischen Chemie. Von Prof. Dr. A. Classen, Geheimer Regierungsrath, Director der Laboratorien für Anorganische Chemie und Elektrochemie der königlichen technischen Hochschule zu Aachen. Erster Band. Unter Mitwirkung von H. Cloeren. Friedrich Vieweg und Sohn, Braunschweig. 1901. Price M. 20.

8vo volume, containing preface, table of contents, and subject-matter covering 903 pages, and illustrated with 78 excellent wood engravings. The work ends with alphabetical indexes both of authors and subject-matter. The text of the work is devoted to the analysis, qualitative and quantitative, of the following metals, with their ores, alloys, &c.:—I. Silver. II. Lead. III. Mercury. IV. Copper. V. Bismuth. VI. Cadmium. VII. Arsenic. VIII. Antimony. IX. Tin. X. Selenium. XI. Tellurium. XII. Germanium. XIII. Molybdenum. XIV. Tungsten. XV. Vanadium. XVI. Gold. XVII. Platinum. XVIII. Palladium. XIX. Rhodium. XX. Iridium. XXI. Osmium. XXII. Ruthenium. XXIII. Zinc. XXIV. Manganese. XXV. Nickel. XXVI. Cobalt. XXVII. Iron. XXVIII. Aluminium. XXIX. Chromium. XXX. Uranium. XXXI. Indium. XXXII. Thallium. XXXIII. Gallium. XXXIV. Cerium. XXXV. Lanthanum. XXXVI. Didymium. XXXVII. Samarium. XXXVIII. Scandium. XXXIX. Yttrium. XL. Thorium. XLI. Zirkonium. XLII. Beryllium (Glucinum). XLIII. Niobium. XLIV. Tantalum. XLV. Titanium. XLVI. Barium. XLVII. Strontium. XLVIII. Calcium. XLIX. Magnesium. L. Potassium. LI. Sodium. LII. Lithium. LIII. Cæsium and Rubidium. LIV. Ammonium. LV. Volumetric Determination of the Alkalis.

Practical Organic Chemistry for Advanced Students. By Julius B. Cohen, Ph.D., Lecturer on Organic Chemistry, The Yorkshire College, Lecturer of the Victoria University, &c. Macmillan and Co., Ltd., London and New York. 1900. Price 3*s*. 6*d*.

Small 8vo volume containing preface, table of contents, subject-matter covering 279 pages, and an alphabetical index. The text is illustrated with 78 wood engravings, and an appendix, extending from page 273 to page 279; it contains tables of Atomic Weights, Vapour Tensions, and Specific Gravities, &c. The object of the work is to provide a systematic course of instruction in practical organic chemistry for the student, as regards reactions, analysis and preparations. Descriptions are given in detail of the methods of preparation of some 120 organic substances as examples and exercises.

A Manual of Assaying. The Fire Assay of Gold, Silver and Lead, including Amalgamation and Chlorination Tests. By Alfred Stanley Miller, Professor of Metallurgy and Mining, University of Idaho. John

Wiley and Sons, New York. Chapman and Hall, Ltd., London. 1900. Price 1.00 dol. or 4s. 6*d*.

This small work contains preface, subject-matter filling 87 pages, and is illustrated with 38 woodcuts, and an alphabetical index.

The chapters are devoted to the following subjects:— I. Cupels and Flux. II. Assay of Ores. III. Notes on the Assay of Ores. IV. Fluxes and Reagents. V. Slags. VI. The Assay of so-called Refractory Ores. VII. Amalgamation and Chlorination Assays.

Trade Report.

TARIFF CHANGES AND CUSTOMS REGULATIONS.

(*From the Board of Trade Journal.*)

New Liquor Law in France.

The Board of Trade have received, through the Foreign Office, a copy of a French Law, dated Dec. 29, 1900, and which was to come into force on Jan. 1 last, relative to the taxation, sale, &c. of liquor in France, together with a Customs Circular explaining such portions of the new regulations as affect the duties to be levied by the Customs service. The following is the substance of this Circular:—

Alcohols, Spirits, Brandies, Liqueurs, Fruits in Brandy, Absinthes, and other Alcoholic Liquors.—The consumption duty on these liquors has been increased from 156 frs. 25 cts. to 220 frs. per hectol. of pure alcohol, and the same duty will also be levied on alcoholic perfumes, alcoholic distilled waters, alcoholic solutions of aniline dyes, and varnishes, as well as on such medicines and chemical products as are subject to consumption duty.

Denatured Alcohols and Products with a Basis of Denatured or Evaporated Alcohol.—The tax on denaturation of 3 frs. per hectol. of pure alcohol, established by the Law of Dec. 16, 1897, has been suppressed, and replaced by a statistical duty of 25 cts. per hectol. of pure alcohol. The charge of 80 cts. per hectol., destined to meet the cost of supervising the denaturation of alcohols, remains in operation.

Dangerous Essences.—The Government is empowered to prohibit, by Decree, the manufacture, circulation, and sale of any essence recognised as dangerous, and declared to be such by the Academy of Medicine.

United States.

Customs Decision.

Extracts of Bark for Dyeing or Tanning.—Merchandise, in both liquid and solid or dry condition, described as "tan extract" and found from a chemist's report to be extracts of bark such as are commonly used for dyeing and tanning, but differing materially from commercial extract of quebracho in practical results in dyeing, and in percentages of both moisture and solid matter, although closely resembling quebracho extract in other respects, is dutiable at seven-eighths of a cent per pound under the provisions of paragraph 22 of the Tariff.

Duties on Alcohol and Tinctures in Japan.

Chem. and Druggist, March 23, 1901.

The Japanese Government have laid a Bill before the Parliament now in session relating to the import duty on alcohol and tinctures. Under the new law the import duty on alcohol will be 40 sen per litre instead of 250 per cent. *ad valorem*, which makes the duty a little higher than hitherto. The duty on tinctures under the present tariff is 10 per cent. *ad valorem*, but the recent increased importations of tinctures has attracted the attention of the Government, and, in order to stimulate local production, the duty on tinctures, with exception of *tr. opii*, has been increased to 40 sen per litre. The above Bill has passed the Lower House, and will become law on Oct. 1.

Linseed Oil, Turpentine, and Paints in India; Trade Descriptions of ——.

A copy has been received at the Board of Trade, throu the India Office, of a Circular (No. IV. of 1901), issued the Finance and Commerce Department of the Governm of India on the 22nd January last, relating to the pract which should be followed in affixing trade descriptions certain adulterated goods—namely, linseed oil, turpenti and paints—under the Indian Merchandise Marks Act 1889. The procedure prescribed for all ports in India that such goods are to be passed by the Customs authori if they are marked "reduced," "mixed," "boiled," "mineral," but if they are adulterated to the extent of per cent. or more, the actual percentage of the adulterat must be conspicuously marked on the receptacles contain them. These orders apply to white lead, white zinc, lead, and similar compositions; and also to linseed oil turpentine.

Importation of Dangerous Goods into West Australia.

The following notice has appeared in the *West Aust lian Government Gazette* for the 1st January last:—

"The attention of importers is directed to the follow provisions of 'The Customs Consolidation Act, 1892':-

"Section 107.—If any person imports or lands, attempts to import or land, into Western Australia, goods of a dangerous nature—that is to say, explosi lucifer matches, petroleum, kerosene, naphtha, benz acids, or goods of a like nature—without specially decla the same at the custom house prior to importation landing, or shall be concerned in, or aid or abet in, such importation or landing, or attempt to import or l the same, every such person shall be subject to a pen of one hundred pounds, and the goods may be forfeited

LEGISLATION.

The Patents Acts.

Standard, March 25, 1901 (*see this Journal*, 1900, 4

The questions submitted to the Committee by the B of Trade were three. In the first place, ought any, an so, what, additional powers to be given to the Pa Office to control, impose conditions on, or otherwise l the issue of letters patent in respect of inventions whicl obviously old, or which the information recorded in the c shows to have been previously protected by letters pa in this country? Secondly, do the provisions in the Pat Act, 1883, as to the grant of compulsory licences, stan need of any, and what, amendment? Lastly, can the pe of seven months' priority allowed by the existing Ac applicants for letters patent under the Internat Convention properly be extended, and on what conditio

In regard to the grant of letters patent, English law all along occupied an intermediate position between extremes. In certain countries, including France, a p is little more than a certificate of registration, a expressly stated to convey no official guarantee as t novelty. In others—*e.g.*, the United States, Germany Austria—a rigorous examination into novelty prec and if the result is adverse prevents, the issue of a p England takes a *via media*. There is, at present, no liminary examination into novelty; but the quaint fo patent still in use declares the grant to be made not o "the especial grace and mere motion" of the Sove but of his "certain knowledge" of its subject (although there is a qualifying recital), and the renewa in spite of recent reductions, are sufficiently high to some colour to the contention of many inventors tha Patent Office should do something more towards maki grants of real commercial value. The Board of T however, expressly negatived in the reference to the mittee any inquiry into the question of a prelim examination into novelty. But the Committee hav forward a scheme which appears to be of very consid merit. The "obviously old" inventions, the Report constitute so small a proportion of those that are pre the Patent Office as to be negligible. From this consion the Chairman, Sir Edward Fry, dissents.

\s regards anticipated inventions, however, the Com- tee have a very definite view to record. It seems that r a period of three years—1897, 1898, and 1899—forty- per cent. of the specifications accepted had been, in ›le or in part, anticipated. The Committee, therefore, gest that, in addition to the existing inquiries, an mination ought to be made in the Patent Office into the stion whether any invention claimed in a deposited ification has been anticipated by any complete ification within fifty years previously; and, giving t in substance to the provision of a Bill introduced the last Parliament by Lord Alverstone—then Sir iard Webster—and Mr. Moulton, recommend that lications (in specification), of fifty years or upwards ld not, in the legal sense, be regarded as anticipations. a the compulsory licence question the Committee make proposals. The jurisdiction to grant compulsory ces is to be transferred to the High Court from the d of Trade; and failure on the part of a patentee to . his patent is to be added to the grounds on which the t of a compulsory licence may be ordered. The mittee propose to extend the period of protection r the International Convention from seven months to e, subject to comprehensive and satisfactory con- s. The foreign applicant is to file a complete specifi- n with his application at the Patent Office, just as the sh inventor has to do. On acceptance, this specifica- s to be published; and the extension of time is only erate in favour of the subjects of countries which British inventors in an equally generous spirit.

I.—GENERAL.

Imports and Exports of Spain in 1899.

reign Office Annual Series, No. 2560, *March* 1901.

Class 1.—*Earths, Minerals, Glassware, &c.*

Imports.		Exports.		
rticles.	Value.	Articles.	Quantity.	Value.
	£		Tons.	£
., stones, &c.	257,000	Coal	8,073	9,118
	1,827,000	Tar	2,503	25,036
	250,000	Sulphide of lead	9,798	114,595
c.	121,000	Other lead minerals.	555	4,220
um, &c., mineral oils.	302,000			
		Blende	63,438	137,165
are	167,000	Zinc	31,649	60,768
	107,000	Phosphorus	20	8
		Antimony	92	1,107
		Copper	948,917	1,370,440
		„ ore	14,508	307,586
		Iron	8,613,137	4,134,304
		„ pyrites	319,284	153,256
		Manganese	139,352	317,763
tal	3,031,000	Total	..	6,635,366

Class 2.—*Metals.*

	£		Tons.	£
on	81,000	Gold and silver, jewellery, &c.	..	60,000
ht iron	428,000			
	48,000	Iron, in pigs	40,879	147,000
ht iron e pieces).	27,000	Iron, manufactured.	6,734	61,600
manufac- l.	210,000	Copper, shell	28,423	966,400
		Copper, old and manufactured.	1,075	53,800
tes	26,000			
and its s.	212,000	Tin, copper, and bronze, manufactured.	27	5,500
ingots	78,000			
		Mercury	3,221	695,000
		Argentiferous lead, pigs.	68,974	965,600
		Common lead, pigs.	92,123	1,031,800
		Lead, manufactured.	664	10,100
		Other metals and alloys.	2,777	83,600
al	1,119,000	Total	..	4,080,400

Class 3.—*Drugs, Chemicals, &c.*

Imports.		Exports.	
Articles.	Value.	Articles.	Value.
	£		£
Simple drugs	709,000	Simple drugs	261,000
Colours, dyes, varnishes, &c.	423,000	Salt	198,600
		Raw tartar	192,700
Chemicals and pharmaceutical products.	1,461,000	Cream of tartar	52,300
		Soap	142,400
Starch, soap, &c.	331,000	Wax and stearin	41,000
Perfumery	79,000	Perfumery	22,100
Total	3,003,000	Total	910,100

III.—TAR PRODUCTS, PETROLEUM, Etc.

Petroleum Production in Russia in 1900.

Bd. of Trade J., Feb. 28, 1901.

The Russian *Gazette of Trade and Industry* in an article on the production of naphtha in Russia in 1900, states that although the precise figures are only available for the first 11 months, the total for the whole year may safely be estimated at more than 600,000,000 pouds. Taking, for purposes of comparison, the round figure of 600,000,000 pouds, the increase over the figures for the preceding year amounts to 75,000,000 pouds, or about 14 per cent. The following table shows the production of naphtha in Russia during the last five years:—

Year.	Quantity.	Increase.
	Pouds.	Per Cent.
1896	386,000,000	2·4
1897	421,000,000	9·1
1898	486,000,000	15·2
1899	525,000,000	8·1
1900	600,000,000	14·3

Note.—Poud = 36 lb.

In seven years (1894 to 1900) the production of naphtha has been doubled, but in spite of this increase the average price has shown a constant and considerable rise.

According to an approximate calculation made by the last Congress of Russian naphtha traders, the probable production in 1901 will be about 700,000,000 pouds.

The *Gazette* further states that in spite of the sources of naphtha of extraordinary richness that are from time to time discovered in the territory of Térek, the only important working in this region is that of Grozny, the production of which in 1900 will probably amount to 29,000,000 pouds as against 25,000,000 pouds in 1899. Besides the sources at Baku and Grozny there are, according to the *Gazette*, naphtha-bearing areas in the district of Kouban, in several other districts in the Caucasus and in the north of the Ural, but they are as yet only slightly developed. It is probable that very productive naphtha-bearing lands will be found in Central Asia.

In conclusion, the *Gazette* says that in 1900 the Minister of Agriculture and Domains put up to auction concessions for the working of 114·6 dessiatines (dessiatine = 2·7 acres) of naphtha-bearing land in the Baku basin. Moreover, the Nobel Bros. Company has obtained the right to acquire land in Turkestan in order to establish naphtha depôts.

Inflammable Liquids; Transport of ——.

Chamber of Commerce J., March 1901, 56.

The Association of Tar Distillers has recently been in communication with the railway companies and the Home Office authorities respecting certain changes proposed in the mode of transporting inflammable liquids by rail consistently with the public safety, and the following particulars concerning the conditions imposed on the

French, German, and Belgian railways have been specially compiled :—

French Regulations.

Reply to Queries as to the Transport of Dangerous Substances on French Railways.

Question 1.—Are benzol, crude naphtha, and coke-oven oils carried by the railways in railway tank waggons without restrictions?

These products are carried on all the French railways subject to certain restrictions.

Question 2.—If there are any restrictions please specify.

These restrictions are stated to be those contained in Article XX. of the Annex of the Berne International Convention of the transport of goods, of which the terms (in translation) are appended.

The further provisions of the French law on the matter will be found on pages 4, 5, 27, 28, 33, 34, 51, 52, and 53 of the regulations of the 12th November 1897, for the transport by rail of dangerous substances.

Question 3.—What is the specification of the tank waggons used?

The specifications in force on the Northern Railway with regard to tank waggons for the use of dangerous substances have been received by the Association, but are too long for insertion here. It is stated that similar regulations are in force on other lines.

Question 4.—(*a*) What are the general regulations under which this traffic is carried?

(*b*) Under what classification?

(*c*) And what would be the freight from a point to point, say 100, 150, and 200 miles?

(*a*) The general regulations under which this traffic is carried are those laid down in the Annex to the Berne Convention above referred to, together with the special regulations prescribed for France, which will be found in the Regulations of the 12th November 1897, before referred to.

(*b*) (*c*) These substances are included in the second and third of the six categories into which explosive and dangerous substances are divided by the French Regulations, of which particulars will be found on pages 3 to 8 of these Regulations.

Benzol is classified as "Benzol" by some of the French railways, but when a product does not exist in the classification of a railway company, it can only travel under the general tariff, which comprises six series. For example, on the Northern Railway benzol does exist in the classification, and according to the *Tariff Spécial, Petite Vitesse* No. 15, Table II. is applicable when 4,000 kilogrammes minimum at a time are loaded in one truck, *viz.*:—

	Frs. per 1,000 kilos.
100 kilometres	9·00
150 "	11·40
200 "	14·40
300	18·40

and 60 centimes per 1000 kilos. extra if the loading and unloading are done by the railway company.

In the classification of the Orleans Railway Company, however, benzol is not provided for, and in consequence, series 1 is applicable, whatever quantity is sent at a time, *viz.*:—

	Frs. per 1,000 kilos.
100 kilometres	17·50
150 "	25·00
200 "	32·50
300 "	47·50

including loading and unloading by the railway company.

If, however, benzol (not existing in the Orleans Railway Company's classification) assimilated to and declared on the way-bills as "Huile essentielle extraite du Goudron de Houille," Table No. 3 becomes applicable for quantities not less than 5,000 kilos., *viz.*:—

	Frs. per 1,000 kilos.
100 kilometres	13
150 "	18·50
200 "	24
300 "	35

ncluding loading and unloading by the railway company.

Most tariffs provide different rates for different minin quantities (50, 1,000, 3,000, 4,000, 5,000, 8,000, 10,000 ki &c.).

As regards crude naphtha and coke oven oils, cr naphthas are described in the classification of most rail companies as "Naphte (ou huile de) non rectifiée," and rates charged per 1,000 kilos. by the Northern Rail Company are :—

—	4,000 kilos. Minimum.	8,000 kilos. Minimum.
	Frs.	Frs.
100 kilometres	6·40	5·40
150 "	8·15	6·90
200 "	9·90	8·40
300 "	12·15	10·40

and 60 centimes per 1,000 kilos. extra if the loading unloading is done by the railway company.

(*Translation referred to under Question* 2.)

Petroleum in a crude and rectified state, having a sp gravity of at least 0·780 at a temperature of 17·5 or if it does not give off inflammable vapours at a perature of less than 21° C., and at a barometrical h of 750 mm. in relation to the level of the sea.

Oils prepared with lignite tar, if they have at leas specific weight above mentioned (Solar Oil, photogene

Oils prepared with coal tar (benzol, toluol, xylol, c &c.), as well as essence of mirbane (nitrobenzol),

are subject to the following regulations :—

1. Unless special waggons, specially constructed fo traffic (tank waggons) are used, these products can on carried—

(*a*) In particularly good and strong casks; or

(*b*) In stanched strong metal vessels; or

(*c*) In glass vessels. In the latter case, howeve following regulations have to be followed :—

(*aa*) When several vessels are packed in one pac they have to be firmly packed in wooden cases stuffe straw, hay, bran, or sawdust, soil, or other such substa

(*bb*) When the vessels are packed separately, the port is permitted in solid baskets or tubs provided covers, fitted well and provided with handles, and sufficient quantity of packing material. The cover, of straw, rushes, or reeds, or such materials, mu impregnated with clay or chalk or similar subst mixed with soluble glass. The gross weight of the must not exceed 60 kilos.

2. The vessels which are damaged during trans immediately unloaded and sold, with whatever may remaining contents, to the best interest of the senders

3. The transport only takes place on open waggo customary formalities require waggons provided with bags, the transport would not be allowed.

4. The preceding regulations of No. 3 also apply t and other vessels in which these products have been These vessels must always be declared as such.

With reference to the packing of other materi XXXV.

It must be stated on the way-bill for products under paragraphs 1 and 2, that they have a specific of at least 0·780, or that the petroleum has the pr given in the first paragraph as regards inflammabl When this indication is not stated on the way h usual transport paragraph No. XXII., concerni carrying of petroleum, will be applied.

Belgian Regulations.

Benzol, crude naphtha, and light oils obtained making of coke are transported in tank waggons the Belgian railway lines.

These tank waggons, which are not provided wit brake, belong to private owners.

They are composed of an iron tank firmly fixed frame, also made of iron.

The tank, closed hermetically is provided with valve, with several taps and tubes for emptying.

ecaution is taken that the tanks are not quite filled, to take into account the dilutation of the products.

e Belgian railway companies do not place tank gons at the disposal of the senders.

e circulation of special vehicles on the lines worked e State and corresponding lines is granted subject to egulations and to the special conditions to be determined, ed be, in each case.

ansport of benzol and of crude naphtha eventually ed in tank waggons comes under the same tariffs as sent in casks or in any mode of package admitted zol: 1st class of tariff No. 3; crude naphtha, 1st class pecial tariffs Nos. 6 and 18).

ght oils derived from the making of coke, and transd in tank waggons come under the 3rd class of tariff , whereas, if sent in cask, they are charged at the rate 2nd class.

a general way, each tank waggon is charged according net contents, with a minimum of 10,000 kilos., and ilway company has not to pay for this material any r travelling or for demurrage.

following table shows the rates of the various classes rtain distances and the special tariffs mentioned :—

Rate per Ton (in Francs).

Tariff No. 3. General Table.			Special Tariff. No. 6 Exportation.	Special Tariff. No. 18 Importation.
1st Class.	2nd Class.	3rd Class.		
14·60	9·50	7·0	12·05	8·25
17·60	10·50	7·50	14·05	9·0
19·60	11·50	8·0	15·55	9·75
21·60	12·50	8·50	17·05	10·50
23·60	13·50	9·0	18·55	11·25

1 mile = 1 kilometre and 609 metres.
1 metre = 3.2809 ft.
1 kilometre = 1,000 metres = 1093.639 yds.

II.—ACIDS, ALKALIS, AND SALTS.

CHEMICAL IMPORTS OF SPAIN IN 1899.

eign Office Annual Series, No. 2560, *March* 1901.

class 3, the drugs and chemicals imported from the Kingdom in 1899 were valued at 991,000*l*. The aluable articles were nitrate of soda and sulphate of , 41,852 tons, valued at 480,000*l*.; alkaline carbon- 1,971 tons, valued at 200,000*l*.; and paraffin wax, alued at 40,000*l*.

SALT PRODUCTION OF SPAIN IN 1899.

eign Office Annual Series, No. 2560, *March* 1901.

largest productions of salt in 1899 were at Cadiz, 0 tons; Alicante, 187,000 tons; Balearic Islands, tons; Almeria, 27,000 tons; and Guadalajara, tons. The Torrevieja salt pits are stated to have ed 180 000 tons, and the Ibiza salt pits 80,000 tons. tal production of the 71 salt pits in Spain in the year mounted to 598,108 tons, valued at 218,000*l*.

ACETIC ACID.

U.S. Cons. Reps.: through Chem. Tr. J., March 16 *and* 23, 1901.

petition having become somewhat keen among acturers of acetic acid in the United States, attention ecently been directed to the possibility of finding markets for a portion of the output. A circular was accordingly issued to American Consuls in t parts of the world, asking them to report what ation they could collect respecting the article in their districts. They were requested to state the conon, price, duty, if manufactured, and to what extent, imported, the form in demand, whether crystal or liquid, its strength and respective purity, the cost of transportation, and, in general, all such features in regard to it that might prove of value to American manufacturers. The following is an abstract of the replies:—

Budapest.—Consumption: Considerable demand in Hungary. Two factories. Price: 92 crowns (18·68 dols.) per 100 kilos. (220·46 lb.) for 100°. Whence imported: Besides the two factories, acetic acid is imported from Austrian Silesia. Form in demand: Chemical houses use 100° crystal. Vinegar manufactories buy 65° and 40° and dilute it.

Prague.—Consumption: About 660,000 lb. Price 80 per cent. pure, 30 florins per 100 kilos. (12·0 dols. per 220 lb.). Whence imported: Hungary, Slavonia, and Bosnia. Form in demand: Solid, 80 per cent. pure.

Reichenberg.—Consumption: Heavy. Chiefly used in dye works. Price: Common, 24 to 30 crowns per 100 kilos. (1·87 dols. to 6·09 dols. per 220·46 lb.), and 56 crowns per 100 kilos. for refined (11·37 dols. per 220·46 lb.). Whence imported: None imported. Bought from other ports of the Empire. Form in demand: Liquid.

Trieste.—Consumption: About 200 quintals (44,006 lb.) a year. Price: 24 to 26 florins (9·71 dols. to 10·26 dols.) per quintal (220·46 lb.). Whence imported: Austrian province of Bohemia. Form in demand: 80 per cent. Duty: Austrian import duty, 20 florins gold (9·74 dols.) per quintal (220·46 lb.).

Vienna.—Consumption: For various purposes more than several hundred pounds are used. Exports exceed imports. Price: 6 cents. per lb. Imports: From Germany, Italy, Switzerland, 7·3 tons, value 1,088 dols. Exports: Various European countries, 441·2 tons, value 60,539 dols.

Antwerp.—Consumption: For the whole of Belgium, about 661,380 lb. per annum. Of this amount 551,150 lb. of 40° strength, and 110,230 lb. of 80° strength. Price: About 3·86 dols. per 220·46 lb. for 40°, and 15·44 dols. per 220·46 lb. for 80°. Whence imported: Only a very little from Germany. Duty: 14·47 dols. per 26·417 galls.

Brussels.—Consumption: Annual consumption in Belgium about 400,000 kilos. (881,840 lb.); 300,000 kilos. (661,380. lb.), 40 per cent. for industrial purposes and 100,000 kilos: (220,460 lb.), at a strength of 80 per cent. Price: Wholesale, 80 francs (15·44 dols. per 100 kilos. net, not including duties. Duty: Above 40° 75 francs (14·48 dols.) per hectoliter (26·417 gallons), and for crystallised $187\frac{1}{2}$ francs (36·19 dols.) per 100 kilos. (220·46 lb.) Whence imported: Germany. Form in demand: Crystallised.

Ghent.—Consumption: Heavy. Imports, 4,500 kilos. (9,921 lb.); and exports, 49,203 kilos. (108,473 lb.). Whence imported: Germany, and small quantity from France. Price: For 99—100° crystallised from 92 to 97 francs (17·76 dols. to 18·72 dols.) per 100 kilos. (220·46 lb.), and from 80 to 85 francs (15·44 dols. to 16·41 dols.), according to seller. Form in demand: For making vinegar.

France; Bordeaux.—Consumption: Not made in this district, but of French manufacture. Price: for vinegar, 1 franc (19·3 cents.) per kilo. (220·46 lb.); for crystallised, 4·50 francs (86·8 cents.) per kilo. Form in demand: Commercial for vinegar.

Havre.—Consumption: Employed on very large scale. Price (per 220·46 lb.): Crystallised (crystals, pure), 27·02 dols.; 80 per cent. solution, 20·25 dols.; 40 per cent. solution, 10·60 dols.; 33 per cent. solution, 5·40 dols. No discounts allowed. Whence imported: None imported for consumption in France. Form in demand: Commercial, 40 per cent. Duty: Acid rendered unfit for vinegar making, per 220·46 lb.—containing less than 40 per cent. of crystallisable acid, 1·93 dols.; containing from 40 to 80 per cent. of crystallisable acid, 3·86 dols.; containing over 80 per cent. of crystallisable acid, 5·79 dols. Acid for vinegar making, per 26·418 galls.—solutions containing 8 per cent. less of crystallisable acid, 1·54 dols. Per degree and per 26·418 galls.—solutions containing over 8 per cent. of crystallisable acid, 1·93 dols. Freight: New York to Havre, $26\frac{1}{4}$ c. per 100 lb.

Nice.—Consumption: About two tons per annum. Price: For 100 per cent., 2 francs (38·6 cents) per kilo. (2·2046 lb.), exclusive of excise tax, which is paid by buyer. Form of demand: Crystallised, 100 per cent. Whence imported: French acid alone used.

Lyons.—Consumption: Estimated between 500 and 600 tons annually. Price (per 220·46 lb.): 35 per cent. acid, 5·79 dols.; 40 per cent. acid, 6·18 dols.; 80 per cent. acid, 19·30 dols. Form in demand: 40 per cent. strong for silk dyeing. Whence imported: All made in France.

Marseilles.—Consumption: Unimportant. Price: 80 per cent., 22·19 dols. per 220·46 lb.; in bond, subject to excise duty of 19·68 dols. per 220·46 lb.

Paris.—Consumption: Not given. Form in demand: For food and commercial purposes. Prices (per 220·46 lb.): For industrial purposes. 40 per cent., 6·56 dols.; 35 per cent., 6·18 dols.

Roubaix.—Consumption: Important, but quantity not given. Forms in demand: For dyeing purposes. Price: 28 francs per 100 kilos. for quantities of 5,000 kilos., less 3 per cent.

Germany.—Consumption: Not given. Imports from European countries: 1899, 21,660 barrels, 1,022 bottles; 1898, 20,220 barrels, 304 bottles. Exports to European countries: 1899, 292,596 barrels, 269,880 bottles; 1898, 331,428 barrels, 238,692 bottles. Price for 220 lb.: 80 per cent., 12·38 dols.; 100 per cent., 16·66 dols.

Bavaria.—Consumption: Not given. Whence imported: All acid used is of German make. Price: Not given.

Coburg.—Consumption: Used for vinegar; quantity not given. Price: Wholesale, 6 per cent. solution, 1·90 dols. per hectolitre (26·417 galls.); 9 per cent., 2·86 dols. per hectolitre; pure acid, 20 c. to 21·4 c. per kilo. (2·2046).

Crefeld.—Consumption: Used for dyeing; quantity not given. Price: Best quality, 17 marks (4·05 dols.) per 100 kilos. (220·46 lb.). Whence imported: All made in Germany.

Dresden.—Consumption: Large, but not estimated. Price: 30 per cent., 8·3 c. per kilo. (2·2046 lb.); 50 per cent., 11·9 c. per kilo.; 80 per cent., 19·8 c. per kilo.; 100 per cent., 21·5 c. per kilo. Imports: None.

Hamburg.—Consumption: Not given. Imports: None; quantities are exported. Price: 60 marks per 100 kilos. (14·28 dols. per 220·46 lb.) for 100 per cent.

Hanover.—Consumption: Not given. Price per 100 kilos. (220·46 lb.): 98 to 100 per cent., 56 to 60 marks (13·32 dols. to 14·28 dols.; 80 per cent., 46 marks (10·94 dols.); 50 per cent., 6·42 dols.

Plauen.—Consumption: Not given. Price: From 5·71 dols. to 10·23 dols. per 100 kilos. (220·46 lb.). Imports: None.

Gibraltar.—Consumption: Hardly any used.

Greece.—Consumption: Very little. Price: From 50 to 130 francs gold (9·70 dols. to 25 25 dols.) per 100 kilos. (220·46 lb.); 90 francs (17·47 dols.) ruling price. Imported: From Germany in liquid.

Italy.—Consumption: Not given; there are several factories making acetic acid. Imports: For 1899, 207·7 tons, valued at 14,781·47 dols.; the imports were from France, Germany, Austria, Hungary, and Great Britain. Duty per ton: Acetic acid (impure) 1·93 dols.; 10 per cent. or less, 28·95 dols.; over 10 per cent. and less than 50 per cent. 173·50 dols.; 50 per cent. or over, 347·40 dols.; crystallised 386 dols. There is also a duty on kegs and demijohns. The former from 4 c. to 6 c. per hectolitre (2·838 bushels); the latter are taxed 1·15 dols. per quintal (220·46 lb.). Exports: For 1899 38·6 tons, valued at 1,728·73 dols. Price: Impure acid, 28 lire (5·40 dols.) per quintal (220·46 lb.); 10 per cent. or less pure acid, 18 lire (3·47 dols.); more than 10 per cent. and less than 50 per cent., 40 lire (7·72 dols.); 50 per cent., 80 lire (15·44 dols.).

Castellamare.—Consumption: Very limited. Price: Per kilo. (2·2046 lb.). 2·80 lire (54 c.). Imports: None made here. Form demanded: Liquid.

Florence.—Consumption: Fifty tons per annum. Price: Dark, for arts. 2·40 dols. per quintal (220·46 ib.); white. for arts, 6·14 dols. per quintal; pure glacial, 52 dols. per quintal. Imports: Very little. Form in demand: Liquid.

Leghorn.—Consumption: Insignificant. Price: 98 per cent. 310 to 320 lire the quintal (56·83 dols. to 61·76 dols. per 220·46 lb.); 48 to 50 per cent., 155 to 165 lire the quintal (29·91 dols. to 31·84 dols. per 220·46 lb.). these figures a local octroi duty is charged. Impor About 300 kilos. (661 lb.) from Germany.—Form demand. Mostly 30 to 40 per cent.

Messina.—No production except for pyroligneous a used for printing. Produced in Italy and costs 35 lire 100 kilos. (6·35 dols. per 220 lb.).

Venice.—Consumption: Small.

Guatemala.—Scarcely any demand. Only vine imported.

Salvador.—Consumption: About 400 lb. Sold in fla of 16 ounces. Whence imported: Germany.

British West Indies.—Consumption: About 300 ga Price: As in England, 20 s. (4·86 dols.) per cwt. (112 l plus 25 per cent. for this market. Whence import England. Form in demand: Diluted in form of vinegar

Dutch West Indies.—Consumption: Of no conseque Comes as vinegar very much diluted.

Brazil.—Consumption: A strict law is enforced, prev ing use for vinegar, and how the little used is of no mate consequence. Price: Ranges from 36 c. to 76 c. per k (2·2046). Whence imported: England, France, Germany.

British Guiana.—Consumption: Glacial, 26 g Other grades come in form of vinegar. Price: Ave about 10 c. per lb. Whence imported: England. D On 66 per cent. and up, 12 c. per lb.: less than 66 cent. and more than 10 per cent., 60 c.

Chile.—Consumption: Estimated to be about 1,500 k (3,300 lb.) 80 per cent., and 50 kilos. (110 lb.) crystall Price: For 80 per cent., 1·50 pesos per kilo. (55 c. 2·2046 lb.), and 3 pesos (1·09 dols.) per kilo, crystalli Whence imported: Germany.

Columbia.—Consumption: Moderate, about 3,000 Price: From 97 c. for German 50 per cent. to 23 c. French glacial 100 per cent. Duty: Forty-five cent per kilos. (2·2046 lb.), equal to 2·8 cents U.S. gol kilo.

Ecuador.—Consumption: Of no importance.

Paraguay.—Consumption: Too small to merit a rep

Uruguay.—The value of imports for several averages 2,800 dols. per annum. Imported from Belg Germany, and England in bottles, highly concentrated pays a duty of 57½ per cent. on the custom valuatio 80 c. per kilo. Freights against American trade.

Egypt.—Consumption: Not known. Price: G 100 per cent., in boxes of 50 kilos. (110 lb.) 67·50 n per 100 kilos. (8·69 dols. per 220 lb.). Whence impo Germany. Form in demand: White for vinegar.

Madagascar.—Importation prohibited.

Madeira.—Consumption: Insignificant. Price: 6 dols. per cwt. for best commercial or 20 c. per ll glacial. Whence imported: Great Britain. For demand: Liquid and glacial.

Morocco.—Consumption: About 5,900 litres (galls.). Price: About 40 c. Spanish (7·72 c. U. S litre (105 quarts). Whence imported: Germany. of demand: As extract or essence of vinegar.

St. Helena.—Only an infinitesimal quantity used.

South Africa.—Consumption: About 7,462 gal Cape Colony and 813 galls. at Natal. Price: A c.i.f. Cape Town, 1*s.* 6*d.* (36 c.) for glacial.

Bombay.—Consumption: About 1,000 jars ann Price: About 7 rupees per jar (2·24 dols.). W imported: England and Germany.

Calcutta.—No record of consumption. The ruling in England, 20*s.* (4·86 dols.) per hogshead.

China.—The consular district of Hankau is the o from which material information was received. C tion there was estimated at 200 lb. annually. Retail 25 c. to 30 c. for common and 45 c. gold for Wholesale figures not given. Whence imported: E and Germany. Form demanded: Liquid.

Dutch India.—Consumption: Not given. glacial, 40 c. per kilo. (2·2046 lb.); aceticum, dilute, 8 c. Whence imported: Germany. demanded: Liquid, 40 to 42 per cent. and 98 to cent.

Holland.—Consumption: Considerable. Imports . timated to be from 100,000 to 150,000 lb. per annum. ity: Water free acid under 100 , 1·2 c. per litre; of , 1¼ c. per litre; over 100° (according to strength of acid), highest duty levied on same, 14·84 dols. per ctolitre (26·417 galls.). Price: On the basis of 100 per it., 32 c. per kilo. (2·2016 lb.). From 12·72 dols. to ·20 dols. is paid for pure acid per 220 lb., with duty of ut 12 c. per kilo. (2·2016 lb.) to be added.

Russia.—Consumption: Not given. 'All made in Russia. ce: From 5·70 dols. to 14·50 dols., according to ngth. Duty: 3·10 dols. per 36 lb. Imports: The y makes imports practically prohibitive. Form in nand: Liquid.

pain.—Consumption: Between 500 and 550 tons, tly 30 to 80 per cent. used in dyeing. Price: On a is delivered at Barcelona of 70 pesetas (10·50 dols.) 100 kilos. (220·46 lb.), for 40 per cent.; 60 pesetas lols.) for 35 per cent.; 50 pesetas (7·50 dols.) for 30 cent.; and 16·50 dols. per 100 kilos. for 98 to 100 per . Duty: Industrial acid nearly all made in Spain; ign being shut out by high duty of ·50 pesetas (7·50) per 100 kilos. (220·46 lb) Import: Pure acid of 100 per cent. is imported from Germany in demijohns 10 to 150 lb.

orway.—Consumption: Between 3,000 and 4,000 galls. ally, mostly 80 per cent. Price: About 40 c. per Whence imported: Mostly from Sweden.

veden.—Acetic acid is made in large quantities in Sweden, the exports exceed the imports. During 1898 the aggregated 74,954 lb. and the former 157,975. The rts came principally from France. Price: For 50 per , 35 ore (9·38 c.) per kilo. (2·2046 lb.); for 75 per , 60 ore (16·08 c.) per kilo.; for 99 to 100 per cent., arks per 100 kilos. (15·0 dols. per 2·2046 lb.). Duty: gar and acetic acid in barrels: Up to 10 per cent. per 10 ore (12·684); for each per cent. higher the duty reased by 1 ore (·0026 c.) per kilo.; in carboys or s, independent of strength, 1 kroner (26·8 c.) per

itzerland.—Consumption: Not given. None produced Price: Average, 31 francs (5·98 dols.) per quintal ·46 lb.), and extra charge for bottles. Imports: For , 9,248 quintals, equivalent to 20,771 lb. Duty: gar of double strength and vinegar spirits containing and including 12 per cent. of acid, shipped in barrels, pay a duty of 10 francs (1·93 dols.) per quintal ·46 lb.), gross weight. Vinegar of all kinds in bottles, jars, etc., containing more than 12 per cent. of acid not exceeding 50 lb. gross weight, pays a duty of 30 s (5·79 dols.) per quintal gross weight.

minion of Canada.—Consumption: Minimum, 10,000 Price: For 80 per cent. proof, 20 c. sp. gr. 1·064 41½ c. per lb. Pure, sp. gr. 1·055, 52½ c. Imports: United States and Europe, for year ending June 30. cess of proof, 1,917 galls., valued at 1,789,000. Crude y strength not exceeding 30 per cent., 11,319 galls. d at 606 dols.

wfoundland.—Consumption: 160 gallons. Price: 51 c.; impure, 30 c. Whence imported: England. : 33⅓ per cent.

xico.—Consumption: There was imported during year 1898–99, 140,261 kilos. (314,629 lb.), valued at 5 dols. gold. Price: About 70 c. per kilo., silver. ice imported: All from Germany, in glass jars of s. (11 lb.) each.

ta Rica.—Consumption: Unimportant. Imports: Europs, 559 kilos.: from United States, 35 kilos. pounds, 1,309 for 1896. Duty: 11 c. per kilo., equal sent rate of exchange to 4½ c. American gold.

pan.—The only consular port that gives any information Yokohama. The imports there for 1899 amounted ,535 lb., valued at 23,218 dols. Put up in demijohns n 20 to 30 kilos. (44 to 66 lb. each). Price: Per 2·2046 lb.), 22 c. to 24 c. Form in demand—Quality 95 to 98 per cent. Fair demand for above 96 per

Persia.—Quantity consumed too insignificant to merit notice.

Siam.—Consumption: About 100 lb. Price: Pure Acid, 10 c. per lb. Whence imported: England.

Straits Settlements.—Consumption: Very little used. Price: Average, 35 c.; Mexican (17 c. gold) per lb., retail. Whence imported: England. Form in demand. Pure, in 1 oz. and 2 oz. bottles.

Turkey in Asia.—Consumption: Limited; about 1,320 lb. Price about 66 c. per lb. Whence imported: France, Germany, Austria, and England.

New South Wales.—Imports: For year 1898, 20,847 galls. valued at 3,455*l.* (16,814). Price: Worth about 220 dols. per ton of 2·240 lb. Whence imported: United Kingdom and Germany.

New Zealand.—Consumption: Used mostly for making vinegar. Imports: During year 1899, 293,275 lb., valued at 15,713·98 dols. Mostly glacial. Whence imported: United Kingdom, Germany, Belgium, United States, New South Wales, and Victoria. Duty: Acid of not over 30 per cent., 1½*d.* (3 c.) per lb. In every 10 per cent. of acidity, ½*d.* (1 c.) per lb. additional. Glacial is taxed 20 per cent. *ad valorem.* Price: Wholesale for glacial, 23 c. and 24 c. per lb. for the 30° of real value. An extra cent. per lb. is added for every 10° or portion thereof.

Tasmania.—Consumption: About 8,000 galls. Price: Rather under 12 c. per lb., duty paid. Duty: Per gall., 1*s.* (24 c.) not exceeding 6 per cent. of absolute acid, and 1 c. for each additional 1 per cent. of acid. Whence imported: New South Wales and Victoria.

Victoria.—Imported in limited quantities. Is manufactured here. There is an import duty of 6 c. per lb.

Caustic Soda; Electrolytic Manufacture of ——.

Chem. and Druggist, March 2, 1901, 361.

The *Electrical Review* learns from its Niagara Falls correspondent that the new plant of the Acker Process Company, of Niagara Falls, has commenced operations. The product of this new factory, says the correspondent, will be caustic soda and bleaching-powder, and the manufacturers of these articles are materially interested in the results hoped to be obtained from the plant by the process to be used. It is understood that this is the first plant built to develop the Acker process. The power used in the factory is supplied in the form of direct current of 8,000 ampères and at a voltage of 300. The current is used in a single series of decomposers, and it is said that it is quite 15 times greater than that thus far used in any plant having a similar product for its output in the United States or Europe. This is one of the important features of the plant for as the current is 15 times greater so is the output capacity of the plant expected to be 15 times greater. The efficiency of the apparatus, and the fact that an electric current of such volume can be operated successfully in the space required, are alleged to be due to the employment of a molten electrolyte in place of the solution employed in other plants. The electrolyte is maintained in a molten condition by the electric current that traverses it, and for this reason the electromotive force required is somewhat higher than where brine is decomposed. It is claimed that by this process the caustic soda will be in a condition ready for being put in packages, thus obviating the necessity of "boiling" down, as at present obtains.

Sulphuric Acid in Japan.

Chem. and Druggist, March 23, 1901.

Reports received in New York from Japan state that the consumption of 50° sulphuric acid in 1900 there amounted to fully 62,000,000 lb. The bleaching-powder makers are credited with using 21,700,000 lb., while the petroleum refiners consumed 18,600,000 lb., the remaining 21,700,000 lb. being taken by the Government, the artificial manure and other manufacturers. It is recorded that 3,100,000 lb. were exported, some of this acid going to China. In the present year Japan expects to increase its production of sulphuric acid. This acid is made largely from native pyrites, as the brimstone production and imports are comparatively small.

SULPHUR DEPOSITS IN JAPAN.

The *Engineering and Mining Journal* (New York) for the 16th ult. contains a description of a recently-opened source of sulphur supply in the little island of Etrofu, which is situated about half-way between the extreme northern point of Japan and the southern point of Kamchatka. The island is volcanic; there are on it three cones about 2,800 ft. in height, largely composed of sulphur, and the vapours which arise from the centres of the cones are continually adding to the deposits. The island is owned by a Japanese syndicate, which holds a grant from the Government of Japan. The sulphur deposits are about two miles from the coast, and the land surface declines gradually to Moyoro Bay, which is a good harbour, and is about 2,000 miles by water from Yokohama. The island is rocky and barren, with nothing to attract settlement. From 15th May to 10th October, 1900, 10,000 tons of the sulphur were mined and transported to the sea level; of this 6,000 tons have been shipped to Hakodate, Japan, where a refinery has been established. The remaining 4,000 tons will be refined on the ground at Moyoro Bay. Toward the latter part of the season, when everything was running in full swing, the rope-transmission plant was able to bring down about 3,000 tons per month. The season of 1901 will probably see this new industry well established.

ASBESTOS DEPOSITS IN CANADA.

Bd. of Trade J., Feb. 21, 1901.

The *British Columbia Review* of the 9th inst. states that there appears to be a good opening for English capital in developing the asbestos deposits in the province of Quebec. A German and an American company are already operating there in addition to local companies, and nearly 3,000 hands are employed, but the demand is considerably in excess of the supply, and the enquiry for asbestos is said to be constantly increasing. This form of mining is said to yield a very satisfactory profit, and as there seems every probability that the consumption will steadily increase, there should be a good opening for capital in that direction.

IX.—CEMENTS, Etc.

CEMENT TRADE OF GREAT BRITAIN.

Bd. of Trade J., Feb. 28, 1901.

The following tables show the quantity of cement imported into the United Kingdom, and of cement of foreign and colonial origin exported from the United Kingdom in January, 1900 and 1901:—

Imports of Cement.

Country whence Imported.	January 1900.	January 1901.
	Tons.	Tons.
Germany	556	1,018
Holland	103	403
Belgium	3,061	7,668
France	201	368
Italy	11	..
United States (Atlantic	2	..
Totals	3,934	9,457

Exports of Cement of Foreign Origin.

Countries to which Exported.	January 1900.	January 1901.
	Tons.	Tons.
Portuguese West Africa	..	1
Spanish West Africa	8	..
Porto Rico	6	..
Gold Coast	36	..
Totals	50	1

NOTE.—The exports of cement, the produce of the United Kingdom to all countries, amounted to 22,811 tons in January 1901, as compared with 20,390 tons in January 1900.

CEMENT TRADE OF BELGIUM.

Bd. of Trade J., Feb. 28, 1901.

According to the December (1900) number of th *Belgian Monthly Accounts*, the exports of Belgian cemen show a large decrease in 1900, as compared with the figure for the two preceding years, due, it is said, to events in t Far East. The following are the official figures for t past three years:—

	Kilos.*
1898	419,131,234
1899	445,692,154
1900	408,551,454

* Kilo. = 2·2 lb.

For imports of Belgian cement into the United Kingdo see *ante*.

X.—METALLURGY.

MINERAL PRODUCTION IN SPAIN IN 1899.

Foreign Office Annual Series, No. 2550, *March* 1901.

The total value of the minerals produced in Spain in 1 is the largest yet recorded, and amounted to 6,686,0 This total exceeds the value of the production in the y 1898 by 591,303*l*.

The mines actually being worked in Spain cover an a of 625,056 acres, and the total extent of mines include concessions already granted amounts to 1,526,709 acres.

The interest in the mining industry may be judged f the fact that during 1899, new mines, amounting to 16 acres, were marked out, and at the end of the year 7, petitions for mining rights remained to be examined acted upon.

In 1899 the most valuable minerals produced wer follows:—

Minerals.	Quantity.	Value.
	Tons.	£
Lead	308,659	2,479,000
Iron	9,505,119	1,741,000
Coal	2,565,437	956,000
Copper	2,443,044	597,000
Quicksilver	32,144	254,000
Zinc	119,770	241,000
Salt	598,108	218,000
Manganese	104,974	70,000
Sulphur	58,922	20,000

The most noteworthy increases in the productio minerals, as compared with the previous year, were coal, copper, and salt. Minerals of which the produ decreased included lead and sulphur.

With regard to Spanish exportations to the U Kingdom, it happens that Spanish produce is of the de tion that is especially required in the United Kingdo that the demand is practically unlimited.

In the year 1899 Spanish metals and minerals wer ported in the United Kingdom for a value of upwar 7,000,000*l*., and it is necessary that the production s be largely increased to meet the continued demand.

A great advance is also being made in the meta industry.

The value of the production of manufactured mi and metals in the year 1899 amounted to 7,047,00 increase of 376,000*l*. as compared with 1898.

The most valuable productions in the year 1899 w follows:—

Metals.	Quantity.	Val
	Tons.	
Lead	162,613	2,409
Iron	885,310	1,699
Copper	57,706	1,361
Silver	88	112
Quicksilver	1,361	290
Coke	341,413	202
Zinc	6,184	192
Hydraulic cement	165,645	72

Lead.—The production of non-argentiferous sulphide of d in Spain in 1899 amounted to 123,750 tons, valued at ,000l. Of this, the lead mines in the province of Jaen duced 101,907 tons; the mines in Almeria, 13,909 tons; Ciudad Real, 4,160 tons; and in Tarragona, 1,439 tons. e exportation amounted to 1,779 tons, valued at 16,300l., which 1,251 tons were sent to France, 210 tons to gium, and about 150 tons to both Great Britain and ly.

he production of argentiferous sulphide of lead in 1899 184,906 tons, valued at 1,524,000l. The principal es are in the province of Murcia, and these produced ,582 tons, valued at 960,000l. The mines in Ciudad l produced 25,988 tons; in Badajoz, 13,012 tons; and Cordoba, 10,834 tons.

he exportation of argentiferous lead in 1899 amounted ,018 tons, valued at 99,400l., of which 6,987 tons were t to Belgium, 803 tons to Great Britain, and 204 tons to many. Of other lead minerals, 555 tons, valued at 0l., was exported, for the most part, to Belgium.

opper.—The production of the copper mines in Spain 899 amounted to 2,443,644 tons, valued at 597,000l., an ease of 140,000 tons over the preceding year. Of this, 6,152 tons, valued at 582,000l., were produced in the ince of Huelva, 15,489 tons, valued at 10,980l., in lle, and a few hundred tons in Murcia, Leon, and arre.

accordance with the memorandum published by the Tinto Company, the production of the Company's s was as follows:—

	Tons.
Mineral for exportation	644,271
Mineral used in Spain	1,005,573
Total	1,649,844

e production of fine copper amounted to 34,817 tons, g 20,230 tons of copper produced at the mines, and 87 tons contained in the pyrites that were shipped ad.

he mineral extracted is stated to have contained an age of 2·710 per cent. of copper, as compared with 2 per cent. in the preceding year.

he quantity of mineral exported to England, Germany, the United States amounted to 636,323 tons in 1899, ompared with 618,110 tons in 1898, 582,540 tons in , and 519,585 tons in 1896.

he average price of copper in 1899 was 72l. 16s. 6d. per as compared with 51l. 0s. 7d. in 1898.

e profits in the year amounted to 1,877,103l., or an ase of 658,586l. as compared with the preceding year.

e net profits amounted in 1899 to 1,669,194l., ining 13,392l. balance from the preceding year, as comd with 1,016,804l. in 1898. A dividend of 4 per cent. he year was declared.

he production of other copper mines in the province of lva is reputed to have been:—Tharsis and Lagunazo s, 256,747 tons of pyrites and 4,416 tons of shell; Silas alañas mines, 316,194 tons of pyrites and 3,210 tons of l; Peña del Hierro mines, 90,000 tons of pyrites; San uel mines, 56,486 tons of pyrites and 972 tons of shell; rerias mines, 51,786 tons of pyrites and 722 tons of l, &c.

he exportation of copper mineral in 1899 amounted to ,000 tons, valued at 1,366,000l. The principal countries rested were Great Britain, 550,000 tons; Holland, ,000 tons: United States, 118,000 tons; Germany, ,000 tons; and Belgium, France, and Italy about 10,000 each.

opper ore was exported in 1899 to Great Britain for 00 tons, and to Germany, 842 tons.

ercury.—The production of mercury in 1899 amounted 32,144 tons, valued at 255,000l. Of this, 20,322 tons produced in the Almaden Mines; 10,732 tons in do, and 1,090 tons in Granada. The total production 399 was 307 tons less than in 1898, which was probably to trade reasons.

The production of the Almaden Mines was as follows:—

Description.		1898.	1899.
Mineral extracted	Tons	19,945	20,322
„ used	„	18,233	15,194
Mercury produced	„	1,594	1,289
„ „	Flasks	46,211	37,378

The production of mercury in Oviedo in 1899 was at the Porvenir Society (Mieres) 1,475 flasks (flask = 34½ kilos. or 76 lb.); La Union Asturiana (Mieres), 300 flasks; and La Soterraña Pola de Lena, 61 flasks.

The exportation of mercury in 1899, 3,221 tons, valued at 695,000l., was divided between the United Kingdom, 3,156 tons; France, 61 tons; and about 1 ton each to Belgium and Mexico.

Zinc.—The total production of zinc ore in 1899 amounted to 119,770 tons, valued at 241,760l. The principal provinces producing zinc were Murcia, 56,499 tons; Santander, 13,825 tons; Cordoba, 6,795 tons; Granada, Almeria, and Guipuzcoa, upwards of 2,000 tons; and Teruel, 1,520 tons.

The exportation of blende in the year 1899, amounting to 63,438 tons, was chiefly to Belgium, whither upwards of 50,000 tons were sent; to France, 6,631 tons, and small portions to Holland and Great Britain.

Calamine, of which 31,649 tons were exported in 1899, was sent in quantities of upwards of 15,000 tons to France and Belgium, and in quantities of a few hundred tons to Great Britain, Holland, and Italy.

The principal ports for shipping zinc are Cartagena, Santander, Seville, Almeria, and Malaga.

Manganese.—The production of manganese in the year 1899 was confined to the province of Huelva, with the exception of 525 tons produced in Oviedo and a few tons in Teruel and Gerona.

Sulphur.—Sulphur was produced in Murcia to the extent of 35,000 tons, valued at 350,000 pesetas (14,000l.); in Albacete, 19,506 tons, valued at 117,036 pesetas (4,700l.); and in Almeria, 4,416 tons, valued at 43,714 pesetas (1,700l.).

Iron Pyrites.—The exportation of iron pyrites amounted to 319,284 tons, valued at 153,000l. The largest quantity was sent to the United States, 126,028 tons; to Great Britain, 61,778 tons; to Holland, 48,014 tons; and to France, 47,330 tons.

The total exportation of iron pyrites in the year 1899 shows an increase of 62,944 tons.

TIN IN 1900; WORLD'S SUPPLY OF ——.

Bd. of Trade J., March 14, 1901.

The following data are put together by *L'Economiste Français*, of 2nd inst., as indicating the world's supply of tin in 1900:—

——	1899.	1900.	Increase or Decrease in 1900.
	Tons.	Tons.	Tons.
Straits Settlements (exports)	45,872	46,041	+ 169
Australia (exports)	3,305	3,200	− 105
Banca (exports and additions to stock).	9,934	12,843	+ 2,909
Billiton (sales)	5,920	5,678	− 242
Bolivia (exports to London)	4,700	4,350	− 350
Cornwall (production)	4,013	3,910	− 103
Total	73,744	76,022	+ 2,278

TIN IN BOLIVIA; PRODUCTION OF ——.

Chamber of Commerce J., March, 1901, 61.

The Bolivian mines are situated about 14,000 ft. above the level of the sea, between the 15th and 21st degrees of latitude, and are distributed in the order of their importance, over the departments of Oruvo, Potosi, La Paz, and Cochabamba. The tin varies from vein to vein. It is found at

Oruvo and Potosi, mixed at a certain depth, and in a proportion of from 5 to 20 per cent., with silver ore or pyrites of iron. The ore presents itself besides in the form of "palla," or a very compact metal, or still otherwise, in the shape of "llampu," or thin metal very much mixed with clay. In the former case the tin thus obtained will be rich; in the latter, on the other hand, it will fluctuate between 10 and 15 per cent. In 1846 the exportation of "barrilla" tin amounted to 920,000 kilos. During the 50 years from 1846 to 1897, the annual average was 1,824,550, and in 1889 it reached 3,339,995 kilos. According to the statistical returns the exportation of tin ore amounted to 2,316,000 kilos. during the first quarter of 1900, which leads to the anticipation that the total for that year will amount to double the quantity exported in the preceding year. In order still more to exploit the production of the metal, it is most necessary to establish good roads for transport and to introduce foreign capital.

Mineral Imports and Exports of Spain.

Eng. and Mining J., March 2, 1901.

The imports of fuel into Spain in the year 1900 included 1,769,921 metric tons of coal and 197,407 tons of coke. Imports of metals included 4,692 tons of pig iron, 7,226 tons of wrought iron, 53,321 tons of steel, and 2,381 tons of tin plates. Exports of minerals are reported by the *Revista Minera* as below, in metric tons:—

—	1899.	1900.	Changes.	Per Cent.
Iron ore	8,613,137	7,824,837	D. 788,300	9·2
Copper ore......	948,853	1,029,240	I. 80,387	8·5
Zinc ore	96,533	60,970	D. 35,563	36·9
Lead ore	9,798	4,632	D. 5,166	52·7
Salt	326,356	205,561	D. 120,795	37·1

Exports of metals were 20,169 tons of pig iron (40,918 tons, 1899); 29,083 tons of copper (28,443 tons, 1899); 154,541 tons of lead, against 162,853 tons in 1899.

XII.—OILS, Etc.

Olive Oil Exports of Spain.

Foreign Office Annual Series, No. 2560, *March* 1901.

The exportation of olive oil in 1899 amounted to 21,424,000 kilos., valued at 728,000*l*. Of this, the olive oil produced in the southern provinces amounted to 12,000,000 kilos., and in the eastern provinces 8,500,000 kilos.

The largest consignments of olive oil were to the United Kingdom, amounting to 4,854,000 kilos.; to France, 4,754,000 kilos.; Italy, 3,793,000 kilos.; and Cuba, 2,669,000 kilos.; and in large quantities to Denmark, Argentine Republic, Russia, Germany, and Austria-Hungary, &c.

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

Leather Trade of United States.

Bd. of Trade J., March 7, 1901, 567.

The fact that America is a large exporter of leather to the United Kingdom shows that they can manufacture it there more cheaply. Considering that so much of the raw material has to be imported into the United States by the tanners, there seems no reason why leather should not be manufactured as cheap or cheaper in the United Kingdom. This applies especially to the finer qualities such as patent leather, glazed kid, and others.

There is no doubt that as far as certain class leather is concerned, America possesses considerable natural advantages. There are plentiful supplies of suitable bark growing in the different parts of the country, and the tanneries have been placed at no great distance from it. The hemlock bark, which is that most used for tanning sole leather, is obtained from the forests situated in the States of Wisconsin and Michigan. It is also found in New York State and Pennsylvania, but not in such lar quantities, and the supply is rapidly diminishing. T larger tanning companies in the west own large tracts forest land from which they draw their supply of bar Oak bark, which makes the best leather, is not used in a large quantity in the eastern and central northern Stat Oaks grow in the north-western and southern States, b only sparsely in the others. It is consequently too costly use in comparison with the hemlock. For tanning the fin qualities of leather, chemicals and extracts are used, a lar quantity of which is imported.

The United States is a large importer of hides. The were imported during the 12 months ended 31st Decemb last, 307,257,924 hides, valued at 10,748,007*l*., of whi 152,792,232, valued at 3,815,987*l*., were hides of cat which pay import duty of 15 per cent. *ad valorem*, a 69,121,666, valued at 3,960,320*l*., were goat skins, whi are admitted free of duty. Of the total imports, 124,255,2 valued at 4,288,707*l*., came from Europe, and 66,212,7 valued at 2,191,451*l*., came from the East Indies.

Those in the trade will doubtless be able to say wheth the disadvantages of having to import this quantity of hid bringing them from such great distances and paying per cent. duty, paying higher wages than are customary Europe, and heavy railway and steamer freights, compensated for by getting cheaper bark; if not, th there must be something in the process of tanning t enables the American tanners to compete with ot countries in their own markets. This is surely a questi that tanners in the United Kingdom would do well to stu Needless to say, only the latest improvements in the gene process of tanning are employed in the United Stat Though there is necessarily a large amount of man labour in the process, the latest thing in machinery is u wherever possible to save labour and time. Each tann as a rule, keeps to its particular speciality. One ma nothing but sole leather, another certain qualities of t leather, and so on. One treats about 900 horse hi and 700 calf hides a day, and employs about 550 ha It makes nothing but the finer qualities of leather, imports most of the hides and material.

American Boot and Shoe Industry.

The exports of leather of all sorts last year from United States and the United Kingdom were as follo viz.:—

—	Exported from United States 12 months ended 31st Decembe		
	1898.	1899.	1900
	£	£	£
Sole leather	1,341,786	1,414,211	1,359,
Upper and other leather	2,550,473	3,190,883	3,077,
Boots and shoes	405,088	764,257	983,
Harness and saddles........	44,311	61,697	99,
Other manufactures	224,346	154,334	159,
Total	4,566,004	5,585,382	5,660,

—	Exported from United Kingd 12 months ended 31st Decem		
	1898.	1899.	190
Leather—	£	£	£
Unwrought	1,421,996	1,483,114	1,449
Wrought (except boots and shoes).	408,427	429,637	481
Boots and shoes	1,493,931	1,426,608	1,480
Saddlery and harness	445,012	464,111	477
Total	3,769,366	3,803,470	3,889

The following figures are worthy of the attentio British tanners as showing what progress is being mad the United States in securing a share of the trade in Br Colonies.

Table showing the Exports of Sole Leather and Upper Leather during the 12 months ended 31st December.

To	1898.	1899.	1900.
ole leather—	£	£	£
West Indies and Bermuda......	1,491	1,900	1,586
British Australasia	6,876	9,672	8,584
Africa	5,508	7,446	20,438
Total (sole leathor)	13,875	19,018	30,608
pper leather—			
West Indies and Bermuda (except Cuba and Porto Rico).	3,948	6,070	6,767
British Australasia	59,172	88,620	132,110
Africa..........................	4,668	7,209	5,701
Total (upper leather) ..	67,788	101,899	144,578
Total of both kinds	81,663	120,917	175,186

XV.—MANURES.

Phosphate Trade of Great Britain.

Bd. of Trade J., Feb. 28, 1901.

The following tables show the quantity of phosphate of
e imported into the United Kingdom, and of phosphate
foreign and Colonial origin exported from the United
gdom in January 1899, 1900, and 1901 :—

Imports of Phosphate of Lime and Rock Phosphate.

Countries from which Imported.	January, 1899.	January, 1900.	January, 1901.
	Tons.	Tons.	Tons.
many	10	..	..
land	..	502	200
gium	7,807	4,495	7,186
nce	3,299	2,372	1,311
is	..	4,094	3,575
eria	7,470	7,650	16,000
ted States on the Atlantic	14,072	15,455	5,882
ish West India Islands..	..	..	775
ch " " ..	1,203	1,021	..
Totals	33,861	35,589	34,929

xports of Phosphate of Lime and Rock Phosphate of Foreign and Colonial Origin.

Countries to which Exported.	January. 1899.	January. 1900.	January. 1901.
	Tons.	Tons.	Tons.
negal	20	..	..
nch West India Islands .	..	98	..
l Coast	..	2	..
e of Good Hope.........	..	180	..
uritius	100	..	..
South Wales.............	50	..	..
Totals..........	170	280	..

Phosphates in Palestine.

Eng. and Mining J., Feb. 23, 1901, 248.

rench papers report the existence of phosphate deposits
he Jordan Valley in Palestine. These include lump or
ble phosphates running about 50 per cent. of phosphate
ime; and green phosphates, similar to apatite, carrying
per cent. of phosphate of lime, and 1¼ per cent. of iron
le.

XVI.—SUGAR, STARCH, Etc.

Beet Sugar Industry in Canada.

Bd. of Trade J., Feb. 28, 1901.

the annual report for 1900 of the Toronto Board of
le, it is stated that during the year great interest has been taken in the proposal to establish the beet sugar industry in the province of Ontario. The climate and large portions of the soil are specially adapted for the growth of sugar beet; coal is within easy reach, and limestone is in abundance. Southern Ontario is within what is known as the beet sugar zone, and offers unsurpassed facilities for the production of this important staple. From numerous tests for some years, made under the supervision of the Ontario Government, and at various parts of the province, the most satisfactory results have been secured as to percentage, purity, and yield per acre. Capital is however, timid, and the farmers somewhat uncertain, and in order to give confidence to the undertaking and establish the industry on a satisfactory and permanent basis, it would seem necessary that the proposal should be assisted by the Government. In this connection the Council have recommended to the Government a schedule of bounties. The report adds:—"It is gratifying to know that the Ontario Government, as well as the Dominion Minister of Agriculture, are considering what assistance can be granted towards the establishment of what should be a most important industry offering a profitable field for the employment of capital and labour."

Beet Sugar in Spain.

Foreign Office Annual Series, No. 2560, *March* 1901.

Among the most important of the new industries rapidly spreading in Spain is beet sugar manufacture. Until a few years ago the vast quantity of cane sugar imported from Cuba prevented any great expansion of beetroot sugar factories, although several were successfully carried on.

The loss of Cuba, and the consequent necessity of meeting the national demand for sugar, drew general attention to the importance of the question. A rush was made to establish factories, and there are now 24 beetroot factories in actual working order, and 18 others under construction, in addition to 19 cane sugar factories.

With a population of 18,200,000, and an annual consumption stated to be 5·53 kilos. (12⅙ lb.) per head, making a total of about 100,000 tons, and no foreign markets to which it would be profitable to export, it is evident that an excessive production is threatened.

Whatever the ultimate result may be to the owners of factories, the opening of the industry is of great value to the country in general.

The cultivation of beetroot is now an important factor in agricultural districts, and as the crop is less liable to destruction by the changes of weather and ravage of disease than cereals and vines, it offers a more reliable source of income.

The importation of sugar is now reduced to very small dimensions. In the year 1899 only 9,301 tons, valued at 4,420,000 pesetas (177,000*l*.), were imported, and of these nearly 8,000 tons, valued at 3,721,000 pesetas (149,000*l*.), were imported from Cuba, 1,000 tons from the Canary Islands, and smaller quantities from Germany, France, and Porto Rico.

XVIII. B.—WATER PURIFICATION.

Royal Commission on Sewage Disposal.

Public Health Engineer, March 9, 1901.

The Royal Commission on Sewage Disposal, appointed in May, 1898, are unable to state with any degree of precision when their inquiry will terminate, as some of the questions submitted to them can be properly determined only after a careful and prolonged scientific research. Their secretary reported to the Treasury on December 3 that they had held 52 meetings, had taken the evidence of 87 witnesses, and had visited 22 sewage works. Under the direction of the Commission a large number of chemical and bacteriological investigations in relation to sewage disposal had been made by experts, and a systematic examination of the land treatment of sewage was in progress.

XXII.—EXPLOSIVES, MATCHES, Etc.

EXPLOSIVES: IMPROVEMENTS IN ——.

Letter from the War Office.

The following letter has been addressed to the manufacturers of propellants and high explosives on the Home Office list:—

"War Office, Pall Mall, London, S.W.

"Gentlemen,—I am directed by the Secretary of State for War to inform you that he considers it desirable to draw your attention to the work which is now being carried out for the Admiralty and War Office by the Explosives Committee, though it is possible that you are already aware of the composition and terms of reference of this Committee, as these have already been made known through the public press. The Committee was formed after consultation between Lord Lansdowne, then Secretary of State for War, and Viscount (then the Right Honourable G. J.) Goschen, then First Lord of the Admiralty, and the following were the terms of reference to the Committee, which were agreed upon by the two Departments:—

"To carry out trials with a view to ascertaining what are the best smokeless propellants for use in existing guns of all natures, and in existing small arms.

"To report as to whether any modification in the existing designs of guns is desirable with a view to developing the full powers of any propellant which may be proposed.

"To carry out trials with a view to obtaining a high explosive for shells which can be fired from all natures of guns and howitzers with as much safety as lyddite, with greater certainty of detonation, and with greater explosive effect.

"The following gentlemen consented to serve on the Committee:—President, the Right Hon. Lord Rayleigh, F.R.S., D.C.L., LL.D. Members: Sir A. Noble, K.C.B., F.R.S., D.C.L.; Sir W. C. Roberts-Austen, K.C.B., F.R.S., D.C.L.; Sir W. Crookes, F.R.S.; R. B. Haldane, Esq., K.C., M.P., LL.D.

"I am now directed by Mr. Brodrick to invite you to put forward for trial any propellants or high explosives which, in your opinion, are sufficiently matured to give reasonable promise of fulfilling the requirements of the services, and of proving themselves more efficient than the existing service explosives. Any trials of explosives put forward by you will be treated as confidential, and the manufacturing departments of the Royal Ordnance Factories will not have access to any powders which you may put forward for the purpose of experiment, unless you should so desire it. The requirements of service explosives are probably well known to you, but the Explosives Committee consider that it may be desirable to draw your attention to the points which appear to the Committee to be the most essential ones to aim at.

"*Propellant.*—A new propellant should give the highest possible muzzle velocity without excessive pressures, with the minimum of erosion, and should exhibit good keeping qualities under the varying conditions which obtain with service ammunition in ships' magazines, in Canada, in India, in other hot climates, and in transport. Its ballistics should be affected as little as possible by its being kept under these conditions. The variations in ballistics with charges at different temperatures should be as small as possible. It should be absolutely smokeless, and should exhibit no tendency to detonate or to develope excessive pressures when fired. It is not essential that the composition of the powder should be the same for all natures of weapons (small arms, guns of various calibres, &c.), though it is obvious that, if no considerable advantage is to be gained by changing the composition, it would be a convenience if the same composition suited all arms.

"*High Explosive.*—The following are some of the principal points that should be borne in mind in developing a high explosive that would be suitable for service purposes. The explosion of a given bulk should be as powerful as possible; complete detonation in small shells as well as in large ones, should be aimed at; the explosive should be capable of being fired from all natures of ordnance in ordinary shells with full charges; it should b safe to handle and store under the same conditions a specified above for propellants: it should not require a fulminate fuse or primer to detonate it; incendiary effec should not be lost sight of.

"The Explosives Committee have also brought t Mr. Brodrick's notice the establishment of the Centralstelle fuer Wissenschaftlich-Technische Untersuchungen Berlin, and have recommended that the attention of manufacturers of explosives in this country should be drawn t such an institution, with a view to their considering th advisability of forming a similar institution in this country Mr. Brodrick has, therefore, desired me to forward you th enclosed memorandum, which, it is believed, correctl states the position and functions of the Centralstelle.

"I am, Gentlemen, your obedient Servant,
"H. BRACKENBURY,
"Director-General of Ordnance."

"The Centralstelle, or Central Offices for Scientifi Technical Instruction, was founded in 1898 as a limite liability company, with a capital of 105,000*l.*, by and for th exclusive benefit of various manufacturers of ammunitio and war material. The interested firms submit thei individual experiments to the Centralstelle, where all th information thus collected is sifted and examined. A new discovery which the Centralstelle holds to be of suff cient importance is communicated to those of the work intetested in the Centralstelle to whom it may be usefu To enable the Centralstelle to carry out its experiment large grounds have been purchased at Koenigs-Wuste hausen, near Berlin, to the extent of 125 acres, which hav been fitted out as artillery ranges. Experimental worl are also at Koenigs-Wusterhausen, where the factory M. von Foerster has been bought for the Centralstell The ranges are adjacent to these works. The laboratori are at Neu-Babelsberg, near Potsdam. Professor Dr. W is general manager of the Centralstelle, and the head of t chemical division. Professor Stribeck (late Professor Mechanical Engineering at the Dresden Polytechnic) manager of the physical and metallurgical division. T staff of the Centralstelle consists of 82 people in a Twenty-one of them are engaged in scientific work, assist by 24 assistants and attendants; 12 people do office wo and 25 are foremen and workmen. The Centralstelle d not receive any subsidy from the Government; it is, ho ever, often employed by the Government. The Centr stelle is not supposed to yield any profit, and the cost the grounds, buildings, plant, &c., as well as the curr expenses, are borne by the works interested in it."

BOARD OF TRADE RETURNS.

SUMMARY OF IMPORTS.

Articles.	Month ending 28th Febru	
	1900.	1901.
	£	£
Metals	2,162,573	2,248,6
Chemicals and dyestuffs	546,629	578,0
Oils	602,070	606,5
Raw materials for non-textile industries.	3,562,842	3,135,4
Total value of all imports	37,644,808	39,714,4

SUMMARY OF EXPORTS.

Articles.	Month ending 28th Febr	
	1900.	1901.
	£	£
Metals (other than machinery)	3,856,669	2,645,
Chemicals and medicines	869,278	649,
Miscellaneous articles	2,819,871	2,920,
Total value of all exports	23,219,849	21,037,

MPORTS OF METALS FOR MONTH ENDING 28TH FEBRUARY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
opper :—				
Ore.............. Tons	14,210	3,482	125,579	76,076
Regulus .... „	6,256	3,666	244,378	159,818
Unwrought..... „	4,484	4,960	332,659	359,346
ead, pig and sheet „	10,076	17,069	166,035	267,570
yrites .... „	60,431	59,081	100,294	96,150
uicksilver....... Lb.	57,500	23,250	5,755	2,753
lver ore....... Value £	..	..	72,916	64,728
in .... Cwt.	44,186	48,864	284,191	298,903
nc.............. Tons	5,707	4,538	126,086	81,483

IMPORTS OF RAW MATERIAL FOR NON-TEXTILE INDUSTRIES FOR MONTH ENDING 28TH FEBRUARY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
rk, Peruvian .. Cwt.	4,886	2,961	10,228	7,577
outchouc ...... „	45,730	34,350	682,925	494,188
m :—				
rabic .... „	3,926	3,648	10,204	7,952
ac, &c. .... „	12,344	10,892	39,660	31,349
tta-percha .... „	8,934	6,890	125,609	101,176
des, raw :—				
Dry............ „	53,337	22,155	142,858	58,958
Wet .... „	51,820	58,943	122,347	137,716
ry .... „	694	243	33,266	9,358
nure :—				
Guano .... Tons	2	302	12	1,695
Bones.......... „	6,252	3,885	27,823	16,025
raffin......... Cwt.	109,902	31,955	119,360	46,108
en rags .... Tons	1,534	1,616	14,299	13,837
arto .... „	20,248	18,462	79,975	81,075
p of wood..... „	39,207	37,047	172,631	189,570
un............ Cwt.	51,749	78,693	15,457	19,573
low and stearin „	129,285	131,503	175,184	166,825
ns :—				
Goat .... No.	1,806,081	1,115,412	169,728	106,095
Sheep.......... „	1,210,992	875,926	145,870	89,995
rate of soda... Tons	2,832	2,794	24,117	21,708
sphate of lime „	37,758	30,265	67,540	45,195

IMPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 28TH FEBRUARY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
nent.......... Tons	7,018	11,227	14,857	20,509
na and earthenware. Cwt.	27,768	24,639	69,479	61,515
ugs .... Value £	..	..	90,339	76,773
ss :—				
Sheet .... Cwt.	140,319	60,547	72,323	33,438
Plate .... „	44,658	27,436	46,238	33,541
Flint .... „	33,077	36,218	62,380	66,443
Bottles .... Gross	123,656	149,771	49,019	67,425
Other.......... Cwt.	23,889	19,519	41,491	32,211
ue, size, gelatin „	18,229	17,620	36,437	39,144
ather, unmanufactured. „	93,481	93,465	632,873	572,359
seed cake .... Tons	37,627	38,933	229,547	239,733
nts and pigments. Value £	..	..	123,536	86,586
er, pasteboard Cwt.	479,832	506,402	330,373	351,456
entific instruments. Value £	..	..	43,916	46,274
p and soap powder. Cwt.	16,730	23,928	20,596	
s manufactures „	31,320	28,029	39,727	33,243

IMPORTS OF CHEMICALS AND DYESTUFFS FOR MONTH ENDING 28TH FEBRUARY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	901.
			£	£
Soda compounds... Cwt.	27,152	10,768	12,783	5,631
Bleaching materials „		20,653		8,340
Borax .... „	47,797	3,625	24,580	2,482
Brimstone .... „	29,020	23,087	6,833	4,737
Nitrate of potash.. „	29,047	27,517	24,903	22,587
Chemicals, other Value £	..	..	109,240	133,143
Cutch and gambier. Tons	1,318	1,375	26,858	29,606
Dyes :—				
Alizarin.......Value £	..	..	17,194	14,192
Aniline and other „	..	..	37,189	53,477
Indigo .... Cwt.	10,152	10,563	166,660	168,395
Bark.............. „	16,907	19,418	6,204	6,321
Valonia........... Tons	1,131	2,678	11,713	29,037

IMPORTS OF OILS FOR MONTH ENDING 28TH FEBRUARY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Cocoa-nut....... Cwt.	40,335	42,554	47,586	50,420
Olive........... Tuns	1,196	1,022	44,826	39,722
Palm .... Cwt.	71,813	94,019	81,884	107,194
Petroleum :—				
Illuminating.. Gall.	8,955,076	15,004,552	168,375	294,616
Lubricating... „	2,840,787	2,879,895	77,787	89,530
Seed........... Tons	2,470	4,949	53,860	118,660
Train, &c. ...... Tuns	441	1,376	7,729	23,124
Turpentine ..... Cwt.	34,786	14,939	66,472	20,807

EXPORTS OF METALS (OTHER THAN MACHINERY) FOR MONTH ENDING 28TH FEBRUARY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Brass............ Cwt.	9,750	9,389	50,795	49,343
Copper.......... „	71,891	54,790	273,439	213,217
Lead............. Tons	2,487	2,454	48,419	48,217
Plated wares... Value £	..	..	26,496	29,154
Tin .... Cwt.	8,233	7,175	52,395	46,163
Zinc............. „	22,617	12,157	22,683	10,700

EXPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 28TH FERRUARY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
	Lbs.	Cwt.	£	£
Gunpowder..... Lb.	435,300	4,226	11,580	10,143
Candles......... „	1,865,200	2,053,000	32,134	36,750
Caoutchouc..... Value £	..	..	115,708	81,000
Cement......... Tons	28,814	24,147	53,516	46,497
Products of coal. Value £	..	..	149,277	102,138
Earthenware ... „	..	..	145,604	133,417
Stoneware ...... „	..	..	13,819	13,669
Glass :—				
Plate .... Sq. Ft.	124,184	4,891	6,229	10,113
Flint .... Cwt.	6,151	8,396	15,800	21,415
Bottles .... „	54,380	79,312	26,066	38,762
Other kinds ... „	14,435	12,401	15,088	12,784
Leather :—				
Unwrought .... „	12,453	10,639	144,631	113,766
Wrought......Value £	..	..	33,197	41,068
Seed oil .... Tons	3,348	3,483	78,282	95,343
Floorcloth.......Sq. Yds.	2,996,300	2,439,400	127,933	116,741
Painters' materials Val. £	..	..	161,296	157,761
Paper............. Cwt.	75,379	99,584	118,109	153,679
Rags.............. Tons	5,782	4,221	36,548	21,581
Soap .... Cwt.	66,552	69,083	63,685	69,993

Exports of Drugs and Chemicals for Month ending 28th February.

Articles.	Quantities.		Value.	
	1900.	1801.	1900.	1901.
			£	£
Alkali .... Cwt.	824,542	..	93,767	..
Bleaching materials „	131,362	59,281	37,700	20,708
Chemical manures Tons	31,234	23,774	242,309	173,372
Copper sulphate .. „	7,026	3,517	165,252	84,346
Medicines....... Value £	..	..	94,718	96,776
Soda compounds:—				
Ash............. Cwt.	..	94,806	..	20,103
Caustic .... „	..	67,161	..	31,194
Bicarbonate .... „	..	22,090	..	7,570
Crystals .... „	..	12,081	..	1,887
Sulphate........ „	..	36,307	..	2,913
Other sorts ..... „	..	7,515	..	4,172

Monthly Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

Applications.

3456. C. Griffin. Improvements in liquid fuel burners and furnaces. Feb. 18.

3529. R. Gaunt. A new or improved reverberatory or the like furnace. Feb. 19.

3536. T. O. Owen. Improvements relating to drying floors, kilns, ovens, and like heating, drying, or cooking apparatus. Feb. 19.

3557. O. P. Ostergren. Improvements in and connected with refrigerating apparatus. Complete Specification. Feb. 19.

3641. C. V. A. Eley. A water cooling tower. Feb. 20.

4012. William Brothers. Improvements in the ammonia absorption process of refrigeration and in apparatus therefor. Feb. 25.

4126. E. Passburg. Improvements relating to vacuum drying apparatus. Feb. 26.

4155. W. G. Potter. Improvements in and relating to refrigerating apparatus. Feb. 26.

4157. W. G. Potter. Improvements in and relating to refrigerating apparatus. Feb. 26.

4264. J. Powell. Improvements in gas furnaces. Feb. 28.

4265. J. Powell. Improvements in gas producers. Feb. 28.

4355. Z. Holden. Improvements in apparatus for boiling and agitating fluids. March 1.

4393. E. Edwards.—From Krauschwitzer Thonwaarenfabrik für Chemische Industrie vormals Ludwig Rohrmann Actien-Gesellschaft, Germany. Improvements in and relating to apparatus for distilling and evaporating liquids. March 1.

4554. M. J. Adams. Improvements in filters. March 4.

4780. P. E. Domergne. Improvements relating to apparatus for regulating the density of liquids. Complete Specification. March 6.

5105. H. Müller. Improvements in the process of distillation and in apparatus for fractional distillation. March 11.

5118. E. J. Clubbe and A. W. Southey. Improvements in apparatus for condensing and cooling liquids. March 11.

5509. R. Axer. Improvements relating to drying kilns. Complete Specification. March 15.

5529. K. Enzinger. Improvements in and relating to filtering materials. March 15.

5541. R. J. C. Collins. Improvements in filter press March 16.

5553. B. G. Smith. Improvements in apparatus f operating platforms of hoists, gas purifier lids, and t like. March 16.

5559. R. A. Sloan.—From W. H. Martin, Holla Improvements in evaporators. Complete Specificatio March 16.

5568. J. I. Friedrich. Improvements in centrifug separators. Complete Specification. March 16.

Complete Specifications Accepted.*

1900.

4556. W. P. Thompson.—From V. Karavodine, Fran Solidification of crystalline bodies containing wat March 13.

5319. G. W. Emmerson and J. Ward. *See* Class March 6.

7080. A. J. Boult.—From P. Audonin, France.

11,380. S. C. Hauberg. Centrifugal separators. March

1901.

1133. J. McNeil. Evaporating apparatus. March 20.

2888. F. Kafferle. Pressure-reducing apparat March 13.

II.—FUEL, GAS, AND LIGHT.

Applications.

3540. C. de Ricaris. Process of simultaneous separate extraction of hydrogen and oxygen gases from body-water by electrolysis. Feb. 19.

3571. W. T. Sugg and G. F. L. Foulger. Improveme relating to incandescent gas lighting. Feb. 19.

3586. J. H. Darby. Improvements in apparatus for manufacture of coke. Feb. 19.

3671. L. Yousbasheff. Improvements in the manuf ture of artificial blocks of ore or fuel. Feb. 20.

3805. W. P. Gibbons and C. R. Teasdale. Impre ments in apparatus for the manufacture of gas. Feb. 2

3845. C. S. Snell. Improvements in connection w burners used for incandescent gas lighting. Feb. 22.

3849. A. R. Scherding. Improvements in heat devices for liquid-fuel. Feb. 22.

3943. E. Anderson. Improvements in or connected apparatus for generating and storing acetylene Feb. 23.

4055. S. F. McKee and A. C. Browne. Improvement liquid fuel apparatus for heating purposes. Feb. 26.

4082. A. Lüthi. Acetylene gas apparatus. Feb. 26.

4111. A. M. Clark.—From Süddeutsche Glühkör- Fabrik J. Sauer, Germany. Improvements in the pro tion of incandescent gas light mantles. Feb. 26.

4159. F. Stadelmann and Co., Ltd., and L. Thurna Improvements in or connected with incandescent burners. Feb. 26.

4229. C. Clamond. Improvements in incandesc mantles. Feb. 27.

4250. A. A. Vérel. Improvements in or connected hot air or vapour producing apparatus. Feb. 28.

4302. W. MacKean. Improvements in apparatus burning and seasoning incandescence mantles. Feb. 2

4323. E. R. Besemfelder. Improvements in the man ture of cyanogen compounds from gas mixtures contai ammonia. Complete Specification. Feb. 28.

4350. W. Green. Improvements in or relating to in descent gas burners. March 1.

4351. S. Dawson and J. Dawson. Improvements i relating to apparatus for the generation and suppl acetylene gas, for the lighting of public and other veh and for other uses. March 1.

4354. M. Hepworth, J. A. Smethurst, and E. Why The "combination" mantle holder and anti-vibrato incandescent lights. March 1.

4395. H. Borchardt. Improvements in means for lighting gas. Complete Specification. March 1.

4403. E. C. Rossiter, H. W. Crowther, and G. S. Albright. e Class VII.

4446. S. Cowper-Coles. Improvements in the manu-ture of coal briquettes and smokeless fuel. March 2.

4485. E. Lisle and G. F. Prew. Improvements in carrettors. Complete Specification. March 2.

541. E. M. Goldstraw. Improvements in and connected h incandescent gas lighting and burners. March 4.

707. W. K. L. Dickson. Improvements in and relating ncandescent gas mantles. March 5.

746. R. J. Moss. Improvements in governing the eration of acetylene gas, and in apparatus therefor. rch 6.

792. I. L. Harris. Improvements relating to acetylene generators. March 6.

828. E. A. Le Sueur. Improvement in process and aratus for separating fluids rich in oxygen from air. rch 7.

830. A. E. Tucker and C. Cory. Improvements in the ufacture of artificial fuel. March 7.

15. T. Rauthmell. Improvements in apparatus for rating acetylene gas for household lighting and other oses. March 8.

51. H. Keller and J. Knappich. Improvements in lene gas generators. March 8.

62. C. E. Stuart, jun., and W. Allsopp. Improves in acetylene generators. March 8.

82. F. Hoffmann. Improvements in or relating to the iction of compressed gas for lighting or heating oses. Complete Specification. March 8.

97 F. Windham and C. E. Squier. Generation of lene gas and apparatus therefor. March 9.

28. J. W. Pearson. Improvements relating to night-, candles, and the like. March 11.

13. W. P. Thompson. Improvements in or relating to ng, heating, and to apparatus relating thereto, or for ing power. March 11.

9. F. Dannert. Improved means for enriching ng and heating gases with oxygen. Complete fication. March 11.

5. P. Naef. Improvements relating to the treatment uminous fuel. March 12.

8. W. T. Sugg. Improvements in the production uminant appliances for incandescent gas-lighting. h 12.

0. G. Delin. Improvements relating to the treatment s for illuminating and heating purposes, and to atus therefor. March 13.

2. K. Schultze. Improvements in and in connection he manufacture of incandescent bodies for gas and lighting. Complete Specification. March 13.

4. J. Jackson. Improved means for cleansing the ion pipes, hydraulic mains, and condensers used in anufacture of coal gas. March 15.

1. C. M. Rewley. Improvements in the production uminant surfaces for incandescent gas-lighting. 16.

Complete Specifications Accepted.

1899.

02. R. Thompson. Gas producers. March 13.

1900.

. W. G. Hicks. Automatic gas lighting. March 6.

. W. F Richards. Production of gas for regenera-s furnaces. March 6.

. Welcome and Co., and G. C. Fowler. Method and for incorporating alcohols, ketones, volatile liquid arbons, and other similar liquids, with solid sub- for the production of a solid portable fuel. 29.

5817. E. A. Javal. Apparatus for generating acetylene gas. March 6.

6184. S. H. Hanslich. Apparatus for carburetting air. March 20.

6865. R. H. and F. Sunderland and G. Marshall. Apparatus for the generation of acetylene gas. March 13.

7863. V. B. Lewes. Manufacture of coal gas. March 6.

7905. The Patent Agglomeut Fuel Syndicate, Ltd., H. C. B. Forester, and J. A. A. Yeo. Manufacture of artificial fuel, and apparatus therefor. March 6.

8141. J. R. Hatmaker.—From J. A. Just, United States. Solidification of mineral oil distillates. March 20.

9932. A. E. Tucker. Manufacture of artificial fuel. Feb. 27.

10,591. W. H. A. Sieverts. Incandescent gas burners. March 6.

12,581. H. Talbot. Means for lighting incandescent burners. March 6.

14,692. W. T. Sugg. Lanterns for public incandescent gas-lighting. March 13.

16,952. R. MacLaurin. Means for utilising the heat from illuminating flames for heating apartments and the like. March 13.

18,621. B. Holŭb and P. Dvořáček. Apparatus for producing acetylene gas without gasometer. Feb. 27.

18,947. A. H. Deike, J. Mitchell, and A. W. Alexander. Acetylene gas generating machines. March 6.

23,236. W. J. R. Sims and A. L. Davis. Means for extracting roots and foreign matter from peat. March 13.

1901.

51. M. Göhler. Gas-producing apparatus. March 6.

1058. J. H. Sheldrake. Incandescence gas burners. Feb. 20.

2469. O. Imray.—From J. R. McLean, United States. Process and apparatus for enriching coal-gas. March 13.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Applications.

5047. J. Wetter.—From Aktiengesellschaft für Theer- und Erdol-Industrie, Germany. Processes for obtaining pure hydrocarbons such as fluorene and phenanthrene contained in coal-tar, and for recovering certain by-products. Complete Specification. March 9.

5232. W. Heinemann. An improved process for recovering the by-products from coke-kiln gases. Complete Specification. March 12.

IV.—COLOURING MATTERS AND DYESTUFFS.

Applications.

4024. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of blue colouring matters and intermediate products Feb. 25.

4507. O. Imray.—From The Basle Chemical Works, Switzerland. Manufacture of a new silver paranuclein. Complete Specification. March 2.

4568. O. Imray. — From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of a brown sulphurised dyestuff from 2 : 4-dinitro-paraoxydiphenylamine or 2 : 4-nitroamido-oxydiphenylamine. March 4.

4609. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture and production of substantive colouring matters, and of products for use therein. March 4.

5167. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of fast double colour lakes. March 11.

5168. O. Imray. — From The Society of Chemical Industry in Basle, Switzerland. Manufacture of indophenolthiosulphonates from sulphurised indophenol, and of corresponding sulphurised compounds. Complete Specification. March 11.

5359. H. H. Lake.—From The Chemical Works, formerly Sandoz, Switzerland. Improvements relating to the manufacture of dyes. March 13.

5363. A. G. Green, A. Meyenberg, and The Clayton Aniline Co., Ltd. Improvements in the manufacture and production of colouring matters containing sulphur. March 13.

5580. R. B. Ransford. — From L. Cassella and Co., Germany. Improvements in the manufacture of dyestuffs. March 16.

Complete Specifications Accepted.

1900.

6036. T. R. Shillito.—From J. R. Geigy and Co., Switzerland. Production of the homologues of alpha-isatine-anilide, and of indigo. Feb. 27.

7291. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Production of dyestuffs of the anthraquinone series. March 6.

7332. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of a black colouring matter directly dyeing cotton. March 20.

7692. G. W. Johnson.—From The Chemische Fabrik Griesheim - Elektron, Germany. Production of nitronaphthalene derivatives from 1 : 4-chloronitronaphthalene. Feb. 27.

23,687. G. W. Johnson.—From C. F. Boehringer und Soehne, Germany. Manufacture of triphenylmethane colouring matters. March 6.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Applications.

3463. W. A. E. Crombie. A process for the manufacture of artificial threads or fibres. Feb. 18.

3568. F. Shuman. Improvements relating to machines for use in the mercerising of yarn. Complete Specification. Feb. 19.

3592. C. F. Cross, E. J. Bevan, and C. Beadle. Treatment of viscose for the preparation of useful products therefrom. Feb. 19.

3861. J. Imray.—From Heberlein and Co., Switzerland. Manufacture of lustrous and variously coloured threads and strips of textile materials. Complete Specification. Feb. 22.

3945. J. Imray.—From J. Bonavita, France. Process and apparatus for purifying viscose. Feb. 23.

4125. H. H. Lake.—From National Package Company, United States. Improvements in and relating to the manufacture of fibrous compositions. Complete Specification. Feb. 26.

4303. J. Imray.—From E. Bronnert, M. Fremery, and J. Urban, Germany. An improvement in the manufacture of thread from cellulose solutions. Feb. 28.

5076. J. E. Bousfield, of the firm of G. F. Redfern and Co.—From La Société Anonyme de Produits Chimiques de Droogenbosch, Belgium. Improvements in the treatment of nitrocellulose to be used for the manufacture of lustrous yarns. March 9.

5516. C. Danilevsky, S. Tourchaninoff, A. Danilevsky, and V. Timonoff. A process of metallising fabrics. March 15.

5521. E. Silberstern. An improved process for applying ornamentation to fabrics, and apparatus therefor. March 15.

Complete Specifications Accepted.

1899.

24,188. J. R. Ecob. Apparatus for mercerising fabrics and the like. March 13.

1900.

8654. O. Kopp and E. Usuelli. Apparatus for stretching and mercerising cotton yarn. March 20.

14,050. A. N. Briggs and W. Priestley. Desulphuris wool and other objects smelling of sulphur diox March 13.

20,564. C. Baswitz. Proofing of textile fabrics. Feb.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, and BLEACHING.

Applications.

3518. F. Taylor, A. Cooke, B. W. D. Montgomery, the Lishman Process Bleaching Company, Ltd. Impre ments in appliances to be employed in the process bleaching. Feb. 19.

4017. A. A. Vogelsang. Improvements in the electrol bleaching of cotton and other textile materials, and apparatus for use in connection therewith. Comp Specification. Feb. 25.

4279. J. C. Hamer. Improvements in apparatus dyeing and otherwise treating yarn or rovings in com form. Feb. 28.

4280. J. C. Hamer. Improvements in apparatus dyeing and otherwise treating fibrous material in a spu other state. Feb. 28.

4441. J. A. Sackville. Improvements in apparatus use in the bleaching, dyeing, drying, and like treatme textile fabrics, especially fabrics having a pile. March

5326. F. Moll and M. Dickhuth. Improvements i relating to washing and bleaching processes. March 1

Complete Specifications Accepted.

1900.

6523. H. R. Armitage. Method and apparatus dyeing and bleaching fabrics. March 20.

7388. G. Comber and J. C. Chorley. Colouring fa composed of vegetable or animal textile fibres. Marcl

7686. H. E. Newton.—From The Farbenfabriken vor F. Bayer and Co., Germany. Dyeing with amido-oxyan quinone sulphonic acids. March 20.

23,400. W. Mather. Apparatus for bleaching, dy and otherwise treating fabrics. March 6.

23,401. W. Mather. Bleaching and dyeing, and ratus therefor. Feb. 27.

VII.—ACIDS, ALKALIS, and SALTS.

Applications.

3530. C. A. Flanagan. Improved apparatus for co trating sulphuric acid. Feb. 19.

3779. E. G. Scott. Improvements in the manuf of sulphate of ammonia. Feb. 21.

3582. A. J. Rossi, J. MacNaughton, and W. D. Edm Process and method for producing concentrates cont high percentages of titanic oxide. Complete Specific Feb. 19.

4403. E. C. Rossiter, H. W. Crowther, and Albright. Improvements in the manufacture of cy March 1.

4447. S. Cowper-Coles. Improvements in de-arsen sulphuric acid. March 2.

4610. G. W. Johnson. — From The Firm of Chemischer Fabriken, Germany. Improvements manufacture or production of sulphuric anh March 4.

4893. H. H. Lake.—From C. R. P. Steinau, Ge *See* Class X.

5015. F. M. Spence, D. D. Spence, H. Spence, J. J and T. J. I. Craig. Improvements in and connect the manufacture of sodium bichromate. March 9.

5239. W. H. Wheatley.—From the Clyde C Company, Ltd., New South Wales. Improvements means employed for the extraction of oxide of ch from its ores, and its subsequent treatment to obtain salts. Complete Specification. March 12.

Complete Specifications Accepted.

1900.

3918. W. H. Woodcock. Method and appar extracting nitrate of soda from the raw material and from refuse thereof. Feb. 27.

3987. E. G. Scott. Treatment of ammonia liquors, and nufacture of sulphate of ammonia. March 6.

6254. F. M., D. D., and H. Spence. Manufacture of minous compounds. Feb. 27.

7282. C. M. Joseph (dit Claudius). Production of tallic carbides and derivatives therefrom. March 20.

23,678. W. P. Thompson.—From G. Flick, Germany. nufacture of nitrites. Feb. 27.

1901.

491. C. G. Sudre and C. V. Thierry. Treatment of des of metals or metalloids or compounds of same, and ducts obtained therefrom. March 20.

282. C. L. Gelstharpe and F. Gelstharpe. Recovering and producing copperas from waste tin cuttings or other stances containing tin, and apparatus therefor. March 20.

VIII.—GLASS, POTTERY, AND ENAMELS.

Applications.

729. J. Boulton. Improved boards or slabs for use in ng ceramic or earthenware articles. Feb. 21.

396. W. Haley. Improvements in apparatus for pres- and moulding glass-ware. Complete Specification. ch 14.

Complete Specifications Accepted.

1900.

51. E. H. L. Bolle. Finishing of ceramic and similar . Feb. 27.

,267. O. Imray.—From the Opalite Tile Co., United s. Manufacture of Glass Tiles. March 13.

—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Applications.

57. C. A. Peters. A wood preservative. Feb. 20.

58. W. Michaelis. Improved manufacture of hydraulic nt. Feb. 21.

63. A. Mack. Improvements in and relating to gypsum, at, and like slabs. Complete Specification. Feb. 22..

75. W. G. Hofstadt. Process of and material for ering walls, ceilings, and the like. Feb. 25.

92. F. Marx. Improvements in or relating to the facture of artificial stone. Complete Specification. 27.

95. R. W. McDonald. Improvements in the con- ion of fire-proof floors. Feb. 28.

'9. J. Konegen. Improvements in grinding mills for nt and other like substances. March 4.

0. J. Konegen. An improved process for finely ng cement and like substances. March 4.

0. C. Hitchins. Improvements in abestos linings for ngs and the like. March 5.

7. J. Steiger. An improvement in the manufacture nent. March 5.

6. B. B. Lathbury and H. S. Spackman. Improve- in apparatus for calcining cement. Complete fication. March 13.

3. H. Higgins. Improvements in or relating to the nent of wood for fireproofing or preservative purposes. h 15.

Complete Specifications Accepted.

1900.

5. C. E. Challis. Artificial stone, and appliances used nection therewith. Feb. 27.

5. H. H. Lake.—From D. Wachtel and Co. Manu- e of artificial stone. March 20.

3. W. P. Thompson.—From The Firm of Terranova ries. C. A. Rapferer and W. Schlenning, Germany, acture. March 20.

7096. A. Grünberg. Process and apparatus for producing artificial stone free from air. March 6.

7848. A. Renault and G. Cusson. Machines for purifying and separating flours, cements and other pulverulent materials. March 20.

22,941. J. Doyle. Means for producing artificial stone. Feb. 27.

X.—METALLURGY.

Applications.

3177. J. Armstrong. Improvements in the reduction of metals from ores or mattes. Feb. 18.

3672. W. S. Rawson and R. D. Littlefield. Improvements in refining metals, and apparatus for that purpose. Feb. 20.

3797. S. Cowper-Coles. Improvements in or connected with the welding or uniting of aluminium surfaces. Feb. 22.

3953. R. A. Hadfield. Improvements in the manufacture or production of steel. Feb. 23.

4039. J. C Clancy and L. W. Marsland. An improved process for the elimination of zinc from sulphide ores, and the extraction and recovery of lead, silver, gold, and other metals therefrom and from other sulphide ores. Complete Specification filed Feb. 25. Date applied for Nov. 26, 1900, being date of application in Australia.

4094. T. K. Bellis and C. Joly. Improvements in alloys and the like. Feb. 26.

4099. A. Smallwood. Improvements in muffles or furnaces for annealing and like purposes. Feb. 26.

4129. R. A. Hadfield.—From H. D. Hibbard, United States. Improved method and apparatus for toughening manganese steel. Feb. 26.

4147. W. J. Foster. Improvements in the introduction of carbon and fluxes and mixtures of carbon and fluxes into blast-furnaces in the manufacture of iron. Feb 26.

4297. F. W. Harrison. An improvement in connection with the manufacture of steel. Feb. 28.

4375. W. Pethybridge. Improvements in the treatment of telluride gold ores. March 1.

4376. W. Pethybridge. Improvements in the treatment of antimony sulphide and bismuth sulphide ores. March 1.

4448. J. Swinburne. Improvements in reduction of metals. March 2.

4696. A. Rónay. An improved process of making briquettes from comminuted or pulverulent ore, including purple ore. Complete Specification. March 5.

4711. A. R. Shaw and A. Wallace. Improved combination process for the liberation of metals from their ores and for the recovery of gold. March 5.

4713. E. E. Neild (executrix of the late H. W. Neild) and F. Campbell. Improvements in and relating to solder, especially applicable to aluminium. March 5.

4782. A. A. Lockwood. Improvements in the extraction of gold and silver from ores, and in apparatus therefor. Mar. 6.

4893. H. H. Lake.—From C. R. P. Steinau, Germany. Improvements relating to the purification of zinc-bearing solutions. Mar. 7.

4917. R. A. Hadfield.—From H. D. Hibbard, United States. Improvements in, and furnaces or apparatus for treating manganese steel and other metals for toughening and other purposes. March 8.

4975. M. Römer and J. Schmidheiny. Improvements in and connected with glaze-melting furnaces. March 8.

5166. J. Kennedy. Improvements in apparatus for charging blast-furnaces. March 11.

5207. A. M. Clark.—From The Nichols Chemical Co., United States. Improvements in metal casting apparatus. Complete Specification. March 12.

5214. C. E. Manton and J. W. Rayfield. A new or improved process of direct smelting and purifying, principally for gold precipitates or base bullion. March 12.

5234. S. F. Prest and J. W. Cabot. Improvements relating to the treatment of slag resulting from the manufacture of iron and steel. March 12.

5440. A. S. Plews. Improved process for treating antimony ores containing gold. March 14.

5478. F. H. Cartland. Improvements in melting furnaces. March 15.

5520. A. S. Plews. Improved apparatus for treating antimony ores containing gold. Mar. 15.

Complete Specifications Accepted.

1900.

3531. M. Wiszniewska and J. H. Strzelecki. Welding aluminium. Feb. 27.

4896. T. Twynam. Direct production of iron and steel. March 6.

5319. G. W. Emerson and J. Ward. Furnace for the manufacture of calcium carbide or the like, or for melting steel, brass, or other metals or alloys. March 6.

5647. S. O Cowper-Coles. Cleaning or preparing and coating with zinc, iron, or steel. March 20.

6924. P. Naef. Recovering by-products in smelting and calcining. March 13.

8133. H. W. Hemingway. Stripping the tin from tinned iron, and recovering the respective metals. March 6.

8481. B. Talbot. Manufacture of iron and steel March 13.

9046. L. M. Bullier and La Société des Carbures Métalliques. The metallurgical treatment of metallic sulphides and sulphide ores. March 20.

13,641. H. Lange. Soldering aluminium. March 13.

14,780. T. Andrew and T. K. Bellis. Treatment of low-grade steels. March 13.

20,514. E. Gates Method and apparatus for separating paramagnetic and diamagnetic materials. March 20.

21,455. R. G. Wood. Manufacture of sheet metal. Feb. 27.

23,046. Société Internationale des Usines et Fonderies d'Aluminium. Uniting aluminium and steel or iron. February 27.

1901.

12. S. E. Page.—From R. W. Davies and H. W. Hartman, United States. Apparatus for casting metal and other substances suitable for casting, especially casting iron into pigs. February 27.

952. S. Davis. Stripping tinned-scrap and spelter-scrap. Feb. 20.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

Applications.

3450. B. M. Drake and J. M. Gorham. Improvements in accumulator plates. Feb. 18.

3540. C. de Ricaris. *See* Class II.

3992. H. W. Cobb. Improvements in electrical accumulators. Feb. 25.

4017. A. A. Vogelsang. *See* Class VI.

4259. J. Kelly. The preparation and use of calcium compounds for the electro depositions of metals other than calcium. Feb. 28.

4422. C. A. Hussey and S. G. Clarke. Improvements in electric primary batteries. Complete Specification. March 1.

4429. F. M. Chaplet. Improvements in or relating to electric storage batteries or accumulators. March 1.

4489. A. A. Vogelsang. Improvements in electrolytic cells and in electrodes therefor. Complete Specification. March 2.

4494. W. P. Thompson.—From Akkumulatoren und Electricitäts-Werke Aktiengesellschaft (formerly W. A. Boese and Co.), Germany. Improved process for ma electrodes for accumulators. Complete Specificat March 2.

4508. H. J. H. Pickard and J. S. Evans. Improvem in accumulator plates. Complete Specification. Marc

4509. H. J. H. Pickard and J. S. Evans. Impr composition of paste for filling the cells of reticul accumulator plates. Complete Specification. March 2

4586. C. N. Gauzentès. Improvements in pri batteries. March 4.

5017. G. Heidel. Improvements in batteries. C plete Specification. March 9.

5063. T. T. A. Hansen and C. C. F. F. Petersen. provements in accumulators for secondary batte March 9.

5265. J. F. Webb, J. E. Lilley, and J. Chap Improvements in and relating to the recovery of pre metals by electrolysis. March 12.

5596. G. J. Atkins. Improvements in the electr of chlorides of metals of the alkalies and alkaline earth the purpose of obtaining chlorine, and apparatus the Complete Specification. March 16.

Complete Specifications Accepted.

1900.

7372. A. Tribelhorn. Manufacture of electrodes. M 20.

8827. H. W. Butler. Electrical batteries. March

11,097. H. Woodward. Secondary batteries, and facture thereof. March 6.

14,924. H. Rose, J. Halifax, and C. H. Ant Electric accumulators. March 20.

17,757. W. W. P. Thompson.—From The Akkumul und Elektricitäts-Werke Aktiengesellschaft vormals and Co., Germany. Electrode plates. Feb. 27.

22,698. H. A. Frasch. Extracting and reducing by electrolysis. Feb. 27.

1901.

1966. H. Rose, J. Halifax, and C. H. Ant Positive for secondary batteries. March 6.

XII.—FATS, OILS, AND SOAP.

Application.

3922. H. Herborn. Process of treating tar oils f production of preservative oils for coating and impreg Feb. 23.

Complete Specifications Accepted.

1899.

25,112. W. Fox and T. H. Kingscote. Oil filte separators. Feb. 27.

1900.

4506. J. Crichton and P. H. Joselin. Refining oil and waxes. March 13.

8090. J. Rattaire and A. Cottard. An improve Feb. 27.

10,012. J. Delattre. Apparatus for liberating matters from liquids and other substances. March

19,806. F. Morgan. Hydro-refiner for oils, es seed oils. March 6.

1901.

1014. J. W. Warren. Clarifying hydrocarbo Feb. 20.

1379. P. H. Joselin and J. Crichton. Obtaining oil. March 20.

2011. A. W. Barwell. Oleaginous compounds or tinning baths, and method of producing the same. M

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, Etc.

Applications.

3912. E. Bailey and W. T. Hey. Improvements in the ethod of and apparatus for the production of white lead. b. 23.

4176. J. S. Rigby. An improved method in the manuture of whiting and the apparatus therefor. Feb. 27.

4648. E. J. C. Christie and R. Anderson. Improvements treating the milk, juice or sap of trees, shrubs or plants lding gutta, balata, rubber or other rubber-like subnces. March 5.

4702. E. Hecht and G. Poulenc. An improved process the manufacture of lacquers and varnishes. Complete ecification. March 5.

4771. F Weger. Improvements in the manufacture of rit varnishes. March 6.

4803. O. F. J. Duwez. A process for the devulcanision of india-rubber. March 6.

Complete Specifications Accepted.

1900.

906. A. R. Arnaud, A. V. L. Verneuil, A. M. G. Wehry l A. G. Lebeuf. Manufacture of india-rubber. Feb. 27.

6,871. W. Rule. Composition for coating iron, steel, other metals or materials, to prevent corrosion. rch 13.

1901.

842. G. W. Flather. Manufacture of varnish. rch 13.

IV.—TANNING, LEATHER, GLUE, and SIZE.

Application.

470. N. B. Powter. An improved process and apparatus extracting oil, grease, glue, and the like from waste ducts and other substances. Complete Specification. . 18.

Complete Specifications Accepted.

1900.

841. R. B. Ransford.—From L. Cassella and Co. many. Preparing and dyeing furs. March 6.

429. A. J. Boult.—From G. Poppe, Germany. Manuure of artificial leather. March 6.

8,027. H. Saxl, H. Kramer, and L. Widrin. Manuure of superphosphates. March 13.

XV.—MANURES, Etc.

Applications.

779. E. G. Scott. *See* Class VII.

310. R. Burnard. An improvement in the manufacture lkaline superphosphate. Feb. 28.

215. R. Burnard. An improvement in the manufacture lkaline superphosphate. March 12.

Complete Specification Accepted.

1901.

594. R. Hartleb. Producing cultures of bacteroids of cro-organisms of the leguminosæ and the permanent ms of such bacteroids, and innoculating seeds and soils h micro-organisms. March 6.

XVI.—SUGAR, STARCH, and GUM, Etc.

Applications.

199. A. Classen. Improved process for converting ulose into sugar (dextrose). Complete Specification. . 27.

4207. J. R. Hatmaker. From J. A. Just, United States. Process for obtaining pure solutions of casein. Feb. 27.

4506. S. P. Child. From G. Reynaud, France. Improved manufacture of crystallised sugar. March 2.

Complete Specifications Accepted.

1900.

5787. H. de V. Robbé. Apparatus for dissolving sugar or the like. March 20.

6733. A. Wohl and A. Kollrepp. Desaccharifying saccharine solutions. March 13.

8514. Société Anonyme Alliance Industrielle. Rendering soluble amylaceous or starchy matters for use in brewing and distilling and the manufacture of syrups. March 20.

1901.

2251. L. Wenghöffer. Treatment of gluten to render it more stable or durable and suitable for transport. March 20.

XVII.—BREWING, WINES, SPIRITS, Etc.

Applications.

4251. R. Wolheim. A new form of combined conversion and wort boiling vessel for brewers' and distillers' use. Feb. 28.

4263. E. S. Beaven. Improvements in the process of drying malt and other substances, and apparatus for use therein. Feb. 28.

4511. J. Drapier and P. Dubois. Improvements in the manufacture of solidified alcohol. March 2.

4635. W. Ackroyd. Improvements in malt kilns. March 5.

4943. H. A. Hobson and The Concentrated Beer Company Ltd. Improvements in brewing. March 8.

5219. J. Kirkaldy. Improvements in or relating to portable distilling apparatus. March 12.

5404. R. C. Wild. Improvements in connection with solidified spirit. March 14.

Complete Specifications Accepted.

1900.

8514. Société Anonyme Alliance Industrielle. *See* Class XVI.

1901.

2026. C. G. Sudre and C. V. Thierry. Treatment of distillers' spent residues or wash, and apparatus therefor. March 20.

2690. F. Grötte. Preserving beer. March 20.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

Applications.

A.—Foods.

3489. A. Schleissner. A new or improved process for the preparation of a milk specially suitable for children. Feb. 18.

3561. J. H. Campbell and C. H. Campbell. Improvements in the manufacture of condensed or desicated milk, and in apparatus therefor. Feb. 19.

3750. J. Meyenberg. An improved process of making a substitute for mother's milk. Complete Specification. Feb. 21.

4135. R. Katz. Method of sterilising and preserving coffee or coffee preparations. Feb. 26.

5525. H. Popper. Improvements in the manufacture of food preparations. March 15.

B.—Sanitation; Water Purification.

5240. P. L. Hulin. Improvements in the preparation of oxygenated water. March 12.

C.—Disinfectants.

5492. B. J. B. Mills.—From E. D. Taylor Company, United States. Improvements in apparatus for producing formaldehyde gas for fumigating, disinfecting, and sterilising purposes. March 15.

Complete Specifications Accepted.

1901.

A.—Foods.

647. A. Sauer. Process for producing a milk preservative affording a rich milk similar to mother's milk. March 13.

755. S. Székely, and E. Kovács. Separation of milk into casein and whey. Feb. 27.

B.—Sanitation; Water Purification.

1900.

4173. D. Cameron, F. J. Commin, and A. J. Martin. Apparatus for treatment and disposal of sewage. March 6.

6800. S. Peck.—From J. E. Carroll, United States. Apparatus for purifying water for industrial and other purposes by means of heat. Feb 27.

1901.

1777. O. Schmidt. Apparatus for purifying effluents. March 6.

XIX.—PAPER, PASTEBOARD, Etc.

Applications.

3656. A. Kalmann. Improvements in the manufacture of peat-fibre pulp. Complete Specification. Feb. 20.

4001. H. C. W. Schacht. Improvements relating to the production of cellulose. Feb. 25.

4025. J. B. Payne. Improvements in the manufacture or treatment of paper to render it waterproof. Feb. 25.

4326. E. Fühl. An improved method of producing a celluloid-like substance. Complete Specification. Feb. 28.

4365. E. J. C. Christie. An improvement in the manufacture of blotting paper. March 1.

5093. J. White. Improvements in apparatus for straining paper-pulp and like material. March 11.

Complete Specifications Accepted.

1900.

18,786. H. H. Lake.—From L. Weldon, United States. Apparatus for making sheets or continuous lengths of fabric from pulp. March 6.

21,222. H. Schmolka. Apparatus for use in purifying paper-pulp, &c. March 20.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

Applications.

4200. C. Ramage.—From A. S. Ramage, United States. A new or improved process for the production of terpene peroxide. Feb. 27.

5046. G. B. Ellis.—From Société Chimique des Usine du Rhône anciennement G. P. Monnet, et Cartier an P. Genvresse, France. Improvements in the manufactur of terpineol. March 9.

Complete Specification Accepted.

1900.

7199. W. P. Thompson.—From E. Gfeller, Switzerland Manufacture of saccharine. March 13.

XXI.—PHOTOGRAPHY.

Applications.

3439. E. D. Fawcett. An improvement in the practi of the three colour line-system of colour photograph Feb. 18.

3989. E. D. Fawcett. A method of contact printing i colours directly from transparent coloured positive photographic or other. Feb. 25.

4353. C. W. McLaughlin. The separate rollable pho film. March 1.

5502. C. D. Abel.—From The Actienges. für Anili Fabrikation, Germany. Manufacture of a photograph developer stable in the dry state. March 15.

XXII.—EXPLOSIVES, MATCHES, Etc.

Applications.

3725. A. Hollings. Improvements in presses for gun cotton or the like. Feb. 21.

4526. R. Hawkins and H. Hawkins. Improvemen relating to the manufacture of explosive compound March 2.

5231. J. V. Skogland. Improvements relating to t manufacture of explosives. Complete Specificatio March 12.

5256. W. Majert. Improvements in matches. March

5264 R. W. Scott. Improvements in explosive charg for guns. Complete Specification. March 12.

Complete Specification Accepted.

1901.

2650. J. C. Schrader. Machines for mixing explosi compounds. March 13.

XXIII.—GENERAL ANALYTICAL CHEMISTRY.

Application.

5105. H. Müller. Improvements in the process distillation, and in an apparatus for fractional distillati March 11.

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THE JOURNAL

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Messrs. John Yeul and R. W. Griffith. "Relative Leather-forming Value of Various Tanning Materials."
Mr. W. Cecil Jones. "Gas-Firing in Small Gasworks."
Messrs. R. F. Wood Smith and R. L. Jenks. "Arsenic in Coal and Coke."

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Friday May 3rd, 1901:—
Dr. J. B. Harrison. "The Resources of British Guiana."
Mr. T. G. A. Rhodin. "Commercial Utilisation of Felspar."
Mr. Wilfrid Irwin. "New Test for Sulphur Compounds in Benzol."

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John Clark.
C. J. Ellis.
W. Foulis.
G. G. Henderson.
Robt. Irvine.
D. S. Jerdan.
A. D. Ker.
J. G. F. Lowson.
J. McCulloch.
J. B. Readman.

Hon. Secretary and Treasurer:
Thomas Gray, c/o John T. Tannahill, 14, West George S
Glasgow.

The following take office in July next:—*Committee:* D. W. Ivison Macadam, T. L. Patterson, and D. J. Playfair.

Yorkshire Section.

Chairman: George Ward.
Vice-Chairman: J. J. Hummel.
Committee:

J. E. Bedford.
H. K. Burnett.
A. W. Cooke.
T. Fairley.
W. M. Gardner.
H. Grandage.
Edw. Halliwell.
S. G. Rawson.
G. W. Slatter.
A. Smithells.
A. Turnbull.
Thorp Whitaker.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.

Hon. Assistant Secretary: A. Turnbull.

The following take office in July next:—*Vice-Chai* Fairley. *Committee:* E. A. Brotherton, A. J. Murph Watson, and J. B. Wilkinson.

NOTE.—The names in *italics* are those of Members of Committee who retire at the end of the current session.

NOTICES.

Annual General Meeting.

The Annual General Meeting will be held in Glasgow, on ednesday, July 24th, and following days. Full particulars ll appear in a subsequent issue.

In accordance with the provisions of Rule 18 of the e-laws, notice is hereby given that those Members whose nes are placed in *italics* in the list of Council will retire m their respective offices at the forthcoming Annual eting.

Mr. Ivan Levinstein has been nominated to the office of sident; Mr. Jos. W. Swan, F.R.S., has been nominated ice-President under Rule 11; and Mr. Robert Irvine, R. Messel, and Mr. J. M. C. Paton have been nominated e-Presidents under Rule 8.

'he Hon. Treasurer and Hon. Foreign Secretary have n nominated for re-election to their respective offices.

Iembers are hereby invited to nominate fit and proper sons to fill four vacancies among the Ordinary Members Council. Forms for this purpose can be obtained, on lication, from the General Secretary, or from the Hon. al Secretary of the New York Section.

xtract from Rule 18:—"No such nomination shall be l unless it be signed by at least ten Members of the ety who are not in arrear with their subscriptions, nor ss it be received by the General Secretary, at the ety's Office, at least one month before the date of the ual General Meeting, to the election to take place at h it refers. Nor shall any such nomination be valid if erson nominated be ineligible for election under Rules 15. No member shall sign more than one nomination ."

Changes of Address.

hen notifying new addresses, members are requested to them distinctly, and state whether they are temporary ermanent. Multiplication of addresses is also to be led as tending to create confusion. When sending riptions, the use of the form attached to the application in the verification of addresses, on which the safe ery of the Journal depends.

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thors of communications read before the Society, or f its Local Sections, are requested to take notice that Rule 43 of the Bye-laws the Society has the right of ity of publication for three months of all such papers. gement of this Bye-law renders papers liable to be ed by the Publication Committee, or ordered to be acted for the Journal, in which case no reprints can rnished to the author.

Arsenic.

view of the great public interest which has been ed by the the Arsenic Epidemic, it has been decided to lish, in pamphlet form, uniform with the Journal, the s, discussions, and abstracts dealing with the detection letermination of Arsenic and other associated elements, have appeared in the Journal since the beginning of year. To these have been added extracts bearing on ubject from other sources, including a description, from klyn's new book on Arsenic, of the Marsh test, in the ter's own words, and dated 1836. Copies, price 1*s.* may be obtained from Messrs. Eyre and Spottiswoode.

IST OF MEMBERS ELECTED 23rd APRIL 1901.

, Albert M., c/o John Smith and Sons, Field Head Mills, Bradford, Chemist.

ss, Prof. C. F., University of Wisconsin, Madison, Vis., U.S.A., Electro-chemical Engineer.

rt, Jos. E., Etna, Allegheny Co., Pa., U.S.A., Analytical Chemist.

ll, J. Kear, Finsbury Town Hall, Rosebery Avenue, E.C., Analytical and Consulting Chemist.

Dunn, Wm. R., Easton, Pa., U.S.A., Cement Works Manager.

Gansser, Dr. August, Garessio-Ponte, Prov. di Cuneo, Italy, and (Journals) 116, Grosvenor Road, Highbury New Park, N., Chemical Engineer.

Higginbottom, Alf., Quarry Bank, New Mills, near Stockport, Colourist.

Humphrey, Henry C., c/o National Starch Co., Glen Cove, Long Island, N.Y., U.S.A., Chemist.

Koehler, Dr. H., c/o Roessler and Hasslacher Chemical Co., Perth Amboy, N.J., U.S.A., Manager.

Lomax, Clarence S., c/o New England Gas and Coke Co., Everett, Mass., U.S.A., Chemist.

Magruder, Egbert W., Department of Agriculture, Richmond, Va., U.S.A., Chemist.

Master, Chaturbhai G., Khodi-Ambli, Ahmedabad, India, Size and Chemical Manufacturer.

Ogston, Alex. G., Ardoe, near Aberdeen, N.B., Soap Manufacturer.

Olivier, Dr. Louis, 22, Rue du Général Foy, Paris, 8e Directeur (Revue Général des Sciences).

Patterson, Chas. A., c/o Repauno Chemical Co., Chester, Pa., U.S.A., Analytical Chemist.

Rees, Harald B., Asheville Tannery, Asheville, N.C., U.S.A., Tanner and Currier.

Remington, J. Percy, c/o E. R. Squibb and Sons, 36, Doughty Street, Brooklyn, N.Y., U.S.A., Chemist.

Schieren, G. Arthur, 47, Ferry Street, New York City, U.S.A., Engineer and Tanner.

Scott, Leonard C., East Chicago, Indiana, U.S.A., Chemist.

Siau, Raymond L., 32, Sussex Villas, Kensington, W., Carbohydrate Research Chemist.

Staempfli, Major W., Worblaufen, Bern, Switzerland, Director (Swiss Smokeless Powder Factory).

Tilden, Philip S., 35, Burling Slip, New York City, U.S.A., Manufacturing Chemist.

Timmans, Wm. G., 5, Windmill Hill Lane, Ashbourne Road, Derby, Chemical Works Manager.

Watson, Herbert J., 33, Main Street, Kilwinning, Ayrshire, Chemist.

Wing, Herbert H., c/o Oxford Copper Co., Newbrighton, Staten Island, N.Y., U.S.A., Chemical Engineer.

MEMBER OMITTED FROM LIST.

1898. Odling, Walter, 56, High Street, Burton-on-Trent, Brewer and Chemist.

CHANGES OF ADDRESS.

Aldrich, R. C., l/o Erie; 45, East Clay Street, Waterbury, Conn., U.S.A.

Baxter, J. G., l/o Gravesend; Cemetery Lodge, Heckmondwike, Yorks.

Bird, W. R., l/o Gordon Road; 125, Goddard Avenue, Swindon.

Bragg, E. B., l/o Cleveland; 1116, Michigan Avenue, Evanston, Ills., U.S.A.

Buchanan, D. G.; Journals to c/o Gibbs and Co., Iquique, Chile.

"Bulletin de l'Association des Chimistes de Sucrerie et de Distillerie"; Journals to M. E. Silz, 156, Bd. de Magenta, Paris.

Burnside, C. F., l/o South Amboy; c/o International Smokeless Powder Co, Parlin, N.J., U.S.A.

Campbell, Andrew, l/o Burmah; c/o Thos. Cook and Son, Ludgate Circus, E.C.

Cohen, Dr. Hermann, l/o Cöln; c/o S. Mandle, 5, North Spring Avenue, St. Louis, Mo., U.S.A.

Comey, A. M., l/o Cambridge; 32, Hawley Street, Boston, Mass., U.S.A.

Devas, E. W., l/o Manchester; Westward Ho, Wimbledon Common.

De Wilde, Prof. P., l/o 339; 343, Avenue Louise, Brussels.

Field, S. S., l/o Westcombe Park; 3, Glenluce Road, Blackheath, S.E.

Fleming, Wm. P., l/o Jamalpur; retain Journals.

Fletcher, E. Morley, l/o Headingley; 3, Woodhouse Cliff, Leeds.

Frusher, Tom, l/o Stone Street; 87, Nassau Street, New York City, U.S.A.
Gaskell, Holbrook, jun., l/o Aigburth; Bridge House, Sefton Park, Liverpool.
Hamilton, Robt.; Journals to 62, Tempest Road, Beeston Hill, Leeds.
Holgate, Thos., l/o Greenroyd; Rockleigh, Savile Park, Dewsbury.
Just, Jno. A., l/o West Kennedy Street; 116, West Castle Street, Syracuse, N.Y., U.S.A.
Kern, W. P., l/o Brooklyn; 275, Paulison Avenue, Passaic, N.J., U.S.A.
Lambert, Alan, l/o Bishopsgate Street; Union Oil Mills, 21, St. Mary Axe, E.C.
Little, J. G.; Journals to c/o A. von Gernet, 101, Leadenhall Street, London, E.C.
McDougall, Hugh; Journals to Phœnix Works, Milton, North Staffordshire.
Mahon, R. W.; Journals to Baggaley, Pa., U.S.A.
Messel, Dr. R., l/o Ebury Street; 7c, Lower Belgrave Street, London, S.W.
Meyer, Karl, l/o Fredericiagade; Osterbrogade 60, Kopenhagen, O.
Mommers, Rich.; Journals to Glucose Sugar Refining Co., Rockford, Ills., U.S.A.
Morison, Saml. L., l/o Cortlandt Street; 15, Broad Street, New York City, U.S.A.
Rae, Roderic H., l/o Highbury; West Grove Lodge, West Grove, Woodford, Essex.
Royle, Thos., l/o Manchester; 329, Upton Lane, Forest Gate, Essex.
Sawers, W. D., l/o Barrington Drive; 1, Athole Gardens Place, Glasgow.
Schryver, Dr. S. B., l/o Snow Hill Buildings; Effingham House, Arundel Street, Strand, W.C.
Schulze, Dr. K. E., l/o Winkel; Ladenburg, bei Mannheim, Germany.
Scrutton, W. J. C., l/o Barberton; 18, Billiter Street, London, E.C.
Stephens, H. C., M.P., l/o Finchley; 4, Carlton Gardens, London, S.W.
Sudborough, Dr. J. J., l/o Nottingham; University College of Wales, Aberystwith.
Thornton, Christopher; Journals to 16, Hillside Avenue, Providence, R.I., U.S.A.
"Wagner's Jahresbericht"; Journals to "Fischer's Jahresbericht," Prof. Dr. F. Fischer, Hohestrasse 1, Göttingen, Germany.

Deaths.

Burtt, Stratford, 840, Halsey Street, Brooklyn, N.Y., U.S.A.
Holliday, Robt., Messrs. Read Holliday and Sons, Huddersfield. April 2.
Myers, Dr. Jno. A., Anderson Building, New York City, U.S.A.
Young, T. Graham, Westfield, West Calder, N.B.

Liverpool Section.

Meeting held on Wednesday, March 27th, 1901.

MR. C. LONGUET HIGGINS IN THE CHAIR.

THE RATE OF DISSOLUTION OF IRON IN HYDROCHLORIC ACID.

BY JAMES T. CONROY, D.SC., PH.D.

The behaviour of acids towards metals is a problem of great interest, both to the chemist and the manufacturer, and such behaviour has been the subject of considerable investigation.

Sometimes, perhaps most frequently, it is the manu turer's object to obtain a metal not acted upon by particular acid; at other times action is desired, an this case a knowledge of the course of the reaction, its and the conditions under which it occurs is of the grea importance.

To take a particular instance, I may refer to the clea of iron by acids—the so-called "pickling" process—a p minary operation in the preparation of this metal fo galvanising bath. In an industry of this nature, wher various units of plant for the several operations designed to deal with the same quantity of material, will do so under certain definite conditions, the import of knowing and being able to control these conditions be readily recognised. That these conditions are always known, even in large and prosperous works, I had opportunity to learn. As a matter of fact, the pr investigation arose out of the marked difference in work done on a manufacturing scale by acids of chemical purity. The only apparent differences in conditions at the starting of the pickling operation we the concentration of the acids and the temperatures o two baths, and these differences appeared almost too to account for the great variation in activity betwee so-called "good" and "bad" acids.

I felt, however, that these differences were points following up, and I consequently investigated the effe concentration and temperature on the rate of dissol of iron in hydrochloric acid, the acid generally use "pickling."

So far as I am aware, nothing has been published o particular subject, although, as before stated, the amo work done on the interaction of acids and metals has very great. The results obtained in the various show how impossible it is to prophesy what will even as regards the nature of the reaction, unde specified conditions; each case requires its own se investigation. Thus sulphuric acid will only react certain metals when hot and concentrated, the g products of reaction being sulphurous anhydride. other metals it will react in the cold, and at almo strength, with evolution of hydrogen; but even with of these latter metals it will give sulphurous acid heated. With iron, whilst strongly active at certai centrations, it becomes almost inactive at some intermediate concentration.

Of work done on the influence of concentratio temperature on the rate of dissolution of metals i probably the most important is that done by Dive Shimidzu (Chem. Soc. Trans. 1885, p. 597), Spri Van Aubel (Chem. Soc. Abs. 1887, p. 1074), and (Chem. Soc. Trans. 1889, p. 361).

Considering briefly these investigations in the named, Divers and Shimidzu, studying the rate of lution of zinc in sulphuric and nitric acids, came conclusion that "the time taken to neutralise a quantity of an acid, or to complete some other c action upon it, such as the formation of hydrox from nitric acid mixed with sulphuric acid, is directl dilution of the acid, and inversely as the area of between the metal and the solution, other circum being equal. It is independent of the quantity acid."

Spring and van Aubel worked with zinc co 0·6 per cent. of lead, and studied the rate of dissol this alloy in hydrochloric, hydrobromic, hydriod sulphuric acids. They made measurements at co tions corresponding to 5, 10, and 15 per cent. H at the temperatures 15°, 35°, and 55° F. They fo for the same temperature the rate of solution is in a proportional to the strength of the acid, whilst the i of temperature is shown by a curve asymptotic to of the temperatures, the curves for the three concer converging to a point corresponding with a temper −60° to −70° C. They divided the reaction in parts. The first, "a period of induction," they co abnormal, and as being a stage during which the slow action produced an infinite number of minute couples on the surface of the metal. In the secon e activity has reached its maximum value, whilst in the ird period this activity decreases with the diminution in id strength. Their deductions as to rate of action are sed on a theoretical initial velocity derived from the ximum value observed during the second period.

Veley, whose work is, to my mind, the most important t done on this subject, took very special precautions to ercome the errors inevitable when working with the metal rest, and he devised an apparatus by means of which a sh surface of metal was continually exposed to the vent, and this latter agitated to remove the products of change from the vicinity of the dissolving metal, and so intain uniform concentration and minimise local superting. Further, in his first series of experiments he solved copper in a mixture of potassium bichromate and phuric acid--a reaction in which no gas is evolved; he s kept the surface of the metal free from bubbles. He soaked the metal sphere in a separate portion of the ent mixture before making a quantitative experiment, thus had from the start the surface of the metal in a dition to give constant results. He avoided the "period duction" of Spring and van Aubel. From his experits he drew the following conclusions :—

) When a metallic sphere, placed within an acid liquid, ives an equal number of impacts per unit time, or is larly rotated, it will dissolve uniformly, the amount olved off being, as was to be expected, proportional to surface exposed.

) In the particular case of metallic copper within a ion of potassium bichromate acidulated with sulphuric the amount of metal dissolved off is dependent upon conditions of (*a*) temperature, (*b*) proportion of uric acid, and (*c*) proportion of potassium bichromate.

) If the temperature in degrees be varied in an arithal proportion, the amount dissolved off varies in a etrical proportion. This amount is doubled for every whatever be the concentration or acidity of the solu- This change is thus perfectly analogous to several s quite different from it and from one another in their c.

) If the quantities of sulphuric acid, other conditions ining the same, be varied in arithmetical proportion, mount of metal dissolved off also varies in arithmetical ortion.

If the quantities of potassium bichromate, other tions remaining the same, be varied in arithmetical ortion, the amount dissolved off is at first increased derably by each successive addition of potassium omate, then varies in arithmetical proportion, and y is but little effected by the amount of potassium omate present.

a further paper on "The Chemical Changes between and Nitric Acid" (this Journal, 1891, p. 206), he ed that when the temperature was kept uniform the nt of lead dissolved per unit of time increased up to a num point and then decreased, this behaviour being e that of copper, mercury, and bismuth. He ascribed iminution in activity beyond a certain concentration er cent. HNO_3) to the decrease of solubility of the nitrate formed in the acid liquor.

ese examples will serve to show how very variable is behaviour in the several cases described; they also ate, however, the existence of some law.

own work was started before I became acquainted Veley's experiments, and the refinements introduced method of working are, I am sorry to admit, entirely it in my case, where the method adopted was the rsion of the sheet metal in the acid. It was to all s and purposes working on a small scale under the tions existing in the galvanising industry.

already stated, the experiments were started to solve mercial problem, and were therefore made, as regards metal, on commercial material and in imitation of ng conditions. The measurement of the rate of ution of the sheet iron in the acid under these ions was found to yield the information desired, and nly for these very far from ideal conditions that I le to give the following figures.

Effect of Concentration on the Activity.—My first experiments were done to find out the effect of the concentration of the acid on the rate of dissolution, and they consisted in noting the loss of weight suffered at ordinary temperature by pieces of iron of the same area in acids of various strengths.

The iron used was the black sheet of the galvaniser, that is, the iron as ready for the pickling bath after annealing. Each piece measured 5 cm. × 2½ cm., and was immersed standing on end in a small beaker containing 50 c.c. of hydrochloric acid, this quantity of acid being just sufficient to cover the metal. The loss of weight was determined after intervals of 1, 2, 3, &c. hours, the metal being in each case washed with water and alcohol before drying. The acid concentration in the several beakers varied from 23 to 358 grms. per litre.

The results obtained indicated that over this range of concentration the amount of action was not directly proportional to the acidity of the solution. Thus, with a decrease of 10 per cent. in the quantity of real acid present (from 310 grms. to 280 grms. per litre) the rate of solution fell to 50 per cent.; that is, at the lower concentration it was only one-half its value at the higher. Although the results obtained could not be represented by a straight line, the values, however, seemed to follow a regular curve (dotted lines, Curve I.).

As in this method of experimenting the percentage of free acid decreased materially during the time of action, thus giving much too low values for the rate at the higher concentrations, it was thought advisable to alter the method of experiment so as to read the quantity of gas evolved, this method allowing results to be obtained continuously and in much shorter time, consequently with less alteration in the concentration or acidity of the solution.

The apparatus used (Fig. 1) consisted of a graduated tube B, with a stop-cock on top, surmounting a vessel, A, in which was the iron sheet (2½ ins. × 1½ ins.), together with a thermometer. The whole was connected at the bottom with a bottle, C, containing the acid of required strength. By raising this bottle the whole apparatus was filled with the acid, and the action allowed to take place at atmospheric temperature, the volume of gas evolved being read off at suitable intervals. It is unnecessary to give the series of readings obtained at all the concentrations employed; the following for acids of 200, 300, and 325 grms. HCl per litre are representative, and will show the general course of the reaction (Table I.). The volume of the gas was read at the atmospheric temperature and pressure, but no correction was made for the tension of aqueous vapour in the atmosphere above the acid in the tube, the constancy of the other conditions not being sufficient to justify this correction. The variation in the temperature of the solvent, due to the heat of reaction, was only slight.

Fig. 1.

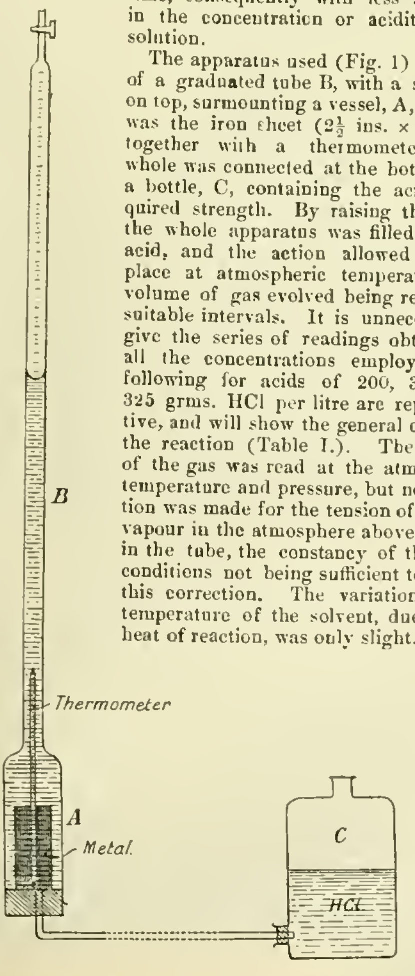
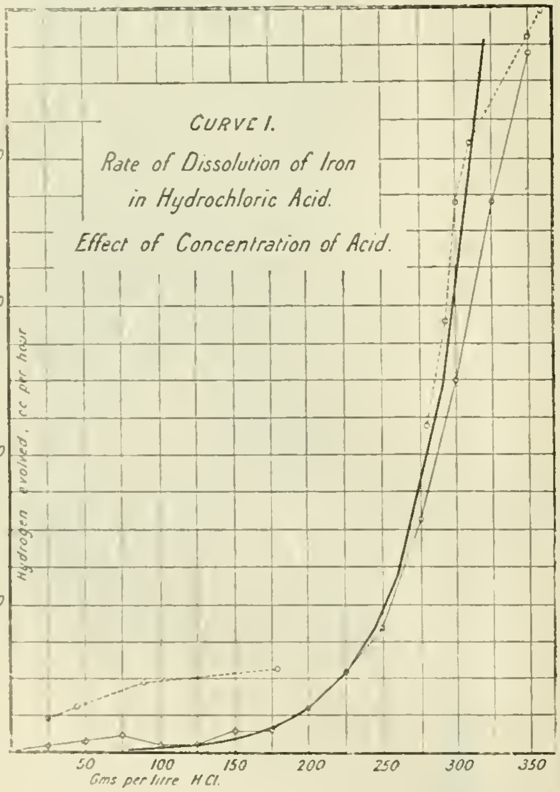


Table I.

200 grms. HCl per Litre.		300 grms. HCl per Litre.		325 grms. HCl per Litre.	
Period after start.	Rate of Evolution in c.c. per 1 hour.	Period after start.	Rate of Evolution in c.c. per 1 hour.	Period after start.	Rate of Evolution in c.c. per 1 hour.
Mins.		Mins.		Mins.	
0— 40	11·0	0— 10	42	0— 20	42·5
40— 65	17·0	10— 25	123	20— 35	135
65— 85	19·8	25— 35	157	35— 50	224
85—105	23·0	35— 45	173	60— 70	313
105—130	31·5	45— 55	207	70— 85	355
130—145	28·5	55— 65	227	85— 95	369
145—180	27·8	65— 85	248	95—110	368
		85—100	252	110—120	364
		100—120	233	120—135	348
		210—220	179	135—145	341
		220—235	180	145—165	340
				165—180	308
Maximum	30	Maximum	250	Maximum	370

It will be noticed that the action of the acid was apparently much slower at the start of the experiment than later, and that after a period varying with the strength of the acid employed it rose to a maximum, and then fell as the percentage of free acid in the solution diminished, owing to neutralisation.



That is, in this method of working there are three stages. During the first period the thin film of magnetic oxide covering the iron sheet was dissolved, naturally without evolution of gas, but whether other causes in addition to this had also to do with the smaller gas evolution I cannot say. It will, however, be evident that the gas evolution during the first period did not represent the true activity of the acid; for this value the maximum figure must be taken.

The following table (Table II.) gives the maxim figures for the activity at the various concentrations inves gated. These figures correspond, owing to the diminuti in acid strength during the period of slow evolution, to aci of somewhat lower strength than that given in the fi column.

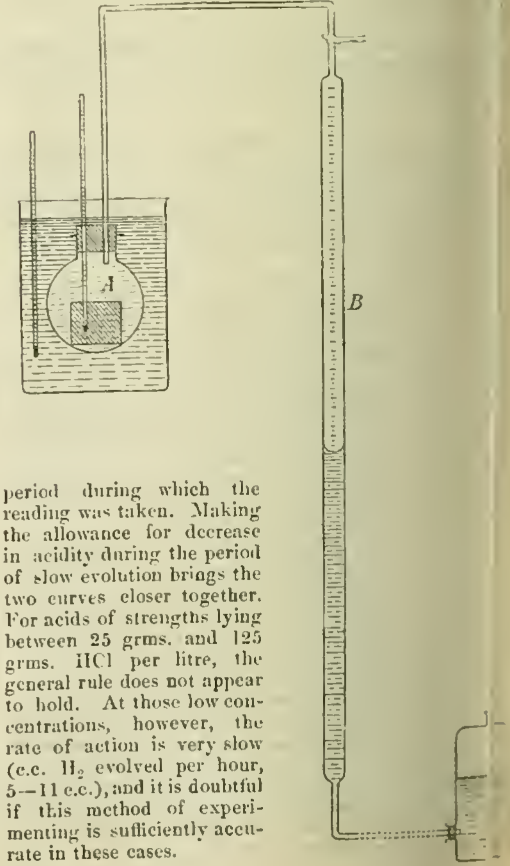
Table II.

HCl per Litre.	H_2 evolved per Hour.	HCl per Litre.	H_2 evolved per Hour.
Grms.	C.c.	Grms.	C.c.
25	5	200	30
50	8·5	225	55
75	11	250	85
100	5	275	158
125	5	300	250
150	15	325	370
175	15	350	470

Plotting these values in the form of a curve, it will at once seen that the relation between activity and c centration follows some definite law, the general natur which was also indicated by the first series of experime made. It is quite evident that, in the case of hydrochl acid and iron, the activity and concentration are not dire proportional to each other, as is stated to be the case other acids and metals. The curve appears to be logarith and for a considerable portion of its length the law app to be that each increase of 30 grms. HCl per litre in strength of the acid used brings about a doubling of activity. The more marked line in Curve I. is drawn this relation.

In the experimental curve the c.cs. gas are plotted aga the concentration of the acid at the beginning of experiment, and not against the actual concentration at

Fig. 2.



period during which the reading was taken. Making the allowance for decrease in acidity during the period of slow evolution brings the two curves closer together. For acids of strengths lying between 25 grms. and 125 grms. HCl per litre, the general rule does not appear to hold. At those low concentrations, however, the rate of action is very slow (c.c. H_2 evolved per hour, 5—11 c.c.), and it is doubtful if this method of experimenting is sufficiently accurate in these cases.

How far the heating of the metal affects the rate of lution it is impossible to say; that the metal becomes rmer than the surrounding liquid has been demonstrated Spring and van Aubel.

Effect of Temperature on the Activity.—The experiments de to determine the effect of temperature on the activity re carried out in a modified form of the apparatus eady described, and so constructed that all the acid could maintained at any desired constant temperature. The angement is shown in Fig. 2, the gas evolved in the sk A, which was fitted with thermometer and delivery e and immersed in a water-bath, was collected in the ette B, entering from the op. Here, again, the ximum gas evolution was taken as the figure sought, the ies of figures for any particular concentration and perature being of the nature already indicated in le I. The duration of the period of induction varied h the temperature; thus, for acid of 180 grms. HCl per whilst this period was five hours at 15° C., it was only minutes at 55° C.

able III. gives the values obtained; these are plotted on accompanying curves II.

hese curves, again, are logarithmic, and are thus similar heir nature to that obtained by Veley in his investigation he action of potassium bichromate and sulphuric acid on per. Whilst, however, in his experiment, an increase of C. was necessary to double the activity, in the present ance an increase of 10° C. is sufficient. This will be ily seen by inspecting any of the curves, but it is aps rendered immediately evident by the more strongly ked curve drawn on this supposition.

is this temperature curve which is perhaps of most e to the galvaniser. The acid liquor prepared by ng a given number of carboys of acid, which is bought niform strength, to a certain depth of water in the ling tank is not subject to great variation in acidity ue care is exercised. Atmospheric conditions are, ever, a factor rather beyond the control of a work's ager; and in cold weather, unless the acid bath is cially heated, much trouble may be caused. Thus at C. the activity would be a third more than at 15° C., that is, the bath would begin its work at a rate of four batches of plates at 20° to only three batches at 15°. Owing to the greater activity at the higher temperature this bath would become heated much more rapidly than that starting at the lower temperature, with the result that the difference in output would be still further increased. So slight a difference as 2° F. between two fresh baths I have known to cause considerable trouble. I may add that calculations, based on the curves, as to the relative times necessary for cleaning plates, under varying conditions of temperature and concentration, agree very well with the results obtained on a large scale.

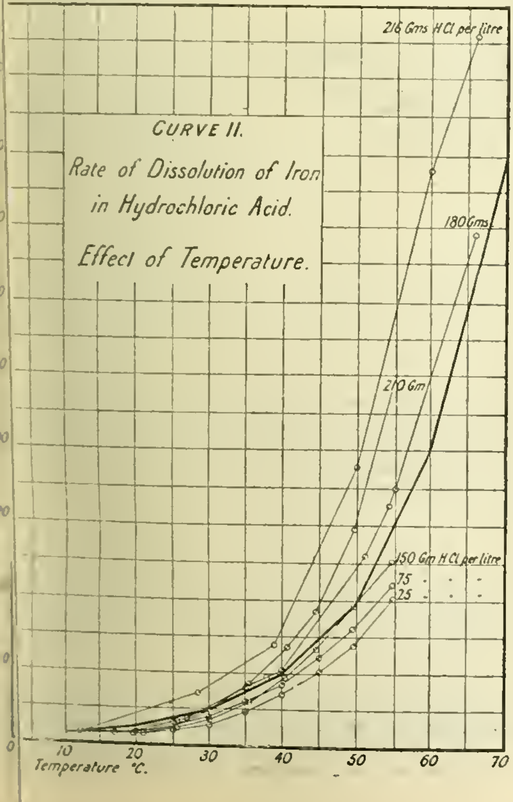

CURVE II.
Rate of Dissolution of Iron in Hydrochloric Acid.
Effect of Temperature.

TABLE III.

Temp.	C.c. Hydrogen evolved from Acid containing grms. HCl per litre.					
	25.	75.	150.	180.	210.	216.
° C.						
12	..	..	..	12	..	..
14	..	..	..	..	..	12·8
17	..	..	15	..	15	..
19·5	12·4	19	..	..	..	..
20	..	..	..	17·2	..	..
21	..	..	15	..	20	..
25	20	27	..	..	..	..
25·5	..	..	24	..	30	..
27	..	..	..	37·5	..	..
28·5	..	..	..	..	..	70
30	30	40	37	..	50	..
35	48	60	..	80	..	..
35·5	..	..	60	..	84	..
38	..	..	..	95	..	140 at 39°
40	72	84	..	105	..	..
40·5	..	..	96	..	..	..
41	..	..	..	..	135	..
44·5	..	..	132	..	186	..
45	102	123	..	..	..	..
49·5	138	162	192	..	292	..
50	..	..	..	260 at 51°	..	380
54·5	204	222	255	..	480	..
55	..	..	..	350	..	..
59	..	..	..	..	..	780 at 60°
63	..	..	..	..	..	..
66	..	..	..	690	..	950

The figures also explain why baths made up on Monday morning, after a week-end stoppage, work poorly compared with those made up in a recently emptied tank, the walls of which are still warm from the previous operation.

The foregoing experiments were all done with distilled hydrochloric acid practically free from impurity of any kind. In practice commercially pure acid is employed. Such acid must be free from arsenic, the presence of which is prejudicial during the pickling stage, apart from the trouble it causes later on in the galvanising bath. The effect produced when arsenic is present in small quantity is shown is Table IV. When larger quantities are present the iron becomes completely covered with a film of arsenic, which, at ordinary temperature, almost completely checks further action, even with the more concentrated acids.

TABLE IV.

HCl, Grms. per Litre.	As_2O_3, Grms. per Litre.	t° C.	C.c. Hydrogen evolved per 1 hour.			In Minutes.
			Before addition of As_2O_3.	After addition.	Rising to	
200	0·08	18	30	21	26	50
200	+0·16	18	26	19	26	60
216	0 04	18	12·6	5	..	..
180	0·08	54·5	304	120	248	40
180	0·08	55	370	156	345	60
180	0·08	61·5	522	220	470	40
216	0·04	56	425	305	..	..

To summarise:—

Under the conditions of experiment described—

(1) The relationship between the concentration of hydrochloric acid and its activity in the dissolution of iron

is such that, as the strength of the acid increases in arithmetical progression, its rate of action does so in geometrical progression over a considerable range, and in such fashion that the rate of dissolution is doubled for each increase of 30 grms. HCl per litre in the acidity of the solution.

(2) The law connecting activity and temperature is of the same nature as the preceding; the rate of dissolution appears to be doubled for each rise of 10° C. in the temperature. This law holds for concentrations of acid lying between 25 and 216 grms. HCl per litre.

THE ACTION OF REDUCING GASES ON SULPHOCYANIDES.

BY J. T. CONROY, B.SC., PH.D., O. HESLOP, AND J. B. SHORES, D.SC., PH.D.

The reducing action of hydrogen on thiocyanic acid has been investigated by Hoffmann, and more recently by Sestini and Funaro (Chem. Soc. Abst. 1882, p. 1180). These latter chemists have given us the primary reaction—

$$HCNS + H_2 = HCN + H_2S.$$

The products are however not nearly so simple, owing to secondary reactions taking place between the thiocyanic acid and the products first formed, notably the reaction represented by the equation :—

$$HCNS + H_2S = NH_3 + CS_2.$$

The ammonia and carbon bisulphide so produced then react further with hydrogen to yield as reduction products trithioformaldehyde and methylamine.

The reduction of thiocyanic acid thus appears to be an exceedingly complex problem.

Subsequently Playfair (this Journal, 1892, p. 14) studied the reaction between sulphocyanides and hydrogen passing this gas through the molten mixture of the sodium and potassium salts heated to redness in a glass tube. He found that sulphuretted hydrogen was evolved and that the product consisted of a mixture of sulphides and cyanides of sodium and potassium, about 80 per cent. of the sulph cyanide having been decomposed. The sulphide and cyan he found to be present in nearly equal quantities, that about 20 per cent. less cyanide than would be required the equation—

$$4KCyS + 6H = K_2S + 2KCy + 3H_2S + 2C + 2N$$

and he stated that apparently not more than half cyanogen of the sulphocyanide can be expected as cyan by this method.

We have recently studied the reaction of reducing ga on sulphocyanides under various conditions and we n give the results, which we hope will prove of some inter to the Society.

Two methods of experimenting were adopted; in the the hydrogen was bubbled through the molten sulph cyanide as in Playfair's experiment, in the second the was passed over the sulphocyanide contained in a boat in horizontally placed combustion tube. The results obtain were the same in both cases, and it was only as a matter convenience that in particular experiments sometimes o sometimes the other method was adopted.

After a few preliminary experiments to find out the m satisfactory conditions of working, a series of experime was made in which dried hydrogen was passed thro molten potassium sulphocyanide (previously dried at 100 contained in a hard glass tube, heated to about 600° (this temperature having been found to be the most suita Reaction, however, takes place below this temperature, up to 500° C. decomposition proceeds at only a slow rat

The quantity of potassium sulphocyanide operated on in each case 4·76 gm., and the hydrogen was bubbled at rate of about 20 litres per hour. The gaseous product reaction issuing from the tube were passed through wash bottles, the first containing sulphuric acid and second caustic soda solution. These were examined ammonia, sulphuretted hydrogen, and hydrocyanic aci having been found in the preliminary experiments that three gases were evolved. The contents of the tube analysed for undecomposed sulphocyanide, cyanide, sulphide. The results obtained are shown in the follo table (Table I.).

TABLE I.

Reduction of Potassium Sulphocyanide by Hydrogen.

Experiment.	Duration.	Percentage of KCNS Decomposed.	Products of Reaction calculated into terms of Percentage of Sulphocyanide Decomposed.					Nitrogen accounted for.	Sulph accoun for.
			KCN.	H_2S.	HCN.	K_2S.	NH_3.		
	h. m.								
1	0 10	16	69	67	18	21	10	97	88
2	0 30	32·5	69	74	21	23	9	99	97
3	1 30	89·5	74	75	20	28	5	99	103
4	2 0	94	73	69	18	23	5	96	92
5	2 0	94	70	73	17	24	4	91	97
6	2 30	97	73	69	17	24	6	96	93
	Mean		71	71	18	24	6·5	96	95

From these experiments we may conclude that sulphocyanide of potassium can be practically completely decomposed by hydrogen at a suitable temperature to yield about 70 per cent. of its cyanogen as potassium cyanide in the fixed residue and some 20 per cent. as hydrocyanic acid; the remaining 10 per cent. is partly evolved as ammonia and also partly unaccounted for. There is evidently no great destruction of cyanogen involved in this reaction as is suggested in Playfair's equation.

Inspection of the table further reveals the fact that the quantity of sulphuretted hydrogen evolved corresponds very closely with the potassium cyanide remaining in the melt, whilst for the potassium sulphide present in this latter, an approximately equivalent quantity of hydrocyanic acid has been evolved as gas.

These considerations would suggest that the chief reaction taking place therefore is—

$$KCNS + H_2 = KCN + H_2S;$$

that is, the primary reaction here is the same as that ta place between hydrogen and thiocyanic acid. The lil tion of hydrocyanic acid might then be due to a secon reaction between the sulphuretted hydrogen and the cy first formed taking place as follows :—

$$2KCN + H_2S = K_2S + 2HCN,$$

and the correspondence between the figures showing quantity of sulphide formed and hydrocyanic acid libe strengthens this view, and it would appear as if 20--25 per cent. of the cyanide formed were acted up this manner.

In order to find out whether this last reaction act occurs, sulphuretted hydrogen, dried by passing over ca chloride, was passed for one hour into potassium cy kept fused at a dull red heat, the issuing gases being p into caustic soda solution. As a result we found

,drocyanic acid was evolved, but that the main reaction hich occurred was practically a reversal of the equation—

$$KCNS + H_2 = KCN + H_2S.$$

Some two-thirds of the cyanide was converted to sulpho- ·anide, and corresponding with this change we found that ıne of the issuing gas escaped absorption. This gas ·oved on examination to be hydrogen containing some rbonic oxide.

A similar result was obtained in a second experiment in ıich the temperature was maintained at 500° C., the :e of flow of the sulphuretted hydrogen being 5 litres per ur.

The formation of sulphocyanide is in all probability due dissociation of the hydrogen sulphide at the temperature the experiment, hydrogen sulphide dissociating rapidly temperatures above the boiling point of sulphur. Any phur liberated in this fashion would be taken up by the ıide to form thiocyanate.

The origin of the ammonia produced during the reduction sulphocyanide by hydrogen is still somewhat uncertain. · at first put it down to the presence of moisture acting ı high temperature upon the cyanide and sulphocyanide sent. Against this view we have to state that ammonia ; evolved in experiments in which both the hydrogen gas . the sulphocyanide were very carefully dried, the latter ng fused in the reaction tube *in vacuo* for some time ıour) prior to bubbling the hydrogen through. To com- ely dehydrate the sulphocyanide appears, however, to be atter of some difficulty, and it is possible that in spite engthy drying some moisture was still retained by the ıhocyanide. When potassium sulphocyanide is heated ısses, after becoming molten, through various shades of ur, at first pink to red, finally becoming blue. During heating, in our experiments performed *in vacuo*, the hygroscopic water is given off and gas is evolved with decomposition of the sulphocyanide, amounting to some 1½ to 2 per cent. In several experiments we found that after this evolution of gas had ceased the molten product contained potassium sulphide, equivalent to a decomposition of about 1 per cent. of the sulphocyanide taken and cyanide to a somewhat less extent. The gases evolved during the drying consisted of ammonia and sulphuretted hydrogen; this decomposition may be due to a splitting up of the sulphocyanide by the water present. This point is of interest in connection with a paper recently written by W. B. Giles, and published in the Chemical News (Feb. 8th, 1901, p. 61), in which the author ascribed the blue colouration produced on heating potassium sulphocyanide to redness to a partial decomposition, resulting in liberation of sulphur. He found that this blue colour could be destroyed by passing hydrogen through the fused salt, and in this connection he noticed the evolution of sulphuretted hydrogen, and stated that "the residue in the tube consists principally, if not wholly, of potassium cyanide." That the residue is not wholly potassium cyanide, the figures we have quoted above are sufficient to prove, our average product being about two-thirds cyanide and one third sulphide.

Action of Hydrogen on other Sulphocyanides.—The reduction of other sulphocyanides by hydrogen has not been so fully investigated as the reduction of the potassium salt, and these cases may therefore be considered more briefly.

Sodium Sulphocyanide.—The experiments were carried out in the same fashion as those on the potassium salt, but we found the sodium salt much more difficult to dehydrate than the corresponding potassium compound. It is probably on this account that a poorer yield was obtained and that much more ammonia was found in the reaction products. The figures obtained are shown in Table II.

TABLE II.

Salt.	Gas.	Duration.	Per Cent. Decomposed.	Products of Reaction calculated into terms of Percentage of Sulphocyanide Decomposed.				
				RCN.	H_2S.	HCN.	R_2S.	NH_3.
KCNS	Coal gas	2½ hours	83·5	58·5	68	15	9·5	16·5
"	"	3 "	95·0	51	69·5	16·5	10	19
"	..	Mean	..	55	69	16	10	17·5
"	Hydrogen	"	..	71	71	18	24	6·5
NaCNS	"	2½ hours	90	40	60	14	23	35
"	Coal gas	2 "	90	46	59	17	24	30
"	"	2 "	86	42	59	13	21	24
$Ba(CNS)_2$	Hydrogen (slow)	..	95	..	6·5	65	..	..
	" (quick)	..	94	..	7·4	71	..	12·5

ılcium Sulphocyanide.—On passing hydrogen through compound the mass swelled strongly without fusing, ıugh the heat applied was stronger than that employed the potassium salt. The salt was never more than fluid. During the reaction dense white fumes of ·asant odour were evolved, which were not absorbed r by the acid or the alkali, but were partially soluble cohol. At the end of two hours it was found that only s of hydrocyanic acid and sulphuretted hydrogen had : over, although the residue in the tube consisted almost ely of calcium sulphide. The alcoholic solution ıned by absorption of the white fume gave no hydro- ic acid when tested immediately after the experiment, ın standing over night it was found that both hydro- ic acid and sulphuretted hydrogen were present.

ırium Sulphocyanide.—This compound, unlike the um salt, fused readily, but it was found difficult to drate it completely. On the passage of the hydrogen nposition took place with formation of barium sulphide liberation of hydrocyanic acid admixed with some ıuretted hydrogen. No cyanide was left in the tube. g with the hydrocyanic acid other volatile products evolved, the nature of which depended on the rate at ı the hydrogen was bubbled. If this gas was passed y carbon bisulphide and ammonia were formed, if quickly, more especially at higher temperatures, these compounds could not be detected, their place being taken by white fumes.

As a method of producing cyanide, the efficiency was nearly equal at both rates of working, being 65 per cent. of the theoretical with the slow current of gas, and 71 per cent. with the more rapid flow.

Copper Sulphocyanide.—Here again the reaction was found to be complex and the yield poor, only some 50 per cent. of the cyanogen present in the sulphocyanide being evolved as hydro-cyanic acid in the several experiments tried. The cuprous sulphocyanide used was first dried in the air bath, and then heated for some time *in vacuo* at 100° C., after which it was submitted to the action of hydrogen. On gentle heating the salt turned black, and at about 200° C. sulphuretted hydrogen began to come over. At 250° hydrocyanic acid was found accompanying the sulphuretted hydrogen, but up to 300° C. reaction only took place slowly. From this point to 600° the reaction appeared to be uniform in character, both these gases being liberated, together with carbon bisulphide and some substance which condensed as a red sublimate in the cooler parts of the apparatus, which sublimate yielded on heating ammonia and hydrocyanic acid. The residue left in the tube consisted of copper sulphide and some metallic copper; no undecomposed sulphocyanide remained in any of the several experiments made nor was hydrocyanic acid evolved on treatment with acid.

Reducing action of Coal Gas.—In addition to the action of hydrogen we also tried the effect of substituting coal gas, otherwise working as regards temperature and speed of gas under the same conditions as have already been described. This substitution was accompanied in the case of the potassium salt by a serious diminution in the yield of cyanide, both as regards the potassium cyanide remaining in the residue and the hydrocyanic acid evolved in the gas. The ratio, however, between the cyanogen remaining fixed in the residue and that evolved as hydrocyanic acid remained the same as in the hydrogen experiments. Corresponding with this decreased yield of cyanide much more ammonia was evolved, also more sulphide remained in the residue.

The comparison of the results obtained after $2\frac{1}{2}$ to 3 hours' treatment with hydrogen and coal-gas respectively is shown in Table II.

With sodium sulphocyanide, on the other hand, the reaction appeared to proceed the same with coal-gas as with hydrogen. The yield was bad in both cases and fell much below that of the potassium salt with coal-gas. As before indicated the poor yield may have been due to moisture in the sodium sulphocyanide. With calcium sulphocyanide we obtained, with the exception of a slight sublimation of sulphur, the same result with coal-gas as with hydrogen.

Action of other Reducing Gases.—With acetylene we also found it was possible to reduce potassium sulphocyanide at a temperature of from 500° to 600° C., that is the same as that employed in the hydrogen and coal-gas experiments. Of the cyanide formed in our experiments about half remained as potassium cyanide in the residue and half was liberated as hydrocyanic acid. Ammonia was also produced and in the same ratio as in the hydrogen experiments. As in these experiments, the sulphide formed in the tube corresponded with the hydrocyanic acid liberated. Carbon was also deposited in the melt.

The foregoing experiments were mainly undertaken with the view of obtaining cyanides from sulphocyanides, and we may state in excuse for the many points in which this paper is incomplete, that when the reaction did not proceed in the desired direction problems, which might otherwise have called for special consideration, were left unsolved.

As a method of converting sulphocyanides to cyanides in an economical fashion the reduction with hydrogen does not offer great prospects. Though, as we have shown, no great decomposition of the cyanogen group occurs, great difficulty would be experienced in obtaining a pure product. In the case of the potassium salt the greater portion of the cyanogen remains in the melt, whilst in the other cases less and less remains here until with the barium salt all is evolved as hydrocyanic acid and none is retained. In either case the cyanide obtained is largely contaminated with sulphide, a very undesirable impurity.

London Section.

Meeting held at Burlington House, on Monday, April 1st, 1901.

MR. OTTO HEHNER IN THE CHAIR.

The Chairman having asked the meeting to sanction an addition to the bye-laws, as follows:—"That in the event of any member of the Committee being elected Vice-Chairman, he shall not be subject to any of the bye-laws as to retirement during his term of office, but that he shall not retain that office for a period exceeding two years," it was resolved:—"That this Section approves the alteration submitted to it."

The Chairman then announced the election of the following gentlemen to fill five vacancies in the Committee occurring under Bye-law 11., Section 11.:—E. Divers; W. Kellner; J. Lewkowitsch; L. T. Thorne; F. Wilson.

THE EFFECT ON THE MARSH TEST OF SOME COMMERCIAL PRODUCTS CONTAINING SELENIUM AND TELLURIUM.

BY A. E. BERRY.

(*This Paper was handed in to the Section early in February* 1901.)

I VENTURE to think analysts are now aware of the formation of sulphuretted hydrogen when any substance containing sulphites, sulphides, or any sulphur compound is treated with zinc and an acid, but I believe the lack of this knowledge in conjunction with the action of selenium, of which I shall speak later, is indirectly one of the causes of the very contradictory reports that were to be found at the commencement of the arsenic scare, and which one unhappily finds even at the present time. Although oxidising agents and boiling with acid may be resorted t in the case of sulphites, traces of sulphuretted hydroge are always evolved sooner or later, and these must b absorbed; or otherwise, if arsenic were originally present the deposit in the tube would be liable to become contaminated with sulphur. In the case of selenium and tellurium, however, the oxidation of the acids or salts o these elements in no way retards the evolution of the hydrides, as these gases are just as readily liberated from such compounds (by the action of zinc and an acid as when they are present in a reduced condition. If the exist as in the latter case there is greater probability of th elements being completely reduced, in which case they ar unacted upon by the Marsh test.

It has been stated that the production of sulphurette hydrogen in the evolution flask would be likely to thro down any arsenic present in the form of insoluble sulphid and in this way the arsenic would be lost. By introducin minute quantities of sulphide of arsenic into the Mars flask I have been able to obtain the mirror from same i the usual way; if the material under investigation ha been treated in a proper manner before entering th evolution flask (that is to say, the arsenic all reduced to a arsenious condition) then it is very unlikely that sulphid of arsenic will be formed. Arsenic in the arsenious condition is all evolved from the flask within a few minute and if the sulphites and sulphides are completely destroy in the first place, then the troublesome sulphuretted hydrog will only be generated after the arsenic has all been set fr and therefore escape the precipitation as referred to in t Marsh flask.

I have tried a large number of methods for absorbi the hydrides of sulphur, selenium, &c., but time will n allow a description of all of these. I will, therefore, on mention that I found ordinary cotton wool, moistened wi a solution of acetate of lead, to answer very well.

On closely examining some of the deposits obtained fr commercial articles, I was surprised to find that unless absorption medium such as the one just mentioned w employed, that in some instances very large deposits we obtained, and these deposits exhibited various colours.

A very heavy deposit on one of the tubes was examin and found to be free from arsenic, and to consist of t elements above named. Sample tubes obtained from t same acid were broken up, and the contents dissolved cyanide of potassium and tested for selenium in the us way, and this element was found to be present in considable quantity. A search was made for tellurium a other metals, but they were found to be absent, and w this information I commenced a series of experiments order to ascertain the effect of selenium and tellurium the methods of testing for arsenic.

The quantity of selenium in some acids is as high one-fifth of a per cent., and it is said to be poisono although no actual case of poisoning has been reco in the case of man, and until more reliable informat is obtained, I think judgment on this score must suspended.

In examining a number of materials in the manufact of which certain sulphuric acids had been employed noticed occasionally that a brownish red deposit or r formed in the Marsh tube and always nearer to the fla an the mirror of arsenic. The formation of this deposit dy occurred when the absorption medium had been in use o long and required renewing, and after the operation d been going for some considerable time. At first I was lined to attribute its pressure to the formation of the rahydride of arsenic (As_2H_4), which exists as a brown wder and is decomposed by heat. On applying the me to the deposit it immediately darkened (a property ich I now know is very common to selenium), and on oling again regained its original brown-red appearance. it was also soluble in a solution of bleaching powder formation of a solid hydride of arsenic appeared to the most probable solution of the difficulty. About s time I had occasion to consult with an analyst as to presence of arsenic in a sulphur compound, and as we e unable to arrive at an agreement in our results, I was wn Marsh tubes containing a small brown deposit ch at that time was attributed to arsenic. This fact aced me to investigate the matter further, and on finding t the same brown-red deposit was obtained in much larger ntities from some brands of sulphuric acid, I was led to discovery that these deposits were due to selenium.

now find that Prof. Tunnicliffe and Dr. Rosenheim, in Lancet of the 9th of February, state that they have been to prove the presence of selenium in brewing sugar beer, the only source of which is the impure sulphuric used in the manufacture of the sugar; and that the examined was one which had been concerned in the nt poisoning epidemic.

fter noticing the presence of selenium in various acids other materials, which were obtained from different s of the country, I commenced a series of experiments, find that like arsenic, it has the curious property of ibuting itself over any manufactures into which it may ought in contact.

ave been unable to find a trace of tellurium in any of naterials examined, and I would here mention that is a difficulty in obtaining a deposit in the Marsh from this element, even when a solution of the metal cali is introduced into the evolution flask, there being ater tendency to complete reduction and precipitation e metal in this case than in that of selenium.

obtained purified samples of these elements, and ined their effect upon the Marsh and Reinsch tests senic, and will briefly describe the results obtained.

the elements are present in their metallic condition, are unacted upon by either of the tests; but as they in various manufactured articles they are slowly ed as a gas from the Marsh flask in a manner similar S.

re samples of the elements were dissolved in pure uric acid, and on introducing the treated acid into volution flask the hydrides of the elements were ated, and as no absorption medium was employed, passed along until reaching the heated part of the when they were decomposed and deposited. If alkali d for dissolving the elements, the results are exactly ame. In all of these experiments a part of the um and tellurium is thrown out of solution, and then ed upon by the zinc and acid. I have a number of of selenium and tellurium which have been obtained way described, from which you will see that while eposit of tellurium is dark in colour, very closely bling arsenic, that of selenium varies from black to This is due to the different modifications the latter nt exists in, and which are formed by the varying es of heat employed, and also the action of hydrogen selenuretted hydrogen in the presence of heat.

nd that Prof. Tunnicliffe and Dr. Rosenheim state that m is not acted upon by the Marsh test, and without g mention of an absorption medium, I presume ave been working with the element in its metallic ion. This is a serious error, as it is important to hat selenium, when existing as an acid or in combination with bases, is evolved from the Marsh flask, and obtained as a red deposit by holding a piece of orcelain in the flame at the end of the tube. If the e heated it is deposited as a red powder, sometimes ack shining mirror, and the deposits in the tube and on the porcelain are soluble in hypochlorite; a property which may very readily lead to the black modification being mistaken for arsenic. These gentlemen further state that in the Reinsch test selenium is deposited upon the copper, and before sublimation may be mistaken for arsenic. I have made a number of experiments in this direction, but find no resemblance whatever between the deposit obtained from selenium and that from arsenic, and I fail to see how a mistake could be made in this respect. In fact, owing to the insolubility of selenium in hydrochloric acid, it is thrown out of solution by long boiling, such as is generally used for this test. I have also found that in some cases the whole of the copper completely dissolves, a feature which I attribute to the presence of selenious acid.

When I found selenium to be present in various materials, I was at the time unaware of any mention whatever with regard to its presence in such quantities, or its action upon the methods of testing for arsenic. It is very important to note, however, that Mr. G. E. Davis read a paper on the 29th April 1883, before a meeting of this Society in Manchester, in which he stated that it is more than probable that the complaints at that time of the presence of arsenic in some sulphuric acid, were often due to the presence of selenium.

It may be asked if selenium and tellurium are absorbed by acetate of lead, why is it deemed desirable to go further into their effect upon the Marsh test. I would only state in reply that at the commencement of the "arsenic scare" there were many who did not employ acetate of lead or any such medium, and I have good reason to believe that samples were erroneously judged as containing arsenic, and that the same discrepancy might occur again, unless the action of selenium and tellurium are well known.

As it may be important to ascertain if a material, say such as sulphuric acid, contains selenium, I would suggest a method which I have been employing as follows:—The absorption medium for the retention of H_2S, &c., is not used, and the gases issuing from the generating flask, after passing through chloride of calcium, enter the heated tube where the hydrides of selenium, tellurium, and sulphur are dissociated, and the elements deposited along with any arsenic. The contents of this tube are first treated with a hot solution of cyanide of potassium, when sulphur and selenium dissolve as sulpho-cyanide and seleno-cyanide of potassium. On treating this solution, first with a little sulphurous acid, and then strong hydrochloric acid, the selenium is deposited, while sulphur remains in solution. Arsenic is unaffected by this treatment, and any tellurium, although it is very unlikely that this element will be present (as I have not yet been able to find it in any commercial product) is very slightly affected. On treating the residue which is insoluble in cyanide, with a solution of hypochlorite of lime, any arsenic that is present dissolves instantly, leaving insoluble tellurium behind, which can then be fused and examined in the usual way.

I had expected to be able to give you a detailed account of some experiments which I have been making, with a view to testing the method in all directions, but the time at my disposal has been so limited that I have been unable to complete the work, and there are one or two points which require further elucidating. I trust, however, that the suggestion may prove of interest to those engaged in this class of work.

In conclusion, I would like to express the opinion when reporting as to the presence of arsenic, that a very much greater distinction ought to be made between quantities that are of pharmacological importance, and the absurd minute traces that are found in almost everything we eat, such as bread, &c. I mention this fact in consequence of some of the statements which one finds made, especially in Lancashire (such as the presence of 1/50,000th part of a grain of arsenic in a gallon of beer).

Discussion.

Mr. David Howard thought the subject one of high importance. The paper was valuable as it pointed out the importance of perfectly clear methods of applying well-known tests. The curious contradictions that had been shown to exist on the question of whether or no the Marsh test discovered the presence of selenium were clearly proved to be due to minute modifications in applying the test, which modifications hardly seemed necessary in themselves, and yet were shown to have a highly important bearing on the question. Whether selenium was or was not poisonous was a more obscure question of toxicology, but it was very important to avoid its presence and to know what one was dealing with and what charges could be brought against anyone who allowed such a product to be in articles of food or medicine. After hearing the paper, he could not help thinking that some obscure results obtained in his own laboratory were probably due to the more or less perfect washing of the gas; and he therefore felt personally grateful to Mr. Berry for his interesting paper.

Mr. Thos. Tyrer agreed to a large extent with what Mr. Howard had said, but thought that the author had rather somewhat exaggerated his case. He recollected clearly that in a recent discussion on arsenic Dr. Messel had said that selenium was removed at the same time and by the same means as the arsenic in the process of sulphuric acid manufacture. If that were so, it was strange that a tube should be handed round that night having all the evidences of the presence of arsenic and selenium in equal degree as the result of heating the tube in the usual way for the production of arsenic mirrors from commercial oil of vitriol. That was a very serious matter, and he could not conceive that a man of the experience of Dr. Messel, and to whom the matter was of vital importance, should make a statement which was apparently in direct contradiction to that made by the author of the paper before them. The question of selenium had been raised early in the discussion on the arsenic in beer controversy, and it had become the duty of all who were interested in manufacturing products of various kinds as nearly as possible pure, to investigate it. In his own laboratory they had not found the presence of selenium a common impurity, as implied by the author of the paper. But they had found some things which indicated that the facts relating to the obtaining of mirrors from arseniuretted hydrogen were not quite to be taken as represented, and therefore it behoved them to be careful, and compare what really happened. The mirror of selenium was red, and when selenium and arsenic were together it was possible by careful examination to say whether it probably contained selenium or not. Absorption by lead acetate solution of proper strength was good for both sulphuretted and seleniuretted hydrogen. In the ordinary Marsh-Berzelius apparatus the drying tube was as usual; then there were added at the anterior position rolls of filter-paper and cotton wool saturated with lead acetate solution. In his opinion these were not sufficient under all circumstances, and greater security was obtained by a washing bulb. There was the possibility of contamination from previously used corks, however sound, and however prepared or coated. The ordinary india-rubber cork was also a probable source of contamination, and therefore Mr. Charles Tyrer had adopted an improved apparatus which would eliminate these sources of error, *viz.*, by having the joints of ground glass-like stoppers. In putting the gases through the modified bulb apparatus containing 10 per cent. of lead acetate solution some curious effects had resulted. These were illustrated by some capillary tubes, drawn out in the usual way, and which were exhibited. For comparison, known quantities of substances in solution were placed in both forms of apparatus, and the mirrors produced by heating the tubes for 15 minutes.

Experiment 1.—Potassium selenide :—

In ordinary apparatus the orange-red selenium mirror was obtained.

In the lead acetate bulb apparatus no selenium mirror was obtained.

Experiment 2.—A solution of arsenious acid was employed, and in both apparatus an equal characteristic arsenic mirror was obtained.

Experiment 3.—A solution of equivalent quantities of arsenious acid and potassium selenide was employed.

In the ordinary apparatus a mirror characteristic of arsenic was obtained in the middle section of the whole mirror, but the anterior portion of the mirror was of a distinctly reddish-brown colour, varying from red to brown as the pure arsenic mirror was reached: this was ve pronounced by reflected light. A peculiarity observed w that the arsenical mirror was sensibly lessened wh selenium was present. Might not this be due to a seleni of arsenic being formed in the generating flask?

In the bulb apparatus the arsenical colour of the mirr was unaffected, although not so intense as in the ordina apparatus with equal quantity, due, possibly, to the cau just mentioned. But the solution of acetate of lead in t bulb became dark, and a distinct precipitate, of what prov to be lead selenide, was produced. So far, in his experien of commercial sulphuric acid over a considerable peric selenium was an exceedingly rare impurity. If, howev further experience showed Mr. Berry's suggestions to be w founded this paper would have done good. He ought add that he had observed that selenium when present selenium or selenic acid gave a mirror only after so time. Silicon hydride gave brown stains and passed throu a heated tube. Tellurium gave no mirror.

Dr. E. Divers wished to add his testimony to t experimental evidence on this subject. His work had be done some years ago and was therefore quite impartial, a it had enabled him to discover the presence of b tellurium and selenium where they had not been suspect before, and it convinced him that Mr. Berry's conclusic were undoubtedly correct. Mr. Tyrer's work also tend to confirm that view, for it showed that selenium a tellurium might be dissolved in the acid, and, if so, wo rise and give their respective deposits. As to the otl point referred to by Mr. Tyrer, namely, Dr. Mess statement that the ordinary process for the purification sulphuric acid removed not only the arsenic but with it selenium also, that he could confirm from a large experie quite independent of the present question.

The Chairman considered that the remarks as to merit of Mr. Berry's paper were amply justified. At same time it must be admitted that the absorption me referred to had now been in use for some months, and was generally acknowledged that they did retain tellurium and selenium evolved, and it therefore should be possible for those bodies to obscure the arsenic mirr His experience showed that there was no difficulty retaining the selenium or tellurium in an absorption ap ratus and letting the arsenic pass. But a far more seri question was raised by Mr. Tyrer, namely, that wh selenium was present the mirror was not so strong a would otherwise be—a fact which he himself had poin out some time ago. Whether the arsenic was evolved in s cases, or was retained in the flask with the zinc, wa question for further investigation. At the same time thought that a great deal too much was being made of selenium question. He had not yet seen any proof t either in beer or in glucose it had in the slightest deg interfered with the usual reaction for arsenic.

Mr. A. E. Berry, in reply, said that with regard Mr. Tyrer's remarks as to the heavy deposits in som the tubes exhibited, the selenium had been first introdu purposely into sulphuric acid in the metallic form, in w it dissolved, forming selenious acid. He did not say the sulphuric acid had been treated for the removal of arsenic. In some cases his object was to obtain as lar deposit as possible, and the test was continued over a period. He had pointed out in his paper that with absorption medium, such as lead acetate, there wa fear of these deposits at all; and his results referred on the action that took place when no absorption media employed.

Mr. R. Stewart observed that some investigations shown that so-called pure tellurium contained selen Perhaps that would account for the red deposit obtaine Mr. Tyrer.

A NEW SYSTEM FOR THE MANUFACTUR OF BORAX AND NITRATES.

BY WM. NEWTON, PH.D., F.I.C.

In the manufacture of borax by boiling crude borate alkali and in the production of refined nitrate "caliche" we have difficult materials to deal with.

ıpossible to heat by fire directly under the boiling tanks cause the large amount of mud settles and would cake ıl cause the bottom plates of the boilers to burn out.

There have been two methods used for heating. The st by blowing in open steam and the second by heating steam coils.

The objection to the first is that towards the end of the eration when a strong solution should be formed the am condensing is really diluting the crystallisable liquor. Heating by steam coils has several objections. The iling tanks being large, in case of nitrate usually 9 ft. 32 by 6, the heating is extremely slow. Consequently re is practically no ebullition, and there is hardly any culation and stirring in the mass of material. The waste heat in this indirect heating is enormous, partly from ling as the steam travels to the boiling tanks, but chiefly waste of heat up the chimney stacks. The hot gases en only partially burn, being lost up the flue at a nperature of 600° C.

To get a thorough stirring in order to produce as rapidly possible saturated liquors, and to utilize all the heating ver of the fuel, I have tried the following process:— fuel is burnt in a closed furnace under forced draught about half an atmosphere. The furnace, apart from ng closed, is an ordinary one except that it contains an a chamber where a further supply of air is forced in roduce complete combustion. The hot gases pass out into a pipe leading to the bottom of the boiling tanks; they are distributed by two or more arms passing ng the bottom of the boiling tank. These arms are forated by numerous holes on their under side. The gases bubble up through the mass of liquid and solid be dissolved, giving up all their heat and causing a ough stirring.

lthough the furnace gases go in at a white heat, by the they have bubbled through the seven or eight feet liquid, they are so cooled that there is no inconence in holding one's hand above the surface of the d. By this means not only the essential stirring is luced, but almost the whole heat value of the fuel is tive.

ı borate manufacture the carbonic acid of the gases is tionally useful in accelerating the complete decompon of the borate of lime.

he highest temperature of the saturated solutions can ery rapidly obtained; if I say in a quarter the time lly needed I am giving a very large margin. efore the plant necessitated can do at least four s the work, and the process is easily applied to the ent system, the saving being not only in fuel and , but also in the cost of the steam coils, which are small item when their numerous repairs with the equent delay and decrease of capability of production ıe plant are taken into account.

ıe only inconvenience in this system is the stoking, he pressure has to be taken off for a few moments e the furnace doors are open. In practice, however, ve not found this a great drawback.

ı the case of liquid fuel, water gas or Mond's gas, &c. slight difficulty could be completely avoided.

ıis form of furnace can be adapted to, and is also ially effective for, rapid and cheap evaporation of ost any liquors not injured by contact with carbonic gas.

DISCUSSION.

r. E. **DIVERS** asked whether the author had not been bled by sulphurous acid from the fuel getting into the tions under treatment.

r. O. **GUTTMANN** said he was glad that Dr. Newton particulars of an invention, for which he applied for tent only a few days ago. The principle involved was lar to that which characterised Kessler's method for entrating sulphuric acid, and Güttler's furnace for the ring of wood, hot generator gases which do not affect naterial to be treated being passed through and the imum heat being thereby utilised. The process seemed im to be quite rational and feasible, and the only back he feared was that Dr. Newton would not always his solutions quite as clear as he wished, and would have to resort to a re-crystallisation. The direct utilisation of fuel was one of those things that engineers were always aiming for, and he considered that the solution of the problem had in this case advanced a great step.

Dr. W. **NEWTON**, in reply, said that with regard to the first objection the sulphurous acid had not led to any serious difficulty in actual practice, at any rate in the case of nitrates; and he did not expect any difficulty in the case of borates either. In no case could its amount be important. With regard to Mr. Guttmann's fears that the solutions would not be sufficiently clear, that was obviated in the case of nitrates by allowing the material to stand a little while; and in the case of borates, they, by the present method, had to be filtered through filter-cloths. The practical difficulties to be encountered were not so great as the speakers seemed to think.

BASIC SUPERPHOSPHATE: ITS PREPARATION AND USE AS A MANURE.

BY JOHN HUGHES, F.I.C.

THE manufacture of superphosphate in this country may be considered to have commenced in 1842, when the late Sir John Bennett Lawes, F.R.S., obtained a patent for treating ground mineral phosphates with sulphuric acid.

The chemical theory then enunciated may be briefly expressed, namely, that the agricultural value of phosphatic manures depended upon the extent to which the phosphoric acid they contained was rendered soluble in water through the aid of sulphuric acid.

It was contended that this solubility in water insured the most complete diffusion through the soil that could possibly be obtained, and this theory in itself is still regarded as correct.

At first the treatment of ground coprolites with commercial sulphuric acid was carried on in a cautious manner, only a portion of the phosphates, amounting perhaps to 20 per cent., was converted into what was known as soluble phosphates, and frequently as much as 8 to 10 per cent. was still left as undissolved phosphates.

The manure so produced was in an excellent dry condition. Indeed in those days complaints respecting damp condition were of rare occurrence.

When acid, however, became cheaper, as the result of improved manufacture, and as competition increased, the utmost amount of soluble phosphate was got out of the manure, so that only 2 or 3 per cent. of phosphate was left in a condition not soluble in water.

Superphosphates then became damper and more acid, so that complaints respecting the condition were of frequent occurrence, because the farmer could not obtain uniform distribution from the manure clogging in the drill.

Superphosphate when first introduced was chiefly applied as a manure for root crops, such as turnips and swedes, which were usually raised on good arable land containing a fair quantity of lime.

Indeed as early as 1863 the late Dr. Augustus Voelcker, writing in the journal of the Royal Agricultural Society upon "Phosphatic Manures for Root Crops," writes:—

"Superphosphates of lime applied to root crops has a different practical effect on different soils.

"The more rapidly and completely the soluble phosphate in commercial superphosphate and turnip manures is precipitated and rendered insoluble in the soil, the more energetic will be its effect upon the turnip crop.

"Purely mineral superphosphates fail to produce good turnip crops on light sandy soils.

"Bone dust partially dissolved by acid is a better manure on light soils than a purely mineral superphosphate.

"It has indeed been observed that the exclusive use of superphosphate, however beneficial it may be in the majority of instances, has in some soils led to the complete or partial failure or the presence of disease in the turnip crop.

"The reconversion of soluble into insoluble phosphate perhaps may appear undesirable, but in reality it is not only beneficial, but absolutely necessary to the healthy and luxuriant development both of turnips and of all other crops to which superphosphate is applied.

"No acid combination as such can enter into plants without doing them serious damage; even free vegetable acids, such as humic and ulmic acids, are injurious to all crops cultivated for food for the use of man or beast; and unless these acids, which are always present in what practical men call sour humus, are neutralised by lime, or marl, or earth, none but the roughest and most innutrious herbage can be grown.

"Free mineral acids are, I believe, still more injurious to all farm crops, and perhaps to all plants, than the free organic acids that are found in humus.

"A very dilute solution of sulphuric acid—say 1 part in 1,000 of water—may be used with advantage for killing grass in gravel walks made with flint or quartz sand; after one or two applications the weeds will be destroyed and will not reappear for a long time.

"But if the walks are made with limestone gravel the application of a much stronger acid has little or no effect on the grass or weeds; after some time the latter indeed seem to grow all the better for having had a taste of dilute sulphuric acid.

"In reality, however, no acid enters these plants, but on coming into contact with the limestone gravel unites with the lime to form that useful fertilizer sulphate of lime or gypsum."

The above paragraphs express the opinion of one who was rightly regarded as an authority upon the properties and application of artificial manures.

In 1875 the Aberdeenshire experiments, conducted by Professor Jamieson, were instituted, and continued for some years.

The published results excited much interest, for they demonstrated by actual field experiments that insoluble, or more properly termed undissolved phosphates, if applied in a finely ground state and in sufficient quantity, were of very considerable value as a manure, whereas according to the previously held theory, they were supposed to possess no practical value at all.

Further, these experiments proved that on certain soils ordinary soluble phosphate, that is to say, phosphate of lime rendered soluble by acid, was not superior in its action to undissolved phosphate to anything like the extent that had hitherto been generally supposed.

Not unnaturally, these results, being opposed to the theory hitherto held, excited a considerable amount of hostile criticism, which, however, time and more extended enquiry has proved to have been unreasonable.

The experiments were carried out at five stations situated in different parts of the county, and the soils are described as being black mould resting upon a granite subsoil, and the analyses show that in every case they were specially deficient in lime.

The figures for lime at these five stations being respectively 0·08, 0·17, 0·21, 0·33, and 0·38 per 100 parts of the dry soil.

Such soils were, in fact, exactly those upon which soluble phosphate, as supplied by superphosphate, would not be likely to exert its full benefit, while the vegetable acids present in the black mould would be certain to dissolve the finely-ground mineral phosphate to a very considerable extent.

In short, the conditions were most favourable to the action of undissolved phosphates, and most unfavourable to the action of dissolved phosphates.

About the year 1883 the now well-known Thomas phosphate powder, prepared from basic slag, was introduced to the agricultural world as an entirely new manure.

At first, agricultural chemists of high repute were disinclined to place any agricultural value upon this material, which was really only the refuse in the manufacture of iron from ores which, by reason of containing much phosphorous and silica, required additional lime to be specially added to remove the same.

Little by little, however, farmers were induced to take small quantities for trial, chiefly on their old grass lands, and the practical results were so good on certain soils, rich in vegetable remains but poor in lime, that scientific authorities were soon compelled to recognise the value this manure when applied to suitable soils.

In this country the importance of fine grinding has bee fully recognised as a test of the probable manurial valu but in Germany Prof. Paul Wagner of the agricultur station of Darmstadt has insisted upon the solubility citric acid as a further test of probable manurial value, a it is to be hoped that the attention recently directed to th test by Mr. F. J. Lloyd will accentuate the importance adopting some such additional test, rather than to confi the examination to a statement of the total phosphate lime and the fineness of the grinding.

The author, however, had already adopted this citr acid method of testing the probable manurial value; b instead of employing the 2 per cent. cold solution of citr acid used by Wagner, or the 1 per cent. cold soluti recommended by Dr. Bernard Dyer in his paper "On t Determination of probably available Mineral Plant Food Soils" (Journal of the Chemical Society, 1894), he prefe to use a solution very much weaker, and in his opini more nearly resembling the acidity of soil water.

The solution employed is 1 in 1,000, namely, 1 gr of citric acid to 1 litre of cold distilled water, taking 1 gr of the slag or ground phosphate, and allowing the same be exhausted with occasional stirring for 24 hours.

On referring to Table I. the relative solubility of fi different kinds of ground phosphate is compared with th of basic slag.

The Peace River, with a fineness of 93·61, shows t highest figures for phosphoric acid dissolved out, nam 9·90 as against 8·70 in the basic slag, but as regards li the latter shows 22·17 as against 15·23 in the former.

The French phosphate, specially rich in carbonate lime, upon which the citric acid first acts, shows 15·34 lime and only 2·85 phosphoric acid.

TABLE I.

Solubility in a Weak Solution of Citric Acid.

1 grm. phosphate powder.
1 grm. citric acid.
1,000 c.c. cold distilled water.

Allowed to stand 24 hours, with occasional stirring; t filtered, the insoluble portion weighed, and the solut analysed.

—	1. French.	2. Algerian.	3. Florida.	4. Tennessee.	5. Peace River.	
Containing phosphate of lime per cent.	50·86	55·99	78·26	79·57	61·23	3
Fine powder passed through 100-hole sieve.	76·21	67·69	72·37	91·63	93·61	8
*Portion soluble in citric acid solution.	30·00	30·00	22·60	22·80	31·40	38
*Containing—						
Lime	15·34	13·66	11·87	11·64	15·23	22
Phosphoric acid.	2·85	6·35	8·25	8·40	9·90	8
Equal to phosphate of lime.	6·22	13·86	18·01	18·34	21·61	1

These results certainly go to prove that much of the g effects of basic slag must be ascribed to the ready sup of lime rather than to the supply of phosphoric a Further, that the solubility in citric acid solution depe upon the character of the phosphate, the fineness of grinding, the strength and quantity of the solvent, and time allowed for the treatment.

It has been stated that ordinary basic slag contain much as 20 per cent. of free caustic lime, but this is not case, and obviously so, because any such excess of l would indicate a wasteful method of manufacture, for l is only added in sufficient quantity to remove the p phorus and silica existing in the original iron ore.

robably 2 or 3 per cent. of caustic lime is the utmost sent, for most of the lime not combined with phosphoric l exists as silicate of lime in a form readily soluble in ık solutions of vegetable acids, but not soluble in inary water, as may be easily demonstrated by actual l.

The Preparation of Basic Superphosphate.—Bearing all before-mentioned points in mind it occurred to the hor that a manure, superior to ordinary basic slag in ırd to its solubility, and at the same time combining its line character, could be prepared by the addition of , preferably slaked lime, to ordinary superphosphate ufficient quantity to convert such acid superphosphate alkaline or basic superphosphate.

xperiments were accordingly made, and it being found the addition of lime in proper proportions did not er the soluble phosphates insoluble in very weak cold tions of citric acid (1 in 1,000), such as might be cted to exist in certain soils, a provisional specification at once filed and eventually a patent was granted.

e preparatien in theory is very simple, but in practice are certain mechanical difficulties to be overcome in r to effect a uniform and complete admixture of the superphosphate with the caustic lime.

e quantity of slaked lime required to be added nds upon its quality and the care with which it has burned in the kiln. No particular degree of purity is ssary, but by preference the best commercially avail- is to be employed.

e original specimen of basic super was prepared from er having the following composition :—

	Per Cent.
Soluble phosphate..................	27·72
Insoluble phosphate................	4·82

is would be regarded as a somewhat wastefully made ty, having nearly 5 per cent. of undissolved phosphate ; was found that a considerable portion of such phos- , though insoluble in ordinary water, was readily le in weak solution of citric acid (1 in 1,000).

out 85 parts of the super were thoroughly mixed with rts of good slaked lime and allowed to remain in a for fully 24 hours. Next day 1 grm. of the manure, with of standard solution containing 1 grm. of citric acid, laced in a large beaker, and, with occasional stirring, allowed to stand for 24 hours, no artificial heat what- being applied. On the following day the solution was d, the portion left insoluble was burned and weighed, he filtrate carefully analysed for lime and phosphoric with the following results :—

ortion soluble in citric acid solution..............	94·70
ortion insoluble (after burning) in citric solution	5·30
ontaining soluble lime	34·66
„ phosphoric acid	12·00
Equal to phosphate of lime............	26·19
ontaining insoluble lime.........................	2·40
„ phosphoric acid.........................	0·65
Equal to phosphate of lime	1·41

cording to calculation the sample so prepared should contained—

Ordinary soluble phosphate	23·56
Ordinary insoluble phosphate	4·09

t the actual results obtained by treatment with the ard citric acid solution were—

Soluble phosphate.........................	26·19
Insoluble phosphate	1·41

sequently 2·68 per cent. of the phosphate originally ble in warm water was found to be readily soluble cold weak citric acid solution employed.

nufacturers hitherto have never been paid anything count of the so-called insoluble phosphate in super- hate.

ıen made from materials like Tennessee rock hate, containing 4 to 4½ per cent. of oxide of iron and na, there must always be a considerable proportion of phosphoric acid retained in a form insoluble in water, but readily soluble in weak vegetable acids, and therefore probably available as plant food.

TABLE II.

Works Samples of Basic Superphosphate as actually prepared in England, Ireland, and Scotland.

——	1.	2.	3.	4.
*Portion soluble in weak citric acid solution.	94·60	94·20	93·00	92·60
Portion insoluble in same (after burning).	5·40	5·80	7·00	7·40
*Containing—				
Soluble lime	33·93	36·73	32·53	29·56
Soluble phosphoric acid.	13·60	13·35	12·00	12·45
Equal to phosphate of lime.	29·68	29·14	26·19	27·18

It is intended that the quality sent out shall average 25 to 27 per cent. of such so-called soluble phosphate, and that the manure shall always have a distinctly alkaline reaction.

Basic super is much more soluble in ordinary water than basic slag, as may be easily ascertained by treating 1 grm. of each with a litre of cold distilled water, allowing the same to remain in contact for 48 hours, with occasional stirring, and subsequently filtering off the insoluble portions and analysing the filtrate as follows :—

TABLE III.

Relative Solubility in Cold Water after 48 hours.

——	Basic Super.	Basic Slag.
*Portion soluble	66·80	6·60
Portion insoluble (after burning)	33·20	93·40
*Containing—		
Soluble lime	22·28	4·70
No phosphate soluble in water.		

These results demonstrate the superior solubility of basic super, and also may explain why basic slag fails on soils which do not contain an excessive proportion of accumulated vegetable matter.

It is not ordinary water, but water largely impregnated with vegetable acids, that is capable of dissolving a hard fused mass like slag. Ordinary water has but a slight action on slag, however finely ground it may be.

In this case the slag was very well ground, having a fineness of 83·88 and containing 38·97 per cent. of phosphate of lime.

TABLE IV.

Comparative Solubility in Ammoniacal Citrate of Ammonia.

Taking 1 grm. of phosphate, 2½ grms. citrate of ammonia, and 100 c.c. water, gradually raised to boiling point and filtered, and the insoluble portion burned and weighed.

——	Basic Super.	Basic Slag.
*Portion soluble	86·70	28·90
Portion insoluble (after burning)	13·30	71·10
*Containing—		
Soluble lime	32·03	14·72
Soluble phosphoric acid.......	10·20	3·35
Equal to phosphate of lime....	22·27	7·31

The above results show that basic super is very readily dissolved by citrate of ammonia solution (slightly ammoniacal), while basic slag is only very slightly dissolved, though containing originally a higher percentage of phosphate of lime.

Mechanical Condition.—As may be expected, the condition of basic super is excellent, being a dry powder easily distributed either by hand or machine; and the farmer need not fear that clogging in the drill, resulting from damp condition, which is such a difficult matter to overcome.

The light bulky character of the material as compared with the heavy nature of slag may be conveniently illustrated by placing the same weight in two ⅝ inch diameter glass tubes, about 1 foot long, when it will be seen that the basic super occupies a space of 11 inches, as compared with only 4½ inches occupied by the basic slag, the relation being as 100 to 40.

This greater bulk in itself ensures a more perfect distribution, and will be appreciated by farmers who have already recognised the difficulty of obtaining a uniform delivery of slag, especially when applied by hand, for the heavy gritty powder falls between the fingers before complete delivery can be effected.

Its use as a Manure.—Basic super is not intended to supersede ordinary superphosphate on good arable land containing plenty of lime, but is intended to be applied on soils that are either deficient in lime or contain an excessive quantity of vegetable acids, such as sour pastures do.

It is also recommended as specially suitable as a fertiliser for turnips grown on land subject to the disease known as "finger and toe."

Manure manufacturers have suffered seriously from competition with basic slag, because on sour grass land acid manures were unsuccessful, but now, by the simple addition of slaked lime, ordinary superphosphate can be converted into a manure particularly adapted to all sour soils.

Field Experiments —Of course, as the provisional specification was only filed on the 1st November last, no field experiments have yet been made, but during the coming season a fair trial will be made upon a great variety of soils throughout the United Kingdom, and upon the results so obtained the future success of the manures will depend.

It may, however, be interesting, and tend to engender confidence in the new manure, if attention is directed to the reports of certain field experiments in which superphosphate and lime were applied separately with most satisfactory results.

In the joint report of Prof. Carruthers and Dr. John Voelcker on the improvement of grass land, published in the Journal of the Royal Agricultural Society for March 1898, the following statement occurs in reference to an experiment in Lincolnshire upon a soil containing only 0·17 per cent. of lime.

The soil is of a very light character, with a subsoil of clay; it is deficient in vegetable matter, and has not much potash, but is fairly supplied with phosphoric acid; and, from the analysis, lime would appear to be the great requisite.

Half the experimental plot was limed in January 1896 at the rate of four tons of lime per acre, and the other half received no lime.

On the limed portion mineral superphosphate was applied in February at the rate of 4 cwt. per acre; and on the unlimed portion, basic slag, at the rate of 8 cwt. per acre, was applied also in February.

The report states that "the entire half that had been limed has shown marked improvement."

"Basic slag used alone has produced more clover, but is hardly as good as mineral superphosphate with lime."

In the Journal of the Board of Agriculture, December 1900, Dr. Somerville, in a paper "On the Influence of Manures on the Production of Mutton," resulting from experiments carried out on Cockle Park Farm, in Northumberland, writes, respecting the grass plot that had received a dressing of 7 cwt. superphosphate in 1897 and 1900, and 10 cwt. of ground lime for 1897 and again for 1899:—

"This is a plot in which the interest increases each season, and this year it merits special notice, as it has produced the greatest aggregate increase of all."

The results are further favourably contrasted with th obtained from two other plots, one of which had recei a dressing of 7 cwt. superphosphate, but no lime; and other had received as much as 4 tons per acre of ordin burned lime, but no superphosphate. He writes:—

"The main reason for this difference in the effect of l is that where used alone its action is limited by the w of phosphates, in which the soil is very deficient; whe in the presence of a phosphatic dressing it is able to e its full, or nearly its full effect."

"On the other hand, phosphates, used alone, have been able to exercise the maximum influence becaus the *want of lime.*"

The practical results obtained by Dr. Somerville ag so well with the opinions expressed by the late Dr. Augus Voelcker in 1863, that the author has a reasonable h that basic superphosphate will prove a useful and econom manure on the particular kinds of soils already mention

Instead of going to the expense of liming a field thoroughly that every square inch of soil shall con sufficient lime to neutralise the acid superphosphate may be afterwards applied, it is proposed to add suffic lime to the super before application, and thus secur very important economical saving both of time and mo

If superphosphate can be thus adapted for applicatio sour soils, a great increase in the demand may in a years be expected.

Moreover, the superphosphate employed may be m from materials containing more oxide of iron and alum than usual.

Phosphates which have once been rendered solubl water by treatment with sulphuric acid are superior, must always remain superior, in their action to all phosphates, which are merely mechanically divided, h ever finely ground.

Though the total phosphates supplied by basic s may be less in actual amount than that existing in ordi basic slag, they will be found much more certain effectual in their results.

Mr. D. Wilson, D.Sc., of Carbeth, Killearn, very t remarked, in a recent lecture on the manuring of f crops: "Artificial manures should be so arranged a yield a profit on the *first crop*, and should be of a qu acting class, and limited in quantity to the requirement the particular crop."

Basic super may be regarded as a quick-acting man and may be used with advantage quite late in the sea with a reasonable expectation that under favourable clim conditions satisfactory and economical results may obtained.

Discussion.

Dr. J. A. **Voelcker** said that not many weeks a lecture had been read to chemical manufacturers, more especially to manufacturers of superphosphate the effect that they must "put their house in or Now they had another warning—they must no longer dissolved phosphates. That seemed to him a retrog step, for when one considered the great benefits to agr turists which had come from the introduction of diss phosphates, one could not but wonder at the propos dissolve phosphate first and then precipitate it agai other words, to go to the trouble of undoing the already done. Mr. Hughes had referred to the labou his (the speaker's) father on the subject; but it necessary to consider the present question in its diff aspects, and to remember also the attitude taken up b late Dr. Voelcker with regard to the comparative valu dissolved and undissolved phosphates. Mr. Hughes referred to one point which the late Dr. Voelcker always insisted upon, *viz.*, the very fine state of divisi the phosphate when superphosphate was washed int soil by rain; but Dr. Voelcker was always decidedly op to the views held by Mr. Jamieson, of Aberdeen, as re the harm done to the soil by the use of superphos On his farm at Woburn he (the speaker) had a plot which had been manured yearly with superphosphat the last 24 years to his own knowledge. That soil h the commencement, a very small amount of lime, 0·2 cent. of carbonate of lime only, but the plot had ne fered from deficiency of lime. There were other plots in same field which had, indeed, so suffered, the lime ving been removed to a very great extent by the conued use of soluble nitrogenous manures. He could not, refore, altogether agree with Mr. Hughes as to the great essity for a manure which had the acid character taken ay by admixture with such a substance as finely ground e. He had certainly come across soils which were so r in lime as to require nothing so much as a good ssing of lime; he had not yet had experience with the material which Mr. Hughes had just introduced, and lid not know whether that purpose might be well served t; but, if so, he ventured to suggest that it could be done iout the necessity of buying a patent manufactured ure. He was not going to discuss the question of citric , and how far it was a test of the availability of phoslic materials; but as they had just heard the use of hot r mentioned for determining the amount of phosphate lable, and had been reminded that it did not occur in soil, he might equally well point out that they did not citric acid in the soil either. With regard to basic he did not think they had yet arrived at a solution of cause of its utility. Attempts had been made to estithis by the solubility in citric acid solution; but there many other things in the soil which might exercise an ence on the solubility of the materials applied to it. would like to have seen some comparison given between slag and basic superphosphate with regard to their ective solubilities in citric acid solutions of different gth. What was the behaviour of each in a solution of trength likely to be met with in soils? It might be for granted that there were soils which were sorely in of lime, and where superphosphate might do harm; e would ask Mr. Hughes where was the advantage of superphosphate mixed with lime as compared with se of a material like precipitated phosphate, which just as soluble in citric acid as was Mr. Hughes' ure. And then, even if it were granted that the mixture dvantages, what was there to prevent the farmer from g the lime and the superphosphate separately and g them together himself? If Mr. Hughes said that a r could not do this, but would be bound to buy a t manure, ready mixed, he (the speaker) had still to that such a patent was of any value when it was taken If the farmer thought it a good thing to neutralise phosphate by lime he would mix the two materials her, patent or no patent. There was, to his mind, a r disadvantage, inasmuch as Mr. Hughes did not ently imitate the action of the soil in the mixing ner of the two materials. If superphosphate was and ground lime added to it, the lime did not through the whole mass, but there was only a superaction, the external portion being neutralised and the left as it was. So one did not get a thorough lisation and distribution of precipitated phosphate y by a mechanical mixing of the ground lime and phosphate. The only advantage apparent to him was here might be some places abroad or in the colonies lime was not obtainable, or where it was so expensive its use in any quantity was practically out of the on. If soils in such places were very deficient in lime ight certainly get some advantage by using lime and phosphate together, but, for that matter, he did not the advantage which the new material had over itated phosphate in this respect, nor why one should t the materials separately and mix them for himself.

. F. J. **Lloyd** said that it was now about a quarter of a ry since any new manure was brought before the ltural world and that was a sufficient reason for ing Mr. Hughes for having brought before them a manure. Whether it would prove of value or not, nly could show. The author had given two reasons it might prove valuable: first, because from the ical tests made there was every reason to suppose he phosphate of lime would be quite as available to ant as the phosphate in superphosphate, and more ble than that in basic slag, which for the last twenty had proved a valuable and effective manure; and, lly, because it was not acid, and therefore suitable for f an acid character or deficient in lime. There was another reason, in his own opinion, why Mr. Hughes's mixture should be a valuable manure. The progress of science in agriculture had of late years been mainly bacteriological. As lecturer on agriculture at King's College, it was his duty to explain why we manure the land. Formerly there were only two reasons: one, to supply a deficiency of any material in the soil; and the other to supply material of a nutritive character to the particular crop to be grown. But science had recently shown a third reason of considerable importance, and one which threw light on the action of manures hitherto difficult to explain. The soil was full of bacteria, and many of the plants grown in the soil were affected by bacteria. These bacteria must be fed in order to carry on the functions of their life. Taking the bacteria most studied, those which produced nitrification in the soil, it had been proved that they were most active in a material of an alkaline nature, and did not act and grow, except slowly, in any material of an acid nature; therefore if one added something to the soil which, while it supplied the plant with one variety of food, also supplied conditions which enabled the bacteria to supply another form of food, and helped the nitrifying organisms to carry on their work, that manure served a double purpose. Basic slag had had that effect, because of the double action brought into play—the supply of nitrogenous matter to the plant as well as phosphatic food. Arguing *a priori*, there was every reason to suppose that this basic superphosphate would have the same effect, and he really believed that they had to thank Mr. Hughes for the introduction of a material of considerable value. It was all very well to say that if the soil contained lime an acid superphosphate did no injury; but they had to deal with the British farmer, and he was a peculiar man. For the last twenty years liming had gone out of fashion, and the soil was deprived of lime as much by the use of nitrogenous manures as by superphosphates. Consequently, the soils of the country were becoming more and more deficient in lime, and an acid superphosphate was not, in his opinion, likely to have the same effect as a basic superphosphate, which gave the farmer the lime and available phosphates at the same time. He would not enter into the question of the estimation of the value of this material; but he did hope, as an official agricultural analyst having to carry out the Fertilisers Act, that those who put the manure on the market would give a distinct guarantee as to what it should contain. He was sure they would find it beneficial to themselves, and it would be a subject for future discussion to determine whether that guarantee was a satisfactory one or not. He felt personally grateful to Mr. Hughes for bringing this valuable communication forward.

Mr. J. **Ruffle** agreed with the last speaker. He was not surprised that Dr. Voelcker should throw cold water on this new idea, for it was just what happened on the introduction of basic slag 20 years ago. One after another the authorities refused to have anything to do with it, and he got a wigging because he suggested that it would have a manurial value. The fact was that basic slag had become a very useful manure both in England and on the continent. Dr. Voelcker asked, Why should not a farmer take his superphosphate and add lime to it himself? He might, but he would not do it so well as a manufacturer. But would one gain anything by taking superphosphate and adding lime to it? He ventured to think one would, wherever an alkaline phosphate would be useful; also because the ordinary acid superphosphate was, after all, not on the average in a very fine condition; it would hardly go through a 10-hole sieve. But after mixing it with lime, one could send the mixture through a 30- or 40-hole sieve. Taking the relative surfaces which the increased fineness yielded, one would find very great advantage by that superior subdivision, so that in many cases it would be found quite equal to the ordinary acid superphosphate, even where this article was successfully used. One advantage it had was that it was more readily distributed, and that it would allow of the simultaneous use of nitrate of soda, and where it was desirable to put them together that could be done. One point had not been touched upon which he thought the makers of this article would find desirable, namely, the degree of hydration of the lime to be added to the superphosphate. If they took quicklime and added it after grinding, they would get tricalcic phosphate, but if they hydrated it with as much water as it would carry, they would get a finely divided powder; this, added as Mr. Hughes directed, was one that produced a hydrated mono- or dicalcic phosphate which was far more soluble. Therefore he suggested that they should take a lime that would take two-thirds of its weight of water, and hydrate it at that rate, this would break down readily. If they took lime and water in those proportions, namely, one of lime (CaO) to two of water (H_2O), when added to the superphosphate it would form a body which would be more soluble than with a greater number of molecules of lime (CaO) only. He believed it would prove to be more valuable as a manure than even basic slag had been.

Dr. Bernard Dyer said that it was interesting to think that the author of the paper before them, Dr. Voelcker, Mr. Lloyd, Mr. Ruffle, and himself were all old pupils of the same grand old master, and he could not help thinking that most of what was best in the knowledge of all of them had been derived from him. For really the quotations that Mr. Hughes had made from the early paper by Dr. Voelcker went to the heart of this matter. The great value of a superphosphate lay in its diffusibility, and the utmost value to be derived from this quality could only be realised in those soils which had a satisfactory proportion of carbonate of lime. He had tried to persuade farmers to use more discrimination as to the kind of phosphatic manure they employed, and had laid it down as a rule for guidance that if they had a soil that would effervesce when hydrochloric acid was poured on it, an acid or dissolved phosphatic manure was the most valuable one they could use; but that when no such effervescence took place they should have resource to some other form, such as bone-meal, guano, or basic slag. There was another material which was manufactured to a large extent some years ago, and was referred to by Dr. Voelcker, namely, precipitated phosphate. Large quantities of it were made on the Rhine by precipitating a solution of phosphoric acid with lime, and it was suitable for use on soils which were deficient in lime. What Mr. Hughes made was precipitated phosphate. He felt inclined to quarrel with his term "basic." He really made a precipitated phosphate, and he probably made it more cheaply by this "dry" process than it could be made by the "wet" method of precipitation. But the manufacture of precipitated phosphate by the "wet" process had almost entirely disappeared since the efficacy of basic slag had been recognised, and basic slag had quite taken its place. That fact was presumably due to questions of cost. The question now was whether it was more economical to dissolve phosphate by the process of Mr. Hughes, and then use lime to neutralise it. He took it that the unit price of the phosphoric acid in this material would be higher than in some other forms of manure; and they had yet to learn whether it was so much more useful as to warrant that higher price. Following the teaching of Dr. Voelcker, he had recommended farmers having soils poor in lime to buy superphosphate and bone-meal, and make a compost of it and so neutralise it. It occurred to him that it might possibly be more economical to use finely ground phosphate itself instead of lime. One would thus be retaining in an available form all the phosphate already dissolved, and the free phosphoric acid which existed in the phosphate would react on the fresh quantity make some of that available, as well as being itself converted into the non-acid form. What Mr. Lloyd had said with regard to farmers being reluctant to use lime was quite true. He did not think, however, it was due to obstinacy, but rather to poverty; for to lime soil in some districts was very expensive, and in the present time the farmer had to look at every source of expense. He had no doubt that Mr. Hughes' mixture would be a very useful and valuable manure; his only doubt was as to its economy. He had shown it to be more soluble than slag phosphate in such weak solutions of citric acid as he had taken; but he feared that if he took acids of such strength as were used on the continent those great differences would disappear. As to the doubt which Dr. Voelcker had
thrown on the validity of Mr. Hughes' patent, he w
not like to express an opinion. Patent law was
complicated, and there was no knowing what the resu
litigation on such a subject might be. He should t
the case would go right up to the House of Lords,
that a great many experts would be found on each si
the question.

Mr. A. G. Bloxam presumed that the 27·7 solub
Mr. Hughes' table represented that percentage of trical
phosphate rendered soluble. Mr. Hughes treated the
sample of superphosphate with lime, and found 94 per
soluble in citric acid. Did he mean to say that the cal
sulphate and all dissolved up? If so, the compar
appeared to the speaker to be valueless. Then, with re
to that same determination, the sample mixed with
was washed with water and citric acid, the soluble m
weighed, and the residue ignited and weighed; the v
then added up to 100. Was that so?

Mr. Hughes replied that it was so.

Mr. D. A. Louis said it might interest the meetir
hear the views of one who had not had the advantag
being in the late Dr. Voelcker's laboratory. Some
ago, however, he had been in the laboratory at Rotham
and he remembered the position taken up by Dr. Aug
Voelcker, Sir John Lawes, and Sir Henry Gilbert in
nection with basic slag. They all persistently set
faces against it, considered it absolutely valueless,
even refused for some time to experiment with it. It
thought to contain deleterious ingredients, and the
phoric acid to be in an unsuitable condition, and th
could be valuable as a plant food seemed to the
impossibility. He remembered discussing the su
with Dr. John Voelcker some years ago, who,
considered it quite worthless. In course of time,
ever, all these gentlemen came to recognise basic
as an important manurial agent. That fact showe
position that some of our dear old agricultural friends
liable to take up when anything novel was presented to
although one would think it would be wiser to sus
judgment until experimental evidence was forthco
By Mr. Hughes' suggestion it seemed that a factor
rendered superphosphates unsuitable for certain soils
removed in a very simple manner, and at the same
yielded a mixture in a convenient form for use on the
which, moreover, on the face of it, might prove of
manurial value; but, of course, this point could on
decided by trustworthy experiments, to which the spe
amongst others, would look forward with interest.
chemists, of course, they must all admit that in
mixtures they had sulphuric acid, phosphoric aci
lime, and these bodies had always been the consti
of such artificial manures from the beginning.
Mr. Hughes told him of his invention, it struck hin
the proposal was somewhat retrogressive, and he sug
that to him; and further, that on putting lime in
manure the phosphoric acid would possibly assu
reverted condition, that was, go back to tribasic phos
However, in practice things did not always happen
expected them to happen, and so perhaps in this ca
expected might not happen. He would like to as
Hughes how long the mixture given on the table had
prepared, so as to yield 66·8 of soluble matter, ma
as if it consisted of phosphate, it would at once put
court Dr Dyer's argument, as there was no dibasic
phate that would give that solubility in water.

Mr. Hughes: Table III. represents the portion s
in water. The whole of the phosphates were re
insoluble in water, and therefore it did not appear
table.

Mr. Louis, continuing, said if that were the case Dr.
contention might be right. Then there was the othe
mentioned by Mr. Lloyd, and admitted by all who
that without any doubt it was valuable to add lime i
soils; and, as Dr. Voelcker held, the farmer might
to buy the lime and phosphate separately and mix
himself; but the farmer would not do that; he liked
made easy for him, and liked to buy his materials
for use as "wheat manure," "barley manure," and so
The farmer, for want of means, would not put lime

out he knew that he must put some phosphate; and
could conveniently buy the lime at a moderate price
with the phosphate, he would very likely do so,
ially if he got it in a form convenient for handling,
could by one sowing and one expenditure introduce
aluable factors into his soil. He was sorry to learn
the author that the 66·8 was not the material one
l have liked to see soluble and suitable for plant food,
h it might prove suitable for Mr. Lloyd's bacteria,
robably do good in that way.

te.—At the time of speaking Mr. Louis was not aware
fact that excess of lime was employed in Mr. Hughes'
re.

Chairman had no wish to stand as umpire between
ntending parties. No doubt each of these materials
s value in the right place, and each of them was
in the wrong place. If Mr. Hughes's mixture could
le at such a price as to be as cheap as other phos-
, he thought it had a considerable future before it. But
e considered that first in the making of the super-
ate the original raw phosphate got diluted by
ric acid, and then still further diluted by the addition
e, the net result was a mixture containing only a
of the tribasic calcium phosphate present in the
aterial; and it was difficult to see how such a mixture
ompete with a material like Thomas slag, which had
undergo these processes of dilution. Assuming that
terial of Mr. Hughes was more soluble and more
e than soluble Thomas meal, the question was, how
uch a material, which had to stand the cost of grind-
atment with sulphuric acid, lime, and carriage on a
percentage of phosphoric acid, hope to compete
sic slag? If, however, Mr. Hughes could give
ory assurances on that point he had rendered a
to agriculture.

uffle said that Dr. Voelcker had referred to the
ted phosphate made on the Rhine, and had ques-
whether Mr. Hughes' material would be able to
with it. Was that precipitated phosphate hy-
He believed it was a very rich tricalcic phosphate,
hydrated. Mr. Hughes' proposal really was to
hydrated P_2O_5 in the superphosphate; to that he
ydrated lime, and thus got a hydrated compound
horic acid and lime. Would not that hydration
such a start of superiority that it would answer
e precipitated phosphate would not?

hairman: Does Mr. Ruffle assume that a different
d would be obtained by adding calcium hydroxide
f calcium oxide? Is there any chemical evidence
ffect? No matter what form the lime may be in,
product would probably result.

uffle said he thought one would get Mr. Hughes's
d by putting 15 to 20 per cent. of hydrated lime.
ld want more than that to form a tricalcic phos-
ut by adding 17 per cent. one got a phosphate
ad some water and some lime. In fact, Hughes
an alkaline hydrated dicalcium phosphate in the
sphate (P_2O_5.CaO, CaO, H_2O, *plus* a slight excess
H_2O for alkalinity).

ewart remarked that if one added calcium oxide
s a danger of forming pyrophosphate of lime. Did
hes confine himself to producing dibasic phosphate?
e just sufficient lime to form two of CaO to one of

ughes, in reply, said he was pleased to find that he
little to answer. Dr. Voelcker had suggested that
ould add lime to superphosphate themselves. They
te welcome to do so, for it would increase the sale
hosphate; but they would find a difficulty in pre-
perfectly uniform mixture. Further, it was a fact
ose parts of the country where lime did not occur
ent quantity in the soil, the farmer would have to
it from a distance and at considerable cost; there-
application of lime where it was most required was
neglected. Moreover, instead of purchasing super-
e and lime separately, the farmer could purchase
er, and so supply both available phosphates and
e dressing. With regard to precipitated phosphate, which had been referred to, it was well known that it was an expensive material, prepared by a *wet* process, whereas basic super was a comparatively cheap material prepared as a *dry* mixing, so that any manufacturer could make it; consequently there was no fear of competition with precipitated phosphate. Bearing in mind the opposition that basic slag had originally met with at the hands of scientific men, and knowing the immense quantities of it that were now used, he took encouragement that even if his material met with similar opposition now, he felt confident that the practical results in the field would be satisfactory.

Dr. Voelcker, interposing, said he thought it ought in justice to be pointed out that basic slag as it was known now was a very different body from the slag that was first introduced, and the results now obtained could not have been obtained by the material then condemned and rightly condemned.

Mr. Hughes, resuming, said that the only improvement that had taken place in the quality of slag was due to improved grinding; and he would like to refer to Table I., in which the Peace River phosphate, with a grinding of 93·61 fineness, actually showed a greater amount of phosphate of lime dissolved by the weak solution of citric acid than was shown by the basic slag, the figures being 21·61 as against 18·99. He ventured to think that had the Aberdeenshire experiments been carried out more extensively in this country the actual value of finely ground raw phosphates would have been demonstrated long ago. Basic slag being, however, introduced just when these experiments in the north had terminated, attention was naturally concentrated upon it, especially as the cost was then so low, and it naturally became the favoured material for field experiments, with increasing success; though as will be seen from Table I., its solubility was greatly inferior to that of basic super.

Dr. Dyer: But the solubility of basic slag in a stronger solution, such as 1 per cent., was much greater than that referred to in Table I.

Mr. Hughes, continuing, said no doubt a 1 in 100 solution would dissolve out more than his weaker solution, 1 to 1,000; but the relative solubility was still against basic slag and in favour of basic super, as the following figures clearly indicated:—

Comparison of Solubility.

1 grm. of each of these materials was treated respectively with 200 c.c of 1 per cent. solution of citric acid, 400 c.c. of 0·5 per cent., 1,000 c.c. of 0·1 per cent., and 2,000 c.c. of 0·05 per cent.; allowed to stand 24 hours, with occasional stirring.

—	Basic Super.	Basic Slag.
Portion soluble in 200 c.c. 1 per cent.	94·70	64·70
" " 400 " 0·5 "	95·30	54·50
" " 1,000 " 0·1 "	95·70	38·30
" " 2,000 " 0·05 "	92·40	30·30

It would be seen that while the solubility of the basic super remained practically constant up to a dilution of only one part of citric acid in 2,000 parts cold water, the solubility of the basic slag declined with the dilution enormously. He could not agree with Dr. Dyer's suggestion that perhaps it would be more economical to use ground phosphate instead of slaked lime. The lime was hydrated and in a very soluble form, whereas the raw ground phosphate would be coarse or fine according to the grinding, and the action of the acid in the superphosphate would be directed rather upon the carbonate of lime than upon the phosphate of lime. In conclusion he would say that the new manure must stand upon its own merits; and it only remained for him to thank those gentlemen who had supported him in expressing their opinion that the manure would prove useful. Experience had shown that basic slag was a very valuable manure, and if his manure was still more soluble and rapidly available, as was indicated by its much greater solubility in the particularly weak solution of citric acid (1 in 1,000), he had every reason to hope that the field experiments would prove it to be a quick-acting and reliable manure, which was just what the farmer wanted.

Manchester Section.

Meeting held on Tuesday, April 2nd, 1901.

DR. J. GROSSMANN IN THE CHAIR.

DISCUSSION ON THE NEED OF A STANDARD TEST FOR ARSENIC.

The CHAIRMAN, in opening the discussion, said that in future it would be necessary to examine for arsenic a great number of substances in which that poison had not hitherto been looked for, especially those which had been prepared by means of sulphuric and hydrochloric acids. But, as arsenic was so widely spread, and could be detected in such small quantities, an ordinary qualitative test would be useless, as it would reveal arsenic in almost every article of commerce. It would therefore be necessary to determine quantitatively the amount of arsenic present, so as to form in each case an opinion whether the quantity entering the human system, within certain limits, might be dangerous to health or not. Assuming that $\frac{1}{20}$ grain of arsenic might be taken daily for weeks with safety, and that the line between a large consumer of beer and a drunkard were drawn at one gallon per day—a very liberal allowance—they could not go far wrong in passing a beer at anything under $\frac{1}{20}$ grain of arsenic per gallon. Anyone taking more than a gallon per day would have to suffer for it in any case, and it would be doing arsenic an injustice to blame it for any evil consequences that would be likely to arise in such a case of over-indulgence. But in order to fix the quantities of arsenic which might be allowable in different foods they must have command of a fairly quick, accurate, and simple quantitative test, and preferably one which should be adopted by the chemical and medical professions as a standard one. Such a test was not yet known, and it was a matter worthy of the attention of that Section to assist, as far as it lay in their power, in finding such a test. In his opinion neither Reinsch's nor Marsh's test were originally intended for quantitative tests. As these tests were used at present, they were liable to be extremely fallacious when used quantitatively. But a combination of the two might possibly lead to satisfactory results, and though he had been disappointed in one direction, he had been confirmed in his views in another. His idea was to submit the liquor contaminated with arsenic to Reinsch's test, so as to deposit the arsenic on the copper foil in the usual manner. The foil was then well washed with distilled water, and treated with strong nitric acid, so as to oxidise the arsenic which had been deposited, to arsenic acid, and also to dissolve the excess of copper. To this solution, containing nitrate of copper and arsenic acid, pure caustic alkali was added in excess, so as to remove the copper and any antimony that might have been deposited along with the arsenic, and the solution made up to a definite volume. The excess of alkali in the filtered liquor was then exactly neutralised with pure nitric acid. This solution, containing all the arsenic as arseniate of potash, he tried to nesslerise by means of magnesia mixture, and also by means of a copper solution, but without any satisfactory results. Reliable results might, however, be obtained by the application of Marsh's test to this solution, containing the arsenic as arseniate of potash, viz., by adding this solution to the Marsh's apparatus in such a quantity as to produce a mirror or stain which could be compared with that obtained from a standard solution of arsenic treated in the same manner.

He would suggest that a committee be formed, similar to the one in connection with the London Section, for the purpose of considering the best means of arriving at a good standard test; that members be invited to send in proposals as to methods of analysis. The committee would then appoint a certain number amongst them to try these and report upon them.

This suggestion was supported by Dr. Langdo Messrs. Carter Bell, Royle, and Stenhouse, and i resolved :—

"That the Chairman, Messrs. J. Carter Bell, Thomson, C. Estcourt, H. Bowes, and Dr. A. K. Mill appointed a committee, with power to add to their nu to decide on the best method of determining arsenic i and drugs, and duly report on same to this Sectio invite proposals as to methods."

NOTES ON INDIGO.

BY HERBERT LEVINSTEIN, B.SC., PH.D.

MY purpose in coming here to-night is to give you notes on the general methods adopted or suggested f commercial production of artificial indigo. I shal with the actual details of manufacture and of the app employed in the various and complicated processe another occasion.

Let me recall to your mind that artificial indigo fi the light of day when it was made by Baeyer from as far back as 1870, though the synthesis was only completed in 1878, when isatine itself was produced *o*-nitrophenylacetic acid.

From that day the Badische Anilin und Soda occupied themselves with the technical production substance, yet it was only in the middle of 18 artificial indigo was brought on to the market in bulk

Twenty years of incessant research have been nec before any success was obtained.

Of the numerous methods of preparing indigo, b have been or are being tried on the large scale; a the two methods, due to Baeyer, in which (1) cinnamic acid and (2) *o*-nitrobenzaldehyde are used products; and the methods of (3) Heumann and (4) meyer.

(1) With regard to the first of these methods the o-nitrocinnamic acid proved too expensive, prin owing to the difficulty of finding a use for the i *p*-nitrocinnamic acid, whose formation it was not possible to avoid.

(2) The second method, whereby indigo is pro condensing *o*-nitrobenzaldehyde with acetone, wo the method *par excellence* were *o*-nitrobenzalde cheap substance, for a yield of indigo is obtained 70 per cent. of that which is theoretically possible.

o-Nitrophenyllactic acid ketone, the intermedia produced by the action of acetone on *o*-nitrobenza has actually been on the market since 1893, in the its bisulphite compound.

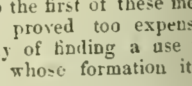
Under the name of Kalle's salt, it has found a application in indigo printing.

Last year a very important advance was made preparation of *o*-nitrobenzaldehyde.

The best process up to that date belonged to Meister, Lucius und Brüning, who prepared it from toluene by a very complicated method, involving four chemically distinct processes.

o-Nitrotoluene was converted into *o*-nitrobenzyl by chlorination, then condensed with aniline, and, oxidised to the corresponding benzylidine derivati

This body, of the following formula :—



$$\begin{array}{l}C_6H_4\text{—}CH : NC_6H_5\\ \;\;|\\ NO_2\end{array}$$

was finally split up into *o*-nitrobenzaldehyde and a the action of dilute acids.

However, a French firm, the Société des Usines d very much simplified the preparation, and obtain satisfactory yield of o-nitrobenzaldehyde by oxidising *o*-nitrotoluene, in one operation, by manganese dioxide.

Their patents include the preparation of two methyl indigos from the two *o*-nitrotolylaldehyde they obtain in a precisely analogous manner by the of the *o*-nitroxylidines.

eister, Lucius und Brüning have acquired the use of patents.

iteresting as this method is, it has not yet attained great tical value.

r. Brunck, of the Badische, has pointed out that by this iod natural indigo could never be entirely replaced g to the limited supply of toluene, which, according to lgures, averages annually but 5,000—6,000 tons.

ow the production of indigo is about 5,000—6,000 tons, even by the new process about 4 tons of toluene are red to produce 1 ton of indigo.

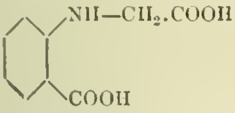
owever, even if we accept the view that the process is iis reason not adapted to entirely replace the indigo , its use on a large scale is feasible.

) At the present moment the only process which is lly competing with the natural method is the improved od of Heumann, the late professor at the Zürich echnical Institute. Originally, as is well known, nann's process consisted (i) in condensing aniline chloracetic acid, and (ii) melting the phenylglycocoll, is thereby produced, with alkali.

oxyl is formed, and readily converted into indigo by idation of the air.

subsequently modified by the inventor, and now d out by the Badische, the process is somewhat ent.

hranilic acid, and not aniline, is condensed with chloracid, since phenylglycocoll-*o*-carboxylic acid—



a more satisfactory yield of indigo than does glycocoll itself.

ıranilic acid is made from phthalic acid and c acid from naphthalene.

ordingly the primary substance for the technical tion of artificial indigo is now naphthalene.

Brunck, of the Badische, lays great stress upon the so that, with your permission, I shall quote the someemarkable statements that he makes with reference substance in a recent paper read before the German cal Society.

th phthalic acid as the raw product for anthranilic naphthalene became the primary product in the sis of indigo, and thereby a secure basis for the pro- of indigo on the large scale was attained. From oment I have been firmly convinced that our great would be attained; namely, the substitution of l indigo for the natural product.

e coal-tar which is annually worked up to hydros contains 40,000 to 50,000 tons of naphthalene, of only 15,000 have hitherto been isolated, since they fficient to satisfy the demand of the world. Therefore at ,000 tons remain at the disposal of the indigo manur, which could be isolated in the same way and at the ost as the above-mentioned 15,000 tons. This y of naphthalene is more than sufficient for the tion of the world's consumption of indigo."

tly speaking, Dr. Brunck is not quite accurate in that these additional 25,000 tons could be produced same cost as the naphthalene now produced, good proportion of the pure naphthalene on the is manufactured from the crude salts which ıeously crystallise out of the creosote oil, and which ily be recovered.

further quantity of naphthalene must be obtained e creosote oil by special methods involving greater

y saying that the cost of producing these 25,000 naphthalene would not be greater than that of ng the 15,000 tons already on the market, nck obviously implies that the price would also be te.

s a serious error.

The best proof lies in the fact that after only a comparatively small purchase by the Badische the price of pure naphthalene went up from 5*l*. 10*s*. to about 10*l*.

Do not think that this is an unduly inflated price due to a temporary cornering of the market.

It does not pay manufacturers to isolate and purify naphthalene at a price considerably below 10*l*., and even at this price many distillers of creosote oil are unwilling to erect the special plant required for the purpose.

If more naphthalene is required there will therefore be a further rise in price.

This rise has taken place when the price of creosote oil was particularly low.

What the price of naphthalene would be if the Badische supplied the whole world with indigo is an interesting speculation for all of us, and must give food for thought to the planters.

The fact is that when the price was 5*l*. 10*s*., the only pure napthalene on the market was prepared from one of two sources: either, as already mentioned, from the crude salts which had spontaneously crystallised out of the creosote oil, and which could be isolated at a very small cost; or that which the manufacturers of creosote oil were bound by contract to remove from the oil against their will and inclination. But to return to our subject.

(*a*) Phthalic acid is produced by dissolving pure naphthalene in fuming sulphuric acid and then distilling the solution in the presence of the mercury.

The utility of the latter substance was discovered by the accidental breakage of a mercury thermometer.

The great point is the recovery of the 35,000–40,000 tons of SO_2 which are annually produced by this oxidation of the naphthalene, and their re-conversion into SO_3 by the Cl. Winkler contact process.

(*b*) The anhydride of phthalic acid obtained in this manner, after purification, is treated with ammonia under pressure, and thereby converted into phthalimide.

(*c*) By the action of chlorine and alkali, phthalimide easily goes over into anthranilic acid, in accordance with the general reaction associated with the name of A. W. Hofmann.

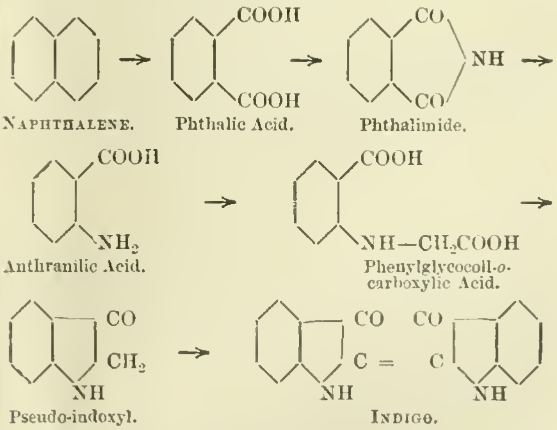
(*d*) This body is now condensed with chloracetic acid, whereby phenylglycocoll-*o*-carboxylic acid is produced.

(*e*) Phenylglycocoll-*o*-carboxylic acid is converted into its sodium salt, and then melted with finely powdered caustic soda.

The melt is then treated with water and a current of air.

Indigo separates, and is filtered off, pressed, and dried.

The following formulæ represent the chemical changes which occur in the course of the process:—



The preparation of chloracetic acid is an important part of the process.

No less than 2,000 tons of acetic acid are already annually chlorinated. An enormous quantity of very concentrated chlorine is required.

This want is satisfied by the Griesheim electrolytic method, though the chlorine must be subsequently purified by liquefaction.

It is of interest to chemical manufacturers to reflect that the commercial preparation of artificial indigo was dependent on a complete change in two of the oldest chemical industries—the manufacture of chlorine and of sulphuric acid.

(4) Very different is the extraordinary process discovered by Sandmeyer, and patented by Messrs. Geigy, of Bâle, in 1889.

This process may turn out to be a more dangerous foe to natural indigo than that of the Badische.

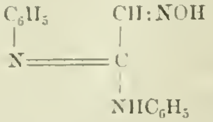
Starting from aniline the materials used are carbon disulphide, potassium cyanide, spirits, white lead, ammonium sulphide, and sulphuric acid.

The price of potassium cyanide is about 1s. a lb., and the cyanide used is quite destroyed.

If a cyanide process were invented which would bring the price of KCN to 3*d.* or 4*d.*, the process would have a chance of success, for the reactions go smoothly and the yields are good.

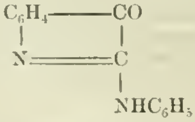
The patentees regard it even now with great confidence, and a large amount of money has been invested in plant and machinery.

Sandmeyer discovered that when aniline was treated with chloral in the presence of hydroxylamine a very peculiar body was obtained, of the following constitution:—



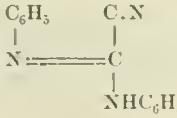
$$\begin{array}{ccc} C_6H_5 & & CH{:}NOH \\ | & & | \\ N & = & C \\ & & | \\ & & NHC_6H_5 \end{array}$$

which, on treatment with concentrated sulphuric acid at 90°, was converted into the hitherto unknown α-anilide of isatine—



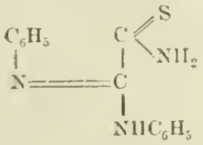
$$\begin{array}{ccc} C_6H_4 & — & CO \\ | & & | \\ N & = & C \\ & & | \\ & & NHC_6H_5 \end{array}$$

Sandmeyer shortly afterwards discovered that the very expensive oxime formulated above could be substituted by the corresponding nitrile, which is identical with Laubenheimer's hydrocyancarbodiphenylimide (Ber. XIII. 2155).



$$\begin{array}{ccc} C_6H_5 & & C.N \\ | & & | \\ N & = & C \\ & & | \\ & & NHC_6H_5 \end{array}$$

(*a*) An almost quantitative yield of α-isatanilide is obtained when this nitrile is reduced with ammonium sulphide to a thioamide of the following constitution:—



before it is treated with concentrated sulphuric acid at 90°.

(*b*) A good yield of the nitrile itself is obtained in one operation by treating thiocarbanilide with potassium cyanide and white lead in aqueous solution.

(*c*) Thiocarbanilide, as is well known, can be prepared by merely boiling aniline with CS_2.

The value of α-isatanilide lies in the fact that it is easily converted into indigo by the action of ammonium sulphide, and into isatin by the action of dilute acids.

It is well known that commercial indigo is a variable mixture, containing, amongst other bodies, indigo red and indigo gluten.

It is claimed—with what truth I know not—that for the dyeing of wool the fastness and the depths of shade produced are to a considerable extent dependent on the presence of these two bodies—in particular of indigo red.

If this be indeed the case, then Sandmeyer's process b a very great advantage over the other synthetic metho which do not simultaneously produce indigo red; for, reducing α-isatanilide in the presence of isatin by mea of ammonium sulphide, indigo red can be produced at wil

I have now put before you, in brief, the methods by whi the synthetical production of indigo on the large scale being attempted, as well as the method by which this already been actually carried out.

The great complexity of the latter manufacture, number of different processes involved before naphthale is finally converted into indigo, must have forcibly i pressed you.

The manufacture of SO_3, the preparation of phth acid, the intermediate production of phthalimide and conversion to anthranilic acid, the preparation of chlor and of chloracetic acid, the condensation to phenylgly coll-*o*-carboxylic acid, and the final conversion into ind are alone eight chemically distinct operations, several which are in themselves important manufactures.

The extreme difficulty of making a body obtained by much toil compete in price with that bountifully bestow by nature is obvious.

Consider only the enormous depreciation in value of apparatus in which fuming sulphuric acid or chlorine caustic soda are continuously used at high temperatu Consider, too, the fluctuating and uncertain price of the materials.

The price of naphthalene has already nearly doub whilst the largest source of supply has just advanced price of pyrites from 3¾*d.* per unit to 5*d.* per unit for a year's delivery. It seems probable, indeed, that difficulties of this manufacture render the Badische incapa of making further substantial reduction in the price artificial indigo. On the other hand, scientific meth have been applied to the cultivation and extraction of indigo plant. A great reduction in the cost of produc natural indigo is already assured.

Let these improvements be but generally adopted, let planters but meet the occasion with energy and determi tion, and the complete substitution of the indigo pl by the artificial product will remain a doubtful problematical event.

New York Section.

Meeting held on Friday, March 22nd, 1901.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

CHAIRMAN'S ADDRESS.

UNIFORMITY IN TECHNICAL ANALYSIS.

BY CLIFFORD RICHARDSON.

The subject which I am bringing to your attention evening is by no means a new one. The question of to attain greater uniformity in methods and results a analysts, and especially among technical analysts, the payment of large sums of money is dependent on work, has been discussed again and again.

I am anxious only to show in this connection wha been actually accomplished in certain directions b operation, and to suggest the extension of this wo other fields under the auspices of our section, at fi course, in a very simple way, to arouse interest i subject and later extending the field as the demand ar

The difficulties to be met and overcome in arriv accuracy and uniformity in analytical work have stated in several addresses and papers which have ap in the last ten years, and which are probably well k to you.

Dr. C. B. Dudley, in September 1892, took as the theme of his address before the Chemical Section of the Engineers' Society of Western Pennsylvania, "Discrepancy in Chemical Work by different Workers" (this Journal, 1893, 379). He showed that the astonishing discrepancies at that time o be found in the work of different analysts upon upposedly the same sample of steel might be attributed ither to lack of uniformity in the samples upon which the vork was done, to impurities in the re-agents used, to lack of uniformity or carelessness in manipulation, or to the nethods employed. The same subject was elaborated by Dr. Dudley in conjunction with Mr. F. N. Pease, in the orm of a paper which was read at the Worlds Congress of Chemists at Chicago, August 21st, 1893, and published in he Journal of the American Chemical Society, 1893, **15**, 01, and which I would urge everyone interested in the ubject to read, although it applies principally to the nalysis of iron and steel.

Hans Freiherr von Jüptner, in May 1896, addressed the ron and Steel Institute of Great Britain on "The Introuction of Uniform Methods of Analysis" in that industry. e went over much the same ground as the preceding uthors and attributed the difficulties and lack of uniformity hich have been met to—

(1) Gross errors of analysis.
(2) Impure re-agents.
(3) Defects in apparatus.
(4) Defects in manipulation.
(5) Defects in analytical methods.
(6) Personal errors.
(7) Errors caused by unsatisfactory factors in use in calculating results, due to inaccuracy in the accepted values for the atomic weights of well known elements.
(8) Lack of uniformity of samples.

In his address, as Vice Chairman, to the Manchester ection of the Society of Chemical Industry in 1899, Dr. J. rossman spoke most interestingly "On the Limits of curacy in Technical Analysis" (this Journal, 1899, 977). considers the constant and incidental errors which may ect results and agrees with Jüptner as to the causes. He kes the point that, with our ordinary balance weights d atmospheric conditions, weighings are not accurate to fourth decimal of a gram, in consequence of which, the ond decimal of the percentage composition is inaccurate l had better be abandoned in most results where only one m of material is taken for analysis, and that in calcuing results we use atomic weights which are better reced by factors obtained by check analyses conducted h materials of known composition under parallel ditions.

Dr. W. F. Hillebrand, in Bulletin No. 148 of The U.S. ological Survey, in discussing "Some Principles and thods of Analysis applied to Silicate Rocks," has also own the causes of lack of uniformity and accuracy arising rock analysis. Many members of the Section could, no ubt, cite other articles on the same subject, but it is hardly essary.

With all these possibilities of inaccuracy before us is it worth while to see what has been or can be accomhed towards avoiding some of them. More numerous more successful attempts in this direction have probably n made in this country than elsewhere, although the rmans have for many years endeavoured to attain formity in the analysis of fertilisers, and the iron and l chemists the world over have endeavoured to get ether in their particular field.

The initiative in this respect in the United States may be l to have been a convention held at the United States partment of Agriculture on July 28th, 1880, in response a call issued by the Commissioner of Agriculture of rgia, Hon. J. T. Henderson, the experience of the vious season, with the variations in the results of the lyses of the same commercial fertiliser by different mists having suggested to him the desirability of securing ter uniformity in the methods of determining the able constituents in this material, according to the entage of which, as determined by analysts, the value and agricultural utility of the particular fertiliser were fixed, at times with injustice to the trade and again to the farmer. This convention made some provisional recommendations, but its chief accomplishment was in bringing men who were working on the same subject into personal contact for an interchange of views. A second convention was held in Boston the same year, a third in Cincinnati the next year, both in connection with meetings of the American Association for the Advancement of Science. At the latter a committee was appointed to recommend methods for the determination of phosphoric acid in fertilisers. The committee sent out samples of various phosphatic manures with proposed methods for their analysis. The results were most discordant and discouraging, and nothing further was done in the way of organised effort until 1884, when investigations of various methods in the hands of several chemists had thrown sufficient light on the subject to justify the calling of another convention at Atalanta in May. At this meeting the results of the experience of the members in the preceding three years were evident, especially the effect of the work of Messrs. Stilwell and Gladding, of New York, published in the *American Chemical Journal* a short time before (January 1884), and of Professor Johnson, of New Haven, both in connection with the determination of reverted phosphoric acid. There was such a unanimity of feeling at this convention that methods were adopted which, although since added to very largely and in some respects modified, have been standards up to the present time for analysing superphosphates.

In September of the same year, at a meeting in Philadelphia, adjourned from that in Atalanta, the Association of Official Agricultural Chemists was formed. This association was originally nothing more than a body of fertiliser analysts, but it was the pioneer in sending out samples of material for analysis by different chemists, and the first report of the committee on the determination of phosphoric acid, in the following year, expressed the belief, derived from the results of the first attempt, that an annual distribution of samples and comparisons of results would be of great use in securing accuracy and uniformity among analysts. This was the general belief of the members, although the results of the determination of nitrogen on the same sample in different laboratories were so discordant that the committee on this subject decided not to report them.

The problems connected with fertiliser analysis had, of course, to be settled first, and no attention could be given to anything else. In 1886, however, the Association extended its scope to the methods to be employed in the analysis of soils, cattle food and dairy products, and in the following years sugar and alcholic liquors were taken up. In 1896 the field of the Association was extended so as to cover methods of analysis of all articles of food and drink, and since then to tannin and insecticides. These methods of analysis now form a pamphlet of eighty-six pages, and all of them can be relied on, at least for uniform results, if the details given are closely followed. They are universally followed by agricultural and food chemists in the United States, but are subject to criticism and modification at each annual convention, at which time new methods are brought up for consideration and are usually tested, under instructions from one of the reporters of the Association, during the following year. The results accomplished by this Association in the thirteen years of its existence form a most striking example of what can be done by organised effort. An historical sketch of it will be found in Bulletin No. 57, Division of Chemistry, U.S. Department of Agriculture.

In another direction the efforts, already alluded to, of the iron and steel chemists to arrive at uniformity are of interest.*

In the summer of 1888, Professor J. W. Langley, of Cleveland, Ohio, suggested the establishment of a set of samples of iron and steel which should be distributed among the chemists of the world and carefully analysed, for the purpose of bringing about uniformity in methods and setting up a standard with which, in cases of dispute in regard to commercial analyses, all future work could be compared. This proposition met with very general approval, and committees were appointed in Sweden, Germany, France, England, and America. The reports of these committees, and the work accomplished up to 1897, was reviewed by Freiherr von Jüptner, in his address to the Iron and Steel Institute, and by Mr. C. B. Dudley, in his address to the American Chemical Society, at their meeting at Troy, in December 1896,* entitled "Some Present Possibilities in the Analysis of Iron and Steel." The latter showed that there is an enormous amount of work still to be done in connection with the methods of analysis of steel, notwithstanding the fact that more attention has been given to this subject, and by as able men, as to any other branch of analytical chemistry; this, of course, being due to the demand of the steel industry for the recognition of minute percentages of substances having marked influence in the quality and character of the metal. There has been no report from this committee since 1896, and the co-operative work seems to have ceased, perhaps because the methods are now so much more satisfactory than when the demand for it began in 1888, and it has been found sufficient for a committee of the Engineers' Society of Western Pennsylvania to publish† the individual methods employed for the analysis of ores, pig iron, and steel by chemists in the laboratories in the region about Pittsburgh, Pennsylvania.

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* World's Congress of Chemists, Chicago, Aug. 22nd, 1893. Jour. Am. Chem. Soc. 1893, 15, 448.

At the Buffalo meeting of the American Association for the Advancement of Science in 1886, the Chemical Section appointed a committee to report upon a uniform system of water analysis. This committee met with many difficulties, and finally asked to be discharged, at the meeting in Brooklyn in 1894, having accomplished nothing more than securing an agreement to state results of analyses in parts per million.

The same subject has been taken up recently by the Section of Bacteriology and Chemistry of the American Public Health Association, a committee of which sent out, in June 1900, a series of inquiries intended to determine the present status of the subject of water analysis. A preliminary report was presented by this committee at the Indianapolis meeting of the Association in 1900. This report, which appears in "Science" for December 1900, shows satisfactory progress, and the final results will be looked forward to with interest.

At the Cleveland meeting of the American Chemical Society in 1895, in response to a request of the Director of the U.S. Geological Survey, that the society should take steps "to formulate in minute detail a method which may come to be accepted as the one by which all analyses of coal and coke in this country should be made," a committee was appointed to consider this subject. The committee presented a provisional method in 1898 and a final report in 1899, which may be accepted as the most authoritative statement on the subject. The directions given will at least result in a uniformity in the method of analysing coal, such as has not been met in the past. These are the principal efforts that, within my knowledge, have been made in the direction of uniformity and accuracy in chemical analysis. There have been, in fact, many others of greater or less importance and success.

The preceding data show, however, that there has been a very considerable attempt to bring about uniformity in methods of analysis in the United States, and that the success met with, in some directions at least, has been great. All these efforts, too, have been directed toward uniformity in methods employed in chemical analysis as related to applied chemistry.

It has no doubt occurred to many of you who have looked into the subject that an attempt might be made to extend the benefits of co-operation to the technical analyst engaged in the examination of materials other than those which have been mentioned. I have had forcibly brought to my attention the possibility of doing something in this way by my personal relation with the Association of Official Agricultural Chemists, and by the following experience, which I have met in another field of analytical work.

In May 1897 the representative of a large cement company came to my laboratory and asked me my opinion as t the results of the analyses of three specimens of hydrauli limestone made by seven or eight different chemists. A the results of no two of the analyses agreed he was at a los to know which to accept. He submitted the results to me which were as follows :—

Limestone No. 1.

Silica	5·06	4·16	5·02	4·80
Alumina and iron oxide	3·70	3·03	1·54	3·10
Calcium carbonate	85·66	88·73	89·00	91·51
Magnesium carbonate	2·64	2·05	2·71	1·60
Total	98·06	97·97	98·27	101·01

Silica	5·01	4·7	4·87
Alumina and iron oxide	3·28	1·4	2·15
Calcium carbonate	90·85	87·5	90·66
Magnesium carbonate	0·54	2·3	1·89
Total	99·68	95·9	99·57

Limestone No. 2.

Silica	7·60	7·63	7·38	7·8
Alumina and iron oxide	2·49	2·46	1·01	2·8
Calcium carbonate	85·09	85·44	86·02	84·7
Magnesium carbonate	4·27	4·39	3·19	3·9
Total	99·45	99·92	97·60	99·41

Silica	7·99	8·2	8·01	8·1
Alumina and iron oxide	2·22	0·6	1·13	3·2
Calcium carbonate	87·58	83·5	85·41	86·3
Magnesium carbonate	2·03	4·3	3·33	2·2
Total	99·82	96·6	97·88	99·9

Limestone No. 3.

Silica	24·40	24·29	24·67	22·7
Alumina and iron oxide	9·24	8·39	7·78	9·5
Calcium carbonate	58·75	57·19	55·16	59·
Magnesium carbonate	3·92	3·56	4·45	3·7
Total	96·31	93·43	92·06	95·

Silica	22·90	22·59	22·06	22·
Alumina and iron oxide	7·24	7·82	7·81	7·
Calcium carbonate	59·71	60·97	61·68	61·
Magnesium carbonate	1·53	1·19	··	2·
Total	91·38	92·57	91·43	93·

The extremes in these analyses are :—

Limestone No. 1.

—	Highest.	Lowest.	Difference.	Ave
Silica	5·06	4·16	0·90	4
Alumina and iron oxide	3·70	1·4	2·30	2
Calcium carbonate	91·51	85·66	5·85	89
Magnesium carbonate	2·71	0·54	2·17	1

Limestone No. 2.

Silica	8·2	7·38	0·82	7
Alumina and iron oxide	3·24	0·6	2·64	2
Calcium carbonate	87·58	83·5	4·08	85
Magnesium carbonate	4·39	2·03	2·36	3

Limestone No. 3.

Silica	24·67	22·06	2·61	2
Alumina and iron oxide	9·59	7·24	2·35	
Calcium carbonate	6·56	55·16	6·40	5
Magnesium carbonate	4·45	1·19	3·26	

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* Jour. Am. Chem. Soc., 1897, 19, 93.
† Easton, Pa., Chemical Publishing Co., 1895.

These results were extraordinary, and it seemed evident at here, in the case of a series of ordinary limestones, there s a great opportunity for the introduction, not only of a ethod which might give uniform results, but also one that uld give accurate ones. I obtained a small amount of each the original powdered samples submitted to the analysts, d let one of my assistants undertake their analysis to termine, if possible, how far the methods and manipulation my laboratory could be relied on in the case of ordinary rk. The results were reported by Mr. R. H. Parker as llows :—

Limestone No. 1.

ica	4·1	4·2	4·6
umina and iron oxide	3·9	4·8	3·4
lcium oxide	49·2	49·9	
gnesium oxide	1·8	1·7	
ss on ignition	40·5	40·3	
	99·2	100·9	
required by CaO and lgO.	40·6	41·1	

Limestone No. 2.

ca	8·0	7·7	7·7
mina and iron oxide	2·2	1·9	2·2
ium oxide	47·2	48·0	
gnesium oxide	3·2	2·8	
s on ignition	40·1	40·0	
	100·7	100·4	

Limestone No. 3.

a	23·4	22·9	23·4
nina and iron oxide	9·6	9·3	9·3
inm oxide	31·3	31·8	
nesium oxide	1·8	1·9	
on ignition	31·6	31·6	
	97·7	97·5	
required by CaO and gO.	26·7	27·1	

he results of the analyses which were submitted to me we unfortunately calculated to carbonates and it has n necessary to calculate our own to the same form for cmparison.

ANALYSES IN OUR OWN LABORATORY RECALCULATED.

Limestone No. 1.

——	1.	2.	3.
a	4·1	4·2	4·6
mina and iron oxide	3·9	4·8	3·4
ium carbonate	87·8	89·1	
nesium carbonate	3·8	3·6	
	99·6	101·7	

Limestone No. 2.

a	8·0	7·7	7·3
mina and iron oxide	2·2	1·9	2·2
ium carbonate	84·9	85·7	
nesium carbonate	6·7	5·8	
	101·8	101·1	

Limestone No. 3.

a	23·4	22·9	23·4
uina and iron oxide	9·6	9·3	9·3
ium carbonate	56·0	53·8	
nesium carbonate	3·8	4·0	
	92·8	93·0	
L on ignition other than O_2 combined with calm magnesium.	4·9	4·5	
	97·7	97·5	

OUR RESULTS AS THEY MIGHT POSSIBLY BE REPORTED IN THE LIGHT OF PROBABLE ERRORS, AS COMPARED WITH THE AVERAGE OF OTHER ANALYSIS.

Limestone No. 1.

——	Our own.	Others.	Reliable.
Silica	4·1	4·8	4·8
Alumina and iron oxide	3·4	2·3	3·1
Calcium carbonate	87·8	89·1	91·5
Magnesium carbonate	3·8	1·9	1·6
	99·1	98·1	101·0

Limestone No. 2.

Silica	7·7	7·8	7·8
Alumina and iron oxide	2·1	2·0	2·9
Calcium carbonate	84·9	85·5	84·8
Magnesium carbonate	6·2	3·5	3·9
	100·9	98·8	99·4

Limestone No. 3.

Silica	23·2	23·3	22·7
Alumina and iron oxide	9·4	8·2	9·6
Calcium carbonate	56·4	59·2	59·3
Magnesium carbonate	3·9	3·0	3·8
Loss on ignition other than CO_2 combined with calcium magnesium.	4·9	Not determined.	
	97·8	93·7	95·4

It was evident that our results were unsatisfactory and did not compare well in some determinations among themselves with the average of the other analysts or with the results of one particular analyst whom I had reason to believe was most reliable.

The methods employed in my laboratory were those given by Blair in his book on the analysis of iron, modified by such refinements as had been found to be desirable from my own experience, such as re-solution and re-precipitation of the iron and alumina and the lime, as without this no proper separation, at least of lime from magnesia, can be accomplished. These refinements, however, were not sufficient, although the re-precipitation of the oxalate of lime had removed a considerable amount of magnesia which had been precipitated with it and had increased the percentage of this substance, shown by our analyses in the case of limestones one and two, over that found by other analysts who had probably only made a single precipitation. Our results agreed in a general way with the average of those of the other analysts, but their discrepancies, as large as six per cent. in the carbonate of lime in stone number three, and nearly six and four per cent. in one and two, with proportionately large ones in the amount of iron and alumina and silica, were not to be explained at the moment.

At about this time Hillebrand's chapter in Bulletin No. 148 of the U.S. Geological Survey, entitled "Some Principles and Methods of Analysis applied to Silicate Rocks," to which I have already alluded, appeared. His careful study of a long experience with the subject enabled him to present us with a fund of information nowhere else available.

It appears from his statements that the variation in the several analyses of the limestones might be due to much the same causes as suggested by Dudley and von Jüptner, and also to—

(1) Impurity of the sodium carbonate used in fusing the insoluble residue of the limestones, as it is impossible to procure a chemically pure carbonate in the open market, or was at that time. Such impurities would increase the percentage of silica, iron and alumina, lime and magnesia, all of them being present in the salt.

(2) Incomplete dehydration of silica, the temperature of the blast being necessary for this purpose.

(3) Incomplete separation of silica from iron and alumina and at times titanium.

(4) Incomplete removal of salts thrown down with the iron and alumina, which can only be removed by a second precipitation after re-solution.

(5) Incomplete separation of magnesia from iron and alumina because of the presence of an insufficient amount of ammonia salts.

(6) Incomplete separation of manganese from the ammonia precipitate, to accomplish which the first precipitation should be made by the basic acetate method.

(7) Incomplete dehydration of the precipitate of iron and alumina, a blast being necessary.

(8) Reduction of the oxide of iron by careless heating.

(9) Lack of endeavour to determine the presence of titanium, barium, strontium, manganese, phosphates, &c., the presence of more or less of which would be unimportant from a technical point of view, but might, according to the way in which the analyses were carried out, be included or excluded from some one determination in a way to affect the result.

As an example of the possibilities in the direction last ted the composition of two limestones from Massachusetts analysed by Eakins and Stokes, and published in the bulletin mentioned, may be given.

——	No. 1.	No. 2.
Insoluble	..	..
SiO_2	0·67	1·01
Al_2O_3	Trace	0·17
Fe_2O_3	0·08	None
FeO	7·60	0·37
MnO	1·61	0·08
NiO	0·03	..
CaO	28·63	30·82
MgO	16·17	21·35
K_2O	..	0·10
Na_2O	..	0·01
H_2O	..	0·09
P_2O_5	..	0·06
CO_2	45·35	45·84
SO_3	..	..
	100·14	99·90

No. 1.—Dolomite, Charlemont, Mass., collected by Emerson. Analysis by Eakins, record No. 1,343.

No. 2.—Dolomite, Webster, Mass., collected by Emerson. Analysis by N. N. Stokes, record No. 1,634.

What would be the result of analyses of such stones by the ordinary industrial chemist? What would the ferrous iron be reported as? And yet, perhaps, the majority of limestones carry some ferrous iron.

With all these possibilities of error before the ordinary analyst is it remarkable that his results do not agree with his neighbours? He has had little opportunity to inform himself on these difficulties heretofore. Scattered through chemical literature are papers on particular subjects, but there is nowhere to-day in a single article, as Hillebrand says, "an exposition of the methods to be employed in accurate silicate analysis," except in so far as Hillebrand has himself put the subject before us.

The trouble seems to me to be that there has been no organised effort to accomplish this, and what has been said of silicate analysis may be said equally well of the analysis of ores, asphalt, acidimetry, and the host of subjects some one of which one analyst meets every day and another only on widely separate dates.

Individuals can accomplish little, but it has seemed to me that the American section of the Society of Chemical Industry or, if this does not seem advisable, an association of technical chemists or analysts might be able to do, in time, for the technical analyst what the Association of Official Agricultural Chemists has done for the agricultural and food analysts. There are, however, many difficulties to be overcome and objections to be met in carrying out such a plan. To most analysts the main objection will be the lack of time which is available for such work. Hillebrand wisely says, "that an amount of time disproportionate to the immediate object to be sought should not be expended on every analysis." To this everyone will agree. For example, if it is sufficient to know that in the limestone numbered three, of which we have spoken, there was between 22·1 and 24·7 per cent. of silica, and that t amount of magnesium carbonate present was somewh between 1·2 and 3·4 per cent., the analyses which ha been quoted would have been sufficient. More oft however, the requirements of such analyses are that t determination shall fall within an accuracy of half of o per cent., and there are a majority of cases where t possible error should not exceed one or two tenths. Su analyses cannot be made except with a great expenditure time, an amount that is either not available or the expendit of which the fee for the analysis will not compensate f As a rule the public, or the individual, is satisfied with t cheapest work as long as they are themselves deceived to any error it contains and as long as the results do n affect unfavourably their purses. This, I think, can be do away with by an attempt to raise such analytical work t higher standard. The problem becomes, therefore, a dou one, to obtain uniformity of method among the high class of analysts and to educate the poorer analysts and individual or corporation to this standard. Suppose th as in the Association of Official Agricultural Chemist referee or a committee is appointed to consider and rec mend a method for the analysis of materials in use in Portland cement industry, and having done so is reques to distribute samples of a hydraulic limestone or cem among all chemists who may wish to analyse them. W are the results which are obtained worth? Lack uniformity in results may, as we have seen, be due to method, the re-agents, or the analyst. There would proba be a greater uniformity among the more experien analysts which would necessitate an extra endeavour on part of the less experienced men to equal them in t work, while an interchange of views and experiences the more skilful men would undoubtedly result in the m fication of the details of the method as originally sugge in such a way as to make the possibility of obtain uniform results with it greater in the future, both for experienced worker and the recent graduate.

For the actual results of work of this description I n refer you to the reports of referees on various subject the proceedings of the Association of Official Agricult Chemists, which are published in Bulletin No. 57 of Division of Chemistry of the United States Departmen Agriculture.

It may be objected that chemists of corporations n not care to enter into such work, or that they migh prevented from doing so by their employers. We sh suffer from the loss of the co-operation of such men at but not fatally in many instances, if at all. They w soon be obliged to accommodate themselves to gen practice in commercial dealings, if not in their laboratory, and, if experience is of any value, would qu take up methods upon which they could rely.

It is possible that we can, if there is sufficient intere the matter, make a beginning in a small way by appoi committees to consider a few subjects which are of than individual interest, and such committees can at learn what the spirit of the technical analyst is to and if he wishes to pull himself out of the narrow that he is now following. If it does not seem wise t majority to attempt uniformity in method, it is at possible to endeavour to collect the various me employed by different chemists, as has been done i iron and steel industry, and, by distributing sampl be analysed by these methods, to learn their relative va

I can appreciate the fact that many chemists d care to publish methods which they have used satisfac themselves because they are criticised and torn to by intolerant persons. Under such a system as I proposed I hope that this can be avoided, as the me could be placed in the hands of a responsible com for rational criticism and comparison with others.

Let me add that all attempts to accomplish anythi this direction must necessarily be slow and subj much careful deliberation, and I ask that you will gi matter your extended consideration and that the be a thorough discussion of it, not necessarily now, b some future time upon which the Section may If nothing is accomplished I shall know tha rofession is not ready for this advance at the present ime, but shall not feel that it can be long before we put urselves on the same basis as the agricultural, the food, nd the iron chemists.

NOTES ON NITRIC ACID AND MIXED ACID ANALYSIS.

BY ARTHUR P. VAN GELDER.

HE calculations relating to low oxides in nitric acid, the antity of HNO_3 actually available, and the correct total idity of nitric or mixed acids, are becoming matters of fficient importance to invite the careful attention of emists and manufacturers. This is especially true in ose acids where a large quantity of low oxides are present. s most acids, however, contain but small quantities of these ides, it frequently happens that chemists disregard the oper terms, causing confusion and retarding investigation. In order to bring this matter again before the Society, int out more clearly the distinction between the various thods of calculating, and urge the use of those methods ich are generally accepted as showing the true state of e acid. I submit the following tables.

Both tables are calculated from actual analysis of acids use at explosive works.

Methods of calculating an Analysis of a Mixed Acid containing Low Oxides.

1.) Original method disregarding low oxides :—

Total nitrogen as HNO_3	25·73
Total H_2SO_4 (free and combined)	59·73
Water by difference	14·54
	100·00

.) Low oxides calculated as N_2O_3. (Lunge's Works:—Pitman, this Journal, Nov. 1900) :—

Available HNO_3	22·13
Total H_2SO_4	59·73
N_2O_3 combined	2·17
Water by difference	15·97
	100·00

.) Low oxides calculated as HNO_2 :—

Available HNO_3	22·13
Total H_2SO_4	59·73
HNO_2	2·47
Water by difference	15·67
	100·00

) Low oxides calculated as N_2O_4. (Van Gelder, this Journal, June 1900) :—

Available HNO_3	22·13
Total H_2SO_4	59·73
N_2O_4 (combined)	2·63
Water by difference	15·51
	100·00

. Low oxides calculated as they existed in the original nitric acid before mixing. (U.S. Naval Department at Newport and Indian Head) :—

Original HNO_3	18·53
Total H_2SO_4	59·73
Original N_2O_4	5·26
Water by difference	16·48
	100·00

) Low oxides calculated as combined with H_2SO_4 in nitrosulphonic acid :—

Available or actual HNO_3	22·13
Free H_2SO_4	54·13
$(HO)(NO_2)SO_2$	7·26
Water by difference	16·48
	100·00

Of the above No. 1 may be considered obsolete, as no one at all familiar with the manufacture and present requirements of ordinary mixed acids would entirely disregard the presence of the lower oxides of nitrogen. If one assumes that there is sufficient water present to decompose the nitrosulphonic acid according to the equations,

$$2(HO)(NO_2)SO_2 + H_2O = 2H_2SO_4 + N_2O_3\text{; or}$$
$$(HO)(NO_2)SO_2 + H_2O = H_2SO_4 + HNO_2.$$

then Nos. 2 and 3 would be correct, but Lunge distinctly states in his Treatise on Sulphuric Acid and Alkali that N_2O_4 is absorbed and converted into nitrosulphonic acid in acid containing as high as 25 per cent. water.

Nos. 2 and 4 are only of use where some method of calculating "Available HNO_3," "Original HNO_3," or N_2O_4 is desired for special technical reasons. They are generally acknowledged to be misrepresentations of the true conditions.

This leaves only No. 6, a method which, while almost universally conceded to be correct, remains almost as universally discarded, either because the calculations are slightly more difficult, the technical conditions in some works require one of the other methods, or, more probably, because the total acidity has been considered, if considered at all, of less importance than the HNO_3 or H_2SO_4, and the low oxides were best understood when written as N_2O_3 or N_2O_4. It seems to me that the time is coming, if not already at hand, when the total acidity will receive more consideration, and if the true conditions of an acid are not reported, the proper terms at least should be applied to the reports so that others than the author can understand them.

In the calculations relating to strong nitric acid, there is room for even greater digression, especially where a large quantity of low oxides are present. This is shown in the following table, the example being identical with the one given in my first paper on this subject (this Journal, June 1900).

Methods of calculating an Analysis of Nitric Acid.

(1.) Low oxides disregarded :—

Total nitrogen as HNO_3	93·17

(2.) Low oxides reported, in addition to total nitrogen as HNO_3, as :—

(1.) Total N_2O_4	1·93
or (2.) Total N_2O_3	1·60
or (3.) Unavailable N_2O_4	0·97
or (4.) Unavailable N_2O_3	0·80

(3.) Showing the HNO_3 available for mixed acid :—

	Per Cent.
Available HNO_3	91·85
Low oxides as in No. 2.	

(4.) Showing the true conditions of the acid :—

Original (or actual) HNO_3	90·53
Total (or actual) N_2O_4	1·93
Total acidity	92·46

It will readily be seen that the true total acidity is shown only by No. 4, and that many discrepancies may occur between the makers and the purchasers of nitric acid unless the analysts always state their results in the proper defining terms, as available HNO_3, original HNO_3, combined N_2O_4, &c., or use those calculations which show the true conditions.

I fear that, in the past, both makers and users of these acids have not considered the question of low oxides and their relations to available nitric, and especially to total acidity, of sufficient importance to examine into their true function in nitration.

These questions are certainly of considerable interest, both to the manufacturer and the scientist, and I trust that these notes may be a stimulus to further investigation.

Yorkshire Section.

Meeting held at the Yorkshire College, Leeds, on Monday, March 25th, 1901.

MR. G. WARD IN THE CHAIR.

ARSENICAL BEER AND MALT.

BY A. J. MURPHY.

Although the arsenic plague first made itself evident in Lancashire, and virulent forms of it have not appeared in any other county, the present meeting is, so far as I am aware, the only one in Yorkshire which has been specially convened to discuss the subject.

I venture to assert that this is not due to indifference; it has been pointed out at many places, and by many persons, that the one redeeming feature in an otherwise disastrous incident has been the splendid anxiety and eagerness on the part of the unfortunate brewers concerned to root out, at whatever cost to their pocket, the last traces of the evil: and I feel bound to add my testimony to the general prevalence of this determination. An intimate acquaintance with a considerable number of cases enables me to state that the predominant feeling has been that the removal of the evil was of far greater importance than the public discussion of its cause and effects.

As soon as it was shown that the public health was endangered, and that arsenical beer had actually caused deaths, or even one death, the question at once entered into a phase of extreme gravity, which was immediately recognised, and will serve as a terrible object-lesson for generations yet to come.

The occurrence was in a sense accidental, and has been so regarded by all the thinking portion of the community; it was hoped, with the destruction of the poisoned product and the additional care born of experience, that excitement and panic would give place to a calmer condition of mind. On the part of the public I believe that this is so, but my experience of the past two months forces me to conclude that it is now the analyst who is inclined to fall into this snare, and it comes about, I suppose, from the fact that the "burden of arsenic" has been transferred from the shoulders of the brewer to those of the maltster, and perhaps the farmer.

The situation thus created is one of extreme difficulty and delicacy; on the one hand we have certain analysts and medical men asserting that if arsenic be present in any food-stuff it must be unearthed and the material condemned, no matter how minute the trace may be, while, on the other hand, the maltsters, who have been manufacturing their malt with the same class of fuel for 30 or 40 years or more, quite unconscious of the presence of arsenic, are now having malt to the value of hundreds and thousands of pounds thrown upon their hands as so much waste material, in face of the conviction that if their malt contain arsenic, not only has it always done so, but they have every reason to believe that a vigorous and robust manhood has been "grown and nurtured" upon the product of this same malt. My sympathies are undoubtedly with the maltster in the evil days which have fallen upon him, but I do also claim a share of sympathy for the analyst; taking one consideration with another, the lot of the analyst—at any rate, the brewer's analyst—is not a happy one. He is between Scylla and Charybdis; if the material contain a percentage of arsenic, represented by the sixth or seventh decimal place, his common sense tells him to ignore it, yet for the sake of his professional reputation he dare not certify that it is free, although for every practical requirement of hygiene it is so, and possibly more free than many of the articles of food forming our daily diet. He is really at the mercy of any faddist, medical or otherwise, who chooses to bring an action under the Food and Drugs Act, although he is every whit as solicitous for the maintenance of the public health as the most ardent sanitarian. Another of his difficulties is the responsibility of deciding whethe thousands of pounds' worth of malt shall be used or de stroyed. Where there is the least danger to public healt he will, of course, never hesitate, but it is a moot poi whether that condition ever exists in the case of malt, an when the analyst's certificate causes wanton waste of larg sums of money, financial ruin, and, in at least one cas actual suicide, I may fairly claim your sympathy.

Mr. Jones, in giving evidence before the Royal Commi sion recently, said "the method of analysis should be le to the individual analyst." Unfortunately, at present th seems to be the course adopted, but it is neverthele regrettable, for it leads to serious difficulties. Two analys report to the same trader and their certificates differ; th trader will, not unnaturally, give preference to the mo favourable certificate, and in so doing may come in conflict with the authorities or endanger public health because of the want of agreement amongst analysts up the methods to be adopted, and because these metho differ greatly in sensitiveness.

Various opinions have been expressed as to the minimu amount permissible, Dr. Delepine, in the early stages of t inquiry, regarded all beers as safe which did not show mo than ·07 grains per gallon, while Dr. Niven told the Ro Commission that he would allow no trace whatever a that he would, if necessary, use a barrel of beer for his te On this basis, and if we assume the accuracy of Mr. O Hehner's statement that 1/1000th mgrm. is discoverab with ease and certainty, Dr. Niven would condemn a be containing arsenic at the rate of 1 part in 160,000,000,00 that is, 1 grain in 2,320,000 gallons, or 1 grain in abo 65,000 barrels.

It may not be competent for this meeting to definitiv settle what shall eventually be the smallest percentage arsenic allowable—that is probably a question for the Co mission—but it is devoutly to be wished that the Commit appointed by the London section of this Society sho promptly give us a working limit for our immedi guidance. Royal Commissions are not so much renowned their celerity as for their thoroughness; and until their Re is published an enormous amount of hardship will certai be inflicted upon brewers, maltsters, and others in absence of some such provisional agreement.

0·01 grain per gallon seems to be the limit which received the largest amount of favour, and although I not think it errs on the side of danger, it is at least s definite standard which may conveniently serve to smo away some difficulties and lessen confusion.

As there are a good many maltsters present this even may I devote a moment to the occurrence of arsenic in and its prevention? It is pretty certain that it comes f the fuel and is merely adherent to the skin of the grain regards fuel, anthracite is generally admitted to be best gas coke worst; but even the most carefully selected fu liable to contain traces, and, therefore, a thorough syste "polishing" seems to be imperative, and I have had n proofs that such a proceeding does remove much of taint.

As arsenic is volatilized during the combustion of fuel, the construction and management of the kiln also factors of importance; there will be least arseni malt where the distance between fire and floor is gre because more will have condensed upon the walls, &c., where the draught is great more arsenic vapour wil carried through the load on the kiln because the condi for condensation will not be favourable.

And here I may refer to the sending of sample analysis; it is not possible to pass judgment upon to material from 10-grm. samples. That portion of the which happens to be undermost at the critical moment contain more arsenic than the upper layers; and in re to the fuel, one lump may contain much arsenic and an none at all, so that care is necessary to secure a representative sample.

I propose now to offer some brief criticisms upo methods of testing; if the criticisms be consi elementary, I can only say that they deal with which have given much trouble to many others myself.

The Marsh, Reinsch, and Gutzeit alone appear to be n common use; the last I shall not refer to having put it side as being the least satisfactory.

With regard to the Marsh, I have already mentioned that lr. Hehner considers that 1/1000th mgrm. can be detected n 10 c.c. or even 100 c.c. of liquid; this works out to part in 10,000,000 or 100,000,000; Scudder gives 1 part n 700,000; Thomson gives 1 part in 200,000; Kirkby ives 1 part in 100,000. These limits are very wide ndeed—from 1 in 100,000 to 1 in a thousand times 100,000—nd if they have any significance at all, it is that the Marsh est yields very different results in different operators' ands. We frequently see hints and warnings of this fact;)r. Stevenson took special care to inform the Royal 'ommission that the Marsh test was a very difficult one, equiring considerable care, skill, and experience. I think at all of us who know will cordially agree with r. Stevenson, but if any chemical student doubts this invite him to repeat our endeavours to prepare a set of andard reference tubes for the purpose of approximately timating the small amounts of arsenic which cannot be alt with gravimetrically or volumetrically.

With this object I drew up the following scheme:—

Preparation of Reference Tubes.

Solution of As_2O_3 containing 1/100th grain per gallon.

Mirrors obtained from 5, 6, 7, 8, 9, 10, 20, 30, 40, 50, 60, , 80, 90, and 100 c.c. should contain an actual weight arsenic corresponding, in order, from 0·000011 grain to 00022 grain of As_2O_3. And 10 c.c. of any "suspect" ution giving a mirror comparable with these should respond, in regular order, to from 0·005 grain per gallon 0·1 grain per gallon.

Note.—Same weight of zinc, same amount of acid, same e of flask, and same total volume of liquid were used.

And I should be glad to compare notes with any gentle-n who has succeeded in getting a consistent set, and ld repeat the success at pleasure.

Probably a modification in the direction of greater ength of standard solution and quantity of suspected terial might give concordant results, but these quantities re fixed upon with a definite purpose, and we preferred postpone the development of the scheme until someug more was known in regard to the factors governing cess or failure. The essential conditions for success med to lie amongst the following:—

1. Purity of materials.
2. Arrangement of apparatus.
3. Rate of flow of gas.
4. Strength of acid.
5. Amount and physical condition of the Zn.
6. Temperature of decomposition of the AsH_3.
7. Manner of adding suspected material to flask.
8. Time given to extract the arsenic.

eed only refer very briefly to these points. That the terials, even the corks, should be of the very purest ainable goes without saying, and it it satisfactory to ow that if the highest price be paid we can procure them ctically arsenic free. One warning may be worth ing; if you get a supply of, say H_2SO_4 in half-a-dozen one dozen Winchesters, in one consignment from the ne maker and certified as the same batch, it is necessary est each of those Winchesters separately before taking ato use. Neglect of this precaution caused us much rry and loss of time.

n fitting up the apparatus an absorbent of H_2S is indissable, since this gas is given off from the very purest erials, and the lead paper suggested by Estcourt seems answer admirably. Without absorbent we get such ilts as—

Tubes were here shown containing mirrors closely rebling arsenical mirrors but were not arsenic; and other es in which the arsenic existed as yellow As_2S_3.)

Vith regard to the flask, it should not be too small, the e size should be always used. There is no danger from ing back if cotton wool be inserted, but it is undesirable llow this to happen because of the moisture which such osion produces in the tube.

I think there can be no doubt that the quantity of arsenic liberated bears a direct proportion to the rate of gas disengagement. In our work this has been proved over and over again, and the tubes shown to illustrate this point are merely typical of a very large number.

As the rate of flow of gas must be intimately connected with the strength of acid and the physical condition of the zinc we found that it was desirable to maintain a percentage of acid equal to that of about 1 part of H_2SO_4 conc to 2 parts of the diluent.

Granulated zinc will of course be more favourable to rapid gas evolution than the ordinary stick zinc, but it is safer to granulate it oneself than to allow the manufacturers to do so at the works. We shall note presently that magnesium is to be preferred to zinc in certain cases.

The formation of the mirror of metallic arsenic being entirely dependent upon the decomposition of the AsH_3 it seemed certain that the intensity of the flame used would influence results, and the tubes shown were prepared with flame at low temperature, half blast and full blast; it is evident that a fairly high temperature is necessary.

From several experiments we concluded that it was immaterial whether the suspected solution was added in portions or all at once.

With regard to the time required to get off a reasonable amount of As there are very diverse opinions. Mr. Hehner said that a quarter of an hour is long enough, but I have not been so fortunate. Dealing with a 100 c.c. of a solution containing 0·03 grain per gallon, the first tube was allowed one hour, and a second tube attached for a further half an hour, as well as a third for yet another half an hour all gave evident mirrors. A stronger solution than this required four tubes and nearly six hours for its complete extraction.

It is in this respect that the erratic behaviour of the Marst test chiefly manifests itself; we have repeatedly found the first tube practically free, and sometimes even the second, while the third and later tubes have shown mirrors distinctly. This experience applies to arsenious as well as arsenic solutions, and to cases in which special care has been taken to maintain a vigorous current of gas throughout.

It is now necessary to refer to the application of this test to beer and malt. Several workers assert that it cannot be used in presence of organic matter, but the evidence does not seem to be very conclusive; it is argued from analogy of As with P, in its facility of entering into organic combination (some 200 of such are mentioned in Watt's Dictionary), that the failure to get the arsenic mirror is due to its existence as an organic compound and, of course, this may be so, although, as a rule, organic compounds are probably not more refractive than inorganic. Our experiments lead us to believe that the circumstance is rather due to a slowing down of the gas current owing to the presence of this organic matter. I will only say in this connection that an inorganic arsenical solution freely giving off its arsenic will give off less in the presence of sugary matter only when special care has not been taken to prevent the slowing down of the current by addition of more acid, or $PtCl_4$, &c.; moreover, if we replace the Zn by Mg[*] the difficulty almost or entirely disappears, due, as it seems to me, to the higher equivalent of the Mg, which makes it much easier to prevent any slowing down.

While these tubes are before us, I will ask your attention to three other sets obtained from (1) the incriminated sugar; (2) beers containing this sugar; (3) beers and malts now on sale. They show how great the danger was, but they also show that it has passed away.

I will now refer to the Reinsch. I doubt whether we are entitled to criticise the Reinsch—it is practically sub judice; but with regard to its sensitiveness it is generally admitted, and my experience confirms the statement, that it will give a perfectly definite sublimate with 1 part As_2O_3 in 1,000,000, that is 0·07 grains per gallon. Of course less than this percentage is sufficient to condemn, but I do not remember having seen it stated that the probable object of the Manchester Commission in recommending the test to be performed in open dishes was to secure evaporation and with it a corresponding increase of sensitiveness.

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[*] In using Mg some care will be necessary to prevent overheating &c.: foil, wire, or ribbon are quite unsuitable, but some thin rod Mg, specially prepared for us by Messrs. Baird and Tatlock, was found to work extremely well.

If a beer examined by the Reinsch test gives no characteristic sublimate when evaporation is constantly compensated for by addition of hot water, we may conclude that it cannot contain more than 0·07 grains As_2O_3 per gallon, but it is a very common experience to note that the Cu does not darken until various stages of concentration have been reached, and it seems probable, from quite a number of experiments, that by suitable evaporation a sensitiveness of 1 in 7 000,000, viz., 0·01 grain per gallon can be secured with ease and certainty. Whether this effect is due to the concentration of the arsenic in the solution or depends upon the precise percentage of acid in that solution is, I think, not known and we are not yet able to express an opinion.

If I were asked which of the tests I preferred you would expect me, from my previous remarks, to name the Reinsch, but as a matter of fact I always employ both and for this reason:—If the arsenic be present in the higher form of oxidation we have been consistently faced with failure to effect its reduction, unless in comparatively strong solutions, when there is always a well-marked spontaneous reduction. We have tried various methods, including, of course, Mr. Allen's, of adding cuprous chloride, but have failed even with solutions containing sodium arseniate corresponding to 1 part As_2O_3 in 100,000, varying the time of boiling and using CuCl prepared in our own laboratory and obtained from four other sources. Although it is improbable that the arsenic in beer exists in any but the lower form of oxidation, we have never felt justified in omitting the Marsh test because, in its reducing action, it appears to be infallible.

I will detain you a couple of minutes longer to raise a question worth discussing—Is arsenic, *per se*, responsible for the whole of the trouble? It may not be possible yet, or ever, to answer this question, but it certainly ought not to be too readily answered in the affirmative. Bostock had 200 customers, and those of us connected with the trade know that these customers were spread over the whole country—north, south, and Scotland, as well as in Manchester and Liverpool: we know that beer containing as little as ·02 grains per gallon sent patients into the Manchester Infirmary, while I, and no doubt Mr. Fairley, have had a number of beers pass through our hands containing much more than this without such beer having produced a single case of neuritis, or having, as far as we know, caused a single day's illness.

Dr. Mackenna (*British Medical Journal*, January, p. 85) gives statistics of the amounts of arsenic administered medicinally to a large number of patients, and adds, "Facts of this kind give one reasonable ground for wondering if the small amount of arsenic found in impure beer can justly be held responsible for all the cases of peripheral neuritis at present laid to its charge." And Dr. Edmunds, at our meeting in London last month, laid stress on the possibility of certain cases of neuritis amongst total abstainers being due to bacteriological influences.

In connection with this suggestion and the fact that Penicillium Brevicaule can extract arsenic, it is interesting to note that the sample of Bostock's sugar in the bottle, which I will now hand round, has developed a greenish mould, and is giving off a very strong odour of garlic with just a suggestion of phosphorus.

It does seem, then, at least possible that there may have been some set of circumstances, or some conditions of environment, at present unknown, which have served to aggravate the evil in the districts most affected.

DISCUSSION.

In opening the discussion Mr. Fairley gave a short account of the recent outbreak of illness traced to arsenic poisoning. He stated the various amounts which had been found in the beer, the glucose and the sulphuric acid used in the manufacture of the glucose, pointing out that the acid contained larger amounts than had hitherto been found in arsenical acid from pyrites. Mr. Fairley also referred to other cases of arsenical poisoning affecting numbers of persons, and gave the results of an investigation on the presence of arsenic in the tiled floors—dust from walls, &c. of malt-kilns and the dust from the malt screening machines. In these cases the arsenic was derived from pyrites originally present in the coal; a par remaining in the coke used in the kilns, which was given of with the products of combustion. The arsenic condensed u or on the tiles, walls, &c. In many cases any arsenic tha might be condensed on the malt was removed by th careful screening and brushing to which the malt wa subjected. In changing to the use of arsenic-free fuel i the kilns it was necessary to see that the tiles and wall were thoroughly cleaned from any dust, &c. deposited o them during the previous use of fuel containing arseni The numbers relating to this investigation are published i the Journal of the Society of Public Analysts.

Mr. Ward asked Mr. Murphy if he had always use sulphuric acid in his analysis, to which Mr. Murphy replie in the affirmative.

Mr. Tetley asked Mr. Fairley what was the height o the drying floors above the kiln fires, and were the kil which were examined fired in the old way through a tunne or with a fire at the bottom of a shaft with a disperser.

Mr. Fairley replied that his chief object had been t put maltsters on their guard and not to pile up a mass o evidence. The samples of dust had been taken from kil fired in the old-fashioned way and also by the newe methods. Nearly the same proportion of arsenic had bee found whichever method was adopted. He had no know ledge as to the origin of the fuel used in the malt kiln which had been examined, but understood that it was g coke. The height of the kilns would be about 15 feet abo the fire.

Mr. Tetley said that in the recent beer scare far t little attention had been paid to other possibilities. It w not so very long since there was a terrible scare abo arsenic in wall papers. He thought that in the interests science and of those who had been blamed, a mo searching examination of the conditions under which th sufferers had lived and died would be advisable.

Mr. Allen pointed out that different analysts employ different quantities of beer in testing for arsenic, and th this practically amounted to the use of different process Whereas Mr. Murphy had not found cuprous chloride much use in applying Reinsch's test, several other analy had expressed themselves well pleased with it, and co vinced of its utility. If cuprous chloride were not us then some other reducing agent such as ferrous sulphate chloride should be added. The method of estimati arsenic which he employed consisted in the success application of Reinch's test to a litre of beer, the arse being then dissolved off the copper by means of cau soda and hydrogen peroxide, and the liquid distilled w fuming hydrochloric arid and cuprous chloride, and distillate neutralised with sodium bicarbonate, and titra with standard iodine solution.

Mr. O'Connor tendered proof that the presence arsenic under the tiles would not affect the malt on the t in that, in a kiln having used arseniated coke for 30 ye a change to arsenic-free coke immediately produ arsenic-free malt. Mr. O'Connor asked the maxim percentage of arsenic found in malt and also in beer bre from malt alone, and the means adopted for extraction fr malt in the earlier stages of analysis; and in reply

Mr. Fairley stated that he did not know whether beer in which he had found the larger percentage of ars had been brewed from malt or not, but thought that c taminated sugar had been used.

Mr. Murphy in reply to a question said that he extracted the malt by soaking in warm water, and acidulated water under varying conditions.

Mr. Richardson stated that he had found ars in malt. The process he had employed for extraction distillation with hydrochloric acid and ferrous chloride, which method 1/100th mgrm. could be easily extracted.

Ir. O'Connor suggested that the malt should be treated he same way for the analysis as in the actual brewing cesses, *i.e.*, that the extraction should be by water alone, ydrocloric and other acids extracted the total arsenic ent, whereas the brewer only required to know what ld be extracted in the brewing process. Exemplifying he mentioned an instance where one of the best known ysts of the day had condemned a consignment of malt ontaining marked traces of arsenic, and then passed beer brewed therefrom as being absolutely free.

r. Slatter expressed the opinion that many of the s of poisoning reported as arsenical were really due to .

conclusion, the Chairman urged the necessity for ysts of having standard processes of estimation, and of a definite limit in regard to the permissible amount y food stuff, and suggested that these points might be ed by the Royal Commission now sitting upon the ect of arsenic in beer.

ournal and Patent* Literature.

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LANT, APPARATUS, AND MACHINERY.

atures; Measurement of High ——, by Means of Spectroscope. W. Hempel. Zeits. angew. Chem. 14, [10], 237—242.

inciple of the method depends on the well-known t the spectrum of an incandescent mass becomes as the temperature of the mass increases. About the red portion of the spectrum begins to become As the temperature increases, the yellow, green, d violet bands successively appear. Although the the spectrum is never quite sharply defined, it is after some practice, to obtain concordant readings. uthor has tested the method by comparing the cope observations obtained on heating various s to definite known temperatures measured by the telier pyrometer. These observations have led the the conclusion that the instrument cannot be used to ascertain the temperatures of chemically different substances in different localities, but that it can successfully be used to ascertain and measure the differences in temperature of one and the same substance in the same circumstances. This is of course all that is required in a technical process, since it is out of the question to talk of a uniform temperature in a large furnace The spectroscopic method possesses the further advantage that it is unnecessary to introduce anything into the furnace since the observations can be made through a small aperture in the furnace walls. Between 700° and 1,350° C., observations agreeing within 20° C. can be obtained; and in the case of persons with eyes sensitive to colour, observations can be made up to 1,600° C., accurate to about 50° C.

The instrument described by the author possesses a scale graduated in temperatures and illuminated by a lamp which is adjustable on a common stand. The scale is movable and is provided with a set screw so that it can be adjusted to indicate temperatures in any given furnace, provided that the readings are taken by one and the same person. To adjust the scale, a Seger's cone is placed in the furnace and the instrument directed on it. At the moment when the cone melts, the scale is adjusted so that the end of the visible spectrum coincides with the known fusing point of the cone. All subsequent observations will then be correct within 20° C., if the temperature is below that of the melting point of the cone, and within 50° C. at higher temperatures.—J. S.

PATENTS.

Temperatures of Substances which become Luminous or Incandescent when Heated; Photometric Apparatus for, and Method of Determining the ——. W. L. Wise, London. From E. F. Morse, Trumansburg, and J. D. Cox and F. F. Prentiss, Cleveland, U.S.A. Eng. Pat. 19,604, Nov. 1, 1900.

In the path of the rays passing from the incandescent substance is placed an incandescence standard, and the temperature of the one or of the other is adjusted until the rays from the two bodies merge into one another and become identical. In the apparatus described, there is placed within an observation tube, which is directed towards the substance under examination, an incandescent electric lamp, having a coiled or looped filament of carbon or platinum. The filament is thus observed against a background of the heated substance. The lamp is supplied with current from a storage battery. Included in the electric circuit are an indicator (a voltmeter or ammeter) and an adjustable resistance consisting of a rotatable cylinder, made of insulating material, "having a screw thread thereon, a conductor on said thread, and a movable mercury contact engaged by said thread, whereby a greater or less portion of said conductor may be added to or subtracted from the circuit by rotating the cylinder."

In standardising the lamp, the incandescent substance—steel, for instance—is heated to the degree of incandescence which experience shows to be best for the purpose in view; the glowing steel is observed through the tube while a current is passed through the lamp, and the rheostat is manipulated until the filament reaches the same degree of incandescence as, and becomes practically undistinguishable from, the glowing background. The reading of the current-indicator is then noted, and in subsequent operations, it is only necessary to set the current at this point in order to obtain the required standard of incandescence.—H. B.

Pumping Air or Gases; Apparatus for ——. J. B. Hilliard, Glasgow. Eng. Pat. 2834, Feb. 13, 1900.

To prevent the gas operated upon from coming in contact with the pump or its piston, one or more U-shaped tubes or reservoirs, partially filled with liquid, are interposed between the pump and the gas reservoir, &c. The operation of the pump causes a reciprocatory movement of the liquid in the U-tubes, which, acting through suitable automatic admission and emission valves, draws the gas from the reservoir, &c., and, on the return movement, forces it through conveying pipes as required. The apparatus is described as employed for treating alcoholic liquids with oxygen.—R. A.

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of these specifications may be obtained by post by 8d.—the price now fixed for all specifications postage -to C. N. Dalton, Esq., Comptroller of the Patent Office. ton Buildings, Chancery Lane, London, W.C.

Mixing and Drying Mixed Products of Solid Substances and Liquids; Apparatus for ——. M. Hecking, Dortmund, Germany. Eng. Pat. 4560, March 9, 1900.

The liquid and solid substances are fed in given quantities into a mixing vessel provided with spirally arranged stirrers, which mix the materials and force them from the inlet towards the outlet at the opposite end of the vessel. From the outlet, the mixed materials are delivered into a revolving drying drum, which is heated externally or internally by suitable means.—R. A.

Filters and Separators for Oils and Other Liquids. W. Fox and T. H. Kingscote, Manchester. Eng. Pat. 25,112, March 13, 1900.

The patentees claim an arrangement of receptacles and sieves for filtering oil, water and other liquids, the various parts being so arranged that they can easily be withdrawn for cleaning purposes.—A. S.

Filtering Apparatus. F. G. Riley, Surrey. Eng. Pat. 6629, April 9, 1900.

The filtering medium employed consists of paper pulp, cotton fibre, or other compressible material, which is compressed in the filtering chamber between two perforated plates covered with flannel. For filtering water, a layer of bone charcoal is preferably employed in conjunction with the pulp. The apparatus may be employed in connection with a bottling machine, for beers, wines, &c., and the liquid may be forced through the filter by the pressure of its contained gas. The outlet aperture from the filtering chamber is covered by a slotted sleeve, and means are also provided for saving waste of the filtering material, &c. The apparatus can be arranged and connected in duplicate, and the filtering material can be cleansed by a backward current of the filtered liquid. Screw or worm gear, or hydraulic pressure, may be employed for compressing the pulp between the perforated plates.—R. A.

Filter Press; High Pressure ——. A. G. Southby, Forest Gate, E., T. Thompson, Twickenham, and L. M. G. Cuthbertson, Greenwich. Eng. Pat. 7742, April 26, 1900.

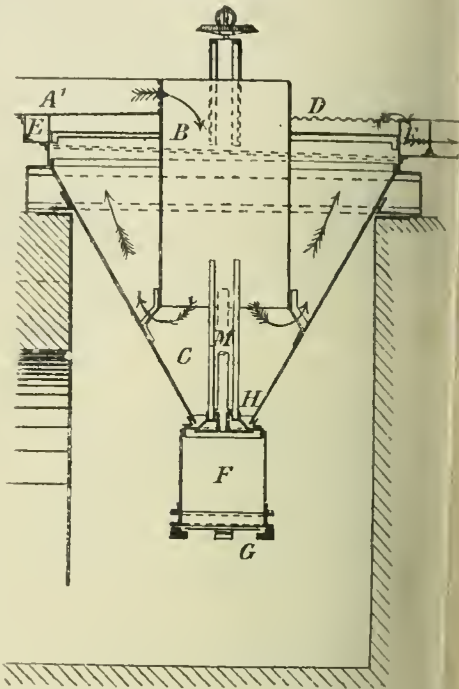
Wire gauze diaphragms are interposed between the press rings and the filter plates, the minute open spaces at the intersections of the wires providing outlets for the expressed liquid. The filter plates are perforated at the centre, but have no other openings. A distance block, operated by hydraulic or other power, is arranged to be interposed between the press and the hydraulic ram before the pressure is applied to the latter, the block being withdrawn to release the rings and plates at the finish of each operation. A primary mechanical feed mechanism is employed to deliver the material directly to the press, or to a secondary feed mechanism which delivers the material to the press at an increased pressure.—R. A.

Centrifugal Vessels for Separating Solid Constituents from Liquids. O. Ohlsson, Sö-dertelje, Sweden. Eng. Pat. 1497, Jan. 22, 1901.

The wall of the separating vessel or drum is formed with annular corrugations, and has outlets for the specifically heavier matter (the solid particles) at the outer parts of the corrugations. The drum is partitioned transversely to the shaft by a number of plates or discs, arranged at a slight distance from each other along the shaft, so as to provide a passage for the liquid alternately at the centre and the periphery of the drum. With this arrangement, the liquid and the solid particles contained therein, in their passage from the inlet to the outlet, are caused to enter into the various annular corrugations or spaces, the solid particles being thus subjected one or more times to the influence of the centrifugal force, where the said force is greatest in the drum.—R. A.

Decanting or Settling Liquids [Water, &c.]; Apparatus for ——. A. Goriainoff, Alexandroffsky, South Russia. Eng. Pat. 7290 April 19, 1900.

The water, &c. to be clarified is delivered through the channel A^1 into the open-ended cylinder B, which is mounted centrally in the conical bell C. The matter deposited in the sinks through the open valve H into the receiving cha F. while the water passes upwards outside the cylin through the openings D in the top of the bell, into trough E, from which a conduit, in the direction of



arrow, conveys it to the reservoir, or into the next ap if two or more are employed. To empty the chan the valve H is closed and the slide G opened by chain gear, &c., the pipe M permitting the admis escape of air to or from the chamber. The deposit discharged directly into trucks, or into inclined chute which it is conveyed by an endless worm to a noria.-

Regenerative and other Furnaces; Construction o and Bricks therefor. W. P. and G. B. A. G Lower Gornal (Staffs.). Eng. Pat. 2663, Feb. 10,

The walls of the air and gas passages of the fura constructed of special recessed bricks in combinati shouldered strut bricks, which engage with the bricks, and both afford support to the walls and i the heating surface. The recessed bricks contain t recesses in the one face in order to reduce the between the waste gas flue and the air passage, and provided with a cylindrical recess to receive the d the strut bricks, as well as with ribs and grooves to any by-passage between the gas and air conduit shouldered strut bricks are of diamond section wit like projections at the ends, to fit into the cy recesses of the recessed bricks, and are set corne prevent accumulation of dust.—C. S.

Kilns for Burning or Calcining Limestone or li stances. W. Spencer, Lothersdale, Yorkshire Pat. 3094, Feb. 16, 1900.

Double-chambered or other kilns are modified by a passages in their walls to supply air at different h order that complete combustion may be secured.—

Furnace for the Manufacture of Calcium Carbi like, or for Melting Steel, Brass, or other M Alloys. G. W. Emmerson and J. Ward, New Tyne. Eng. Pat. 5319, March 20, 1900.

In a crucible furnace, there is claimed, the co with a series of connected chambers adapted t bles, of an antecedent gas-heating chamber having a assage to the first crucible chamber at its upper end, a vaporising chamber having a passage to the heating ber at its lower end. Regenerative air passages cir- e about the heated parts and chambers of the crucible ce referred to, and having an outlet to the first crucible ber in proximity to the gas passages thereto.

II.—FUEL, GAS, AND LIGHT.

ures of Inflammable Gases or Vapours with Air; plosion of ——. K. Kubierschky. Zeits. angew. em. 1901, [6], 129—132.

uthor asserts that the limits of an explosion actually de with those recognised by the eye, and that there avisible decomposition occurring below those limits gh the impetus of a shock. He demonstrates the l phenomenon in an explosion, by mixing air with ne vapour in gradually increasing quantities in a glass cylinder of about 1 litre capacity, the corresponding amounts of benzene being introduced by means of a 1 c.c. pipette, 30 cm. in length, graduated in $\frac{1}{100}$ths of a c.c. A light is then applied to the mixtures.

The table given below shows the results thus obtained, together with the limits previously found by other chemists.

Attention is called to the fact that in mixtures of air with hydrogen, or with an equivalent amount of benzene, the energy of the explosion as estimated by the ear is the same in each case, but that the explosion of the hydrogen mixture is recognised far more quickly by the eye.

The limits of the explosibility of alcohol were found to be less widely apart than those of benzene, so that the former is thus less explosive. Moreover, the gases resulting from the combustion of alcohol show a higher specific heat than those from benzene. Hence, alcohol has less value as an explosive agent in comparison with benzene and similar hydrocarbons, than corresponds to its relative heat of combustion, and its use in explosion motors is irrational.

Substance.	Lower Limit of Explosion.	Corresponding to O_2.	Cals. per c.c. of Gas consumed.	Temperature.	Upper Limit of Explosion.	Observer.
	Per Cent.	Per Cent.		About ° C.	Per Cent.	
e	1·4	10·5	486	1,350	4·7	Kubierschky.
	1·4	12·6	600	1,590	—	"
lcohol	4·0	12·4	614	1,570	?	"
alcohol	7·8	11·5	632	1,560	(18·0)	"
	2·7	10·8	524	1,440	—	"
ther	1·8	10·8	507	1,390	5·2	"
bisulphide	4·1	12·3	512	1,380	?	"
en	9·5	4·8	293	870	64·7	Roszkowski.
monoxide	14·3	7·2	470	1,260	74·6	"
e	6·0	12·0	576	1,560	13·0	"
	7·0		360	1,000	22·6	"
	2·6				4·8	Eitner.
	2·5				4·8	Trautwein.
	3·1				6·3	(Bunte).
e	3·8				(40·0)	"
	6·4				12·8	"
	8·0				19·0	"
n	9·5				66·3	"
nonoxide	17·3				74·8	"
as (theor.)	12·5				66·5	

The bility of carbon bisulphide is extraordinarily great. h the vapours take fire at about 235° C. (*i.e.*, at temperature than benzene), yet in an explosive with air it shows the same temperature of ignition ne and air. Hence the ignition temperature of the bisulphide appears to have no influence on the point of the mixture. Sunlight had also no per- effect on the limits of explosion.

uthor suggests as an explanation of the differences his results with benzene and those of the other in the above table, that possibly the latter made servations with the mixtures under water, thus ght of the solubility of benzene vapour in water ·6 grm. per litre).

reference to the explosibility of substances which readily volatile though of the greatest importance rs, the author remarks that there are great practical s in the way of obtaining the necessary tempera- n the table given in next column he shows in the some of these, selected as typical, what percentage apour must be present in the explosive mixture, the s to which these quantities of vapours correspond, emperatures required to produce such mixtures.

temperatures were calculated by means of the

$$t_x = \frac{T^{\bullet}_{w} \cdot T^{700}_{x}}{273} - 273,$$

in which t_x is the tempe- quired, T^{w}_{w} the absolute temperature of saturated pour corresponding to the pressure in column 4, the absolute boiling point of the substance under ric pressure.

Substance.	Formula.	Explosive Mixture with Air, contains	Corresponding to Pressure of	Temps. required.
		Per Cent.	Mm. of Hg.	° C.
Xylene	C_8H_{10}	1·87	14·2	48
Naphthalene	$C_{10}H_8$	1·64	12·5	106
Anthracene	$C_{14}H_{10}$	1·20	9·1	207
Chrysene	$C_{18}H_{22}$	0·94	7·1	257

tice, however, it is not necessary to convert the ble substance into vapour in order to obtain explosive mixtures; for by heating it to about its boiling point and rapidly introducing cold air, a very fine cloud is produced which has almost the same explosive effect as an inflammable mixture of the vapour with air.—C. A. M.

Acetylene; Analysis and Purification of ——. A. Rossel and E. Landriset. Zeits. angew. Chem. 1901, **14**, [4], 77—82.

The manner in which carbide and water are brought in contact for the generation of acetylene affects the degree of purity of the gas as much as the quality of the carbide employed. The authors investigated the composition of crude acetylene, generated by dropping small lumps of carbide into a relatively large volume of water in apparatus specially designed to avoid admixture of air with the gas. The acetylene was absorbed by fuming sulphuric acid, containing 30 per cent. of the anhydride, in a Hempel's pipette, and the oxygen in the residual gas was determined by absorption in potassium pyrogallate, the hydrogen by explosion, and the nitrogen by difference. In this manner samples of commercial carbide were found to yield gas containing from 0·2 to 0·3 per cent. of hydrogen, from 0·10 to 0·15 per cent. of oxygen, and from 0·10 to 0·20 per cent. of nitrogen. The hydrogen evidently was produced from small particles of metallic calcium distributed through the substance of the lumps of carbide, though carbide made with an excess of lime was found to give no appreciably greater yield of hydrogen; a portion of the surplus lime having been volatilised in the furnace, and the remainder having fused unchanged and given a beautiful crystalline appearance to the product, which, nevertheless, was in reality of poor quality. Normally made carbide yields so little oxygen and nitrogen that they have no practical influence on the value of the product. The absence of methane in the gas indicated that aluminium carbide was probably not formed in the furnace.

Ammonia was always found in unpurified acetylene, and in greater quantity when the lime used for making the carbide contained magnesia. Metallic calcium on the surface of the lumps of carbide and magnesium are converted, on exposure to the air, into the nitrides, which yield ammonia on being decomposed by water.

If, however, the gas is generated by dropping carbide into water, the ammonia liberated may be practically nil, but in gas generated by dropping water on carbide, it was found to range from 242 to over 500 c.c. per 100 litres of gas. Similarly there may be no trace of sulphuretted hydrogen in gas generated by dropping carbide into water, and the maximum amount of sulphur found in gas thus generated was 0·021 grm. per 100 litres, which was equivalent to 2·1 per cent. of the total sulphur in the carbide used. But in gas generated by dropping water on to carbide, the minimum amount of sulphur found in the gas was 0·111 grm. per 100 litres, which was equivalent to 11·1 per cent. of the total sulphur in the carbide, while as much as 18 per cent. was sometimes found in the gas. Probably the injurious fumes often produced when acetylene is burnt are to a large extent traceable to sulphur tri-oxide formed by the combustion. As sulphur is always present in coal, commercial carbide must always contain it in some quantity, but as coal contains very little phosphorus, and limestone free from phosphorus is not rare, the amount of phosphorus in carbide can be kept low. The maximum amount of phosphorus found in carbide of good quality was 0·525 grm. per kilo., and the maximum amount of phosphuretted hydrogen in acetylene was 53·3 c.c. per 100 litres, which is equivalent to 0·240 grm. per kilo. of carbide used. The phosphorus which remains in the residual lime after generation of the gas may be estimated by the usual methods, and the volatile phosphorus products by oxidation with sodium hypochlorite, through a solution of which a known volume of gas is passed, hydrochloric acid being subsequently added to the solution, which is then filtered and neutralized, and the phosphoric acid precipitated with magnesia mixture.

The authors have devised an apparatus for affording a rapid check on the quality of carbide as it leaves the furnaces. It comprises a generating bottle of 6 to 7 litres capacity, containing 5 litres of water, and provided with a plug, through which pass an outlet tube, and a glass rod supporting a small perforated zinc basket capable of holding 25 grms. of carbide. The raising or lowering of the rod brings the carbide in the basket above or beneath the surface of the water. The gas passes through a flask containing solution of lead acetate for the detection of sulphuretted hydrogen, and one containing the solution of sodium hypochlorite already mentioned, to a gas meter, whence it goes to a bell gasholder of 10 litres capacity and not more than 10 cm. in diameter, graduated exactly. The meter is not absolutely necessary, as the gas may be measured sufficiently accurately by means of the graduations on the bell. The water in the gasholder is saturated with common salt, and the water in the generator is saturated with acetylene by adding to it, in two operations, 60 grms. of carbide. As many as 50 samples, each weighing 25 grms., may then be examined in succession before the water in the generator needs renewal. The sample is placed in the basket, which is then pushed well below the surface of the water. When samples are decomposed in rapid succession, the temperature of the water in the generating bottle rises 1° to 1·5° for each tes
the temperature of the gasholder is not affected.

The authors investigated the ratio of water to ca
used with reference to the quality of gas proc
500 grms. of carbide discharged at once into 5 lit
water yielded good gas, and the temperature of the
did not exceed 50°, but on increasing the quanti
carbide to 1,250 grms., the temperature rose to 85
sulphuretted hydrogen was evolved. It was found
was safe in practice to discharge 50 kilos. of carbi
degrees during half-an-hour into 200 litres of water.

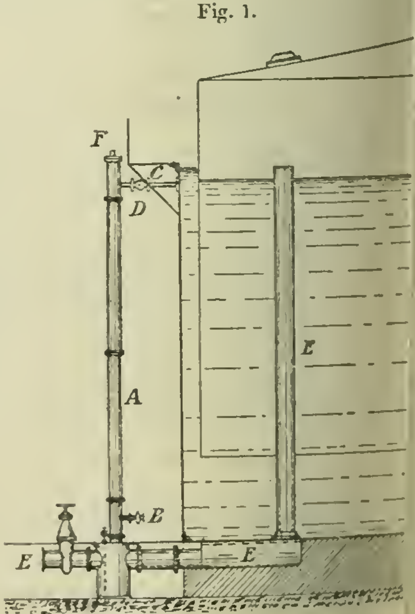
The impurities to be removed from crude acetylene
found to be as follows, per 100 litres of the g
Ammonia, 0 to 500 c.c.; sulphuretted hydrogen,
250 c.c.; and phosphuretted hydrogen, 20 to 53·
Chloride of lime is the best material for the oxida
phosphuretted hydrogen, and the authors have foun
the simplest means of applying it is to add it, in th
portion of from 5 to 20 grms. per kilo. of carbide,
water in the generator. The gas is then passed thr
washer, in which 100 litres of water are used for
50 kilos. of carbide decomposed. One to 2 kilos. o
of lime are added to the water in the washer, wi
object of retaining sulphuretted hydrogen. Gas gen
by discharging carbide into water, and purified
manner described, was found to be free from ammon
sulphur, and to contain, at the most, 0·012 grm. of
phuretted hydrogen per 100 c.c. (? 100 litres).
method of purification is said to present no disadva
the great dilution and the excess of lime are st
prevent the liberation of chlorine and the format
nitrogen chloride.

Acetylene should be consumed under a constant p
of from 60 to 80 mm. of water, if the most suitable
burners of Stadelmann, v. Schwarz, or Biel are
With Bray burners, a constant pressure of 80 to 1
gives a steady flame. To ensure constant pres
sufficiently large gasholder must be employed. T
of automatic apparatus, without pressure regulat
undesirable.—J. A. B.

Naphthalene Obstructions in the Inlet and Outlet
of Gasholders; Removing ——. J.f. Gasbeleuch
44, [7], 113—114.

An arrangement devised by Deegen for removing n
lene deposits from the affluent and effluent m
gasholders with iron tanks is shown in the first
in which E is one of the mains, A a vertical pi

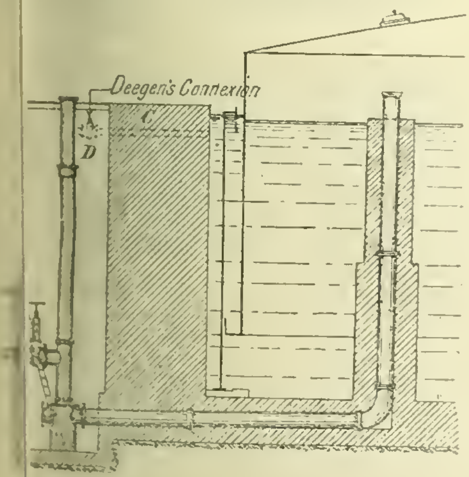
Fig. 1.



:h and draw-off tap B, and screw-cap F. C is a ection between the pipe A and the gasholder tank, i it enters about 0·5 metre below its rim. The pipe ins the main E either at the drip-pot rough a ⊤-piece. The valve on the E is closed when it is necessary to e the portion of the main shown, and is run in from the tank through the ction C, until the pipe A and the main filled with it. The cap F is then ed, and a wooden plunger, packed ow so that it fits the pipe tightly, is d in A and moved up and down by of an iron handle. The deposited alene is loosened from the walls of in by the scouring movement thereby to the contained water. The plunger a removed, the cap F replaced, and lk of the water is drawn off through being admitted through a cock in d the remainder pumped out of the ot. The cock on F is then closed, e main is ready for use by re-opening ve.

r had previously applied the same with masonry tanks, but had not the connection between the pipe A e tank to admit of the water being from the latter. His arrangement is in Fig. 2, in which Deegen's con-, which obviously can also be

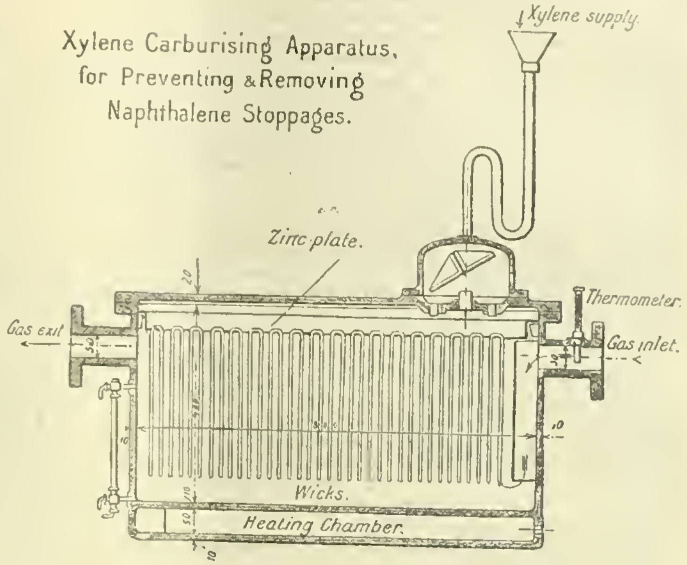
Fig. 2.

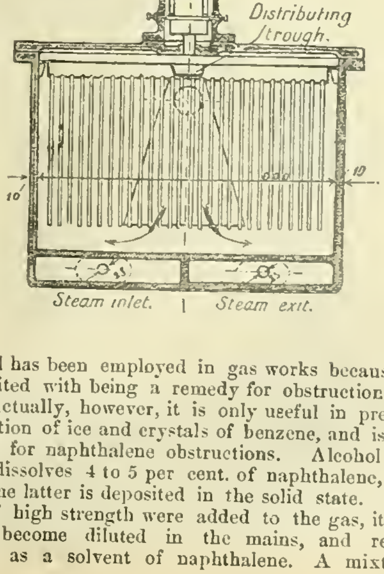


o masonry tanks, is also indicated by the dotted).—J. A. B.

lene Obstructions [*in Gas Mains*]; *The Pre- of ——, by Means of Crude Xylene.* Erlenbach. asbeleucht. 1901, **44**, [4], 57—59.

t of saturation of coal-gas by naphthalene is: at ·56 grm.; at 10° C., 0·32 grm.; at 0° C., 0·14 naphthalene per cb. metre of gas. Therefore, contains, for instance, 0·32 grm. of naph- er cb. metre will not throw down a deposit temperature falls below 10°. The deposition of ne in gas mains occurs in strict obedience to the rning the behaviour of volatile substances, and ce of other substances in the gas is immaterial. of naphthalene in the distributing mains con- only happens when their temperature is lower of the gas at the works. There are three ways ing such deposition, *viz.*:—(1) By the addition ified coal-gas of some gas, such as water-gas, which is free from naphthalene, and consequently reduces the partial vapour pressure of that substance. (2) By washing the gas with an absorbent of naphthalene, such as heavy coal-tar oil containing a little benzene, as is done practically in the Young-Bueb process (this Journal, 1900, 998). (3) By adding to the gas substances which are deposited simultaneously with the naphthalene and prevent it assuming the solid state. Of such substances, alcohol, a mixture of alcohol and benzene, and crude xylene, have been used in practice.


Xylene Carburising Apparatus, for Preventing & Removing Naphthalene Stoppages.



Alcohol has been employed in gas works because it has been credited with being a remedy for obstructions of all kinds. Actually, however, it is only useful in preventing the formation of ice and crystals of benzene, and is useless as a cure for naphthalene obstructions. Alcohol of high strength dissolves 4 to 5 per cent. of naphthalene, but on dilution, the latter is deposited in the solid state. Even if alcohol of high strength were added to the gas, it would naturally become diluted in the mains, and rendered ineffective as a solvent of naphthalene. A mixture of alcohol and benzene is sold as a remedy for naphthalene obstructions, but in use it forms two layers in the mains, the lower one consisting of diluted alcohol and the upper one of benzene. Benzene itself solidifies slightly above 0° C., and so may cause further obstruction. Moreover, 116 grms. of benzene are required to saturate 1 cb. metre of gas at 0°, and such a quantity makes the gas flames smoky, while less is quite ineffective as a solvent for naphthalene. Crude xylene has been shown to be a suitable agent for the prevention of naphthalene deposits by Bunte and Eitner (this Journal, 1899, 356, 742, and 1109), and it has been in practice used by means of the apparatus shown in the annexed figures. A portion of the stream of gas issuing from the gasholder is transferred by means of a by-pass through the apparatus, re-joining the main stream after the governor. The apparatus consists of an iron chamber, with a false bottom, beneath which steam is passed. Wicks hang down from a zinc plate in the upper part of the chamber, where crude xylene is supplied through a tipping-trough to which a counter is attached. The wicks present a large surface wetted with xylene to the gas, which is thus saturated with it. The evaporation of the xylene is perfect, and the chamber does not need cleaning throughout the winter. The apparatus should be brought into use as soon as the cold weather sets in. If it were likely that obstructions in the mains were partially due to ice or benzene, a mixture of equal volumes of crude xylene and alcohol should be used. Crude xylene is also a very suitable material for pouring into service pipes for the removal of existing naphthalene deposits.

The author quotes the data given by Eitner as to the limits of saturation of gas with xylene, and the solubility of naphthalene in xylene at different temperatures (this Journal, 1899, 356). He adds that crude xylene is now recovered from coke ovens.—J. A. B.

Acetylene Lamp; New Immersion ——. M. Rosenfeld.
Chem. Zeit. **25**, [17], 178.

The lamp consists (Fig. 1) of the conical generator E, to which the gasometer *g* (Fig. 2) can be attached, air-tight, by the screw collar *m*, the open pipe *r* of the gasometer extending up to the neck of the generator, which itself projects through a collar on the cover *d* (Fig. 3) and carries a wire basket K to hold carbide, &c., for drying and purifying the gas. When charged with carbide for use, the generator and its appurtenances are placed in the water vessel W (Fig. 4) which is then filled with w through the tubulus O. The over-production of ga prevented by gasometer *g*, in w the gas col and so forces water away fron carbide. More the access of may be prev by depressing generator so compress the r tube leading fro bottom of the meter into the vessel.

When the is taken apar cleaning, the p (Fig. 2) shou immersed in hydrochloric a vinegar. The rator and gas being always rounded by cold when in use, n densation prod acetylene, capa choking the are formed. lamp is said particularly s for use with p larimeter.—C.

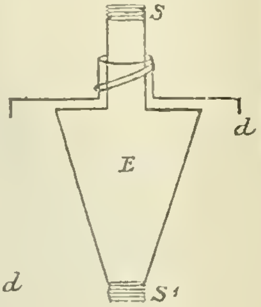


Fig. 1.

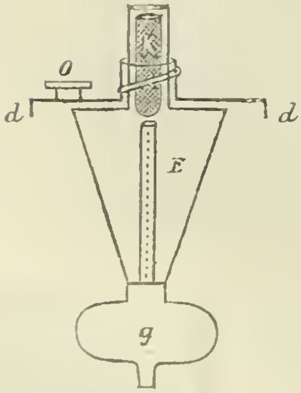


Fig. 3.

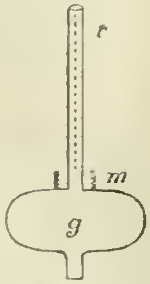
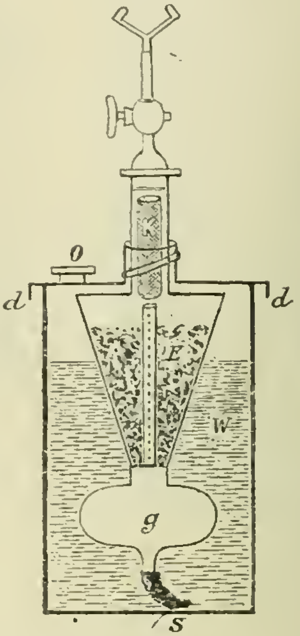


Fig. 2.

Fig. 4.



Osmium Incandescent Lamp of Auer von Wel
Scholz. J. f. Gasbeleucht. 1901, **44**, [6], 101—

Auer von Welsbach was the first to succeed in re osmium, which has the highest melting point of all to a filamentous condition, in which it was a go ductor and could be applied in place of car incandescent electric lamps (this Journal, 1899, 746). It is able to withstand a higher temperatu carbon, and in practice affords a higher illuminati and is more durable.

Experiments showed that the electrical energy e per Hefner unit amounted on the average to 1 and the life of the lamps was from 700 to 1,50 One lamp, which was in use for 1,500 hours, 1·7 watt per Hefner unit at the end of that period, of 1·45 when it was new. Moreover, it has bee possible to restore to their original condition, lam have become darkened, without renewal of either or the osmium filament. The osmium lamp has be for tensions of 25 to 50 volts, and where, as is cu current is supplied at 100 to 220 volts, a transfor be inserted, or several lamps must be coupled i If the current is an alternating one, each house already has a transformer, and in that case there no additional expenditure entailed. Filaments c of oxides as well as osmium were claimed under Welsbach's patent (this Journal, 1899, 571), but t so far proved less economical than the ordinary filaments, and the manufacture has provision confined to the latter.

Some trials made to determine the relative effici osmium lamps and the ordinary carbon lamps h the following results:—Four 25-volt osmium series, and four 100 volt carbon lamps in para 100-volt circuit, gave the same illuminating valu current used by the former was 0·96 ampère, a latter 2·40 ampères, the osmium lamps consumin per cent. of the current required for the ordina Again, an osmium lamp consuming energy equal t afforded a light of 20 candle-power, while a ca with the same consumption gave a light of only power. Or, in order to obtain a 20-candle-power carbon lamp, it was found necessary to expend 68 watts. se figures indicate the degree of economy which the ium lamp affords over the ordinary carbon lamp. The um lamp can be made to give a light of from 2 to 200 le-power.—J. A. B.

PATENTS.

, Gas, and By-products; Method and Apparatus for oducing ——. P. Naef, New York, U.S.A Eng. ts. 2917, 2917A, 2917B, 2917C, and 2917D. Feb. 13, 00, under Internat. Convent. July 20, 1899.

cts of the invention are:—(1) The production of quantities of coke in a single apparatus with recovery -products and gas. (2) The production of coke and oducts and gas without waste of heat. (3) The ery, if desired, of as much tar oil as possible of ior quality. (4) The recovery of a large percentage e nitrogen of the coal as ammonia. (5) The coking el by means of coke dust or other cheap fuel. The use of plants of large dimensions and large ity. (7) The reduction of the pressure required for g gas through fine fuel. (8) Improved methods of cting gas through fine materials; and (9) Improved for charging and discharging materials from the atus.

coking apparatus consists of a shaft supported on us and having an iron mantle and a brick lining in wer part. On the top of the shaft is an arrangement ntinuously charging fuel consisting of a hopper and yor. From the conveyor a number of vertical pipes nto the top of the shaft, terminating some distance the top plate. These are kept constantly filled with el by the conveyor and by regulating the speed of tter so that it contains fuel at the end farthest from pper, a constant feed through all the pipes is main-. By providing a number of conveyors it is possible arrange the vertical pipes, as to keep the apparatus regularly and evenly to the same level without ision; a point of great importance with coking of large size. At the base the apparatus is pro- with a mechanical arrangement for discharging the uniformly over the whole cross section, and without oduction of fine coke. This consists of a number of g shafts fitted with helical blades discharging the u to inclined planes or screens, whence it is removed t conveyors. The air or hot gas enters the apparatus h ducts, which are arranged at a considerable dis- from the bottom of the shaft. The part of the shaft the gas duct is used for coking the fuel, that below cts for acting with steam on the coke for the pro- n of ammonia with the simultaneous formation of gas, and also for cooling the coke. Some distance the gas ducts, outlet pipes communicating with a llector and a gas main are arranged. In the upper the shaft are perforated hoods or bells with toothed which are suspended on chains and are preferably anged, that the bells near the lower ends of the are of a smaller diameter than those further up the The chains are fastened to wheels or levers, by of which they can at intervals be raised a short e and afterwards be allowed to descend again with l. The bells on every alternate chain are placed at ne height, on the other chain they are arranged at ning distances. The bells are of special advantage eans for diminishing the pressure required to force through the fine material, inasmuch as they gather s and distribute it through a short distance of terial, gather it, and again distribute it, and con- well distributed, through a short distance. It is possible for the gas to travel in channels at a great through the fine material, and this is specially by making the bells larger in the upper part, where erial is fine, so that the gas coming from the lower collected by the next or bigger bell. For the same also the bells of adjoining chains are placed at t heights, so that any gas escaping sideways is l by the bell on the next chain. The gas enters the fuel through the perforations of the bells and from ered edges, in numerous places, and its speed is therefore slow, and it carries little dust. By arranging the number and distances of the bells and chains, it is possible to give coal of different quality different treatment. In these five specifications there are 109 claims.—D. B.

Liquid Hydrocarbons, Gas and the like; Burning of ——. [Vapour Generator and Burner.] T. Clarkson, and The Clarkson and Capel Steam Car Syndicate, Surrey. Eng. Pat. 4448, March 8, 1900.

The generator consists of a rectangular casing, having in its upper part a continuous zig-zag tube forming a feed heater, which is connected to a lower but larger tube wound in a coil to form a wall to the casing and situated around the source of heat. The latter tube is connected to and continued by a second zig-zag tube situated directly over the source of heat, and forming the main generating portion. All the tubes therefore constitute one continuous conduit. The generator is heated by an oil, vapour, or similar burner, which is controlled by a thermal regulator operated by the temperature of the contents of the generator. There is provided an auxiliary vaporising apparatus for starting the burner, with or without a fusible locking device in conjunction with the cock controlling the flow of fuel to the vaporiser.—R. S.

Liquid Hydrocarbons, Gas and the like; Burning of ——. T. Clarkson, and The Clarkson and Capel Steam Car Syndicate, Ltd., London. Eng. Pat. 4449, March 8, 1900.

The combinations claimed include: a burner box provided with a jet nozzle and two or more burner orifices, the cross sectional area of which box beneath the orifices decreases as the distance from the nozzle increases; "an air-inducing tube" delivering air beneath the burner box, the bottom of the latter being inclined so that the vapour issues evenly from the burner orifices and the air is distributed evenly on either side of the same; caps for the burner orifices, and means for raising and lowering these caps either simultaneously or independently; a steam jet, fan, or blower; vapour and steam jet nozzles with yielding connections between levers for simultaneously controlling the flow of vapour and steam; a dash-pot device connected with the mechanism controlling the flow of vapour, in order to prevent the flow being shut off too suddenly.—C. S.

Fuel; Artificial ——. A. E. Tucker, Birmingham. Eng. Pat. 9932, May 30, 1900.

The fuel material is cemented together, without any increase of its bituminous or smoky and ashy properties, by the aid of a non-fibrous agglutinant prepared by soaking crushed dari, or other similar grain, in water until softened and then steaming or boiling until gelatinous, the jelly being afterwards heated in water for use. The grain may also be gelatinised in an almost dry state and steamed after admixture with the fuel. The mixing is effected in a pug mill or by other means; the proportions taken being 98·75 parts by weight of crushed fuel, and the agglutinant obtained from 1·25 parts of grain. To protect the product from moisture, about 1 per cent. of paraffin oil, cheap wax, or fat, is added in the mixer. The product is claimed to be free from any tendency to soften when heated.—C. S.

Fuel; Furnaces for Burning Powdered ——. G. C. Dymond, Liverpool. From The Westlake Co., New York, U.S.A. Eng. Pat. 278, Jan. 4, 1901.

The claims include the provision of a non-conducting slide to regulate the charging orifice, and a non-conducting refractory lining around the latter, so as to form a hearth inside the firebox, in order to prevent the heat of the furnace being transmitted to the charging slide and caking the powdered fuel therein; means for inducing the entry of air without compression in the firebox; means, outside the firebox, for feeding down the dust fuel in a thin sheet and in regulated quantity to the hearth; means for cutting off the entry of air below the grate in the firebox; means for inducing air through the charging orifice; and the provision of a firebrick arch above the grate in the firebox.
—C. S.

Fuel Injectors. G. White, Jersey City (N.J.), U.S.A. Eng. Pat. 16,157, Sept. 11, 1900.

This invention is a device for burning coal dust and liquid fuel, the former being injected into the combustion chamber through a conduit, whilst the liquid fuel is delivered through an internal concentric conduit by the injecting action of a current of steam entering through a nozzle, which is contracted in one portion and expanded in another in order to increase the velocity at which the liquid fuel is injected into the combustion chamber. An adjustable conical deflector, arranged opposite the effluent aperture of the steam nozzle, directs the liquid fuel across the path of the coal dust, in order to ignite and mechanically distribute the latter. When the burner is intended for oil fuel alone, the outer device for supplying the coal dust may be omitted.—C. S.

Fuel; Manufacture of Artificial ——, and Apparatus therefor. The Patent Aggloment Fuel Syndicate, Ltd., Swansea; H. C. B. Forester, Sketty, Glamorgan; and J. A. A. Yeo, Cambridge. Eng. Pat. 7905, April 28, 1900.

The method of manufacture consists in raising the fuel mixture in a retort heated, by external means, to a definite temperature between 195° and 215° F. and maintained constant thereat by the aid of a pyrometer, any variations being corrected either automatically or otherwise, and moisture being added to the material as and when shown to be necessary by the indications of a pressure gauge. The apparatus includes the combination of the retort with a pressure gauge, a thermometer to indicate the attainment of the desired temperature, and a pyrometer and means for correcting any variations from such temperature.—C. S.

Generators and Burners chiefly designed for Use in connection with Boilers or Steam Generators; Hydrocarbon Vapour ——. H. H. Lake, London. From B. Rein, Rochester (N.Y.), U.S.A. Eng. Pat. 2472, Feb. 5, 1901.

The inventor claims a vaporiser comprising an auxiliary burner and a series of retorts, one of the retorts supplying combustible vapour to the auxiliary burner and another supplying the main burner, which latter comprises a number of sections out of communication with each other, each section being independently controlled.—C. S.

Temperature of Substances which become Luminous or Incandescent when Heated; Photometric Apparatus for, and Method of Determining the ——. W. L. Wise, London. Eng. Pat. 19,601.

See under I., *page* 343.

Firedamp in Collieries; Method of and Apparatus for the Detection and Indication of ——. S. A. Rosenthal, London. Eng. Pat. 4930, March 15, 1900.

A mercurial thermometer has its bulb in contact with spongy palladium or other material which becomes heated by the hydrogen present in firedamp. The consequent rise of the column of mercury completes an electric circuit, in which is placed a warning lamp or bell.—J. A. B.

Carbonic Oxide; Process for Production of ——. E. W. Engels, Essen-on-the-Ruhr, Germany. Eng. Pat. 23,781, Dec. 29, 1900.

Carbonic acid, either diluted or undiluted with other gas, is passed through carbon rendered incandescent electrically. The carbon is contained in a closed vessel, which may be of very simple construction, *e.g.*, an iron pipe coated with material which is a bad conductor of heat. The process is said to involve very little loss of heat, and in this respect is claimed to be superior to the processes in which the carbon is rendered incandescent by combustion.—J. A. B.

Gases; Apparatus for Indicating the Presence of Dangerous ——. H. G. Prested, London. Eng. Pat. 5125, March 17, 1900.

A flexible diaphragm, with piece of platinum attached, covers an opening in a porous vessel, and, owing to the different rates of diffusion of the gas and air, bulges wards when the vessel is exposed to air containing lighter than air, such as explosive gases, and inwards it is exposed to choke-damp or other gas heavier tha The platinum, in the first case, makes contact with th of a screw, and thereby completes an electric circu which is a glow-lamp, which thereupon becomes lig or, in the second case, breaks contact and extinguis lamp. The diaphragm and end of the contact scre enclosed in an airtight chamber to prevent ignitio explosive mixtures of gas and air by sparking.—J. A.

Gas; Processes and Apparatus for Manufacturing ing ——. R. Thomson, Glasgow. Eng. Pat. 2 Dec. 9, 1899.

This invention is for treating bituminous fuel, pe shale for the production of a non-condensible heatin and for recovering, together with other product nitrogen in the fuel as ammonia. This is done by a stage but continuous process, comprising (1) a prelin distillation operation under external heating; (2) a f distillation under direct internal heating in the prese steam; and (3) a combustion and gasification operat the distilled hot fuel. The producer employed has an preliminary distillation chamber, an intermediate fin tillation chamber, into which steam is introduced f production and preservation of ammonia, and a lowe bustion and gasification chamber, into which distilled are injected by steam and air. These distilled gases gases from the upper and intermediate chambers, whi passed through the lower chamber so as to be con into non-condensible gases and to pass off along wi poor or producer gases, thereby enriching the latter. steam is introduced at two levels, one for the formatic other for the preservation of ammonia, the pipes f purpose being capable of vertical adjustment. The part of the producer, forming a combined feed and d tion hopper, is heated at one part externally by th gas from the producer.—R. S.

Gas for Regenerative Gas Furnaces; Production o W. F. R. Pantgwyn, Swansea. Eng. Pat. 4641, 12, 1900.

Producer gas is enriched by injecting a liquid hydro such as petroleum, in a finely divided state on to fuel in the producer by means of air or steam.—R. S.

Gas Condensing or Purifying Apparatus. A. J. London. From P. Audouin, Paris. Eng. Pat April 17, 1900.

This apparatus is intended for the purpose of sep out the light tar products contained in gas after it ha through the surface condensers. It consists of a s small bells, dipping into liquid, and supported by the a cross-bar device connected to a counterweight. T are formed of perforated plates, and the gas, rising interior of the bells, passes through the small ope one plate and is projected against unperforated the outer plate, finally escaping through perforation latter to the outlet. A hydraulic seal is provided centre of the purifier.—R. S.

Coal Gas; Manufacture of ——. V. B. Lewes, wich. Eng. Pat. 7863, April 27, 1909.

The following is the substance of the claims invention: (1) In the manufacture of gas by the dis of coal, preventing or lessening the decompositio the retort of the gases given off from the coal b rating their rate of flow through the retort. (2) I a gas into the retort for producing this acce (3) Heating this gas to approximately the tem of the retort gases before injection. (4) Appar carrying out the invention, comprising a pipe lead a gasholder and provided with a regulating va pipe entering the retort at or near the mo extending along the crown thereof to the oppo and having one or more openings.—R. S.

l Gas; Process and Apparatus for Enriching ——. Imray, London. From J. R. McLean, Cincinnati, S.A. Eng. Pat. 2469, Feb. 5, 1901.

retort in which coal is destructively distilled, is pro- l internally with a wrought-iron cylinder, open at the farthest from the gas outlet, and closed at the end near Through the closed end passes a narrow tube, which is ected to an oil supply. This tube passes almost to open end of the cylinder, when it bends back, still in the cylinder, and has its open end near the closed of the cylinder. During use, the oil passes therefore the length of the cylinder within the tubes, during h time it is partially vaporised and slightly expands. en escapes into the cylinder itself, where it is completely rised and expands much more. Again traversing the h of the cylinder, it escapes into the retort, where it er expands and mixes with the gas produced. The ure escapes through the stand pipe at the other end of etort. The oil or its vapour thus passes four times wards and forwards in the retort, while it is expanded times. In the plant illustrated, there is a bench of etorts, with connections to the oil supply tank and aster.—R. S.

Producing Apparatus. M. Göhler, Zürich, Switzerland. Eng. Pat. 51, Jan. 1, 1901.

vaporised by air in an apparatus consisting essentially mpartments which communicate with one another, in f which there are rotary discs mounted upon a shaft, rovided with ports, buckets, and apertures. The discs iced with porous materials. A fan for supplying air red to the discs shaft. In use, the buckets successively nto and raise the crude hydrocarbon liquid, such as ne, and as the buckets are carried round, they arge it over the discs for evaporation. A brake for ting the air supply is automatically operated ding to the demand. The supply of liquid is regulated float. The generator is water-jacketted, and the rature of the water in the jacket is maintained con- by a thermostatic arrangement, consisting of a ther- ter, a gas burner, and a lever on the burner-tap under tion of a spring and of an electro-magnet, the current ting the electro-magnet being made and broken by the nd fall of the thermometric column.—R. S.

lene Gas; Apparatus for the Generation and rage of ——. G. Stevenson, Accrington, Lancs. Eng. . 4407, March 8, 1900.

bell of a gasholder, floating in an annular tank, the l cylinder of which also contains water, and commu- s near the base with the annular portion, operates, by of a suspended weight attached to it, a valve which ls the admission of water from the central portion tank to a chamber containing carbide. The gas d reaches the gasholder through a pipe which ates within the tank at a higher level than the intake pipe by which water passes to the carbide chamber. —J. A. B.

ene Gas; Apparatus for Generating ——. E. A. d, Neuilly (Seine), France. Eng. Pat. 5817, March 1900.

DE and a suitable quantity of water are discharged aneously into the same or separate shoots leading into d generating vessel containing water, and having a ated false bottom for the support of the carbide. The ottom is conical and provided with a ball valve which ned suddenly, to allow of the discharge of residual by means of a spring attached to a chain, which is d by a float within the generating vessel in such a t that the discharge occurs each time a fresh quantity ide and water is supplied.—J. A. B.

ne Gas; Apparatus for the Generation of ——. . Sunderland, F. Sunderland, and G. Marshall, all rmingham. Eng. Pat. 6865, April 12, 1900.

tentees describe an apparatus in which the discharge ide into water is controlled by the movements of l gasholder which receives the gas, but state that they make no claim to parts of the apparatus which are described in their Eng. Pats. 6274 and 13,786 of 1899 (this Journal, 1899, 822 and 906). They now claim certain modifications in the controlling connections, and the interposition of a purifier, seal and scrubber, between the generating chamber and the gasholder.—J. A. B.

Acetylene Gas; Apparatus for Producing ——, without Gasometer. B. Holub and P. Dvořáček, both of Vinohrady-Prague, Bohemia. Eng. Pat. 18,621, Oct. 18, 1900.

CARBIDE is fed by means of a rotating worm, turned by a small water-motor or other motor, into a reservoir, in which it is met by a spray of water, which is controlled by a float. The reservoir is open at the bottom and immersed in a tank in which water is maintained at a constant level.—J. A. B.

Acetylene Gas Generating Machines. A. H. Deike, J. Mitchell, and A. W. Alexander, all of Guelph, Ontario. Eng. Pat. 18,947, Oct. 23, 1900.

A CARBIDE holder, comprising several sections, is supported above water in a generator. The bottoms of the sections are hinged, and connected with mechanism which is actuated by the movements of a telescoping gasholder into which the gas evolved passes, so that the carbide in each section is discharged in turn into the water in the generator. —J. A. B.

Acetylene Gas Generators. H. Shepherd, Burnley, Lancs. Eng. Pat. 20,229, Nov. 10, 1900.

A RECEPTACLE contains a bell, within which is inserted from below a carbide container open at the top, and having a number of small perforations at different levels, through which water gains access to the carbide from the outer receptacle, in quantity dependent on the level of the water in the space between the bell and the carbide container, which level is dependent on the quantity of gas contained within the bell. The bell is retained in place by a spring, which, however, allows it to rise in the event of the pressure of gas within becoming excessive.—J. A. B.

Incandescent Mantles; Manufacture of ——. W. P. Thompson, London. From W. Karsten, Berlin. Eng. Pat. 5989, March 30, 1900.

"THE new process is characterised by the use of thoric and ceric (instead of cerous) compounds, and by that of hydrofluoric acid," the acid being mixed with an aqueous solution of thoric and ceric salts, and the mixture being then used for impregnating fabrics as usual. The following proportions are given as an example:—Thorium nitrate, 59·4 grms.; ceric oxalate, 1·5 to 2·5 grms.; pyrocatechol (for effecting the solution of the oxalate), 3·0 grms.; hydrofluoric acid, 0·8 to 2·0 grms.; and water, 135 grms. The hydrofluoric acid is intended to strengthen the mantle without reducing the illuminating power.—H. B.

Incandescent Gas Burners. M. Busch, Cologne. Eng. Pat. 7934, April 28, 1900.

IN the burner described, the central mixing tube is dispensed with. The burner top consists of an annular chamber, which is arranged above a hollow horizontal enlargement, provided at its sides with openings or sockets for the admission of gas and air. Gas supply nozzles are arranged in front of these openings so as to cause streams of gas, mingled with air, to flow into the horizontal chamber in a horizontal direction, passing thence upwards through the annular chamber to the flame.—H. B.

Lime Light or other Purposes; Obtaining Intense Heat for ——. O. Münsterberg, Berlin. Eng. Pat. 8415, May 7, 1900.

"FOR the production of limelight and other purposes, the employment of a flame from the combustion of a mixture of acetylene gas and air, for heating to incandescence rods or the like, of lime, zirconia, or similar substances." "The mixture must be prepared only in the flame itself, and in such a manner that the air is blown into the acetylene flame by means of a blower or similar appliance."—H. B.

Photometers; [*Electric Lamp* ——.] C. Deshler and E. J. McAllister, New Jersey, U.S.A. Eng. Pat. 17,945, Oct. 9, 1900.

A PORTABLE photometer is described, adapted for testing incandescence electric lamps. It consists of three detachably-connected sections:—(1) the main base, carrying two uprights, which support a short, detachable, graduated bar, provided with a disc-spot box; (2) a supplemental section, extending to the right of the main base, and carrying a standard kerosene lamp, and (3) another extension, to the left of the main base, carrying the lamp to be tested, a rheostat, and connections for a voltmeter, an ammeter, and a wattmeter. The bases of the two supplemental extensions consist of parallel strips, so arranged that, when the photometer has to be packed up, both sections can be slipped upon the main base, and the various fittings can be compactly "nested" together. —H. B.

Incandescent Lamps; Electric ——. R. A. Fessenden, Allegheny, U.S.A. Eng. Pat. 4803, March 13, 1900. Under Internat. Conv., Aug. 25, 1899.

THIS relates to lamps in which the incandescence pencil is formed of a material which is non-conducting at low temperatures, but conductive when heated, and relates more particularly to lamps of the type referred to in patentee's English specifications Nos. 4308 and 6308 of 1900 (this Journal, 1900, 651).

To avoid the necessity of using platinum terminals for the refractory pencils, the end portions of the latter are formed of a material which becomes conductive at a lower temperature than the body portion, the comparatively low temperature acquired by the end portions permitting the use of cheap materials, such as nickel, alloys, graphite, &c., for the terminals. In each case portions of the terminals are exposed, and are flush with the surface of the pencil. The latter is mounted within a lamp within which is arranged a block of conductive substance which can be caused to traverse the pencil, imparting to it, from one exposed terminal to the other, a band or coating of conductive material to serve for starting the lamp. The material is of such nature as to be destroyed or neutralised when the refractory pencil has become hot enough to act itself as a conductor. Part of the lamp circuit is formed by a conductor (such as lead, or an alloy of copper, nickel, and iron) adapted to carry the normal current without material change, and to be so heated as to present an abnormally increased resistance on a slight increase of current above the normal.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Kerosene; Methods of Testing ——. Charitschkoff. Petr. Ind. Techn. Rev. 1901, 4, [100], 110.

IN view of the present extensive use of wickless lamps, the author discusses the question as to whether the results of the ordinary tests for illuminating oil will serve as a criterion of the value of the oil for burning in a wickless lamp. It is shown that the results will not serve such a purpose, as even when the best kerosene, according to the present standard of quality, is used in wickless lamps, the capillary tubes frequently become choked up with carbon. The author has devised an apparatus, which he calls the "kerosinometer," for testing the suitability of kerosene for various forms of wickless lamps. In this apparatus, the behaviour of the oil is observed when it is passed through a narrow tube heated to 270°—300° C. The kerosene is classed as good, doubtful, or bad, according as to whether there is formed a scarcely perceptible white froth, which can be easily removed, a series of minute deposits of carbon, or one large deposit of carbon.—A. S.

Petroleum; Inflammability of Light ——. Steingraber. Oesterr. Chem. Zeit. 1900, 589—594; Chem. Centr. 1901, 1, [5], 282.

BY means of the fractions 0°—150° C., 150°—200° C., 200°—250° C., 250°—300° C., which were further split up into numerous smaller fractions, the author sought to mine as to how far the proportion of the last three fra to one another, on the one hand, and the presen benzene in mixtures of these fractions, on the other have effect on the flash points of the mixtures. standard, a mixture flashing at 21° C, in Abel's appa was taken. Tables are given showing the compositi the different mixtures examined. The results show benzines boiling below 100° C. alone have any s influence on the flash point. Higher-boiling benzine be added in considerable quantities to the illuminati fractions without causing the flash point to rise 21° C.—A. S.

Cresol; Determination of ——. F. Russig and G. Fortmann.

See under XXIII., *page* 394.

Cresol; Determination of ——. H. Ditz.

See under XXIII., *page* 394.

Asphalts; New Method for Determining the M Points of ——. C. F. Mabery and O. J. Sieplei

See under XXIII., *page* 394.

PATENTS.

Ammonia Liquors, Treatment of ——; *and the Ma ture of Sulphate of Ammonia.* E. G. Scott, Lo Eng. Pat. 3987, March 1, 1900.

THE ammoniacal liquor pumped into a heater at the b a still (a system of pipes heated by descending liquor) passes from the top of the heater through an ex pipe into the still near its top, through a spring valve, and descending over and through a success plates meets a current of steam, which (a partial v being maintained in the still) may be waste or e steam. If salts are contained in the liquor, lime or added. The spent liquor flows away, heating, as the incoming liquor, and the ammonia set free is, wi steam, conducted into a smaller vessel of acid-re material, containing sulphuric acid and ammonium s solution. Meanwhile, the heat of combination evolution of steam (especially as a partial vacuum is tained in the vessel) which passes on to a seco similar to the first, but in which a higher vacuum i "in order to obtain the necessary suction to ca steam to pass through the layers of ammonia liquid treatment." The steam then passes into a vessel, similar to the second described, except th under a higher vacuum; and from this vessel the s drawn to the vacuum pumps, "where a large propo the condensation may be effected by means of the liquor drawn away" from the bottom of the vessels to.—E. S.

Tar; Manufacture of ——. J. Rauch, Brams Germany. Eng. Pat. 279, Jan. 4, 1901.

A SUITABLE quantity of vegetable or coal tar is mix the same or a suitable quantity of resinous woo turpentine. The product is characterised by the f it does not require heating previous to use, and th having been applied to wood, stone, iron, or similar it dries in a very short space of time without being by atmospheric influences.—D. B.

Hydrocarbon Oils; Clarifying ——. J. W. W Omaha, U.S.A. Eng. Pat. 1014, Jan. 15, 190

THE invention consists principally in subjecting t the action of a clay known as "Wyoming roc found in the state of Wyoming, which removes the compounds contained in the oils after purificati sulphuric acid. In practice it suffices to add to tilled oil (50 galls.) finely pulverised "Wyoming ro (1 lb.). If tarry substances and sulphur be p large quantities, the clay is preferably mixed with quantity of magnesium carbonate. Oils similar in to that known as the "Ohio skunk oil" are cla ating them with a solution of sugar of lead (1 in 10), sorbing the lead by a precipitation of clay; drawing off a distillate, treating it with sulphuric acid, neutralising e same by a precipitation of clay, drawing off the dis- late, treating it with caustic potash, allowing it to stand, treating the distillate with clay, and finally, when clear, awing off the distillate.—D. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

digo Industry. Report of Meeting held in Calcutta, Feb. 20, 1901. Chem. Trade J., March 16, 1901, 249.

MBER of representative members of the Behar Indigo nters' Association, together with several buyers and nts connected with the Indigo industry, met in Calcutta Feb. 20, 1901, when the chairman, Mr. W. L. Thomas, his opening remarks stated that applications had been mitted to the Government of Bengal, soliciting financial istance for carrying on experiments which had already n put in hand by the Behar Indigo Planters' Association the Indigo Improvement Syndicate. The secretary of former gave reasons for holding the meeting in Calcutta, stated that according to the buyers, the planters should ce on the market as large a quantity of Indigo as possible about Rs. 130—140 per maund, including a reasonable fit, at which price the Badische Anilin und Soda Fabrik, the present state of chemical knowledge, could not pete with the natural article. If, however, this large utity were not produced, there would be room for both, and manufacturers of synthetic Indigo would be encouraged nake further researches. For the cheap production of ral Indigo, it was, however, necessary to take advantage everything that has been discovered, and according to son (this Journal, 1901, 165), the use of the blowing ess produces 25 per cent. more Indigo from the same nnt of green plant than hitherto by the old process, and further economies in cultivation and manufacture t be expected. It has been stated that the Badische in und Soda Fabrik could only supply a limited quantity nthetic Indigo, so that the operations of this firm alone ld not account for the very heavy fall in prices. Three r companies are said to be prepared to make synthetic go, but in view of the low prices ruling for the natural uct it was doubtful whether they will commence work. resent rates natural Indigo was said to undersell Aliza- Blue, which at one time threatened to oust it from the ket. At any rate, planters who were in a position to advantage of discoveries already made, had no inten- of reducing the Indigo output by substituting country ace; they intended to put only lands worn out for go under a rotation of crops after manuring them, and the assistance of manures and other improvements expected to obtain the same or even a larger return the reduced cultivation.

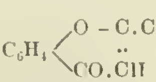
ristopher Rawson then read a paper on the prospects tural Indigo in continuation of his work (*loc. cit.*) is subject. After calling attention to the fact that ate of natural Indigo had frequently been threatened e introduction of other blue dyestuffs, such as those of Alizarin class, for wool, and of the Diamine class for , the culminating point was reached in 1897, when etic Indigotin was put on the market by the Badische n und Soda Fabrik. Up to this time Indigo planters given little or no encouragement to scientific research. , however, it became clear that synthetic Indigo was l a commercial fact, they bestirred themselves. Never- s the army of research chemists engaged in the lid laboratories of the European coal tar colour fac- had a great start on the one or two chemists studying eans of improving the cultivation and manufacture of l Indigo. No trustworthy information was at present ble as to the actual cost of synthetic Indigo, and gh Dr. Brunck (this Journal, 1901, 239) states, that aphthalene was the initial material for the manufacture, oduct could be produced in unlimited quantities, he quently admitted that it was not known how cheaply rs could supply vegetable Indigo, and expressed the hope that the Badische Anilin und Soda Fabrik would be victorious in the long and arduous struggle before them. The prospects of materially increasing the yield of natural Indigo were distinctly encouraging. Good results had been obtained, both as regards the methods of cultivating the plant and of producing a maximum yield of dyestuff from the plant grown. Good Indigo, containing 65 per cent. of dyestuff, has been selling recently in Calcutta at Rs. 165—175 per factory maund, which was much below the figure at which artificial Indigo had hitherto been put on the market, and, with at all favourable weather, taking advantage of the improvements to be put into force, it would be possible, if necessary, for the planters to sell at a considerably lower price next year. Merely by altering the method of oxidising the liquid obtained on steeping the plant, an increase of 25—30 per cent. of dyestuff is obtained. A number of factories were employing this process, but many planters desirous of adopting it were unable to do so for want of sufficient capital to put down the necessary plant. The out-turn of Indigo last year in North Behar was, in round numbers, 60,000 maunds. With the new oxidising process at least 12,000 maunds more, worth nearly 20 lakhs of rupees, would have been produced, and as this is only about one-fourth of the total amount of Indigo produced in India, the value of the crop might have been increased by nearly 80 lakhs. Under favourable conditions in good Behar factories, the average amount of Indigo obtained is 10 seers per 100 maunds of green plant, which could be increased to 12·5 seers by the use of the blower or air-compressor. What proportion this was of the amount theoretically obtainable could, however, only be estimated approximately, owing to the varying (from 9 to 60 per cent.) amount of leaf on the Indigo plant. On an average, the leaf of *indigofera tinctoria*, the Indigo plant of Behar, yields 0·55 per cent. of Indigotin, equal to 0·92 per cent. of 60 per cent. Indigo. This is equivalent to 30·8 seers of Indigo per 100 maunds of leaf, and as a good plant should contain 40 per cent. of leaf, 100 maunds of green plant (stems and leaves together) should be capable of yielding 14·7 seers of 60 per cent. Indigo. If this amount were compared with that actually obtained by the blower process (12·5 seers), it followed that it was possible to get a further increase of about 20 per cent. from the plant as now grown. A bacteriological study of the changes occurring in the steeping or fermentation process, should prove profitable, but the author was of opinion that more favourable results still were to be obtained by a process in which the ordinary steeping of the plant was altogether abandoned. A process such as this would render the planter independent of bad weather during the manufacturing season. A process has recently been patented in several countries by L. A. Calmette, of Lille, according to which it was claimed that about six times the amount of Indigo could be extracted as compared with the ordinary process, but the figures given were not in accordance with facts. Calmette stated that on an average only 1 kilo. of Indigo was now obtained from 1,000 kilos. of plant, which was equivalent to 4 seers per 100 maunds, whereas by his new process 6—8 kilos. per 1,000, equal to 24—32 seers per 100 maunds, were said to be obtainable. These figures evidently referred to the whole plant, and if true, the Indigo industry would indeed be benefited by a plant so rich in dyestuff.

In addition to improvements in manufacture, a far greater increase might result from judicious cultivation. Manuring with superphosphates gave, according to the richness of the land, an increase of 50—100 per cent. of green plant. Dr. George Watt strongly advocated the production of a superior plant by means of natural selection, and was of opinion that the most promising results were to be expected from a careful study of the plant indigenous to or acclimatised in India, although possibly the same methods applied to the Natal plant, which was said to have given excellent results in Java, might also yield a stock of superior quality in India. The Natal plant was much hardier than the variety at present grown in Behar, and gave a much greater amount of leaf. Hitherto it had been customary to cut the plant near the ground, and after about two months a second cutting was obtained from the fresh shoots bearing leaves which spring forth. Mr. H. Collingridge had found that if the leaves only, be stripped from the plant, fresh leaves came forth in a very short time, and 4—5 strippings could be obtained in the course of a manufacturing season. If this system could be carried out on a practical scale, the seed would have to be sown much more sparsely or the young seedlings transplanted a foot or more apart. It would thus be possible to obtain from an acre of land, 2 – 3 times as much Indigo as is produced under the present system. In conclusion, the author appealed for a further addition to his staff, and pointed out that capital was necessary in order to enable planters to take advantage without delay of any discoveries or suggested improvements. He suggested that it might be possible to combine the interests of the Indigo concerns in Behar, or perhaps in the whole of India, similar to the great combinations recently formed in England and America.

After some remarks from Mr. E. A. Handcock as to the prospects of the Indigo industry from an agricultural point of view and questions of land tenure, manuring, and the rotation of crops, it was resolved to appoint a deputation of several gentlemen to wait on the Lieutenant-Governor of Bengal and to solicit the assistance of the Government in support of the applications already submitted on behalf of the Behar Planters' Association and the Indigo Improvements Syndicate.—T. A. L.

Luteolin. Report on Prize Essay. E. Noelting and G. Freyss. Bull. Soc. Chim. Mulhouse, 1901, 33—34.

Most natural dyestuffs are now of secondary importance. Some, such as Alizarin, are produced more cheaply by chemical methods; others, like Indigo, are feeling the competition of the synthetical product, whilst others, such as Cochineal, Archil, Turmeric, and Red Wood, have been almost entirely superseded by artificial dyestuffs. Logwood and certain yellow dyestuffs are, however, still employed in relatively considerable quantities. Whilst the constitution of Alizarin and of Indigotin has been known for some time, that of most other natural dyestuffs is still obscure, except in the case of certain yellow dyestuffs such as Luteolin, Fisetin, Quercetin, Rhamnetin, &c., which Kostanecki has shown are derived from the parent substance, Flavone—

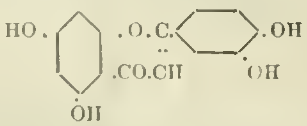


$$C_6H_4\left\langle\begin{array}{l}O - C.C_6H_5\\ \qquad\;\cdot\cdot\\ CO.CH\end{array}\right.$$

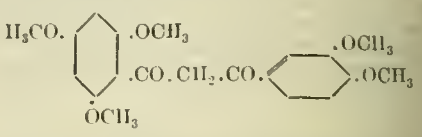
and one of which, Luteolin, he has succeeded in synthesising. Flavone is the chromogen of this group of dyestuffs as anthraquinone is of those of the madder series. The starting points are phloroglucinol and veratric acid, from which it is possible to obtain by simple reactions the dyestuff Luteolin, but the process is necessarily too costly to admit of industrial application. Details of the synthesis are given in the next abstract.—T. A. L.

Luteolin; Synthesis of ——. St. v. Kostanecki. Bull. Soc. Chim. Mulhouse, 1901, 35—41.

The name Luteolin was given by Chevreul in 1832 to the dyestuff he isolated from *Reseda luteola*, and subsequently Hlasiwetz and Pfaundler gave it the correct formula $C_{15}H_{10}O_6$. This was subsequently confirmed by A. G. Perkin and Herzig, the former showing that the substance gave a tetra-acetyl derivative. On fusion with potash, the product yields phloroglucinol and pyrocatechol carboxylic acid. By the moderate action of caustic potash on Luteolin, Perkin obtained acetopyrocatechol, and from these decomposition products it follows that there is in Luteolin a chain of carbon atoms similar to that in benzoylacetic acid. In fact, the condensation of phloroglucinol with benzoylacetic acid minus two molecules of water leads to a formula which a subsequent synthesis showed to be the correct one for Luteolin:—



By reacting with the methyl ester of veratric acid on the trimethylic ester of phloracetophenone in presence of metallic sodium, there results a diketone 2.4.6.3′.4 pentamethoxybenzoylacetophenone having the formula—



When this product is boiled with hydriodic acid (sp. g 1·26), it is converted into Luteolin having the formu already given. Synthetic Luteolin melts at 328—329°·5 and gives a tetra-acetyl compound melting at 224° C. shows all the characteristic reactions of the natural prod and gives an especially fine yellow on an aluminium morda —T. A. L.

Diazobenzene Sulphonic Acid; Explosion of ——. H. Wichelhaus. Ber. 34, [t], 11.

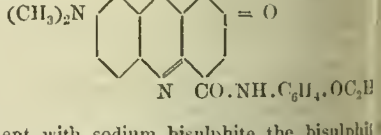
It has usually been assumed that diazobenzene sulpho acid is not very explosive, but the reverse has been fou to be the case with a preparation which had been made the author's laboratory and had been probably dried o sulphuric acid. This preparation exploded violently slight agitation.—T. A. L.

Gallamide Derivatives. R. Gnehm and A. W. E. Ganss J. prakt. Chem. 1901, 63, [2], 77—93.

The amide of gallic acid reacts with amidophenol eth when the two substances are heated together; ammo is evolved and a compound obtained of the t $(OH)_3C_6H_2.CO.NH.C_6H_4.OR$. A similar reaction occ with α- and β-naphthylamine, but not with 2.1-ami naphthol ethers, secondary amines, or (apparently) dismi

Bromine acts upon gallamide, producing a monobro gallamide, melting at 204°—205° C., and a dibromogallam melting at 245° C. When anhydrous, gallamido-*p*-phen yields a tribromo derivative. Gallamide (2 mols.) re with formaldehyde (1 mol.) in the presence of dil hydrochloric acid, producing an amorphous compoun methylenedigallamide, $CH_2[CO(NH_2)C_6H(OH)_3]_2$. Met lenedigallanilide and methylenedigallamidophenetol similar, and similarly obtained.

Derivatives of Gallamine Blue.—When gallamid phenetol is boiled with nitrosodimethylaniline hydrochlo and alcohol for some hours, a greyish-violet solutio obtained and the dyestuff separates in needles. A washing with alcohol and drying, moss-green crystals a coppery lustre are obtained; they dissolve in water alcohol with difficulty, in strong sulphuric acid to a blue solution, in hydrochloric acid to a Magenta solution, and in alkalis with a reddish-violet colour. dyestuff is to be regarded as a substituted Gallamine of the formula—

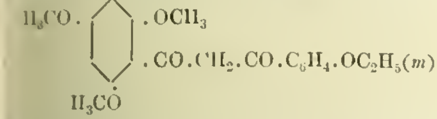


By treatment with sodium bisulphite, the bisulphi a leuco-derivative is apparently formed. The shade duced is similar to that given by Dauphin Blue, but gr When the dyestuff is heated with excess of aniline o water-bath for one hour, on cooling, moss-green cryst a new compound are obtained, from which the anili not evolved at 110° C., as from the anilide of gallami phenetol. The aniline has probably entered the hyd group.

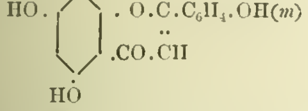
On heating monobromogallamide with nitrosodime aniline hydrochloride, crystals are obtained, soluble difficulty in hot water. They appear to be a mixtu Gallamine Blue and Bromogallamine Blue. If dibr gallamide be used, the latter compound appears to be obtained. In a similar manner from tribromogalla phenetol a dyestuff is produced, soluble in alcohol blue solution, from which water precipitates blue flock —A. C.

.3.3′-*Trioxyflavone.* St. v. Kostanecki and J. Steuermann. Ber. 34, [1], 1901, 109—112.

far the greatest number of natural dyestuffs are flavone ivatives, and of the yellow dyestuffs known, most of them re been identified as polyhydroxylated flavones or their ers. With a view of studying this group more completely, authors propose to prepare the polyhydroxyflavones tematically, so far as they are able to obtain the necessary terials therefor. In the present paper they describe the paration of an isomeride of Apigenin, which they have ained in an analogous manner to that by which they e previously prepared Chrysin, Apigenin, and Luteolin. e method consists in condensing *m*-ethoxybenzoic ethyl er in presence of metallic sodium with phloracetophenone thyl ether and boiling the *β*-diketone so obtained—



hydriodic acid (sp. gr. 1·96), when the product is rerted into 1.3.3′-trihydroxyflavone, having the nula—



he new compound, unlike Apigenin, is readily soluble lcohol. It crystallises from dilute alcohol in microie needles, melting at 299° C., and dissolves in soda with a light yellow colour. Ferric chloride added to alcoholic solution causes a red coloration, which soon brownish. The crystals, when wetted with conrated sulphuric acid, turn yellow and the solution is ared slightly greenish-yellow. The product does not mordanted cotton. It forms a triacetyl compound, tallising in white needles from alcohol, and melting at C.—T. A. L.

phenols; Absorption of Light by ——. P. Bayrac d C. Camichel. Comptes Rend. 132, [6], 338—340.

authors have previously shown that Indophenols conng a tertiary nitrogen atom. All exhibit, when dissolved e same solvent, similar absorption bands. Lemoult stated that the Indophenols which contain a primary gen atom in the *p*-position with regard to the nitrogen ng the two groups, show similar bands, but displaced regard to those first spoken of. The authors consider this displacement cannot be regarded as proved, on unt of the difficulty of fixing the middle point of the ; for the absorption diminishes so gradually towards nfra-red, that differences in the brightness of the rum cause differences in the measurement of the nity of the absorption band.—J. T. D.

enylmethane Dyestuffs. E. Grimaux and L. Lefêvre. l. Soc. Chim. 25, [4], 1901, 213—214. (This and the owing are sealed communications deposited March 14, 22, and 24, and June 12, 1889, opened January 1900.)

-, di-, and tri-amino compounds of triphenylmethane tives and their sulphonic acids are diazotised and ued with phenols, naphthols, and amines and their nic acids. It is to be observed that the Badische und Soda Fabrik obtained a German Patent No. of 1890 for azo derivatives of Magenta and one of the combination with salicylic acid is actually on the t under the name Azoalizarin Yellow. The authors r indicate the production of dyestuffs from resorcinol. obtain a yellow for silk and wool by reacting on inol at 100° C. with half its weight of sulphuric acid. r, the action of nitric acid and sulphuric acid on nol at the temperature of the water bath produces in. This is a yellow dyestuff soluble in alkalis and silk from a soap bath, wool and mordanted cotton. The action of bromine on Resoxeïn gives rise to a red dyestuff, whilst the aniline derivative (heating with aniline at 150° C.) is a reddish-brown. The ethyl derivatives of Resoxeïn and of Neneki's Resaurin are spirit colours, and the same is also true of the bromine compounds of these derivatives. The bromine derivative of Resaurin is a red dyestuff. The anilino derivative obtained by reacting on Resaurin with aniline at 150° C. has also tinctorial properties. —T. A. L.

Triphenylmethane Dyestuffs [Blue]. E. Grimaux. Bull. Soc. Chim. 25, [4], 1901, 215.

When dimethyl-*m*-aminophenol methyl or ethyl ether is treated in benzene solution with carbonyl chloride in presence of aluminium chloride, it yields blue dyestuffs having the formula $ClC[C_6H_3.N(CH_3)_2OR]_3$ which are soluble in water and dye wool, silk and tannin mordanted cotton. The alkyl radicles are interchangeable or can be replaced by others such as benzyl.—T. A. L.

Triphenylmethane Dyestuffs [Pink]. E. Grimaux. Bull. Soc. Chim. 25, [4], 1901, 215–216.

When dimethyl-*m*-aminophenol methyl ether is heated with its own weight of phthalic anhydride for some hours to 175—180° C. a colored melt is obtained which can be rendered soluble by heating it with dilute hydrochloric acid. The solution shows a red fluorescence and dyes wool and silk directly and tannined cotton. The methyl groups may be replaced by other alkyl radicles.—T. A. L.

Triphenylmethane Derivatives. E. Grimaux. Bull. Soc. Chim. 25, [4], 1901, 216–217.

The action of oxidising agents on dimethyl- or diethyl-*o*-anisidine or on dimethylamino-*o*-phenetol yields blue dyestuffs. For example, on heating dimethyl-*o*-anisidine with arsenic acid to 170° C., or by the action of benzene sulphochloride on the hydrochloride of the same base at 174°—180° C. in contact with the air, a dyestuff is obtained which dyes directly silk, wool, and tannined cotton, the shades obtained on the last-mentioned, being fast to boiling soap. The author also finds that the pink dyestuff obtained by the action of phthalic anhydride on *m*-dimethyl or diethylaminophenol methyl or ethyl ether is converted by the action of concentrated sulphuric acid at 180° C. for some time, into a new dyestuff of yellower shade, which dyes wool and silk directly and tannined cotton very fairly fast to boiling soap. Substituted Rhodamines behave similarly, whilst the Phthaleïnes are converted into Phthalideïnes. For example, Tetramethylrhodamine gives a reddish Ponceau by this treatment. The new dyestuff dyes silk and wool well and gives a bright red on tannined cotton, which stands boiling soap tolerably well. When dimethyl-*o*-anisidine is condensed with carbon tetrachloride, a leuco base is formed which gives a violet dyestuff on oxidation with lead peroxide, whilst dimethyl-*m*-aminophenol ethyl ether on heating with arsenic acid to 180°—185° C. gives a brownish red dyestuff. The fact that the phthaleïne derived from dimethyl-*m*-aminophenolmethyl ether on heating with sulphuric acid to 180° C. behaves like Rhodamine appears to indicate that in the reaction with phthalic anhydride, there is a de-methylation of the *m*-aminophenol ether.—T. A. L.

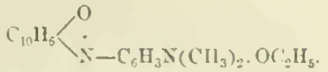
m-Aminophenols; Preparation of Dyestuffs from Alkylated ——. E. Grimaux. Bull. Soc. Chim. 25, [4], 1901, 217—218.

The alkylated compounds are obtained by heating resorcinol with dimethyl- or diethyl-amine for about 10 hours to 200° C., when dimethyl- or diethyl-*m*-aminophenol are formed (see also Leonhardt, Ger. Pat. 49,060).

When fluoresceïn is heated to 200°—255° C. with dimethyl- or diethyl-amine it yields dyestuffs similar to the Rhodamines. One of these is soluble in sodium carbonate and in hydrochloric acid, dyeing a fluorescent reddish-pink. The other is insoluble in sodium carbonate and gives shades very similar to Rhodamine. It is possibly identical with an alkylated Rhodamine. A green dyestuff is formed similar to Malachite Green by condensing dimethyl- or diethyl-*m*-aminophenol methyl or ethyl ether with benzaldehyde or with nitrobenzaldehyde in presence of zinc chloride, the leuco compound being subsequently oxidised.—T. A. L.

m-Aminophenol Ethers; Dyestuffs obtained from Dialkylated ——. E. Grimaux. Bull. Soc. Chim. **25**, [4], 1901, 219—220.

The nitroso derivatives of the dialkylated *m*-aminophenol ethers $m\text{-}C_6H_4(OR)NR_2$ obtained by the action of sodium nitrite and hydrochloric acid, yield analogous dyestuffs to those obtained from nitrosodimethylaniline. For instance, the hydrochloride of nitrosodimethyl-*m*-aminophenol ethyl ether $1.3.4.C_6H_3.N(CH_3)_2.OC_2H_5.NO$, reduced with zinc dust and oxidised with potassium bichromate in presence of α-naphthol gives an ethoxyindophenol—



$$C_{10}H_6\left\langle\begin{matrix}O\\ \cdot\\ N-C_6H_3N(CH_3)_2.OC_2H_5.\end{matrix}\right.$$

The same hydrochloride, when heated with an aromatic diamine yields a blue dyestuff which on boiling turns red. Condensed with β-naphthol in acetic acid solution it gives an ethoxy derivative of Meldola's Blue. When reduced with zinc dust and oxidised in presence of primary amines, it yields Safranines. On boiling with tannin it gives an ethoxygallocyanine soluble to blue solutions in alcohol and acetone and turning red with acids. It dyes a pure and fast blue. When heated with resorcinol, a blue melt is obtained, which on prolonged heating changes to a bronzy mass soluble to a reddish-blue in dilute alcohol. When reduced with zinc dust and mixed with dimethyl-*m*-aminophenol in an alkaline solution, it immediately oxidises in the air, forming a soluble blue product which dyes tannined cotton.—T. A. L.

Amines; Tertiary Aromatic ——. *IV.* C. Hæussermann. Ber. **34**, [1], 1901, 38—40.

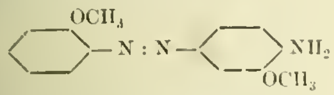
It has been shown in a previous paper (Ber. **33**, 939) that *m*- and *o*-dichlorobenzene, on heating with potassium diphenylamine, give one and the same tetraphenylphenylene diamine, melting at 138° C. This was originally described as an *o*-compound, although the coloration with nitrous acid pointed to the presence of a *m*-diamine. Against this latter view it had been previously observed that *p*-dichlorobenzene and potassium diphenylamine gave two condensation products, one the α, melting at 200°, and the β, melting at 127°—129° C., of which one must be the *m*-compound. On now further purifying the β-compound, it has been found that the melting point can be raised to 138° C., and hence its identity with the derivative from *o*- and *m*-dichlorobenzene is an established fact. With a view of testing whether a similar displacement from the *o*- to the *m*-position takes place in other cases, the author has investigated his so-called diphenyl-o-toluidine (Ber. **31**, 2987). He has compared the products obtained from *o*- and *m*-chlorotoluene and potassium diphenylamine and finds they are identical. Hence the product is diphenyl-*m*-toluidine. It melts at 70° C., the nitro compound melting at 165° C. Like triphenylamine (boiling point 348° C.) it does not combine with methyl iodide either at the ordinary temperature or when heated under pressure for 10 hours to 100° C.
—T. A. L.

Ortho-anisidine; Nitro Derivatives of ——. G. Freyss. Bull. Soc. Ind. de Mulhouse, 1900, 375—383.

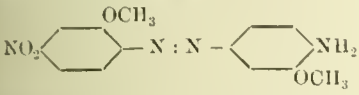
o-Acetanisidide, when dissolved in nitric acid (at 38°—45° B.) alone or in admixture with acetic acid, is transformed into a mixture (melting at about 143° C.) of about 66 per cent. of *p*-nitro-*o*-acetanisidide (m.p. 153°—154° C.) and 33 per cent. of *m*-nitro-o-acetanisidide (m.p. 175°—176° C.). Nitric acid, slightly more concentrated than this, namely, at 45°—46° B., under similar conditions, yields the same two mononitro compounds, together with *m-p*-dinitro-o-acetanisidide (m.p. 162°—163° C.) In sulphuric acid solution, 1 mol. proportion of nitric acid gives the *m*-mononitro derivative as sole product, a rather larger proportion of nitric acid forming a mixture of this and the above dinitro compound, while 2 mol. proportions of the acid produce the latter compound exclusively.

The constitutions of these products were established as follows:—*p*-Nitro-*o*-acetanisidide, when hydrolysed, gives *p*-nitro-o-anisidine ($NH_2:NO_2:OCH_3 = 1:4:6$) (m.p. 139°—140° C.), which is changed by elimination of amido group into *m*-nitro-anisol (m.p. 37°—38° (Similarly, *m*-nitro-*o*-acetanisidide yields *m*-nitro-*o*-anisid ($NH_2:NO_2:OCH_3 = 1:3:6$) (m.p. 116·5°—117·5° and *p*-nitro-anisol (m.p. 51°—52° C.) The compou obtained by Cahours (Annalen, **74**, 301), by reducing nitro-anisol ($NO_2 : NO_2 : OCH_3 = 1:3:6$) with ammoni sulphide, for which he was unable to assign a formula identical with the above *m*-nitro-o-anisidine. The form of this compound is further verified by its giving, wh the amido group in it is replaced by chlorine, the ni chloranisol ($Cl : NO_2 : OCH_3 = 1:3:6$) of m.p. 95 described by Reverdin (Ber. **29**, 2598). That the c pound considered to be *p*-nitro-*o*-anisidine is such, not the only other compound theoretically possible, $NH_2:NO_2:OCH_3 = 1:2:6$, is proved by its yield when reduced, a product (m.p. 220° C.) which exhi the reactions of a *p*-diamine, and which is transfor by the action of alkalis into the nitroguaiacol (103°—104° C.) obtained by Rupe (Ber. **30**, 2446) the oxidation of *p*-nitrosoguaiacol. The ethyl ether of nitroguaiacol (m.p. 85°—86° C.), on reduction and ace ation, yields a methoxyphenacetin of m.p. 145°—146 The *m-p*-dinitro derivative of *o*-acetanisidide, which also been obtained by Meldola and Wechsler (Chem. Proc. 1898, 226, and Trans. 1900, 1172), when hydroly gives *m-p*-dinitro-*o*-anisidine ($NH_2:NO_2:NO_2:OCH$ $1:3:4:6$) (m.p. 187°—188° C.) This can be prepar an impure state by direct nitration of *o*-anisidine, and from both the *m*-nitro and *p*-nitro-o-acetanisidides by t ing these compounds, at a temperature of 30° C., 4 parts of nitric acid at 47·5° B., and hydrolysing the ducts. By replacing the amido group in this comp with hydrogen, a dinitro-anisol is theoretically obtain Instead of it, however, the methyl ether of *o*-n resorcinol ($OCH_3:OH:NO_2 = 1:3:4$) (m.p. 95 produced (Benedikt and Weselsky, Monatsheft, 1, on igniting and boiling with alcohol. On methylation, becomes dimethyl-*o*-nitroresorcinol (m.p. 72°—73° which, when reduced, is converted into the amidodime resorcinol (m.p. 39°—40° C.) described by Bechhold **22**, 2372), who prepared it by reducing benzene-*p* dimethylresorcinol. When the amido group is elimi from this, dimethylresorcinol is obtained. As a sm quantity of sodium nitrite is required for the diazoti in aqueous sulphuric acid solution of *m-p*-dinitro-ani than is needed according to theory, it would seem partial hydrolysis occurs during the process. Fu hydrolysis takes place during the boiling of the product with alcohol, ethyl nitrite being then diseng along with nitrogen. Meldola and Wechsler found when the dinitro compound is diazotised in acetic solution, a nitro group is eliminated and a hydrate of nitro-anisol ($NO_2:OCH_3:N_2.OH$), exploding at 178° produced. Not knowing the constitution of the d compound, they were unable to determine that o compound. As the latter, when combined with β-nap gives an orange-coloured compound, it must be a *m* derivative, and the group which has been removed fr must, therefore, be the *p*-nitro group. The *p*-nitro it would appear, is replaced by hydrogen during the p of diazotisation in acetic acid solution alone.

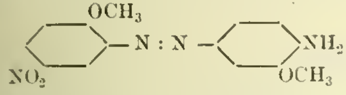
When combined with β-naphthol, by printing u cotton tissue prepared with this compound, diaz *o*-anisidine gives a slightly bluish-red which is les to light than Indigo of the same degree of inte *p*-Nitro-*o*-anisidine, under the same conditions, yields more bluish Red, which in a diluted state is a bright and is in fastness to light equal to an Indigo-dyed sh the same depth (Eng. Pat. 25,756 of 1897; (this Jo 1898, 1039; see also this Journal, 1900, 897). *m*-N anisidine treated in the same way, gives an orange wh of brighter shade than Metranitraniline Orange. *m* *o*-anisidine, diazotised and combined with salicylic yields a yellow dyestuff the chromium lake of which greenish than that of Alizarin Yellow G G. The colou *m-p*-dinitro-*o*-anisidine and β-naphthol is a brownish of no technical value. The replacement in this serie nitro by a methoxyl group renders the shade of the re u-compound bluer; thus, amidodimethylresoreinol gives th β-naphthol a Violet which in pale shades appears as bluish Pink, but which is without fastness to light. The bstitution of the nitro group in the *p*-nitro-anisidine by e chromophorous-azo group results in the shade becoming ore purple, the diazotised base—



ing with β-naphthol a dull purple fugitive to light. The nitro derivative of this, namely,—



es a brighter purple which is faster to light. The *m*-nitro ivative—



ns a reddish-purple of no special value, but, like the t product, considerably deeper in colour than the product ained from the unnitrated compound.

A dinitrodianisidine (m.p. 215° C.), probably identical h the compound prepared by Starke (J. pr. Ch. **59**, 204), o has not, however, determined its m.p. (its diacetyl ivative melts at 260° C.; Starke gives the m.p. of this at about 220° C.), yields when diazotised and combined h β-naphthol a full bright Red.—E. B.

sic and Acid Dyestuffs; Qualitative and Quantitative Determinations of Colouring Matters based upon Mutual Precipitation of ——. A. Seyewetz.

See under XXIII., *page* 394.

PATENTS.

satine-anilide and of Indigo; Process for the Production of the Homologues of ——. T. R. Shillito, London. From J. R. Geigy and Co., Basle, Switzerland. Eng. Pat. 036, March 31, 1900.

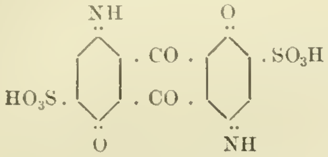
is specification is supplementary to Eng. Pat. 15,497 of 9 (this Journal, 1900, 657), the initial products being metrical ditolyl- and phenyltolyl-thiocarbamide. The hods employed have already been described, and the owing are the characteristics of the various new products. Hydrocyanocarbodi-*o*-tolylimine from di-*o*-tolyl-carbamide crystallises from alcohol in yellow prisms ting at 107° C. It is readily soluble in alcohol, ether, zene, and acetone, and dissolves in concentrated phuric acid with a yellow colour, becoming greyish et at 100° C., and finally reddish yellow. When this ution is poured into water, a yellowish-red liquid is ined, which does not turn blue on adding alkali. A solution is obtained when the undiluted sulphuric acid tion is poured directly into alcoholic soda lye. The esponding para compound from di-*p*-tolylthiocarbamide stallises from alcohol in long yellow needles, melting at ° C., and is easily soluble in alcohol, ether, acetone, and zene. Hydrocyanocarbophenyl-*o*-tolylimine obtained n phenyl-*o*-tolylthiocarbamide, is a yellow crystalline der and melts at 91° C., whilst the para compound tallises from alcohol in pale yellowish needles, melting 104 C. The thioamide of hydrocyancarbodi-*o*-limine crystallises in yellow leaflets, melting at 139° C., is readily soluble in ether, acetone, hot alcohol, and zene, and is also soluble in dilute acids and alkalis. para compound melts at 114° C. The thioamide of rocyancarbophenyl-*o* tolylimine forms brilliant olive-n prisms, melting at 134° C., whilst the *p*-compound tallises in small yellow prisms melting at 139° C. se thioamides on condensation in concentrated sulic acid solution yield isatin derivatives, for example, the thioamide of hydrocyancarbodi-*o*-tolylimine, yields the α-*o*-toluidide of *o*-methylisatin, which crystallises in small brownish-red crystals, melting at 140° C. The brown colour of the alcoholic solution turns intense blue on adding a few drops of caustic soda lye. The *p*-compound melts at 180° C., and forms small dark brownish-violet needles. The reduction of these compounds, according to the process described in the specification already referred to (*loc. cit.*), yields homologues of Indigo, for instance the *o*-toluidide of *o*-methylisatin, gives *o*-dimethyl Indigo, which forms needles having a coppery reflex, scarcely soluble in boiling alcohol, slightly more so in carbon bisulphide. Orthodimethyl Indigo, like ordinary Indigo, may be readily sulphonated, but it is even more easily reduced in the hydrosulphite vat than ordinary Indigo, and dyes wool and cotton greener shades of blue. Paradimethyl Indigo forms a dark blue powder, very sparingly soluble in hot alcohol. It is not sulphonated by treatment with ordinary sulphuric acid at 100° C., but requires the action of fuming sulphuric acid. It is reduced in the hydrosulphite vat somewhat more slowly than the *o*-compound, and dyes about the same shade as ordinary Indigo.—T. A. L.

Blue Colouring Matter; Manufacture and Production of New ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 6053, March 31, 1900. Second Edition.

This specification is supplementary to Eng. Pat. 890 of 1900 (this Journal 1901, 35) and describes the preparation of blue to blue-black dyestuffs for wool by the action of sulphuretted hydrogen on 1.4′-dinitronaphthalene in a solution of concentrated sulphuric acid. About 100 kilos. of 1.4′-dinitronaphthalene are dissolved in 2,000 kilos. of concentrated sulphuric acid (95 per cent. H_2SO_4) and the solution is treated at about 130° C. with a slow stream of sulphuretted hydrogen under constant agitation. Test portions of the melt at first completely soluble in water gradually become insoluble in about 8—10 hours. The whole melt is then poured into water and the new dyestuff is filtered off and washed. The product which is sparingly soluble in cold water dissolves more readily in hot, and can be used directly for dyeing unmordanted wool on which it gives blue to bluish-black shades which become greener on treatment with potassium bichromate. The same product can be obtained from an ordinary naphthazarin melt containing the naphthazarin intermediate product, by heating it to about 130° C. and treating the hot solution with sulphuretted hydrogen.—T. A. L.

Dyestuffs of the Anthraquinone Series; Manufacture or Production of ——. H. E. Newton, London. From The Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 7291, April 19, 1900.

By treating dinitroanthrarufin or dinitrochrysazin disulphonic acid with sulphur sesquioxide, the corresponding diamino compounds are obtained (Eng. Pat. 16,574 of 1899; this Journal, 1900, 732). The patentees now find that intermediate products are formed in the melt which undergo different transformations according to the subsequent treatment of the melt. For example if the melt from dinitroanthrarufin disulphonic acid and sulphur sesquioxide be poured into water, diaminoanthrarufin disulphonic acid is formed, whilst if the melt be mixed with sulphuric acid (75—95 per cent.), the intermediate product is converted into the quinoneimine having the formula—



Instead of mixing the melt with sulphuric acid and water, it can be allowed to stand for some time, or heated for a short time to 80°—90° C., until a test portion poured into water gives a violet-red solution turning red on adding bisulphite. The same quinoneimines can also be obtained by the action of dehydrating agents on the hydroxylamine compounds produced according to Eng. Pat. 20,649 of 1897 (this Journal, 1898, 838) by partial reduction of the dinitro-anthrarufin and -chrysazin disulphonic acids. It is to be noted that the formation of these intermediate compounds is entirely prevented by adding boric acid to the melt, the boric acid ethers of the diamino-anthrarufin and -chrysazin disulphonic acids being readily converted by the action of water into the free diamino acids.—T. A. L.

Blue Trisazo Dyestuffs; Manufacture of ——. H. E. Newton, London. From the Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 7292, April 19, 1900.

The dyestuffs produced according to this specification are obtained by first combining the diazo compound of an acidyl-*p*-phenylene diamine (*e.g.* acetyl-*p*-phenylene diamine) with one molecular proportion of a Clève α-naphthylamine β-sulphonic acid (or α-naphthylamine), secondly rediazotising the resulting amino-azo compound, combining this with a second molecular proportion of a Clève acid (or α-naphthylamine if not already employed in the previous combination), again diazotising and combining the diazo-disazo compound with a naphthol mono- or di-sulphonic acid. The resulting dyestuffs are finally hydrolysed splitting off the acidyl groups and yielding products which dye unmordanted cotton and can be diazotised and developed on the fibre. The dyestuffs produced after hydrolysing, give reddish-blue to greyish-blue shades on unmordanted cotton. When diazotised on the fibre and combined with β-naphthol, blue shades are obtained fast to light and washing.
—T. A. L.

Nitronaphthalene Derivatives from 1.4-Chloronitronaphthalene; Manufacture or Production of ——. G. W. Johnson, London. From The Chemische Fabrik Griesheim-Elektron, Frankfort-on-Maine, Germany. Eng. Pat. 7692, April 25, 1900.

The patentees have found that the chlorine atom in 1·4-chloronitronaphthalene can be readily replaced by the hydroxyl, alkyloxy, amino, or alkylamino group. For instance, 1.4-nitronaphthol is obtained by heating the product in an autoclave to 150°—155° C. with aqueous solutions of caustic alkalis, acid or neutral alkaline carbonates or alkaline acetates preferably with the addition of a certain amount of alcohol. Naphthylamine and alkyl naphthylamine derivatives are obtained by heating 1.4-chloronitronaphthalene with ammonia or the necessary alkylamine. For example, 10 kilos. of the chloronitro product are dissolved in 50 litres of alcohol and heated with 25 litres of a 33 per cent. solution of ethylamine for 6—8 hours at 180° C. in an autoclave. On cooling, 1.4-nitro-ethyl naphthylamine separates in dark red-bluish fluorescent needles, melting at 177° C. In a similar manner, 1·4-nitrobenzylnaphthylamine obtained from benzylamine crystallises from benzene, and melts at 156° C. The other known chloronitronaphthylamines, such as the 1.4′, 1.1′, and 2.1′, do not react in this manner.—T. A. L.

Triphenylmethane Colouring Matters; Manufacture of ——. G. W. Johnson, London. From C. F. Boehringer und Soehne, Waldhof, Mannheim, Germany. Eng. Pat. 23,687, Dec. 27, 1900.

According to Eng. Pat. 1088 of 1900 (this Journal, 1900, 373) the patentees have prepared aminophenyltartronic acid, $H_2N.C_6H_4.C(OH)(CO_2H)_2$, and a series of its substitution products. They now find that these products, when oxidised together with primary, secondary, and tertiary aromatic amines, yield triphenylmethane dyestuffs. For instance, a mixture of 13·4 kilos. of acid potassium aminophenyltartronate, 40 kilos. of aniline, 30 kilos. of nitrobenzene, 42 kilos. of 10 per cent. hydrochloric acid, and 30 kilos. of ferrous chloride is heated at 110°—130° C. with constant agitation for 6—7 hours. The melt is then dissolved in water, the nitrobenzene and aniline being blown off with steam. After filtering from tarry products, *p*-rosaniline hydrochloride is precipitated from the filtrate by adding salt. If, in this example, the 40 kilos. of anili be replaced by a mixture of 20 kilos. of aniline a 20 kilos. of *o*-toluidine, pure Magenta hydrochloride obtained in good yield. For the preparation of N Magenta, 32 kilos. of potassium aminotolyl tartrona 80 kilos. of *o*-toluidine, 60 kilos. of *o*-nitrotoluene, 20 kil of ferrous chloride, 34 kilos. of 11 per cent. hydrochlo acid, and 27 litres of water are heated together at 110° 130° C. for 6—7 hours. The melt, which has a metal sheen, is dissolved in water, and, after blowing off t superfluous oils with steam, the filtered solution yields t hydrochloride of New Magenta on adding salt. In ord to obtain triphenyl-*p*-rosaniline, 16 kilos. of acid potassi diphenylamine tartronate, 30 kilos. of nitrobenzene, kilos. of diphenylamine, 12 kilos. of hydrochloric acid (gr. 1·19), and 10 kilos. of ferrous chloride are heated 6 hours to 110°—130° C. The melt is treated with excess of soda lye, distilled with steam, and the filter residual solution is dried and extracted with hot alcoh The filtered alcoholic solution yields triphenyl-*p*-rosanili hydrochloride on treatment with hydrochloric acid a water.—T. A. L.

V.—TEXTILES: COTTON, WOOL, SILK, E

Cotton Goods; Yellowish Stains on Hot-Calendered — and Detection of Oxycellulose. M. Philip. Zeits. öffe Chem. 6, 524; Chem. Centr. 1901, 1, [6], 342.

Since the erection of a new factory in an establishm for the bleaching and finishing of cotton goods, it been noticed that the fabrics after hot calendering, sh yellowish to brownish stains, which are distinctly noticea when the goods come fresh from the calender, but fade a yellowish tinge on long standing in the air. The essen point of difference between the new factory and old o is that in the former, the goods coming from the chlor of lime bath are stored in piles in the air for a long ti whilst in the latter, the goods are kept in the bath. standing in the air in contact with chloride of lime soluti the cellulose, in places, is converted into oxycellulose. T this conversion takes place can be proved by boiling fabric, after first freeing it from the dressing, with 10 cent. Fehling solution for a quarter of an hour on water-bath, and then rinsing well with water. Cupr oxide is precipitated on the spots which were previo brownish coloured. Tests with Methylene Blue, which d oxycellulose direct, but cotton only after mordanting tannin, did not give such a satisfactory result.—A. S.

Oxycellulose; Detection of ——. M. Philip.
See under XXIII., *page* 393.

PATENTS.

Silk Waste to prepare it for Spinning; Treatmen ——. J. Woodhead and N. Thompson, Bradford. Pat. 3075, Feb. 16, 1900.

A method for the preparation for spinning of gum silk waste, that is, silk waste retaining a portion o natural gum, or gummy or other dressings applied i previous preparation. The waste is boiled for abou minutes in a suitable alkaline or other solution, for insta in a solution containing 1 lb. of carbonate of potash 1 lb. of carbonate of soda per gallon of water. de-gummed fibre is dried, passed through a "garn" machine made with particularly fine teeth, say abou to the inch, then through a gill box, and finally thr a suitable combing machine, after which it is ready spinning.—A. S.

Textile Fabrics or Materials for the Purpose of Filli Weighting same; Treating of ——. W. Brot Prestwich, Lancashire. Eng. Pat. 6839, April 11, 1

Fabrics are steeped in a solution of barium chl (sp. gr. 1·14) for a few seconds, and then passed thr squeeze rollers. They are then steeped in a satu solution of sodium sulphate.—C. M.

xtile Fabrics; [Water-] Proofing of ——. C. Baswitz, Berlin. Eng. Pat. 20,564, Nov. 14, 1900.

E composition employed consists of asphaltum, papier ché or cellulose, glue, chrome-alum, birch tar oil, enzine," and water; mixed together in the manner and portions specified. It is said to be specially useful for treatment of textiles of coarse mesh, such as cement s, workmen's overalls, and jute fabrics generally.
—F. H. L.

rcerising Fabrics and the like; Apparatus for —— . R. Ecob, Methuen, co. of Essex, Mass., U.S.A. Eng. Pat. 24,188, Dec. 5, 1899.

E object of this invention is to prevent lateral shrinkage abrics during mercerisation. The fabric is engaged in a es of upright rollers, placed one above the other, in one nore tanks. The rollers are placed in guide frames, and fabric during the whole of its passage never leaves a er. It is claimed that in this way a high degree of lustre btained with a minimum amount of attendance.—C. M.

rcerising; Stretching Apparatus for Use in ——. . Y. Johnson, London. From F. Hasslacher, Frankfort-n-Main. Eng. Pat. 8230, May 3, 1900.

; novelty in this apparatus consists in rollers having r peripheries corrugated, engaging into similar rollers. wet cloth, after passing through squeeze rollers, passes ctly to the corrugated rollers, and then to a second set. ; effects the washing out of the lye and stretching of the erial. If a larger corrugated surface be required, a drum sed engaging in a small corrugated roller.—C. M.

l and other Objects Smelling of Sulphur Dioxide; eodorising ——. A. N. Briggs and W. Priestley lilligan, Forbes, and Co.), Bradford. Eng. Pat. 14,050, ug. 4, 1900.

ORINE or bromine is sprayed with eucalyptus or other iferous oils on to blankets or other woollen goods which already been bleached with sulphur dioxide, and are moist.—C. M.

l: Impts. in Recovering Solvent from Compounds or mulsions obtained in Degreasing ——. W. Erben, iladelphia, U.S.A. Eng. Pat. 19,688, Nov. 2, 1900. nder Internat. Convention.)

he degreasing of wool, part of the solvent forms an sion with the potash soap derived from the wool. 1 is made for the recovery of this solvent by treating emulsion with a suitable acid, preferably sulphuric of 65° B., which will combine with the alkali of the allowing the liquid to separate, and decanting the nt.—C. A. M.

—DYEING, CALICO PRINTING, PAPER STAINING, AND BLEACHING.

aching; Notes on ——. G. Saget. Rev. Gén. des Mat. Col. 1901, **5**, [50], 43.

EITZER in 1896 (*cf.* Eng. Pat. 24,643 of 1895; this al, 1896, 648) recommended the addition of aniline enol to soda lye for the removal of grease spots in the ing of cotton materials. The author finds Turkey-oil equally, or more, efficacious for the purpose. es may be treated with 5 per cent. of oil and steamed pressure, the spots are then removable by soda lye. "oil" may be mixed with the lye made either with r in the Mather and Platt process with caustic soda. itres to each cubic metre of caustic soda lye (2° B.) to be sufficient. Turkey-red oil and lime appear to etter than oil and soda. Slaked lime is mixed with n weight of oil and diluted with water. The milky thus obtained settles very slowly, and if warm, ates the material perfectly. The oil has the effect ing the bleached materials much more supple. The ation is also quicker and a weaker bleach can be Sulphites and bisulphites can be used in conjunction with the above process. Sodium bisulphite (30°) equal in weight to the Turkey-red oil is added to the oil and lime lye prepared as above. The material is passed through this milky liquid at 50—60° C. If the air be expelled from the vat by steam, there is no danger of tendering the fibre. The pieces undried may then be steamed under pressure for 1½—2 hours, washed in hot water, laid for an hour in warm dilute hydrochloric acid, washed, gently chlorinated, washed again, and dried. In this way several pieces can be bleached in the course of a day.—T. A. L.

Bleaching: Electrolytic ——. Fürth. Färber Zeit. 1901, **12**, [4], 49—51.

THE chlorine in sodium hypochlorite is much more active as a bleaching agent than the "free chlorine" in the amount of bleaching powder from which the sodium salt has been prepared by precipitation with sodium carbonate, and the cost of obtaining a given bleaching effect is about the same in both cases. When, however, the hypochlorite is electrolytically prepared, the author considers that the cost is much less and the mode of application easier and safer.

The copious evolution of hydrogen on electrolysing common salt solution is accompanied by a considerable rise of temperature, and the temperature must be kept below 40° C., in order to avoid formation of chlorate. The preliminary treatment by boiling with soda, &c. is the same for all chlorine bleaching processes, but the "souring" after bleaching, with the consequent possibility of tendering the fibre, is avoided in the electrolytic bleach, and there is also no danger of the formation of a precipitate in the bleaching liquor, as may be the case with bleaching powder.

Calculating the concentration of the salt solution according to the first equation given above, it is found that for the production of a 0·3 per cent. solution of chlorine, it would only be necessary to use a solution containing 6 grms. of salt per litre, but for the maximum formation of hypochlorite it is found requisite to employ solutions containing 40 to 60 grms. per litre. The concentration partly depends on the strength of the current; thus, with a current of 110 volts, a 4 per cent. solution (40 grms. per litre) will suffice, whilst with 60 volts a 10 per cent. solution is required.

Great difficulties have been encountered in the construction of a suitable apparatus; the best known are those of Gebauer, Vogelsang, and Haas and Stahl. The electrodes used at first were of platinum, and the cost of these would be 800*l.*—900*l.* in an apparatus of moderate size. They are now usually replaced by carbon plates and this change really establishes the process on a commercial basis, since the capital sunk in the plant is comparatively small. The chief defect of the carbon is that the plates are gradually destroyed by the action of the nascent chlorine.

A difficulty is found in the breakable nature of the cell. This is usually built of five slate slabs covered with caoutchouc and enclosed in a wooden casing held together by means of bolts, but the author considers glass a more suitable material for the cell, and states that the whole apparatus may be constructed for less than 50*l.*

It is, of course, possible to freshen up the bleaching liquor which has been already used, by the addition of further quantities of rock salt, and in this way the consumption of salt is reduced to a minimum.—R. B. B.

PATENTS.

Bleaching, Dyeing, and otherwise Treating Fabrics; Apparatus for ——. W. Mather, Manchester. Eng. Pat. 23,400, Dec. 21, 1900.

THIS is an improvement in the apparatus described in Eng. Pat. 16,730 of 1899 (this Journal, 1899, 1015), for treating fabrics in their full width rolled upon mandrels, with liquids, gases, or vapours. Some of the operations required for bleaching and dyeing fabrics so rolled involve the use of chemicals which act upon iron vessels and apparatus, damaging them and colouring the liquids employed. The present invention relates to apparatus made of material which is not so acted upon; the tank is constructed of cement and has at one end a retractile seating for the bearing of one end of a roll mandrel, and at the other end a retractile centering plunger for the other end of the mandrel. Within the tank also, are mounted in a bearing a perforated disc and gearing for causing the roll to revolve.

The tank may be cased externally with iron or steel or formed of a framing or casing lined with tiles, slate, earthenware or such like materials. The metallic parts that are exposed to the action of the liquids may be of gun-metal or of other alloys not injuriously acted on by the liquids. (See also following abstract.)—R. B. B.

Bleaching and Dyeing, and Apparatus therefor. W. Mather, Manchester. Eng. Pat. 23,401, Dec. 21, 1900.

This patent refers to a method of completely bleaching and dyeing fabrics in the rolled condition by treatment somewhat similar to that described in a previous patent: Eng. Pat. 16,730 of 1899. The dry grey fabric is taken as it comes from the loom in open or full breadth folds, and the end of the web, or of several webs temporarily connected end to end, is passed through a bath of acidulated water or other cleansing liquid more or less heated, and is attached to a mandrel, which is caused to revolve so as to draw the fabric through the bath and wind it as a roll. By means of a crane the roll is transferred to a tank (described in the preceding abstract) and here it is immersed in liquid, the end of the roll pressing against the perforated wall of a chamber which, as well as the tank itself, is connected by pipes to a rotary or other pump. A cleansing liquid, as before, and afterwards water are caused to circulate lengthwise through the roll until the fabric is thoroughly washed. The fabric is then wound from the mandrel, and on to a second mandrel, passing on its way through an alkaline solution. This second mandrel is mounted on a truck, and two such trucks bearing rolls are run into a kier, in which hot alkaline liquor and steam are passed lengthwise through the rolls. Water is then passed through the rolls, and the trucks are run out again, the rolls being re-transferred to the tank, where they are now treated with bleaching liquor, and, if necessary, subsequently treated with dilute acid. Lastly, water is passed through the roll, and the bleached fabric lifted from the tank and conveyed to the drying apparatus. If, however the fabric is to be dyed, it may remain in the same tank or be transferred to a similar one, where the dye liquor is caused to circulate lengthwise through the roll for the time and at the temperature necessary to effect dyeing to the desired shade.

For some kinds of fabrics which have not to be treated with steam or with liquids under pressure, the closed kier may be dispensed with, and in this case, the roll once formed may be lodged in the tank and may have the cleansing, bleaching, souring, washing, and dyeing liquids circulated through it without changing its position.—R. B. B.

Preparing and Dyeing Furs. R. R. Ransford, Norwood, Surrey. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 6841, April 11, 1900.

Furs (*e.g.* sheepskins) are prepared for dyeing by firs chrome-tanning and subsequently chlorinating. The skins, which have been previously curried as usual with alum and common salt, are subjected to a treatment of which the following is an example: 10 sheepskins, weighing about 8 kilos., are washed in a solution of 250 grms of soap per 100 litres of water, rinsed, and suspended in a bath containing per 100 litres of water: 50 grms. of oxychloride of chromium, 100 grms. of basic sulphate of alumina, 100 grms. of salt, and 150 grms. of acetate of soda. When the leather is impregnated with the liquor, a further addition is made of 100 grms. of oxychloride of chromium, the skins are worked thoroughly and left for 24—36 hours in this bath, then rinsed and squeezed. They are next steeped for 15 minutes in a cold bath of 1 kilo. of hydrochloric acid per 100 litres of water, squeezed and passed into another cold bath containing 800 grms. of chloride of lime per 100 litres of water. After 25 minutes' working, 200 c.c. of HCl are added, the skins worked for 10 minutes longer, and then put back into the first acid bath, to which has been added 500 c.c. more of HCl. After 15 minutes, the goods are rinsed in cold water, and to remove all traces of chlorin they are washed at 30° C. in a solution of thiosulphate soda (3 grms. per litre), and finally rinsed three or fo times in clean water, hydro-extracted, and dyed. Tl dye-bath may be heated to 75° C., and ordinary ac dyestuffs can be employed. After dyeing, rinsing, a drying, the skins are packed in moist sawdust, and wh thoroughly and evenly moist, they are softened by passi over a blunt stretching iron.—R. B. B.

Printing Textile Fabrics; Manufacture of Zinc Cylind for use in —— ; also applicable for Goffering and oth like Purposes. J. A. Dejey, Crémieu, Isère, Fran Eng. Pat. 3976, March 1, 1900.

The cylinders are cast by being run into the bottom of t mould at a temperature very little above the melting-po of zinc, the core of the mould being preferably of cardboa They are then several times re-heated and cooled, a finally mounted on a heated conical mandrel and laminat under a pressure of 40—60 kilos. per sq. mm., the whole this operation being carried out at a temperature of 100 130° C.—J. T. D.

Printing on Raw Silk, or Textile Material containi Raw Silk. J. Y. Johnson, London. From The Badis Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, G many. Eng. Pat. 4534, March 9, 1900.

By printing a mixture of caustic soda and a thicken agent on raw silk or textile goods containing raw s carefully drying, and afterwards rinsing or acidifying material, a local degumming of the portions printed effected, while the remaining parts of the material are unchanged. In order to prevent the action of the cau soda from going too far, it is advisable to effect the lo degumming in the manner described in Eng. Pat. 546 1899 (this Journal, 1900, 344), and to add glycerin grape sugar to the printing paste. Coloured glossy eff on a dull white ground result from adding to the degumm paste dyestuffs which sufficiently resist the action of alk such as Indigo, Anthraquinone Black, and Oxamine Red

The degumming mixture may if desired be printed material which has been already dyed. Another varia of the process is to print with a resist which when drie steamed is sufficiently stable to the action of caustic s (such, for example, as chromium acetate), and the mate so treated, is afterwards passed through a degumn agent, such as one of the mixtures mentioned in previous specification above referred to; the parts w have been printed with the resist are protected from b degummed and in this manner are produced similar eff to those obtained by first printing the alkaline paste on material. Suitable dyestuffs can be incorporated with resist if required.

Undyed material which has been locally degummed be subsequently dyed in the usual manner.—R. B. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphuric Anhydride; Production of ——. Badi Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, many. Ger. Pat. 113,932, June 3, 1898. From Z angew. Chem. 1900, [41], 1037—1040.

The combination of sulphur dioxide and oxygen is ac panied by the evolution of heat. According to measurements of Hess and Thomsen, $SO_2 + O = S$ + 32·2 Cal. This reaction takes place in the presence catalytic agent and at an elevated temperature, and i it is necessary that the gases, or the mixture of should be subjected to a preliminary heating. This imparted to the gases before the reaction, is fu increased during their combination, and can under c conditions cause the temperature to rise to a white heat increase of temperature is dependent on the concent of the sulphur dioxide. In carrying out the reaction practical scale this accumulation of heat has a very terious effect. The plant, constructed of iron, is prema destroyed owing to oxidation; the action of the cat agent is weakened; the efficiency of the plant is dimin

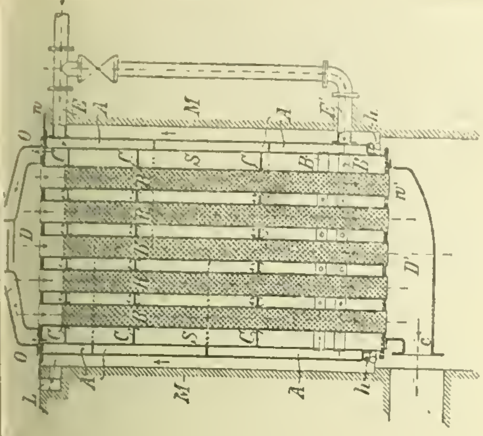


Fig. 2c.

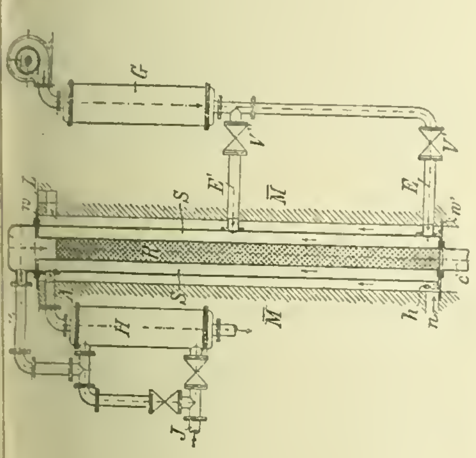


Fig. 2b.

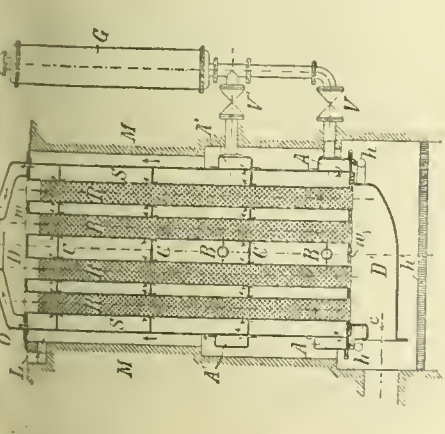


Fig. 2a.

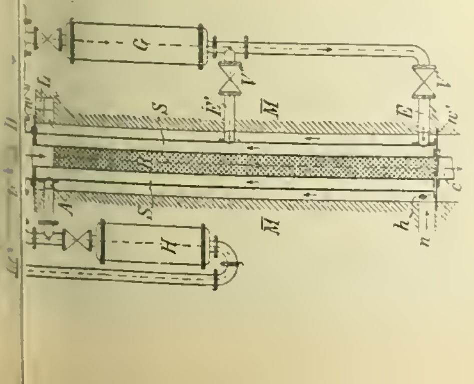


Fig. 2.

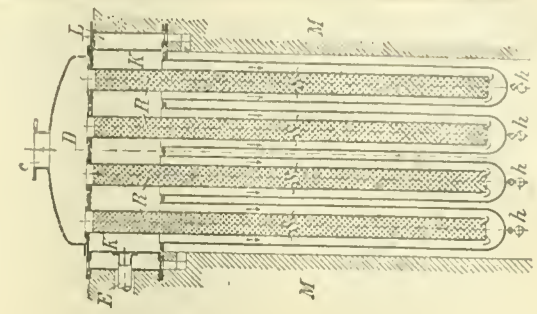


Fig. 4a.

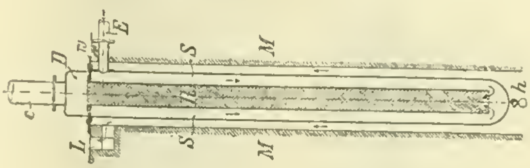


Fig. 4.

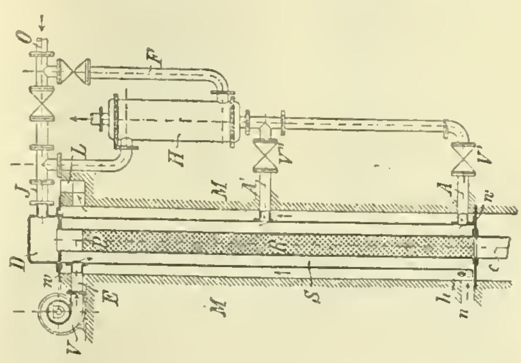


Fig. 3b.

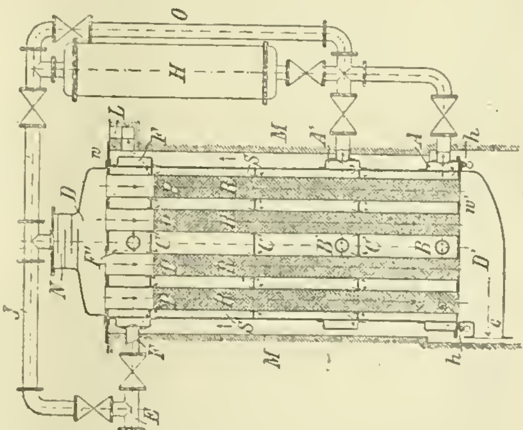


Fig. 3a.

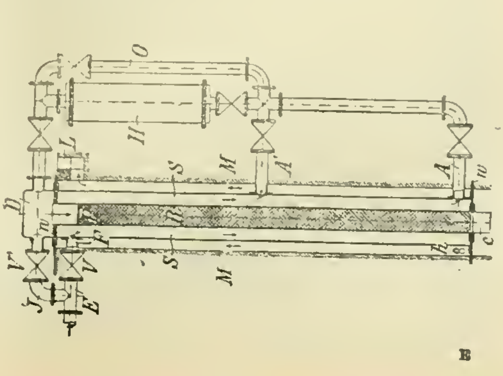


Fig. 3.

and, above all, the reaction, which ought to proceed quantitatively, is reversed, inasmuch as SO_3 decomposes into SO_2 and oxygen at a temperature which does not much exceed that required for the combination. The reversal of the reaction increases the more the catalytic agent is superheated.

In the process described, the superheating of the catalytic agent and plant is avoided, and controlled by external cooling, also the highest yield of SO_3 is obtained, and the most suitable temperature maintained, although the quantity and concentration of the gases varies within wide limits.

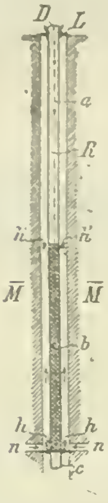


Fig. 1.

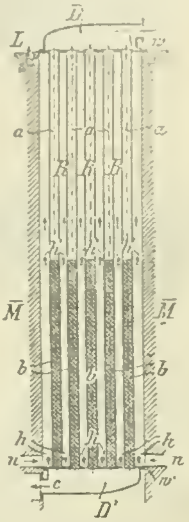


Fig. 1 a.

The carrying out of the process can be varied in many ways and depends chiefly on the concentration of the gases employed. In general the plant is cooled by regulating the quantity and temperature of the current of gas which may either be air or the mixture of gases. If required the temperature may be regulated by means of a liquid and especially by a metal bath. In cases where the mixture of gases is employed to cool the plant, these are conducted, either wholly or partially, through a jacket surrounding the plant in order to remove the excess of heat. The escaping mixture of gases is then brought to the most favourable temperature by suitably cooling or further heating before coming into contact with the catalytic agent.

The accompanying blocks represent suitable apparatus for carrying out the reaction.

In Fig. 1, R is a pipe surrounded by another pipe or jacket M. *b* is the catalytic agent. The mixture of gases is introduced through *a*, where it is also raised to the necessary temperature. The part *b* is cooled by means of a regulated supply of air admitted into the annular space between R and M. If required, the temperature of M can be regulated by means of a special heating arrangement whilst the portion *a* may be further heated when necessary by the heating arrangement shown at *h*¹. Fig. 1*a* represents a battery of pipes R placed inside a common mantle M and put in parallel with each other by being inserted into the tube plates *w w*¹ and by the common covers D and D'.

In the modification shown in Figs. 2 and 2*b*, the tube R, containing the catalytic agent, is surrounded by a tube S, which in turn is surrounded by a still wider tube or brick chamber M. The tube and annular spaces are separated from each other by the plates *w w'*. In Fig. 2 the mixed gases to be treated, or in Fig. 2*b*. air or another gas, previously heated by passing through G, are admitted into the tube S at one or more places through valves V' V'' and pipes E E'. The temperature of the tube S is further regulated by the heating arrangement *h* in the mantle M. The gas or mixture of gases passing upwards through S, maintains the catalytic agent in R at the required temperature, and then passes out through A. If the mixed gases are used this purpose, they are either passed directly (Fig. 2) the tube R through the valve F, or they may be fu heated or cooled as required by passing through H on way to the catalytic substance. When air or another (Fig. 2*b*) is used to regulate the temperature of R, th escaping at A passes through the heat interchanger is made to regulate the temperature of the mixed before admitting these into the chamber D. Figs. 2 2*c* show several tubes coupled up in parallel. In 2 heated gas is evenly distributed into the tube S by of gas chambers A A' and openings B, whilst in 2*c* is one gas chamber A completely surrounding S. In cases baffle plates C are provided to ensure a uniform of the gas round the tubes R. Baffle plates are also in the chamber D to thoroughly mix the gases before pass through the catalytic substance.

Figs. 3, 3*a* and 3*b*, represent modifications, similar 2*a* and 2*b*, in which the positions of the inlet and outl connections to the chamber S are reversed.

In Fig. 4 the gases entering the chamber S at E co tube R. Before admission to the tube R, the tempe of the mixed gases may be regulated if necessary b plying heat at *h* or by forcing a current of cold gas through the mantle M. Fig. 4*a*, represents such jacketed tubes arranged in a common mantle provided with a common collecting chamber D.—J. S

Guttmann's Filling Material [Balls] for Reactio Absorption Towers. R. Heintz. Zeits. angew. 1901, [6], 132—134. (This Journal, 1898, 994.)

The author gives the results of his experience of the perforated balls in towers for nitric and hydrochlori and in Gay-Lussac towers, and asserts that the obj which have been offered to them are groundless. has been stated that their employment led to difficu the passage of the gases, especially in the manufac sulphuric acid. The author, however, proves math cally that even from a theoretical consideration, it shown that the current will pass equally betwe through the balls, even when the holes are only 15 diameter, and this confirms the claim of the inventor

It is necessary to have the space for the pass the gases considerably larger than that of th pipe. If the latter be 500 mm. in diameter, 625 20 mm. in diameter will be required. That is, ther be 625 balls, without taking into account the side The author shows that this number of balls will area 2·88 times greater than that of the sectio 500 mm. pipe.

Solid balls of different sizes can also be used for purposes, and in the author's opinion are specially for Glover towers.

As regards the use of rings, he points out that the is too small and the current too strong, and that they tate the employment of high and wide towers. He mends broken brick or stone as the ground work and then solid balls of 60 mm. in diameter. Th round the balls is less than in the case of the rings, sufficient not to interfere with the current. He c that under these conditions the height of the towe be decreased at least by half. —C. A. M.

Sulphammonium; Preparation and Properties H. Moissan. Comptes Rend. **132,** [9], 510—

When liquid ammonia is sealed up at −80° C. in tubes with sulphur and the temperature allowed reaction begins about −38° C., −15°·5, and −11 spectively with insoluble, prismatic, or octohedral and the purplish-red substance called by the sulphammonium, is formed. This is certainly a compound, though very unstable and only ca existing in presence of an excess of ammonia solution of sulphur in ammonia. It solidifies at temperature than ammonia does, is soluble in ether, or chloroform, and has a characteristic a spectrum. It reacts at low temperatures on iodine, quicklime, zinc oxide, the chlorides of manganese mercury, forming compounds containing sulph

° C., the liquid appears to have the composition $_3)_2S.NH_3$, at + 20° C., $(NH_3)_2S.2NH_3$; the ammonia ars to perform a function somewhat similar to that of r of crystallisation.—J. T. D.

ssium Ferrocyanide; Action of Hydrofluosilicic Acid on ——. J. Matuschek. Chem. Zeit. 1901, **15**, 8—159.

he absence of air, aqueous solutions of potassium cyanide and hydrofluosilicic acid react to form a inous white precipitate, which becomes blue on contact air, owing to the formation of Prussian blue.

e reaction was found to proceed according to the ion—

$$K_4Fe(CN)_6 + 14H_2SiF_6 + O_2 =$$
$$Fe_4[Fe(CN)_6]_3 + 24HCN + 14K_2SiF_6 + 2H_2O,$$

ringing together known quantities of the reagents baking. The iron in the Prussian blue was determ by evaporating with strong sulphuric acid, reducing ferrous state, and titrating with permanganate. The itate was also directly determined by boiling with e potash, and estimating the potassium ferrocyanide d by titration with permanganate.

reacting masses are those indicated in the equation, er the solutions are boiled or are cold, but in the case a large excess of the acid should be present.

—E. H. T.

li-Copper Carbonates. M. Gröger. Ber. **34**, [3], 429—432.

ixing solutions of copper sulphate and potassium ate, blue liquids are obtained, which on standing t either small malachite-green granules of basic carbonate, or crystals of a double alkali copper ate, according to the conditions of the experiment. ler to obtain the double carbonate, the only ry precaution to be taken is that concentrated um bicarbonate solutions be employed. As thus d, the compound has the composition $4KHCO_3$ + $5CO_2.15H_2O$, the ratio (8:5) between the copper and carbon dioxide in the basic copper car- being the same as in the basic carbonate obtained cipitation with sodium bicarbonate. In contact ater, the double carbonate gradually loses potassium ite, and in the course of a few weeks passes tely into green basic copper carbonate. In the sodium copper carbonate, either alkaline carbonate rbonate may be employed for its preparation, is quickly carried out as follows: 20 grms. of ous sodium carbonate, and 50 grms. of sodium nate are dissolved in 700 grms. of cold water, and ution mixed with 8 grms. of copper sulphate d in 20 grms. of water. The liquid is then filtered owed to stand all night in a crystallising dish, by neans pale blue crystalline masses of the composition $.CuCO_3.3H_2O$ are obtained.—T. H. P.

of Magnesium and of the Alkaline Earth Metals. Ouvrard. Comptes Rend. **132**, [5], 257—259.

method previously described (this Journal, 1900, e author has prepared the substances $B_2O_3.3RO$, = Mg, Ba, Sr, or Ca. They are all crystallisable ds, soluble in mineral acids. The magnesium d is not altered by boiling water, and hardly by acetic acid; the calcium salt is altered by water, and is easily soluble in acetic acid; the other intermediate in stability. If in the preparation, a proportion of metallic oxide be used, indefinite are obtained, not definite salts $B_2O_3.2RO$. Sub- the chloride for the oxide of the metal, there is , in the case of magnesium, boracite; but in the the other three, compounds not corresponding to These compounds are still under investigation.

—J. T. D.

m Chlorides; Thermochemical Study of Ammoni- ——. L. Baud. Comptes Rend. **132**, [9], 553— (See this Journal, 1901, 249.)

rides $Al_2Cl_6.2,—10,—12,—18\ NH_3$, are all stable , save the last, which dissociates below 0° C. They are all decomposed by water, the first forming a clear solution of oxychloride, the others giving precipitates of hydroxide. Their heats of formation are:—

	Cal.	Cal. for $1NH_3$
$Al_2Cl_6.12NH_3$	268·23	22·35
$Al_2Cl_6.10NH_3$	245·23	24·52
$Al_2Cl_6.2NH_3$	82·28	41·14

or if we assume each to be formed from that below by the addition of ammonia, we have for the heat of addition of each molecule:

			Cal.
to Al_2Cl_6,	forming	$Al_2Cl_6.2NH_3$	41·14
to $Al_2Cl_6.2NH_3$,	”	$Al_2Cl_6.10NH_3$	20·37
to $Al_2Cl_6.10NH_3$,	”	$Al_2Cl_6.12NH_3$	11·50

Their stability decreases with the increase of ammonia; the compound with $2NH_3$ distils without decomposition at 480° C.; that with 10 NH_3 decomposes rapidly below 380° C.—J. T. D.

Tungstic Acid; Determination of ——, and its Separation from Silica. O. Herting.

See under XXIII., *page* 392.

PATENTS.

Sulphuric Acid; Apparatus for the Manufacture of ——. J. Potut, Vitry-on-the-Seine, France. Eng. Pat. 4272, March 6, 1900.

A FUNNEL having a prolonged tube, drawn out at the bottom to form a small orifice, is set vertically in the pipe leading from the Glover tower to the lead chamber, and nitric acid being poured into the funnel, a steam jet is caused to strike at a right angle the issuing acid, so as to "atomise" it in the current of SO_2 coming from the tower. A gutter, leading to the chamber, is provided below the funnel tube, to collect any drops of the acid that may escape the action of the steam. Or the atomising apparatus may be set in the top of the Glover tower, in which case no gutter is needed. Instead of nitric acid, "an aqueous solution of nitre" may be used, the sodium sulphate thereby introduced into the product being negligible in most cases.

—E. S.

Carbonate of Soda Crystals; Manufacture of ——. J. Künstner, Obersedlitz, Germany. Eng. Pat. 5808, March 28, 1900.

A WARM saturated solution of sodium carbonate is sprayed into a lofty closed tower, into the bottom of which a current of air is forced, apertures being provided at the top for escape of the air. The resulting fine sodium carbonate crystals are deposited on the floor of the tower. The warm solution of the carbonate to be crystallised (at about 35° C.), is admitted near the bottom of a vessel, the cover of which is connected to a compressed air supply pipe, which latter leads into a third upright cylindrical vessel, jacketed for passage of cold water. The solution passes from near the bottom of the first vessel to the top of a second, jacketed for cold water passage, similarly to the third vessel, and thus cooled is led by a pipe passing transversely through the third vessel to a jet in the tower, to which jet the cooled compressed air from the said vessel is also led, so that the air and the liquid issue together, making a lofty spray. It is stated that "if the tower be made of sufficient height, it is possible to dispense with compressed air for spraying the solution, the cooling of the spray being effected during its downward fall by the upward current of cold air."—E. S.

Nitrate of Soda: Method of and Apparatus for Extracting ——, from the Raw Material "Caliche" and from the Refuse thereof known as "Ripio." W. H. Woodcock, West Norwood, Surrey, and W. A. Harper, London. Eng. Pat. 3918, Feb. 28, 1900.

THE powdered caliche is fed through a hopper into the top of a vertical jacketed boiler, previously charged with hot water, which may be derived from the jackets of the coolers or crystallisers. The boiler is elevated to admit of the passage of a waggon beneath it, for receiving the spent caliche when the latter is discharged from the boiler. The boiler is fitted with a mechanical agitator having a lifting screw at the bottom, so that as it revolves it tends to screw itself out of the waste material. By means of a steam- or hot water-jacket, the water in the boiler is kept hot. Two or more of the vertical boilers are connected by a passage at about half their height, and by like passages the boilers communicate with the coolers, the jackets to which are supplied with cold water, which, as already stated, is utilised when heated by the crystallising solution to supply the boilers ready for a fresh charge of caliche, and the levels and arrangements are such that pumping is not necessary. The connections between the boilers are such that interchange of liquor can take place, until the latter is saturated, when the solution may be passed through a filter press, jacketed to maintain the temperature; or it may be allowed to settle and be run into the coolers.—E. S.

Nitrites; Manufacture of ——. W. P. Thompson, London. From Gebrueder Flick, Opladen, near Cologne, Germany. Eng. Pat. 23,678, Dec. 27, 1900.

Sulphur dioxide is passed over a highly heated mixture of a nitrate and an oxide, carbonate, or hydrate of an alkali or an alkaline earth to produce a nitrite. In practice, caustic lime is slaked with a concentrated solution of sodium nitrate, and the mass is heated in suitable retorts until it sinters, while sulphur dioxide free from air is passed over it. The product is digested in hot water and the solution of the nitrite, after filtering from the residue of calcium sulphate, is concentrated and crystallised.—E. S.

Aluminous Compounds; Manufacture of ——. F. M. Spence, and D. D. Spence, Manchester, and H. Spence, Sale. Eng. Pat. 6254, April 3, 1900.

Aluminium sulphate solution, of about 1·39 density at the boiling point, is run into a lead-lined conical bottomed vessel, into or near the bottom of which a pipe is introduced conveying compressed air; or a perforated circular pipe may be used fixed round the conical vessel near the junction of the top of the cone with the vertical wall of the vessel. The liquor is thus rapidly cooled, and the magma of crystals produced is then transferred to a centrifugal machine to be deprived of mother liquor.—E. S.

Iron Oxides and Metallic Chlorides [from Pickling Liquors]; Manufacture of ——. J. Hargreaves, Farnworth, Lancaster. Eng. Pat. 4712, March 13, 1900.

The spent liquors from the pickling of iron goods is, if containing free acid, neutralised by iron, and is then treated in a vessel provided with a perforated false bottom, on which are placed lime, or magnesia, or their carbonates, or zinc or zinc oxide or carbonate, by a current of air forced in below the false bottom, until the ferrous salts in the solution are converted into ferric salts, and ferric hydroxide is precipitated. The chlorides simultaneously formed may be separated in any convenient way. The ferric hydroxide is collected and may be heated to deepen the colour. —E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Porcelain Sand and the Composition of Porcelain Pastes. E. Lindner. Sprechsaal, 1901, **34**, 36; through Chem. Zeit. Rep. 1901, **25**, [5], 45.

The composition of porcelain pastes is regulated not only by plasticity but also by the ability to withstand changes of temperature and the transparency, which varies with the temperature of firing. The higher the proportion of alumina and the lower the proportion of potash (felspar), the higher is the temperature necessary to attain a certain transparency. The proportion of silica in porcelain varies from 58 to 72 per cent., the alumina from 22 to 35 per cent. and the potash does not exceed 5 per cent. Pottery from very transparent felspar pastes to which the quartz has been added in the form of sand (*i.e.*, uncalcined) break very readily in firing. But if calcined flint be used instead of sand, this trouble does not occur. A very good paste is composed of 45 parts of Zettlitz kaolin, 25 parts of calcined flint, 24 parts of felspar, and 6 parts of ground pots. most perfect porcelains are those in which the sili completely combined with the alkali. With pastes ric sand, this is seldom attained except at very high tem tures and lime is often added to facilitate the softe Care must be taken, however, since lime tends to pr deformations in the firing process. Sandy pastes somet show characteristic properties in firing; for instance, a composed of 56 parts of porcelain sand, 42 parts of kaolin, and 2 parts of lime shows an extraordinar difference towards changes of temperature if it is not to true fusion, but loses this property if fusion is com Sandy pastes mixed with felspar give a beautiful por which stands firing well; a good mixture of this t composed as follows: 30 parts of Zettlitz kaolin, 20 p China clay, 40 parts of washed porcelain sand, and 10 of Norwegian felspar.—J. F. B.

PATENTS.

Glass Tiles; Manufacture of ——. O. Imray, L From The Opalite Tile Company, Pittsburgh, Eng. Pat. 11,267, June 21, 1901.

A sheet of opal or coloured glass is rolled on a table having a pattern wrought upon its surface, polished" and annealed; a backing of sand, glass, or material, mixed with a suitable flux is then applie fused; a final annealing completes the process.—J.

Slip and Glazes used in the Manufacture of Potte for other Purposes; Pumping Apparatus fo — G. A. J. Schott, Bradford, Yorkshire. Eng. Pat. Feb. 10, 1900.

A rotary pump is employed, which is immersed liquid to be pumped, and is operated by hand or p force the liquid up through the discharge pipe required level. The pump is carried by a fran which supports the driving gear, and is secured by a ing arrangement to a plank of wood, &c., which r and can be secured in any desired position to, the r containing the liquid. The apparatus is applica pumping thick or boiling or hot liquids.—R. A.

China and Earthenware; Clay or Filter Presses the Manufacture of ——. S. B. Furnival, Staffs. Eng. Pat. 6376, April 5, 1900.

To prevent jamming or locking of the clay press tr are supported on rails arranged slightly above the the tops of the trays. The handles on the top ha trays are arranged transversely, and carry the rolle support the trays on the rails. The top edges of are perfectly ʌ-shaped, and the rollers corres grooved.—R. A.

Enamelling Metal; Means of, and Appara Mechanically ——. A. Dormoy, Sougland, Eng. Pat. 6922, April 12, 1900.

The distribution of the enamel powder over th objects is effected in a cage, in which a slight v maintained for the protection of the workman, withdrawal of the finest dust. Windows in the ca the operator to manipulate the objects, which are on a plate capable of being moved from outside receive evenly the falling enamel powder which from sieves by electric beaters.—J. W. H.

IX.—BUILDING MATERIALS, CLA MORTARS, AND CEMENTS.

Cements; Studies in ——. E. Jex. Thonind. **24**, 1919; through Chem. Zeit. Rep. 1901, 25,

Experiments on the burning of Roman and cements show that in the former, on account temperature employed, no formation of new c occurs, whilst in the latter, the principal obj obtained is the formation of calcium orthosilicate extra molecule of CaO, as compared with met loosely combined, and is ready to separate from it as a as it has the opportunity of passing into a more stable dition. The final result of hardening is identical in the of slag-cement and of Portland cement, but the inter- liate stages are very different. The blast-furnace slag t be mixed with a considerable proportion of lime in form of freely slaked calcium hydroxide ; in combining has to assume the molecular form, some condensation irs, and hence, of necessity, the liability to form akage cracks is inherent in slag-cement.—W. G. M.

PATENTS.

od ; Treatment of ——, for Preservative, Desiccating, id Seasoning Purposes. H. Higgins, Cambridge. Eng. at. 4689, March 12, 1900.

pparatus is described by means of which timber may be treated with steam, and then with a mixture of n and the products of combustion of the fuel used.
—J. W. H.

d and Fibrous Substances ; Impregnation of ——. Krause and A. Beddies, Berlin. Eng. Pat. 23,040, c. 17, 1900.

rs, vegetable, or paludal earth (turf or peat), when ted, give a solution to which any other preserving ts or salts may be added, but which, besides being a preservative, by forming leather-like coatings in the of the wood treated, prevents the washing out of the l substances. The patentee mentions that Grasmann, 301, actually preserved wood by dipping it into a ated turf solution.—J. W. H.

e ; Process and Apparatus for Producing Artificial —, free from Air. A. Grünberg, Berlin. Eng. t. 7096, April 17, 1900.

s are described for removing the air from the materials for making artificial stone, whilst the mixture is taking for the formation of that stone.—J. W. H.

; Preparation of Artificial ——. H. Seifarth, stphalia, Germany. Eng. Pat. 16,307, Sept. 13, 00.

r parts of sand, slag, or ashes, 43 parts of alkali , and 7 parts of lime are mixed, ground, and pressed pe ; the blocks formed are hardened by the action of heated steam.—J. W. H.

ting and Protective Coatings especially applicable Electric Conductors. A. W. Peust and A. Apel, nover, Germany. Eng. Pat. 23,890. Dec. 31, 1900.

esium oxide is made into a paste with a solution of esium chloride (30° B.) to form an insulating and tive cement. Portland cement may be added, or separately, after the application of the magnesium cement.—J. W. H.

X.--METALLURGY.

s ; Action upon ——, of Alcohol of 95°. Malméjac. J. Pharm. Chim. 1901, **13**, [4], 169—171.

alcohol, of 95° strength, in quantities of 250 c.c., was contact with 30 grms. each of copper, iron, tin, zinc, and galvanised iron during six months, the vessels being onally shaken. A white deposit mixed with the was found in the case of tin, lead, zinc, and galvanised deposit of rust being discovered in the bottle containing All the liquids, except that from lead, gave a clear , which, except in the case of copper, left a residue poration. The residue yielded by alcohol which had over tin was very slight.—A. C. W.

; Secondary Radio-Activity of ——. H. Becquerel. Comptes Rend. **132**, [7], 371—373.

l quantity of active radium salt was placed in a , 1 mm. wide and 1·5 mm. deep, in the upper face of of lead, 34·5 mm. by 21·2 mm. by 7·5 mm. thick. When, after nearly a year, this block was laid for two days on top of a photographic plate wrapped in black paper, the plate showed on development a very strong impression, due to the radiation which had passed through the block and out at its sides in all directions. Not only so, but the radiation affected a second and a third plate placed beneath the first, though of course the sharpness of the impression lessened very rapidly after passing through the successive plates. The phenomena are not sensibly changed by interposing a plate of mica between the block and the paper wrapper. If the lead block be laid on a piece of sheet lead of larger area than itself, on the mica plate, and if pieces of metal be laid in various positions on the sheet lead, then, after exposure and development, it is found that the impression on the plate is stronger beneath these metallic objects than at other parts of the field not immediately below the lead block. Close examination seems to indicate that these effects are not due to the direct radiation which has passed through the pieces of metal, but to secondary radiation emanating from them, and excited in them by the incident radiation from the lead block. This radiation has less penetrating power than the original radiation, and seems to be somewhat similar in nature to phosphorescence. The objects concerned lose the power of radiation as soon as they are removed from the influence of the original source.
—J. T. D.

Gold ; Melting Point of ——. L. Holborn and A. Day. Ann. der Physik, **4**, [4], 99—103. Chem. Centr. 1901, **1**, [5], 249.

The melting point of absolutely pure gold was determined by observing the temperature curve on warming or cooling the gold near its melting point. 150 grms. of gold were heated electrically in a graphite crucible. In an atmosphere of carbon dioxide, the melting point of the gold is 1063·5° C. In an atmosphere of oxygen, the course of the curve is somewhat uncertain, owing to the slight solubility of oxygen in the gold.

The wire method, in which a small quantity of gold—0·03 grm. is sufficient — is fused at the junction of a thermocouple, also gives good results. The melting point of gold by this method is 1063·9° C.—A. S.

Silver ; Allotropic States of ——. Berthelot. Comptes Rend. **132**, [5], 234—241.

Silver from various sources was dissolved in a large excess (2 grms. in 1,300 grms.) of pure mercury, and the heat evolved in each case was measured. Calculated on 108 grms. of silver, the following are the figures in calories :—1. Thin sheet silver, 2·03 ; 2. No. 1 after heating in oxygen to 500°—550° C. for 20 hours, 0·47 ; 3. Crystalline needles from electrolysis of 10 per cent. silver nitrate solution, 0·10 ; 4. Precipitated from weak solution of silver nitrate by copper, dried at ordinary temperatures 1·19 ; 4a. Prepared as 4, but dried at 120° C., 0 76 ; 5. As 4, but heated to redness, 0·08.

The samples 1, 2, and 5 are all stable at a red heat, yet are all different allotropes. The author points out that the heats of formation of chemical compounds will vary, according as one or other of the allotropes of an element is taken as the start point : and that this variation may be very considerable where the possible allotropy of two or three elements may enter, as for example, in the case of silver nitrate determined differentially by precipitating the silver by copper, the figure for copper nitrate having previously been determined by precipitation of copper by iron. In all such determinations, the rigorous definition of the initial and final states is of the first importance.
—J. T. D.

Mercury ; Compounds of Silver and ——. Berthelot. Comptes Rend. **132**, [5], 241—243.

Amalgams $HgAg$ and Hg_2Ag, prepared by triturating the metals together in the requisite proportions, and Hg_7Ag (approximately) precipitated by mercury from silver nitrate, were dissolved in a large excess of mercury. The heat-evolution in calories per 108 grms. of silver was measured ; and from this and the heat of dissolution of the silver (see preceding abstract), the heat of combination of 108 grms. of silver with mercury, starting from sheet silver, and starting from crystallised electrolytic silver, was calculated in each case. The following figures—

—	Sheet Silver.	Crystallised Silver.
Hg + Ag	2·36	0·23
Hg_2 + Ag	1·53	− 0·41
Hg_3 + Ag	2·17	0·24

show that silver in any form has but little affinity for mercury, and that in the crystallised form it has practically none.—J. T. D.

Tin: Physico-Chemical Studies of ——. E. Cohen. Zeits. phys. Chem. **35**, 588; through Zeits. angew. Chem 1901, **14**, [4], 85—86.

In 1893 H. Stockmeier pointed out that the sheet tin of the roof of the post office at Rothenburg a. T. had become corroded in consequence of the very low temperature which prevailed in the preceding winter, though sheet tin similarly exposed at the adjacent town hall had remained sound. He explained the difference in the behaviour of the tin according to Lewald's theory, that it is only cast, and not rolled tin, which becomes changed into the gray modification, because actually it was cast tin at the post office and rolled tin at the town hall. This view, the author contends, is erroneous, because his researches (Zeits. angew. Chem. 1900, 138, 541) have shown that tin dust and tin recovered from the gray modification, as well as block tin, become, under favourable conditions, converted into the gray form. In fact corrosion of the tin on the town hall at Rothenburg is now observable, though since 1893 the temperature has not fallen sufficiently low to induce the change spontaneously. The author has made experiments on the influence of vibration, which Erdmann supposed to be instrumental, but could find no difference in two samples, treated similarly in other respects, of which one had been subjected to vibration, while the other had been kept at rest. The author had formerly found that the maximum rate of conversion happened at about − 45° C., but on repeating this investigation with tin placed under an alcoholic solution of pink salt [$(NH_4)_2SnCl_6$] in the dilatometer, he found that the maximum rate had shifted to about 0° C., and that the rate was considerably lower at − 45° C. On removing the solution, however, the maximum again fell to − 45° C. The "pink salt" could not be held responsible for this alteration of the temperature of maximum change, because the earlier experiments had likewise been made in its presence, but the tin then used had been submitted several times to conversion and re-conversion. It was finally established that the latter treatment, after many repetitions, *cæteris paribus*, increased the rate of conversion. Hence the author concludes that the previous history of the samples of tin is of supreme importance in comparing the rates of conversion of different samples.—J. A. B.

Iron Industry: New Process in the ——. A. v. Forselles. Oesterr. Zeits. Berg- u. Hüttenw. 1901, **49**, 74; through Chem. Zeit. Rep. 1901, **25**, [6], 56.

This process consists in melting in the blast furnace a mixture of apatite, phosphorite, or other phosphatic rock with charcoal, scrap iron and suitable fluxes, the products obtained being a slag rich in phosphorus—sold as manure—and a pig-iron which contains phosphorus and can be made use of in the Thomas or basic Martin process. The following are examples of the results obtained by the new process. A charge of 9·0 kilos. of scrap iron, 6·5 kilos. of phosphatic rock from Kangerö and 1·5 kilos. of wood charcoal was kept in motion for about 1½ hours. The resulting slag contained 40·99 per cent. of silica, 13·68 per cent. of iron and alumina, 34·91 per cent. of lime, and 1·98 per cent. of phosphoric acid, the composition of the pig-iron being: iron, 78·52; manganese, 0·29; carbon, 2·16; graphite, 5·10; silicon, 2·19; phosphorus, 12·86 per cent., together with a trace of sulphur.—T. H. P.

Iron; Mass of Meteoric ——, *from the Soudan.* S. Meunier. Comptes Rend. **132**, [7], 141—444.

This metallic mass, reported to have fallen at N'Goureyı province of Macina, Soudan, on June 15, 1900, wei 37·75 kilos. It is a mass of irregular shape, covered places with a polished black coating of magnetic oxi exhibiting grooves and striations. The metal is malleal can be scratched by a knife, exhibits a fibrous fract when broken by stretching, and takes a good polish. density is 7·31. It dissolves very slowly in acids, and etched surface shows no Widmanstadt's figures. results of analysis are as follows:—

	Per Cent.
Metallic iron	91·988
Nickel	7·150
Cobalt	traces
Ferrous sulphide	0·052
Ferrous phosphide Siliceous fragments Graphite	0·169
	99·359

—J. T. 1

Lead-refining Furnace; Separation of a Mass ric Copper in the ——. A. Schertel. Jahrb. f. d. B und Hüttenw. im Königreich Sachsen, 1900, 59. Cl Centr. 1901, **1**, [10], 597.

Whilst working a lead-refining furnace, the author obse near the tap-hole in the hearth, a felted mass of met scales, which, after removal of adherent matter, had following composition:—Cu, 63·31; Pb, 35·45; Sb, 0 Ni, 0·69; Ag, 0·137; and Au, 0·025 per cent.

The crude lead plates are freed from copper in liqu furnaces, and pass to the refining furnace with a conte 0·06—0·1 per cent. of copper. The proportion of co increases normally by the oxidation process to 0·12— per cent. The concentration in the separated mass is about 1,200 times normal; the concentration of the and gold also shows a considerable increase. In ord obtain a metallic mixture with a large proportion of co such as described above, the material must remain for a time at a favourable temperature, but the formation of a mixture is an indication of the strong concentration could be obtained if higher temperatures could be tained within narrow limits.—A. S.

Silver; Determination of ——, *in Sulphide Ores*
A. Hollard.

See under XXIII., *page* 391.

PATENTS.

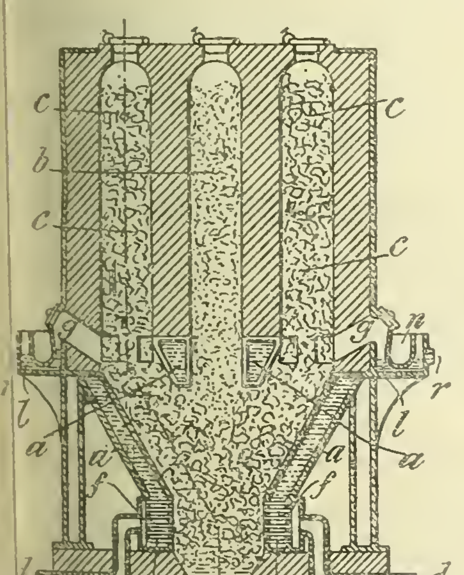
Ores, Limestone, and the like; Process and App for Smelting and Calcining ——, *for Distillin Gasifying Bituminous Fuel, and for reco By-Products.* P. Naef, New York, U.S.A. Eng 6924, April 12, 1900. (Under Intern. Conv., Se 1899.)

The operations are carried out in such a way th by-products are contained in a small volume of ga can be easily recovered. The process can be carri in a revolving furnace. The material may be mixe bituminous fuel and pass successively through a of such furnaces, air being conducted into the furnace. The hot gases of combustion pass in o direction upwards; but through the highest furnac such gas is passed as is required to distil the fuel, a gas is treated separately for the recovery of by-pr The coked fuel from the upper furnace passes contin with the material into the lower furnaces, air being into the lowest furnace. If one large revolving furn used, the method can be so varied that most of t is withdrawn from a central pipe, which reaches distance into the furnace from the charge end. T of the gas passes through the furnace to the end, d coal, and is withdrawn at the charge end and treated he recovery of by-products. A further arrangement is ovide a number of pipes in the end of the furnace at h the material enters. The fuel is charged into these , the material into the surrounding pipes The gases mbustion pass through the spaces between the tubes leave separately. The gases escaping from the tubes conducted to a suitable washing apparatus. The ratus employed is similar in construction to that ibed in Eng. Pats. 2917 and 2917A to D (see page 349). are 83 claims.—D. B.

Ores; Treating ——, *and Apparatus therefor.* J. rmstrong, London. Eng. Pat. 3462, Feb. 21, 1900.

zinc is obtained from the ordinary ore charge by ing it out of contact with air, passing the fumes gh incandescent fuel into or through a bath of the zinc in a liquid state and kept a little above fusing The blast furnace for reducing, volatilising, and nsing the zinc, consists essentially of a central closed n *b* for the charge of calcined ore and carbon, closed ns *c c* for the fuel, coke or anthracite, and a central ion chamber below, into which all the columns rge, together with means for passing the blast at ous points through the fuel and drawing off the through the incandescent fuel and the liquid metal. last enters through *d* and passes through a number of s, *e e*, which are in the water-jacket *f f*, the parts being also water-jacketed. The fuel falling down of the ore charge and being incandescent, carbon ide is formed with the blast and assists the reduction ore, the zinc fumes from which are carried upwards ss out through *g*.

method of condensing the zinc is specially claimed, n be adapted to any kind of furnace. It is a siphon containing a bath of molten zinc *l*, and a tap-hole *r*,



emains closed until the molten zinc reaches the height for tapping, the temperature of the trap gulated by a heating or a cooling medium placed ace above the trap *n*.

on-volatile metals are reduced and run down into ef the furnace below the level of the tuyères, which led with suitable tapping holes for slag and matte, utside well for lead.—A. W.

Zinc from Waste Products; Extraction of ——. C. Kellner, Vienna. Eng. Pat. 7028, April 14, 1900.

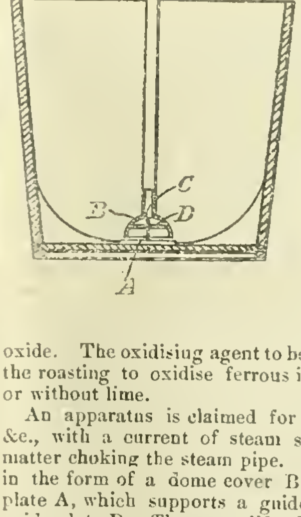
The waste products, resulting from roasting pyrites, are treated with water and sulphurous acid, the bisulphite of zinc so obtained is oxidised by air into the sulphate, which is then mixed with the chloride of an alkali or alkaline earth, preferably sodium or calcium chloride, to convert the sulphate into chloride of zinc with the formation of alkali sulphate, and finally the chloride solution is electrolysed to obtain zinc and chlorine, "whether or not the sodium sulphate be caused to crystallise out of the electrolyte." The sulphate may be crystallised by electrolysing the liquor until sufficiently concentrated, or by cooling or evaporating.

The bisulphite of zinc may be boiled previous to oxidation so as to form monosulphite and sulphurous acid, the latter being again utilised for extraction. The monosulphite is either spread on wicker work and exposed to air, preferably heated, or is dissolved in acidulated water into which air is introduced, for oxidation. Any traces of zinc-sodium sulphate that may be formed by the mixing of zinc sulphate and sodium chloride can be eliminated from the crystallised sodium sulphate by adding sodium carbonate to it.

—A. W.

Ores [Pb, Zn, S, &c.]; Treating Complex ——, *and Apparatus therefor.* J. W. Worsey, St. Helens, and J. H. Lancashire, London. Eng. Pat. 3668, Feb. 24, 1900.

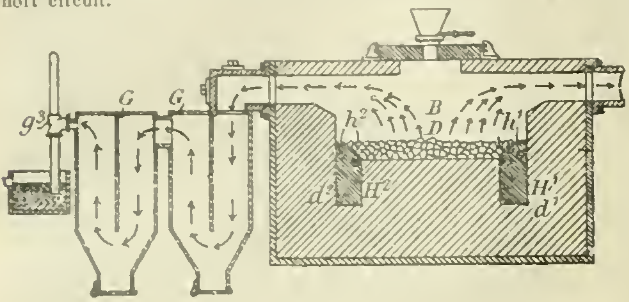
The ore is partly calcined so as to contain between 8 and 16 per cent. of sulphur, and is then ground and mixed with about 2 per cent. of sodium nitrate and sufficient dilute sulphuric acid to combine with all the zinc present. The whole is heated in a watertight receptacle and the fumes carried off to the vitriol chamber, more nitrate being added if necessary. The residue is then roasted in a closed or muffled furnace, with or without an oxidising agent, and the soluble sulphates afterwards dissolved out with water containing sodium sulphate. The clear solution is precipitated with "cream of lime" and the precipitate is heated in the presence of air in a furnace, and the zinc volatilised in the form of oxide. The oxidising agent to be added to the muffle during the roasting to oxidise ferrous iron, is nitrate of soda with or without lime.



An apparatus is claimed for treating dense precipitates, &c., with a current of steam so as to prevent the solid matter choking the steam pipe. It consists of a clack valve in the form of a dome cover B resting on a fixed seating plate A, which supports a guide pin C passing through a guide plate D. The steam lifts the dome and passes between it and the plate, the dome settling down again when the supply is shut off.—A. W.

Ores [As, Fe, &c.]; Method of and Apparatus for Treating ——. G. M. Westman, New York, U.S.A. Eng. Pat. 17,027, Sept. 25, 1900.

Thirteen claims are made for the closed electric furnace, in combination and in parts, as shown in the accompanying drawing, and for the process of treating electric conducting ores, especially arsenical ores, therein. Two electrodes, H^1 and H^2, made of cast iron, and provided internally with wrought iron pipes h^1 and h^2 for cooling by water circulation, are located in depressions d^1, d^2, and extend along the bottom of the melting chamber B. A horizontal non-conducting bed for the ore D is situated between them, and the furnace, which is otherwise closed, is provided with openings for charging, &c., a removable cover, a vapour escape flue in the upper portion, and a tap in the bed for the molten metal or charge. The iron electrode may be covered with a layer of lead, which during the action will be molten and will absorb any gold that may be thrown down, the water-cooling device preventing the lead becoming hot enough to volatilise. The upper surfaces of these compound electrodes are below the general surface of the bed. The sources of the cooling liquid are insulated to prevent short circuit.



The ore is melted by the electric current, the arsenic being thereby vaporised to be collected in vessels G, provided with, if necessary, a water injector g^3. The remaining charge or matte is then withdrawn for further treatment, and a fresh arsenical charge thrown in, the lead with the gold being occasionally removed.—A. W.

Copper Ores or Minerals; Treatment of ——, *for the Obtainment of Copper and other Metals therefrom, and the Recovery and Treatment of By-Products of the Process.* A. Simon, Bordeaux. Eng. Pat. 17,189, Sept. 27, 1900.

Copper ores, containing lead or silver, or both, and antimony, are treated by a process in which the reagents required are produced in the process itself. It consists of a combination of operations whereby the antimony is first eliminated by heating the ore in a closed vessel with sodium sulphide, and lixiviating with water, the solution of the double sulphide being then electrolysed with the production of metallic antimony and a liquor containing bisulphite, sulphydrate, and hyposulphite of sodium. This liquor is passed through vessels in which it meets a current of sulphurous acid from the muffle furnace, by which means the bisulphide and sulphydrate are converted into thiosulphate.

The original sulphide of soda is obtained from salt and sulphuric acid, the sulphate being reduced with carbon, the hydrochloric acid from the reaction being also used for extracting and lixiviating the copper. The ore, after the elimination of the antimony, is roasted in a muffle furnace, the sulphurous acid from which is utilised as mentioned, and the roasted material, a mixture of oxides and sulphates of the metals with sulphide compounds of iron and copper, may then be chlorinated and lixiviated, or if much lead be present, fused for matte and raw lead, the latter of which contains silver. The matte is roasted and chlorinated, and washed first with water and then with the hydrochloric acid liquor from the salt and sulphuric acid reaction. The copper liquors are desilverised by copper and precipitated with iron. The resulting liquor of protochloride of iron, mixed with hydrochloric acid liquor, is employed for extracting the copper remaining as subsulphide in the matte. In the presence of air this is thereby converted into the chlorides and the sulphate, any silver remaining insoluble being dissolved by the addition of salt.—A. W.

Ores [Pb, Cu, Ag, &c.]; Processes for the Reduction of Refractory ——. A. J. Boult, London. From E. C. Pohlé and S. Croasdale, both of Denver, U.S.A. Eng. Pat. 23,477, Dec. 22, 1900.

The process consists of preparing a mixture or charge containing the ore, sulphur, and a chloride of an alkali or alkaline earth metal in proportions quantitatively requisite to produce, when heated in the presence of oxygen, a chloride of the metal or metals to be extracted from the ore and a sulphate of the alkali or alkaline earth metal; the mixture then being subjected to an oxidising roast, preferably above 900° C., with agitation, whereby metals are volatilised as chlorides or oxychlorides. metal values are recovered by subjecting the fumes, eit direct or after filtration, to the action of water.—A. W.

Tin; Processes for Obtaining Pure —— *from Tin. Sheet Iron Waste and other Materials coated wit containing Tin, and for Refining Raw Tin.* Bergsoe, Copenhagen. Eng. Pat. 7026, A 14, 1900.

The tin from the sheet iron waste or the tin a (granulated if necessary) is dissolved in a solu of stannic chloride; and the stannous chlo solution so obtained is electrolysed so as to dep in the metallic state half of the tin it cont and to regenerate at the same time the orig stannic chloride for use on another quantit metallic tin. The apparatus is so arranged permit of continuous circulation of the liquid, stannous chloride going from the dissolving to the electrolytic tank and the stannic chl in the reverse direction.—J. T. D.

Tin from Tinned Iron; Process for Stripping —— *Recovering the Respective Metals.* H. W. Hening Walthamstow. Eng. Pat. 8133, May 2, 1900.

The clippings are added to ferric sulphate till it is pletely converted, by solution of the tin, into fe sulphate, when the tin is precipitated as oxide, mixed a certain quantity of basic ferric salt. The tin is sepa by smelting or other chemical means from the ferric Or the precipitation may be prevented by the additi sulphuric acid to the solution of tin in ferrous sulphate the tin be then precipitated as sulphide free from iro addition of ferrous sulphide.—J. T. D.

Tin; Process for Extracting ——, *from Tinplate a like Waste.* F. W. Preto, Gijon, Oviedo, Spain. Pat. 17,594, Oct. 4, 1900.

The tinplate is treated with hydrochloric acid of s 1·18; when the acid is saturated with tin, scrap added. The precipitated spongy tin floats in the liq collected, pressed or moulded, and fused.—J. T. D.

Tinned Scrap and Spelter Scrap; Stripping — S. Davis, Birmingham. Eng. Pat. 952, Jan. 15, 1

The tin is dissolved off from the iron or steel by a b hydrochloric or other acid, heated if necessary. settlement, the clear liquor is run off into a second where it is treated with zinc, preferably in the fo galvanised iron scrap; here the tin is precipitated. iron or steel basis from both processes is washed and then worked up in any desired way. The solution c chloride may also be utilised commercially.—J. T. D

Slimes; Means for Aërating ——. J. Gwynne and Sargeant, both of London. Eng. Pat. 5502, Ma 1900.

The slimes, or the solution with which they are treated, are aërated by passing them by means of a fugal pump through an aërator, arranged in the d pipe, at such a rate that the inducing action of the draws in the external air and intimately mixes it w slimes or solution.

The aërator is constructed of an inlet tube with a exterior and an outlet tube with a conical interior the two fitting one into the other so as to leave an space between the two conical surfaces, one part of opens into the inside and the other part communicat the outside air by a small air-supply chamber provid an inlet controlled by a cock. The two cones are n less sectional area than the supply and delivery p which they are connected by conical tubes. The that with a high velocity stream, the velocity is through the contracted area of the injector, and air in through the annular space and intimately mix the liquid.—A. W.

ond Steel; Direct Production of ——. T. Twynam,
Egham, Surrey. Eng. Pat. 4896, March 15, 1900.

ore or oxide is mixed with carbonaceous matter and
itted to a suitable heat in a basic-lined open hearth or
suitable furnace in presence of a bath of molten metal
slag. Additions of oxide and of carbon may be made
time to time as the metal is being intermittently
n off. A pig-iron, fairly high in phosphorus may be
without fear of the carbon passing out of the bath
e all the phosphorus is removed.—J. H. C.

and Steel; Manufacturing ——. B. Talbot, Engle-
ield Green, Surrey. Eng. Pat. 8481, May 8, 1900.

e open-hearth process, a mass of molten slag, con-
g a greater percentage of oxide than is necessary to
se the carbon in the metal, is always maintained on
urface of the bath. The excess of oxide in the covering
g is maintained by drawing off portions of the slag
ing, as the same becomes exhausted, and enriching the
nder by additions of mill cinder, scale, iron ore, and
or limestone from time to time as required.—J. H. C.

; Treatment of Low-Grade ——. T. Andrew, Surrey,
. T. K. Bellis, London. Eng. Pat. 14,780, Aug. 17,
0.

bars or billets, which should not be less than 3 ins.
are heated in a closed furnace to a "good soaking
quickly withdrawn, laid on a sand floor, and covered
bonnet, in which is a jet of pure hydrogen gas. After
nutes or more, the billets are re-heated to a bright
white heat, then plunged in a suitable bath, which
t hotter than 120° F., and contains 6 or 7 oz. of
in, 4 oz. of ammonium chloride, and 3 oz. of ammonia
gallon.—J. H. C.

*Brass, or other Metals or Alloys; Furnace for the
nufacture of Calcium Carbide or the like and for
lting* ——. G. W. Emmerson and J. Ward. Eng.
. 5319, 1900.

See under I., *page* 341.

uminium; Soldering ——. H. Lange, Vesteroas,
Sweden. Eng. Pat. 13,644, Jan. 27, 1900.

cleaned surfaces are heated, a thin layer of zinc is
d, and a solder composed of 1 part of aluminium and
ts of zinc is used.—J. H. C.

nium or Aluminium Alloys; Process for Welding
-. M. Wiszniewska and J. H. Strzelecki, New York.
. Pat. 3531, Feb. 22, 1900.

eaned surfaces, heated to about 600° C., are sprinkled
uoride, nitrate, or other volatile compound of alumi-
and then pressed together.—J. H. C.

nium and Steel or Iron; A Process for Uniting ——.
Int. des. I's. et Fond. d'Aluminium, Brussels. Eng.
23,046, June 20, 1900.

eel or iron is first coated with copper by electrolysis
e aluminium is then cast upon it.—J. H. C.

and other Metals; Process for Depositing ——, *upon
allic Surfaces.* J. E. Jasset and A. E. Cinqualbre,
s. Eng. Pat. 23,803, Dec. 29, 1900.

urfaces to be coated are first covered with a layer of
by being washed with a solution of copper in
ic acid; they are then washed with a hydrochloric
lution of nickel, and rubbed with a rag covered with
sed zinc. The treatment with nickel solution and
y be repeated till a layer of nickel of the desired
ss has been deposited.—J. T. D.

Improved. R. Weidner, Germany. Eng. Pat. 4961,
March 15, 1900.

. is first melted with copper, tin, zinc, and iron—the
mass is then mixed with melted aluminium.

For mountings, 0·5 per cent. to 2 per cent. of nickel, 40 per cent. to 65 per cent. of aluminium, 3 per cent. to 10 per cent. of copper, 5 per cent. to 20 per cent. of tin, 0·25 per cent. to 1 per cent. iron is recommended, the remaining percentage being the difference between the total of the percentages of the before-mentioned metals and 100 per cent. is supplemented by the addition of zinc.

For bearings as employed in connection with shafts, about 15 per cent. to 20 per cent. of aluminium is used.
—J. H. C.

Brazing; Improved Flux for ——. G. Huth, London. Eng. Pat. 23,403, Dec. 21, 1900.

Instead of borax, a mixture of sodium carbonate and boric acid, with or without addition of common salt, is used. The advantages are, that the object does not need to be so carefully cleaned as when borax is the flux, and that the intumescence of borax is almost completely avoided.—J. T. D.

Oleaginous Compounds or Oils for Tinning Baths; and Method of Producing ——. A. W. Burwell. Eng. Pat. 2011, Jan. 29, 1901.

See under XII., *page* 371.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Periodates: Electrolytic Preparation of the Alkali ——. E. Müller. Zeits. für Elektrochem. 1901, 7, [38], 509—516.

Perchlorates are easily obtained by the electrolytic oxidation of cold neutral solutions of chlorates (this Journal, 1898, 244 and 578) without the use of a diaphragm. In attempting to prepare periodates in a similar manner; it was found that practically the whole of the current was consumed in reducing KIO_3 to KI at the cathode, and in oxidising KI to KIO_3 at the anode. For a given current density, the ratio KI : KIO_3 becomes constant after the electrolysis has proceeded for some time. An addition of potassium chromate to the electrolyte was tried but without success.

The author then turned his attention to the electrolysis of an alkaline solution of potassium iodate in a divided cell, and found that periodates could be produced. The most favourable conditions are a low temperature, low current density, the presence of at least 4 per cent. of caustic alkali, and a nearly saturated solution of the iodate. The amount of periodate produced was estimated by titrating the solution, before and after electrolysis, with thiosulphate after adding sulphuric acid and potassium iodide. Under the most favourable conditions the highest current yield was 26 per cent. An attempt to obtain periodate by the electrolysis of a neutral solution of the more soluble lithium iodate was unsuccessful. The lithium iodate itself was obtained almost quantitatively by the electrolysis of a solution of lithium iodide to which was added a small quantity of lithium chromate, no diaphragm being employed.—J. S.

Phenol; Electrolysis of ——, *in Presence of Halogen Acids.* H. Zehrlant. Zeits. für Elektrochem. 1901, 7, [37], 501—505.

Chlorination of phenol does not take place in a dilute hydrochloric acid solution on electrolysis, since oxidation occurs at a lower potential, *viz.*, 0·882 volt.

It was expected that an iodine substitution product would be formed on electrolysing a solution of hydriodic acid containing phenol, the E.M.F. required for the liberation of iodine ions being 0·520 volt. Oxidation was therefore excluded, but on performing the experiment it was found that iodine separated out in the free state.

On electrolysing a dilute hydrobromic acid solution, oxidation of the phenol again took place. In a much stronger hydrobromic acid solution, bromination took place to a limited extent.—J. S.

PATENTS.

Electrolytic Apparatus; Porous Diaphragms for ——. T. J. Holland, Tunbridge Wells, and A. P. Laurie, Loughton, Essex. Eng. Pat. 5016, March 16, 1900.

The claim is for a separate and self-supporting porous diaphragm composed of a thin layer of insoluble silicates (*e.g.*, cement), a sheet of non-metallic woven fabric, such as asbestos cloth, which takes no part in the electrolytic action, nor is seriously attacked by the substances in solution, and a framework of cement or equivalent material.
—J. C. R.

Electrodes; Carbon, Connections for ——. H. Baker, Weston Point, Cheshire. Eng. Pat. 7272, April 19, 1900.

A method of making connections to carbon rods is described. The claim is as follows:—In connections for carbon electrodes the combination with each pair of electrodes of a pair of rigid contact plates, and means for clamping the plates to the carbons, and for connecting such plates with the electric lead.—J. C. R.

(*B.*)—ELECTRO-METALLURGY.

PATENTS.

Electrical Arc Furnaces. J. Y. Johnson, London. From The Deutsche Gold und Silber-Scheide-Anstalt v. Roessler, and Birger Carlson, both of Frankfort-on-Main. Eng. Pat. 2783, Feb. 12, 1900.

It is proposed, and claimed, to employ in electrical arc furnaces, in place of one of the usual electrodes, a number of separate electrodes, producing a uniform and constant heat over the area of the furnace by so proportioning the size of the several electrodes that the electric arc cannot exceed the degree of heat requisite for effective operation, the electrodes being placed at such distances apart that the range of action of one electrode joins the range of action of the adjacent electrode or electrodes. Eng. Pats. 27,301 of 1896 (this Journal, 1897, 545) and 4138 of 1897 are referred to in connection with the employment of a number of electrodes.—J. C. R.

Electric Furnaces. G. Benedicks, Stockholm. Eng. Pat. 18,921, Oct. 23, 1900.

This patent relates to furnaces heated electrically, the electric current sufficient for the smelting of ore or of metals being induced in the material to be heated or smelted, or in a conductor in contact with the material. This is effected by means of alternating currents produced in a coil surrounding the furnace, which encloses a core of iron or other magnetic material.—J. C. R.

Metals and Alloys; Precipitation of ——, *from Solutions, Electrolytic Process for the Deposition of Metals or Alloys on other Metals or Alloys or on other Substances.* J. Meurant, Arlon, Belgium. Eng. Pat. 21,149, Nov. 22, 1900.

The inventor names a number of carbon compounds which he proposes to add to solutions of metals to make up electrolytic baths.

In the examples given for the deposition of zinc, tin, nickel, copper, and silver, the leading feature is the addition to the electrolyte of gum arabic, though this in each case may be replaced by glucose.—J. C. R.

Metals [*Cu, Ni, Co*]; *Extracting and Reducing* ——, *by Electrolysis.* H. A. Frasch, Hamilton, Ontario, Canada. Eng. Pat. 22,698, Dec. 12, 1900.

It is proposed to separate, recover, and extract metals, such as copper, nickel, cobalt, and others, direct from their ores, or base concentrates thereof, electrolytically. There are eight claims, the first of which is for a method of producing an electrolyte by electrolysing a solution of a salt of an alkali in the presence of an anode containing the metal or metals to be extracted, and thereby forming a double salt of the salt of the alkali and those metals contained in the anode the hydroxides of which are soluble in a solution of alkali. For this purpose salts of ammonium are claimed. The invention is said to be particularly applicable in the treatment of copper-nickel ore or matte, which is given as an illustration of the process. Ammoni sulphate is the particular electrolyte employed in this ca but other salts are claimed.—J. C. R.

XII.—FATS, OILS, AND SOAP.

Castor Oil; its Physical and Chemical Constants. E. Dowzard. Chem. and Druggist, 1901, 58, [1100],

The author gives the results of the examination o number of samples of pure castor oil. The British Phar copœia limits for the specific gravity are 0·950 to 0·9 it is recommended that these be altered to 0·960 to 0· The optical rotation test is of value, and should be inclu in the Pharmacopœia. Castor oil is soluble in 3—4 volu of 90 per cent. alcohol at 15° C., the British Pharmacop allowance of 5 volumes should be reduced to 4. In following table are shown the variations found by author in the physical and chemical constants of pure ca oil:—

Specific gravity at 15·5° C.	0·960—0·967
Optical rotation (200 mm., 16° C.)	+ 8° — + 9°
Refractometer number (22° C.)	+ 39 — + 42
Solubility in 90 per cent. alcohol	1 in 3 to 4 vols
Solubility in petroleum ether	Insoluble.
Saponification value	175—182
Viscosity (Redwood's Viscosimeter)	1,160 secs.—1,190 sec for 50 c.c. at 100° F
Acetyl value	About 150.

—A.

Maize Oil; Composition of ——. H. T. Vulte and Ha W. Gibson. J. Amer. Chem. Soc. 1901, 23, [1], 1–

Constituents other than Fatty Acids.—The volatile o which maize oil owes its grain-like odour is not consid d here. The unsaponifiable matter, mainly phytos amounted to 1·41 per cent. It is the cause of the coloration obtained on adding a drop of strong sulpl acid to a solution of maize oil in carbon bisulp and allowing the mixture to stand for 24 hours. lecithin (determined by the method given in Lewkowit 's Chem. Analysis of the Oils, Fats, and Waxes) was 1 per cent., making the total unsaponifiable matter 2·5 cent. The glycerin (10·35 to 10·55 per cent.) was d mined by Hehner's bichromate method.

Insoluble Fatty Acids.—The mixed insoluble obtained in the usual way gave the following results melting point being determined by Le Sueur and Cros 's method (this Journal, 1898, 988): Specific grav 100° C., 0·8529; melting point, 22·4° C.; iodine 120·98; bromine thermal value, 21·6° C.; saponific value, by titration, 198·29; by Köttstorfer's m 200·01; molecular equivalent, 282·98 and 280·64. fatty acids fractionated by treatment of the lead salts ether by Muter and de Koningh's method gave subjoined results:—

—	Per Cent.	Iodine Value.	Mol. Equiv.	Sa c v
Liquid fatty acids	72·26	135·97	284·45	1
Solid fatty acids (calculated)	27·74	54·23	269·78	2

Fractional Precipitation of the Mixed Acids.—40 of the acids were dissolved in hot alcohol and fracti precipitated with a boiling solution of magnesium ace alcohol. The fatty acids recovered from the seven fr thus obtained gave the series of values shown in the ta next page.

From the melting points and iodine values, partic of the fourth fraction, the authors inferred the prese a readily oxidisable unsaturated acid, and the anal the fourth fraction giving results nearly correspond the formula $C_{16}H_{30}O_2.2H_2O$, they concluded that th hypogæic acid.

Traces of arachidic acid were obtained by Renard's and identified by the crystalline form under the micro

Stearic, palmitic, and oleic acids were detected by Seyler, and linolic acid by Rokitansky and by H

Appearance.	Melting Point.	Mol. Equivalent.	Saponification Value.	Iodine Value.	Bromine Value.	Iodine Value calculated from Br.
	° C.					
White, wax-like	50·2	272·00	206·25	15·35	..	..
White, tallow-like	37·2	276·03	203·24	69·74	..	..
Pale yellow, soft	35·8	284·76	197·00	101·94	64·55	102·46
Buttery, dark brown	31·1	289·75	193·62	102·77	66·23	105·14
Like 4, but softer	21·5	287·60	195·06	114·98	73·22	116·26
Like 1	55·2	268·11	209·24	9·51	5·32	8·45
Dark red-brown	Liquid	286·07	196·11	137·61	85·91	136·39

Journal, 1899, 152). Rokitansky also claims to have a hydroxylated acid, probably ricinoleic acid, and athors consider this probable from the acetyl value of l (11·12—11·49).

uble Fatty Acids.—The Reichert value of maize oil een found by various observers to vary from 0·0 to In a large number of cases the authors found it to 2 to 4·3. Acetic acid and formic acid were identified g the volatile acids, and the presence of caproic, lic, and capric acids previously recorded by Rokitansky egarded as probable.—C. A. M.

and Fats; Treatment of ——, with Caustic Soda to rove their Taste. P. Huth. Zeits. angew. Chem. 1, [7], 166.

been suggested for this purpose, to treat oils having greeable taste with chalk, because the addition of soda gives rise to the formation of unclarifiable ons. The author, however, states that for a long he has experimented in this direction and these ions were avoided in a very simple manner, by mixing ustic soda lye with a concentrated solution of common By this means only the acid portions of the oil te as flocculent soapy masses, whilst the further on of the fat or oil itself is prevented by the sodium le, and by washing and boiling with dilute sodium le solution the neutral oil or fat can then be obtained lear.—D. B.

; Chemical Composition and Disinfecting Properties he ——. F. K. Rogenhagen. Dissertation, Dorpat.); through Chem. Zeit. Rep. 1901, **25**, [5], 44.

uthor concludes that the estimation of moisture in by Gladding's method in an atmosphere free from ic acid is preferable to the ordinary method. For imation of phenol in soaps, it is best to separate the cids by barium hydrate and then titrate the phenol in lution by means of bromine. The gravimetric ion of the phenol as tribromophenol involves conle errors, owing to the solubility of this substance formation of the bromide.

the estimation of mercuric chloride in soaps, the ls generally available are said to be quite insufficient. disinfecting power, both of pure soaps and of those ing phenol and mercuric chloride, should be deternot only by the percentage of antiseptic, but also terological experiments. Solutions of pure, neutral only act upon the vegetative forms of bacteria; a bacteria and spores are not affected. A proof free alkali increases their bactericidal action, an excess of fat acid diminishes it.

n mercuric chloride is added to soap, its specific tic properties are lowered, owing to the formation ury soaps, which are less active than the chloride. olic soaps also, the action of the phenol is lowered alkali be present in the soap-base, owing to the on of the less active sodium salt of phenol.—J. F. B.

utter Fat; Determination of Commercial ——. W. v. Klenze.

See under XXIII., *page* 396.

Seed Oil; Halphen's Reaction for Detecting and the Behaviour of some American Lards. P. en.

See under XXIII., *page* 393.

Glycerin; Determination of ——. J. Lewkowitsch.

See under XXIII., *page* 395.

PATENTS.

Oleaginous Compounds or Oils for Tinning Baths; and Method of Producing ——. A. W. Burwell, Cleveland, Ohio, U.S.A. Eng. Pat. 2011, Jan. 29, 1901.

Claim is made for the use of a mixture of a mineral oil of a high fire test with oleic acid, or a substance rich in oleic acid. This oleic acid may be derived from the waste palm-oil residuum from tinning baths. Further claims are for the decomposition of this waste product in a closed vessel, and the admixture of the total condensed volatile constituents, or of the oleic acid alone, with the mineral oil in approximately specified proportions. Or the condensed substances may be conducted into the mineral oil until the volume of the latter has been increased by at least a third of its original amount.—C. A. M.

Oils, Fats, and Waxes; Refining ——. J. Crichton, Hackney Wick, and P. H. Joselin, New Wandsworth. Eng. Pat. 4506, March 9, 1900.

According to this patent the oil, fat, or wax, is treated in a fluid condition, with an aqueous solution of borax or other borate, the proportions and conditions depending on the nature of the particular substance to be refined.—C. A. M.

Oils, and more especially Seed-Oils, by the Employment of Cold Water under Pressure and Finely Subdivided; A Hydro-Refiner for Refining ——. F. Morgan. Poggio-Mirteto, Perugia, Italy. Eng. Pat. 19,806, Nov. 5, 1900.

Cold water in a finely-divided state is forced through the oil under a pressure of about 18 feet. The quasi-emulsion which results is allowed to stand at a temperature of 20° to 22° C., and the water on separating draws down all the impurities, leaving the oil clear and refined.

The hydro-refiner claimed for this process has a cylinder open at the top and provided with an outlet at the bottom. The water issues under pressure from small holes in a central tube, and breaks up the oil on its passage through the cylinder. The upper end of the supply-pipe for the water is protected by means of a cylinder of wire netting, the meshes of which are smaller than the holes of the discharge pipe. In using the hydro-refiner for the improvement of rancid oils, the addition of kaolin, magnesium carbonate, or other chemical is claimed.—C. A. M.

Greasy Matters from Liquids and other Substances; Apparatus for Liberating ——. J. Delattre, Dorignies-Flers (Nord), France. Eng. Pat. 10,012, May 31, 1900.

The apparatus claimed consists essentially of several superposed cylinders connected in zig-zag fashion. The substance to be extracted passes downwards and meets an ascending current of solvent, the admixture being effected by means of revolving agitators and baffles. Below the entry of the solvent, the lowest sloping cylinder is heated by means of a coil or otherwise, so as to effect the distillation of the greater part of the solvent carried down by the degreased substance, this solvent again entering into the circulation. On the uppermost cylinder, above the entry of the fatty material, is an extension, preferably vertical, intended for the reception of the solvent charged with grease. Thence it is decanted into another decanting apparatus consisting of three vessels, one of which is filled, whilst the second decants the solvent from any solid particles, and the third discharges it into the distilling apparatus. The material and solvent are introduced into the cylinders by means of pumps, each of which is connected with a measuring chamber provided with means for alternately opening and closing. Various combinations of the different parts of this apparatus are claimed.—C. A. M.

Solvents from Oily, Fatty, Waxy, Soapy, or Emulsified Solutions [of the Same]; Art of Separating ——. E. Maertens, Providence, Rhode Island, U.S.A. Eng. Pat. 9872, May 29, 1900.

Claims are made for treatment of the emulsion with acid or with acidified solutions of salts or other substances, either with or without pressure, decanting the separated solvent, and recovering it by distillation, either with or without previous clarification with suitable solutions of salts or salts and acids.

Additional claims are for the use of a closed receptacle in which the mixture separates, for spraying the emulsion with chemical agents, or *vice versâ*, and for the use of dehydrating agents which simultaneously decompose the soaps.—C. A. M.

Soaps Soluble in Sea Water; Manufacture of ——. J. Rattaire and A. Cottard, Paris. Eng. Pat. 8090, May 1, 1900.

Palm-oil or cocoa-nut oil soap is claimed, with which is incorporated caustic soda or potash, colophony resin, and an aqueous decoction of one of the algæ, fucus crispus, fucus percus, or pearl moss. It is coloured and perfumed as required.—C. A. M.

Wool; Impts. in Recovering Solvents from Compounds or Emulsions obtained in Degreasing ——. W. Erben. Eng. Pat. 19,688.

See under V., page 359.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

PATENTS.

White Lead; Conversion of ——, *into Oil Paste.* G. Bischof, London. Eng. Pat. 2774, Feb. 12, 1900.

It is usually found difficult to convert water-wet white
into an oily paste (without drying) by simple agitatio
a reasonable time unless more than the 8 or 10 per cent
oil, demanded in the arts, is put into the mill. To overc
this trouble, the inventor filter-presses the white lead n
according to his process, as described in Eng. Pat. 11,
1890 (this Journal, 1891, 841), and pugs together
third of the whole charge with two-thirds of the tota
required to suspend it. This is done in a pug-mill f
with specially large, or temporarily enlarged, beaters
otherwise an emulsion of pigment, water, and oil is a
be formed. When the oil and white lead unite, and
water separates, the latter is run off; and then, in ano
mill, or in the same mill with smaller agitators, the
mainder of the pigment and the rest of the oil are a
gradually. The last traces of water are removed
blowing in a current of hot air during the pugging pro
care being taken that the temperature of the blast is so
as not to injure the shade of the lead.—F. H. L.

*Paints; Binding Substances for Colouring Matters
Protective Coatings or* ——. F. Gerhardt, Düssel
Eng. Pat. 21,553, Nov. 28, 1900.

Casein, carefully freed from grease, is mixed wit
antiseptic such as formalin or carbolic acid, and gr
into water so as to form a thin liquid. An equal w
of Portland cement is next added, the whole stirre
together, and allowed to settle. The supernatant liqu
then drawn off, and is employed as the vehicle for p
it spreads well and dries to a perfectly insoluble
resisting the weather. The same liquor may also be
in the preparation of wall papers, and in calico-pri
The deposited matter is ground again and employed
alone or coloured with some pigment as a paint or
protective distemper for stucco, &c.—F. H. L.

(B)—RESINS, VARNISHES.

Varnish Resins; Examination of ——. J. Lewkowi
Analyst, 1901, **26**, [2], 37—38.

The author gives the subjoined results which he
obtained in the examination of various resins, usin
same methods as are commonly employed in the an
of fats. He attaches little value to such figures f
detection of gums used for oil-varnishes, but consider
more information may possibly be obtained from
determinations as the oxygen absorption, Twitchell's a
of determining resin, Liebermann's starch colour re
&c. :—

—	Original Gums.						Gums after heating to 300° C.			
	Acid Value.	Sap. Value.	Unsap. per Cent.	Iodine Value.		Sol. in Alcohol, per Cent.	Acid Value.	Sap. Value.	Unsap. Matter per Cent.	Iodine V
				ICl.	Br.					ICl.
Copal, commercial	109·8	143·1	7·96	135·5	183·6	93·06	26·49	85·4	14·73	124·3
" "	42·43	66·82	14·99	191·2	114·6	54·83	21·94	61·04	46·40	143·7
" Sierra Leone ...	72·83	119·63	18·81	105·7	96·05	..	12·89	114·9	17·22	125·5
" Manilla	127·6	175·17	15·98	137·9	188·2	..	68·21	136·3	22·99	153·3
" Brazil	108·89	171·4	7·66	127·7	72·66	..	46·25	113·8	38·74	136·7
" Sierra Leone ...	65·7	110·5	16·27	94·55	117·0	..	15·32	123·8	22·21	95·23
Kauri	37·39	53·84	20·07	90·99	..	..	17·14	61·67	10·39	67·76
Mastic	52·73	81·79	51·13	175·7	185·0	84·41	23·23	50·21	49·28	165·0
Shellac, dark	61·13	203·0	3·56	35·57	13 25	..	..	..	..	..
Sandarac, Mogador ...	134·39	143·42	13·2	112·2	99·98	..	64·84	136·14	14·28	126·2
" Austral.....	131·15	134·32	17·44	125·4	63·83	..	106·6	137·26	9·93	..
Animi, No. 1	18·69	73·15	6·3	105·3	182·7	..	9·25	58·73	..	106·1
" No. 2	80·22	43·5	6·85	96·21	95·85	..	..	..	..	..
Dammar..............	35·22	32·73	75·96	127·5	169·4	..	10·85	60·44	86·57	127·0
Amber...............	16·7	121·27	18·86	58·98	82·82	..	..	..	..	..
Succinit*	11·24	113·68	7·06	55·05	78·4	..	10·60	99·19	16·25	74·31
Colophony	..	..	..	..	..	..	146·46	153·01	15·94	155·7

* A species of amber.

—C.

PATENTS.

Varnish [Amber]; Manufacture of ——. G. W. Flather, Washington, U.S.A. Eng. Pat. 2842, Feb. 9, 1901.

32 parts of amber in chips or fine powder are heated in an enamelled pot with from 25 to 37 parts of raw linseed oil, without agitation, raising the temperature to 400° C. The mixture is next cooled to 154°, and
with turpentine, stirring well together. It is clai
this varnish does not thicken or deposit, sprea
yields a high polish, and resists the atmosphere,
and ammonia, as well as many acids.—F. H. L.

shed or Lacquered Wood and Similar Surfaces; moving the Brilliancy of ——. H. Buyten, Düsselrl. Eng. Pat. 1163, Jan. 17, 1901.

neans of compressed air or steam, an alcoholic solution ellac or lacquer is sprayed over the surface, destroys polish thereof, and produces the desired dull appearance. effect is durable, and the original brilliancy cannot be red even by repeated wiping.—F. H. L.

(C.)—INDIA-RUBBER, &c.

PATENTS.

; *Elastic* —— [*Rubber Substitute*]; *Process for anufacturing* ——. V. Prampolini, San Luis Potosi, exico. Eng. Pat. 6972, April 14, 1900. Under ternat. Convent., Dec. 2, 1899.

basis of this material is the gummy matter of the can "medicinal" shrub "*Synantheroeus Mexicanus*," d plant known locally under the names of "*Yule*," nalin," "*Yerba del Negra*," "*Guayule*," "*Jiguhiie*," '*Hule*." It grows abundantly in Mexico, roots easily cuttings, and bears cutting down two or three times a On extraction it yields 40 per cent. of gum resin, h is a viscid mass exhibiting all the physical properties ude caoutchouc. It can be vulcanised perfectly, and free from mechanical impurities, needs no preary washing, &c. The woody fibre can be extracted r green or dry, and can therefore be stored or shipped out deterioration. According to the specification, the is pounded with wooden hammers, ground in iron , and treated under pressure at a suitably elevated erature with a volatile solvent such as petroleum ether irit, naphtha, and turpentine.—F. H. L.

-*Rubber; Manufacture of* —— [*by Mechanical traction*]. A. L. Arnaud, A. V. L. Verneuil, M. G. Wehry, and A. G. Lebeuf; all of Paris. g. Pat. 9906, May 29, 1900.

portions of the plants from which rubber has to be ered, are ground one or more times under water, and roduct is passed through "hydraulic sieves," such as mployed in mining. By this treatment the woody is gradually reduced to powder and passes the sieves; rubber remains on the surface, ultimately cohering. water is used hot and finally boiling; and the material rified fully by the ordinary processes. As a prery treatment, the bark, which contains no rubber, be removed by dry grinding.—F. H. L.

V.—TANNING, LEATHER, GLUE, SIZE.

Liquor"; Its Preparation and Uses. Josef Jettmar. Leather Trades' Rev. **34**, 778, 114.

process of currying leather by means of the so-called iquor" originated in America. A fat liquor is a dilute on of fat, which is easily absorbed by the tanned hide, roduces a soft and pliant material.

at liquor to be used satisfactorily must be absolutely l. Fat liquors may be prepared from a number of nt oils and fats. It is essential that they should be or easily emulsifiable with water. Tallow, wax, and in cannot be used for making fat liquor except at omparatively high temperatures at which they assume l condition. With chrome leather, fat liquor may be t a temperature as high as 40° to 50° C. without injury goods, but for vegetable tanned leather the temperature liquor must not exceed 30°, and at this point, of , tallow does not melt. Artificial degras, neat's-foot ve oil, castor oil, wool fat, &c., are the oils which are lly used in the preparation of fat liquors. The ing is one in common use:—2 kilos. of potassium nate are dissolved in 150 litres of water, then 15 kilos. t soap are added, and to this mixture 50 kilos. of , and the whole is well boiled; water is then added ke up to a total of 250 kilos. For every 100 kilos. of r "struck out" there are used 25 litres of the fat diluted with 50 litres of water.

The "fat-liquoring" is best performed in a special stuffing drum made for the purpose, in which, whilst rotating, the fat liquor can be introduced through a hollow axle. The time required is generally about half an hour.

A good fat liquor consists of a milky solution of soap and certain oils and water, which ingredients must be intimately co-mingled one with the other, as upon their being perfectly emulsified depends their effective action. The fat liquor should be made up immediately before use, and not allowed to stand, otherwise the oil is liable to separate out.

The following recipes are also recommended from practical experience:—15 kilos. of olive oil soap and 4·5 kilos. of olive oil, with from 200–300 litres of water. This, thoroughly emulsified, is sufficient for 100 kilos. of leather. For dyed leather the following is recommended:—1 kilo. of castor oil soap, 1½ kilos. of castor oil, and 200 litres of water. For box calf, 3 parts of castor oil and 1 part of castor oil soap, diluted with water. Another:—3 kilos. of castor oil soap, 2½ kilos. of glycerin, and 1½ kilos. of castor oil, emulsified in 50 litres of warm water. Eitner recommends the following for Dongola leather:—100 kilos. of degras, 90 kilos. of soft soap, and 10 kilos. of borax.

All leather not sold by weight should be fat-liquored, as the resulting material is exceedingly soft and pliable, and is free from any greasy feeling. Further, the operation of fat-liquoring can be carried out without manual labour, and the finished product only contains a moderate quantity of fat (about 10 per cent.), as against 30—50 per cent. by drum-stuffing with fats.—J. G. P.

Hide Powder; Report to the Internat. Assoc. of Leather Trade Chemists on Results of Comparative Experiments with Freiberg ——. J. Paessler.

See under XXIII., *page* 395

PATENTS.

Leather; Artificial ——. A. J. Boult. From the Fosslitch Leather Co., Lynn, Mass., U.S.A. Eng. Pat. 2972, Feb. 14, 1900.

Pieces of leather are beaten in a beating machine until the fibres over the whole of the surface are loosened and project upwards without becoming detached. Several of these pieces of leather superposed, either flat or promiscuously, are then pressed together with or without the aid of a sizing or binding material, the result being an interlocking of the loosened fibres of contiguous pieces, and the union of the whole into a slab of greater thickness. The binding material used may (for example) be flour-paste, sometimes containing glue and dextrin, or it may be a composition containing shellac, or the like.—W. G. M.

Leather; Artificial ——. A. J. Boult, London. From O Poppe, Berlin. Eng. Pat. 8429, May 7, 1900.

Linoleum cement is triturated (in a centrifugal apparatus or otherwise) with benzol or other volatile solvent, until a homogeneous fluid emulsion is obtained. This emulsion is applied to a fibrous material arranged in loose or evenly connected layers, such as textile material, felt-wadding, or fleece, after which the solvent is evaporated off. The product is then heated and submitted to great pressure by rolling or by means of plates, to increase the binding power and pliability of the cement, a result which is improved if the material be cooled during (or shortly after) the application of pressure. The oxidation of the binding material is completed in a current of warm air. The tenacity, pliability, porosity, and degree of finish, are modified by the degree of pressure, the percentage of cement, or of resin in the cement, and the nature of the fibre employed. Thus high pressure, best quality cement, and coarse fibre yield a good substitute for sole-leather; cotton fibre with only one side impregnated gives a glacé product, and a basis in which the fibres are in layers (mainly in one direction) gives a material useful for driving belts or for objects liable to be subjected to tension. A little paraffin wax may be added to the benzol prior to the treatment of the cement.—W. G. M.

Glue: Preparation of a Substitute for Animal ——. J. Wezel, Leipzig, Germany. Eng. Pat. 23,250, Dec. 19. 1900.

A solution of keratin is prepared by dissolving 3 parts of horn shavings in a lye containing 10 parts of water and 2 of caustic soda, stirring well and diluting the solution to 7·5 Bé. with water. 36 kilos. of the solution, together with an equal weight of a 7·5° B. solution of soluble glass, are then added to 40 kilos of potato-meal, mixed with a similar quantity of water, and stirred to form a broth. After stirring until the glue is smooth and uniform, acetic acid is added until the liquid is only slightly alkaline. Potash may be substituted for soda-lye, and soluble glass for acetic acid. The glue is said to be well suited for use in fixing the mineral film of "permanent white" and kaolin, employed in the preparation of chromo paper.—W. G. M.

Plastic Composition: A Substitute for Wood, Bone, &c. H. H. Lake, London, for the United States Chemico Wood Co., Detroit, U.S.A. Eng. Pat. 1838, Jan. 26, 1901.

The compound claimed is made from wood-fibre, with a cement of cereal flour and plaster. Proportions of about 50 per cent. of wheat flour, 20 per cent. of buckwheat flour, and 30 per cent. of "reground plaster" in the cement for incorporating with shredded wood-fibre are mentioned in the claims.—J. F. B.

XV.—MANURES, Etc.

Bone-meal Phosphoric Acid; Citrate Solubility of ——. T. Methner. Zeits. angew. Chem. 1901 [6], 134—135.

With reference to the superiority of the phosphoric acid in bone-meal over that in Thomas-meal for manuring purposes, the author remarks that it is strange that this has not also been indicated by the analytical results. Thus, on treating bone-meal (free from collagene) according to Wagner's method (5 grms. rotated for 30 minutes with 500 c.c. of 2 per cent. citric acid solution), only 84·1 per cent. of the total phosphoric acid dissolved, and even after standing for 24 hours, this amount was only increased to 84·9 per cent. This he finds to be due to the fact that the citric acid must be in a definite ratio to the phosphoric acid, which in the case of Thomas-meal, with its 16 per cent. of phosphoric acid = 100 : 8. This ratio must also be maintained in treating the bone-meal (30 per cent. of phosphoric acid). By using 2·5 grms. of bone-meal instead of 5 grms., and following Wagner's method in all other particulars, satisfactory results are obtained. Thus, in the analysis of six different samples, an average of 95·75 per cent. of the phosphoric acid dissolved. In these analyses the ratio was 100 : 7·5, and the author suggests that still higher figures might be obtained by further decreasing the proportion of the phosphoric acid.—C. A. M.

Superphosphate; Absorption of ——, *by Arable Earth and Humus.* J. Dumont. Comptes Rend. **132**, [7], 435—437.

Monocalcium phosphate, equivalent to 0·815 grm. of P_2O_5 in 350 c.c. of water, was allowed to soak 50 grms. of sifted soil, and the phosphoric acid remaining in the liquid was determined after varying intervals of time. The author's conclusions are as follows: 1. In humus-containing soils, the fixation of phosphoric acid is not entirely due to retrogression. 2. The amount of phosphate absorbed is proportional, not to the richness of the soil in calcium carbonate, but to the magnitude of the ratio of humus to calcium carbonate. 3. Peaty soils, in spite of their low content of calcium carbonate, fix notable amounts of phosphoric acid. 4. Presence of abundant humus lessens the tendency to retrogression.—J. T. D.

PATENTS.

Superphosphates, Manufacture of ——. H. Saxl, H. Kramer, and L. Widrin, all of San Francisco, California, U.S.A. Eng. Pat. 18,027, Oct. 10, 1900.

According to the second claim the process consists in "mixing the pulverised phosphate-containing material with concentrated sulphuric acid, allowing the mass to bec homogeneous, mixing the mass with water, allowing the s portions to settle, withdrawing the liquid from the mi evaporating the same to about 20° B., then mixing al 50 per cent. of fresh phosphate-containing material, w drawing the resultant mass and separating the liquid th from, returning the separated liquid and evaporating i from 85° to 95° of strength, and then mixing therewith al 50 per cent. of phosphate of lime-containing materia form a high grade superphosphate."—E. S.

Bacteroids of Micro-Organisms of the Leguminosæ the Permanent Forms of such Bacteroids; Method Producing Cultures of ——, *and for Inoculating S and Soils with Micro-Organisms.* R. Hartleb, Bre Germany. Eng. Pat. 694, Jan 10, 1901.

Cultures of bacteroids of micro-organisms of leguminosæ and the permanent forms of such bacte are obtained by introducing the said micro-organisms in nutrient medium containing a phosphatic proteid compo such as "legumin potassium," sodium or calcium phospl an alkali compound and a carbohydrate. A suitable li medium is made by dissolving in 1 litre of water, 0· 1·0 grm. of legumin [plant-caseïn] potassium phospl 1 to 5 grms. of grape sugar, and traces of calcium chl and magnesium sulphate. The culture thus obtaine used to inoculate the seeds, as follows. The seeds are washed in cold water, then covered with the culture, left until they begin to swell. They are then sown wit admixture of any other substance, and nodule form begins very shortly afterwards.—L. A.

XVI.—SUGAR, STARCH, GUM, Etc.

Saturation; Chemical Effect of Karlik's Process of T ——. K. Andrlik. Zeits. für Zucker-Ind. in Boh 1901, **25**, 195, through Chem. Zeit. Rep. 1901, **25**, 46.

Karlik's process is essentially a fractional precipitatic the non-sugar of the juice at different degrees of alkali In the first saturation the alkalinity is brought to 0·08— per cent. (as CaO) and the mud contains 10·95 per cen organic matter, including 2·13 per cent. of albuminoi the dry solids. The juice is filtered clear, 0·4 per cen CaO is added and the second saturation carried down alkalinity of 0·05—0·06, the mud containing 5·43 per of organic matter. In the third saturation only the e. of lime and traces of colouring matter are precipitated comparison with the composition of the diffusion ; though only of approximate value owing to unavoi errors, showed that in the whole process, calculat 100 parts of beet, 1·07—1·17 parts of inorganic, 4·25 parts of organic non-sugar are removed. About 9 cent. of the phosphoric acid, 94 per cent. of the magn 80 per cent. of the iron oxide and alumina, 60—87 per of the silica, 65—68 per cent. of the lime, 22—30 per of the sulphuric acid, and 9—15 per cent. of the alkal removed. Fats, colouring matters, resin acids, oxalic and invert sugar are almost completely removed o composed. The total nitrogen is reduced by 41·5—4 cent., 17·2 per cent. being separated in the for albuminoids and the rest as ammonia, half of which is off from other bodies in the course of the process. amido-acids pass almost unaltered into the massecuit form the main constituents of its organic non-sugar. acids soluble in ether (excluding oxalic acid) are precip to the extent of about 50 per cent. and the acids vo with steam are increased by about 55 per cent., n through the destruction of reducing sugar by the acti heat and lime.—J. F. B.

Molasses and Analogous Waste Sugar Products Andrlik, K. Urban and V. Stanek. Zeits. Zucker-I Böhmen, 1901, **25**, [5], 247—272.

The authors give a summary of all the work publish the analysis of molasses, osmose syrups, waste water molasses obtained after desaccharification by the stro disucrate method together with an account of thei

ainination of 24 samples of such products obtained during
campaign 1898—1899. Complete tables of the results
appended and lead to the following conclusions:—(1)
hough alkaline to litmus, with three exceptions the
asses were not alkaline to phenol-phthalein; one froth-
syrup was found to be strongly acid. (2) The
asses apparently contained lævo-rotatory substances so
in most cases the determination of raffinose by the
risation method gave negative results; one sample of
echarification molasses contained 12·3 per cent. of
nose. (3) The molasses from raw sugar works, also
ose waters and molasses after osmosis were practically
from invert sugar, as by Herzfeld's method they yielded
from 0 to 24 mgrms. of copper per 10 grms. of dry sub-
ce; one sample of molasses left after desaccharification
108·4 mgrms. of copper, and a frothing syrup, 137·5
ms. per 10 grms. (4) By Peska's method the presence
educing substances could be detected in nearly every
, the quantity varying from 0·13 to 0 24 per cent.
essed as invert sugar; such bodies were found in the
e liquors from the strontium disucrate desaccharifica-
process (5) The quantity of ash (carbonate) from
olasses before osmosis varied from 10·98 to 13·17 per
, and after osmosis from 9·59 to 11·05 per cent.; the
rs from the first osmosis yielded 21·69—21·95 and
from the second, 15·16—20·46 per cent., while the
sses after the strontium desaccharification gave 7·51
ent. of ash. (6) The ash of the molasses contained
5—56·98 per cent. K_2O and 5·85—10·74 per cent.
); the mean percentage of SO_3 was 2.53, the number
e previous campaign being 6·06. (7) The content
n-sugar in the molasses varied from 24·9 to 32·3 per
and the total nitrogen had a mean value of 2·36 per
in the molasses and higher values in the waters from
rst and second osmoses. (8) The nitrogen existed
y (89·4—91·3) as betaïne and amido-acids, the
ities of albuminoids, peptone, ammonia and nitrates
small. (9) An important constituent of the organic
ugar of molasses and especially of osmose-waters, are
cids extracted by ether after the addition of an
anic acid.—T. H. P.

Molasses; Presence of Lactic Acid in ——. J. Weis-
g. Bull. Assoc. Chim. de Suc. et de Dist. 1901, 18,
], 545.

uthor states that lactic acid is a constant constituent
ench beet-molasses, thus confirming the finding of
s and Schoene in respect to German molasses.
—H. T. P.

sses; Properties of ——, *after Substitution of the*
assium by other Elements and by Ammonium. M.
lner. Oesterr.-ung. Zeits. Zucker-Ind. u. Landw. 29,
—867; Chem. Centr. 1901, 1, [8], 481.

thor has made experiments to ascertain whether the
c salts of other elements behave similarly to those
tassium in hindering the crystallisation of the
ses. He found after some preliminary experiments,
e greatest amount of potash can be substituted by
ent with a concentrated magnesium sulphate solution
sponding to the amount of potash and lime present)
ddition of an equal volume of 95 per cent. alcohol.
uting with water till any turbidity which forms, has
eared, a crystalline precipitate consisting of the
tes of potassium, calcium, and magnesium, and some
c magnesium salts separates; the molasses solution
asily be separated, and, after expelling the alcohol,
trated. In the magnesia molasses obtained in this
r, 82 per cent. of the potash, 92 per cent. of the soda,
e whole of the lime was substituted. By treatment
magnesia molasses with milk of lime, baryta, and
um hydrate, the corresponding molasses are pro-
whilst the Na, NH_4, Zn, Cu, Fe, and Al-molasses are
d by treating the baryta molasses with the corre-
ng sulphates. The organic salts of ammonium
es decompose during the concentration; ammonia
ved, and the free acids effect inversion. Molasses
alts of the metals also, as a rule, show signs of
position on evaporation. Magnesium, strontium, and calcium salts have an appreciably less disturbing influence on the crystallisation than the potassium, sodium, and barium salts.—A. S.

Manna; Abundant Production of ——, *by Olive Trees.* J. A. Battandier. J. Pharm. Chim. 1901, 13, [4], 177—178.

The trunks of old olive trees in the gardens of Mansourah, near the Iron Gate, were found at Christmas to have produced a considerable quantity of manna; certain blocks of stalactites weighed about 1 kilo. The manna was found to have the following composition:—Mannite, 52 per cent.; reducing sugar (calculated as dextrose), 7·3 per cent.; gum, 9·8 per cent.; water, 13·5 per cent.; twigs and loss, 17·4 per cent. The gum was soluble in water, insoluble in alcohol, not coloured by iodine, entirely precipitated by ferric hydrate (separation from dextrin), gave a blue solution with caustic potash and copper sulphate, with potash and iodine it yielded iodoform, and with phloroglucinol and sulphuric acid it gave the ordinary reaction of gum.—A. C. W.

Sap of Arum maculatum; Chemical Changes in the Cell-free ——. M. Hahn. Ber. 1900, 33, [19], 3555—3560.

The development of heat in plants has long been known, Saussure and Garreau proved that its intensity is proportional to the consumption of oxygen. A decrease in the dextrose and starch and an increase in the acids most probably accompany the production of heat. Previous work had been done on the living cells; the author has now examined the sap free from cells.

The spadix of *Arum maculatum* having been found to reach a temperature 15° C. above that of the air, it afforded suitable material. The plants were always gathered in the early morning and used as quickly as possible. After removal of the spathe, the spadix was divided into two parts—the upper club-shaped sterile portion and the lower bearing the flowers. Each part was treated separately. The product of several hundred plants was chopped, ground with an equal weight of quartz sand and $\frac{1}{10}$th part of kieselguhr, and the mixture subjected to 300 atmospheres' pressure. The sap was filtered through hardened paper, it was then found by microscopical examination to be free from organised structures. The sap from the upper portion of the spadix soon turned dark greenish-black, the initial neutral reaction became acid, and the colour then acquired a redder shade. The sap from the lower portion was more slimy, was yellower at first, and on standing quickly became greenish. In other respects the two liquids behaved exactly in the same manner; both reduced Fehling's solution and separated albumin; on boiling; the blue coloration produced by iodine rapidly disappeared.

Portions of 20 c.c. of the sap were placed in Meissl flasks provided with sulphuric acid valves, 0·5 c.c. of toluene added, and the flasks then kept at 25° C. in the thermostat. At the end of the digestion, the liquid was neutralised, boiled, made up to 100 c.c., filtered, and the nitrogen and sugar in aliquot parts determined by Kjeldahl's and the Allihn-Soxhlet methods. The sap contains a diastatic enzyme, which increases the quantity of dextrose on standing at 0° C. When the sap is evaporated to dryness *in vacuo* at 30° C., it loses its property of destroying dextrose (see below), the residue contains a small, but constant, amount of sugar and is able to invert cane sugar. The sap also contains a proteolytic enzyme. The quantity of coagulate obtained from the sap after digestion for 11 days was considerably diminished, the nitrogen in the filtrate was increased, but not to a corresponding extent.

The most interesting observation made was this, that the fresh sap loses the whole, or almost the whole, of its sugar, when digested for several days. This property was, however, rapidly lost, either after a period of very wet weather, or also by allowing the material to stand for, say, 12—24 hours in ice. Heating to 60° C. considerably diminishes this power of decomposing sugar; boiling entirely removes it. The presence of oxygen is not essential to the decomposition. The Meissl flasks diminished in weight during the digestion; carbon dioxide was evolved, but its weight was less than the decrease in weight of the flask. The diminution in weight does not correspond to the sugar decomposed, which is evidently transformed into acids, since the digested sap was very acid, whilst sap which was boiled and then digested did not become acid. Attempts to obtain a dry preparation with this sugar-destroying property were unsuccessful; however, a pulverulent precipitate, obtained by the addition of 5 vols. of absolute alcohol to the sap from the upper portion of the spadix, possessed this property in a very diminished degree when dissolved in water.—A. C. W.

Dextrose; Birotation of ——. Y. Osaka.

See under XXIII., *page* 395.

PATENT.

Saccharine Solutions; Process for Desaccharifying ——. A. Wohl, Charlottenburg, and A. Kollrepp, Braistedt, Germany. Eng. Pat. 6733, April 10, 1900.

The inventors claim the process of "separating crystallised lead sucrate from alkaline saccharine solutions by adding to the solution an insufficient quantity of lead oxide or carbonate of lead and alkali, simultaneously or subsequently mixing with finished lead sucrate for starting crystallisation, and then adding the remainder of the necessary lead oxide or carbonate of lead and alkali, in accordance with the progress of crystallisation."

The second claim provides for the regeneration of the carbonate of lead "by saturating the lead sucrate with carbon dioxide for separating the sugar, separating the basic carbonate from the sugar solution by filtration and lixiviation, then renewed saturation of the carbonate in the presence of water or highly dilute acids, for purifying, and further saturation of the carbonate with carbonic acid without reducing the purity of the saccharine solution."

Finally, the process of separating the lead sucrate from the lye "by malaxing the raw sucrate with hot washing lyes" is claimed.—J. F. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Fermentation; The Heat of ——. A. J. Brown. J. Fed. Inst. of Brewing, 1901, **7**, 93—103.

Following a review of what is known concerning the heat changes taking place during fermentation, the author describes his method of using a brewery fermentation square as a calorimeter. The vessel was constructed of thin copper cased with 1-inch wood; the top was open, but the fact that the fermenting wort was covered with 12 ins. of "head" was considered almost perfect protection from heat radiation. The necessary correction for the thermal capacity of the square could be made, as the weight of copper composing it was known.

In order to utilise fermenting malt wort for measuring the heat of fermentation, it was necessary to ascertain (1) the rise in temperature of the wort during an interval of time; (2) the weight of sugar decomposed during this time interval; (3) the specific heat of the fermenting wort. The rise in temperature was measured by a Beckmann's differential thermometer plunged into the fermenting liquid. The method of estimating the amount of sugar fermented, was based on the fall of specific gravity of the solution during fermentation. The specific heat was determined by the method of mixture; it varied but slightly, and could usually be taken as 0·968. Details of the experiments are given and corrections made for the glycerin formed during fermentation, the specific heat of the wort, the heat capacity of the copper vessel, and the carbon dioxide saturated with aqueous vapour the evaporation of which carries off heat. The result obtained was 118·4 calories evolved during the fermentation of 1 grm. of maltose. In this calculation the weight of fermented sugar was determined from its solution weight, but the author uses another method to check the result. It is known that during alcoholic fermentation the change in volume of the fermenting liquid is so small that it may generally be neglected. Taking this into consideration, it is evident that the difference between the specific gravity of a liquid before and after fermentation represents very closely the weigl carbon dioxide evolved, for this gas is the only ma separated from the solution during fermentation. Pas has shown that a given weight of carbon dioxide is evol during fermentation from 1 grm. of a $C_{12}H_{22}O_{11}$ sugar, using this weight, the author's value becomes 118·39 calc for 1 grm. of maltose. Several determinations were car out according to the first method (*loc. cit.*) and a c plotted, with the result that a value of 119·2 calorie 1 grm. of maltose was obtained. When compared Bouffard's number, 23·1 K (this Journal, 1896, 128), w is calculated on the gram molecule of dextrose, the auth becomes 21·4 K. (K represents the heat required to r 1,000 grms. of water 1° C.)—J. L. B.

Platinum; Enzymatic [Catalytic] Actions of Coll ——. G. Bredig. Comptes Rend. 1901, **132**, 490—492. (See this Journal, 1900, 1155.)

The remarkably close analogy between the mode of a of the inorganic catalytic agents and of the org enzymes has been frequently studied; for instance, in cases of saccharification, inversion, saponification, pr lysis, &c. A very large number of the organic enzy bring about the catalysis of hydrogen peroxide, in a ma similar to that of platinum black. The action of t enzymes in this respect is inhibited by increase of tem ture above a certain point and by the addition of tra certain electrolytes (see this Journal, 1900, 1155). T is evidence to show that this decomposition of hydr peroxide is brought about by the presence of a sp enzyme. The main difference between the laws regul the action of the inorganic catalytic agents (acids, b &c.) and that of the organic enzymes lies in the fact the latter bodies are colloids, and that their solu therefore act as suspensions of extremely fine parti the author terms them "heterogeneous catalysts."

By striking an electric arc between platinum poin water, the author obtained (see this Journal, 1899, 2 brown liquid containing platinum in the state of coll solution. The catalytic action of this liquid is remark and has been tested upon the explosive mixture of ox and hydrogen (electrolytic gas) and upon hydrogen pero With this "heterogeneous" or colloidal inorganic cata agent, the analogy to the organic enzymes is com Its relative activity increases with rise of temperature maximum, above which it decreases in exactly the way as that of the organic enzymes.—J. F. B.

Diastatic Actions; Analogy between the —— of Col Platinum and those of Organic Diastases. G. B Comptes Rend. **132**, [9], 576—578.

Colloidal platinum and platinum black act like oxy in accelerating the oxidation of pyrogallol, the decolori of Indigo by hydrogen peroxide, &c. The activi platinum, like that of diastases, is lessened by increased by small amounts and lessened by large am of alkalis. Those substances which poison (or destr activity of) diastases, poison (in the same sense) pla too.

Yeast; Extraction of Protoplasm of ——. H. van Brussels. Ger. Pat. 117,303, Dec. 29, 1898. angew. Chem. 1901, [8], 202.

Yeast is allowed to ferment in presence of about cent. of crystallisable salts, the liquid filtered off, an solid yeast residue employed for the inversion of sugar; the filtrate is subjected to distillation, to obta alcohol present, the coagulated albumin then sep from the residual liquor, from which the remaining al is obtained by evaporation. The yeast made use inverting the cane sugar is digested with water at the albumin being obtained from the liquid by filtratio evaporation, and the solid residue from the filtratio verted into a dry cattle food or into glucose or oxali by ordinary methods.—T. H. P.

Yeast Manufacture; Use of Lactic Acid in —— Bücheler. Zeits. für Spiritusind. 1900, **24**, [10],

On general grounds the author makes several cla favour of adding lactic acid to the mash in which th o grow, rather than allowing the acidity to develop by growth of the lactic acid bacillus. The principal points that when lactic acid is added to the mash, risk of intion by other organisms is reduced to a minimum, and working results are more certain and easier of control. reover, under these conditions the yeast has a greater nentative power. The mash is carried out in the usual y for 1—2 hours at a temperature of 60°—63° C. So n as the cooling of the mash begins, the necessary ount of lactic acid is introduced, and, when a temperature 10°—31½° C. is reached, the pitching yeast is added.

—J. L. B.

hinese Yeast" and the so-called Amylomyces (Mucor Rouxii). C. Wehmer. Centralbl. Bakteriol. [ii.], 1900, 53; also Zeits. f. Untersuch. der Nahr. und Genussittel, 1900, 4, 212—213.

NESE yeast is a preparation used in East Asia for ting the fermentation of rice. It consists of pleasantlling lumps which are powdered and sprinkled over the ace of the damped rice. The yeast contains a mould h the author calls *Mucor Rouxii* (*Calm.*). This ld can be grown in solutions of lævulose, dextrose, ctose, cane sugar, lactose, maltose, or inulin with one or ammonium nitrate, alcohol being formed in y case.—J. L. B.

st Maltase; Synthetic Action of ——. O. Emmerling. Ber. 1901, 34, [4], 600—605.

ER the title of "Reversible Zymohydrolysis" (see this nal, 1898, 684), A. C. Hill described some experiments he prolonged action of certain yeast enzymes upon entrated solutions of glucose.

e results of Hill's experiments, which were conducted the enzyme known as maltase [or glucase], led him to conclusion that this normally hydrolytic enzyme had, r the conditions studied, a slight condensing action, that a small quantity of a disaccharide was produced the glucose; some evidence was adduced that this maltose. That being so, Hill inferred that the hydro- of maltose by the yeast enzyme is under certain itions a reversible process.

e present author has re-investigated this very rtant theoretical question, and has repeated Hill's riments. Working with a maltase preparation obd from bottom fermentation beer yeast, he confirms results, so far as regards the formation of a charide by condensation of the glucose. But he s that the disaccharide produced is not maltose, but somaltose of Fischer, which is also formed by the nged action of acids upon glucose. The excess of se was removed by fermentation with a species of which had no action upon maltose. The residue was unfermentable by ordinary yeast, and was identified maltose by the properties of its osazone. The author urther shown that this condensing action is really ht about by the enzyme maltase, since the enzymes ted from the yeast, which did not ferment maltose, o synthetical action whatever.—J. F. B.

aromycetes; Variations of the ——. E. C. Hansen. nptes Rend. Lab. Carlsberg, 1900, 5, [1]; through ch. für Brau. 1901, 18, [7], 88—91.

e first part of this paper the author classifies and conclusions from the results of all his communicaon this subject during the last 11 years. He alludes production of the elongated forms of cells resembling ia, which are formed in the films of old cultures of The conditions under which the ordinary type of e yields descendants consisting of more or less prerating quantities of permanently asporogenous races tailed. Certain yeasts are subject to variations in the of their sedimentary deposits, these becoming flaky ersisting for several generations. Yeast may be ted under conditions, which may either increase or se its capacity for alcohol production. Cultivation eral years in media incapable of undergoing alcoholic tation, does not deprive the yeast of its characteristic ties of fermentation; neither is it possible to render it capable of fermenting carbohydrates, which it does not otherwise ferment, by prolonged cultivation in their solutions; for instance, *S. apiculatus* cannot be made to secrete invertase, nor *S. Ludwigii* or *Marxianus* to secrete maltase. Several variations favourable to the brewer may be obtained, but their tendency to revert renders their application very uncertain. In the same way yeast may degenerate during the course of a year's use in the brewery, and in this case the variations are unfavourable; the simplest remedy is the introduction of a new pure stock.

The new work contained in the present paper relates to the production of permanently asporogenous varieties. These are advantageous to the brewer on account of their relative constancy, and the ready detection of the presence of sporulating wild yeasts.

The method of the author depends on the fact that with each species of yeast, the maximum limit of temperature at which vegetative reproduction takes place is a few degrees higher than the limit at which sporulation can occur. Consequently, by repeated sub-cultivation of the yeasts, at a temperature between these two limits, cultures are obtained in which the proportion of cells which multiply by sporulation is diminished. Care was taken in most of the experiments to sow really average samples from culture to culture, so that the production of these varieties may be regarded as a veritable transformation of habit and not as a mere selection of a few asporogenous cells; moreover, these races can be evolved from a single spore. In beer-wort no difficulty was experienced in obtaining complete transformation of cultures of *S. Pastorianus I.* Johannisberg yeast No. II. did not undergo complete transformation, but conversions up to 90 per cent. were obtained. With other species, the process was conducted on gelatin plates and the percentage of cells transformed varied with the species. Only from *S. ellipsoideus I.*, *S. Ludwigii*, and *S. membranaefaciens* were no permanently asporogenous varieties obtainable. The races were regarded as permanently asporogenous when they resisted all inducements to sporulation for one year, but several of them have been preserved absolutely constant for 12 years. Apparently the only factor of importance in bringing about this variation from a sporulating to a permanently asporogenous race is the maintenance of a relatively elevated temperature. The composition of the wort, frequent agitation, and special aëration had very little influence in determining the change.

—J. F. B.

Wheat Embryos; Saccharifying Action of ——, *and their Employment in Distilleries.* Lindet. Comptes Rend. 132, [5], 261—263.

IN modern methods of milling, the wheat embryo is separated, and is submitted separately to a further milling to clear it from adhering farina. The bran from this operation, rich in fragments of scutellum, contains considerable quantities of a saccharifying diastase. This appears to have both the dextrinising and the saccharifying properties of malt; though the former is difficult to demonstrate, owing to the coagulation of the large quantities of associated albuminoids before the necessary temperature is reached, yet the latter, by experiment on a solution of dextrin prepared from starch, was found to be rather more vigorous than in the case of malt itself. On treating worts of maize and musts of apples with "embryo-bran," and subsequently fermenting, the alcohol formed was found to be equivalent to both the maltose and the dextrin in the original liquid, showing that the ferment had completely saccharified the dextrin. The author suggests the use of this bran in distilleries as a cheap and effective substitute for malt.

—J. T. D.

Amylomyces; Investigations on Certain Species of ——. L. H. Annales de la Brass. et de la Dist. 3, [21]; through Zeits. Spiritusind. 1901, 24, [8], 80.

REFERRING to the recent papers by Wehmer and by Sitnikoff and Rommel (this Journal, 1900, 839 and 1128), the author regrets that the observations of the two latter on the saccharification of starch pastes were so few, and that the conditions selected differed so widely from those existing in distillery practice. These fungi make no great demand

for nutrients, since they grow well in rice mashes, but, from the results of Sitnikoff and Rommel's experiments, it would seem that the addition of peptone and mineral nutrients to starch pastes does not yield a very favourable medium. In a somewhat similar manner, Wehmer found that beer-wort is a very good medium for these organisms and a vigorous maltose fermentation is set up, but that, if grown in ordinary nutrient maltose media, the fermentation is very slight indeed. Further, Sitnikoff and Rommel made no provision for the submersion of the mycelium, which is one of the most important factors in distillery practice, for it is well known that the mucors act as oxidising ferments, if allowed to form external mycelia. To the above criticisms Rommel replies that the investigations in question were carried out with the object of identifying and characterising the different species from a morphological and physiological point of view, rather than in relation to distillery practice.
—J. F. B.

Molasses; Application of Yeast, Acclimatised to Hydrofluoric Acid, in the Preparation of Spirit from ——. M. Verbièse. Bull. Assoc. Chim. de Suc. et de Dist. 1901, **18**, [8], 583—588.

On account of the insufficient supply of yeast nourishment, and the large excess of saline matters present in molasses, difficulty is often experienced in distilleries using this raw material. If employed for several generations, the yeast deteriorates, the power of secreting invertase becomes apparently dormant, resulting in incomplete fermentation, and less resistance towards the attacks of bacteria. In practice, therefore, the yeast must continually be rejuvenated by cultivation in wort prepared from grain. But this last step may be avoided, and, in general, much better results obtained by the methods worked out by Effront; *i.e.*:—

1. Addition of an antiseptic (HF) to the molasses solution in order to check the development of bacteria.
2. Filtration, or decantation of the solution before fermentation.
3. Fermentation with yeast, acclimatised or habituated to do its work in concentrated molasses solutions in presence of hydrofluoric acid. Yeast so acclimatised retains its invertive activity in successive generations; and does not need strengthening by cultivation in wort. And, apart from other advantages, fermentation in presence of HF is claimed, notably to increase the quality and yield of alcohol produced.—H. T. P.

Brandy "Strengthening" Essences. A. Beythien and F. Bohrisch. Zeits. Unters. Nahr. und Genussmittel, 1901, **4**, [3], 107—110.

To disguise the fraudulent dilution of brandy and spirits with water, so-called strengthening essences are often added. These consist of alcohol with a large proportion of fusel oil [grain essences] or of alcoholic extracts of pungent plants, such as red or black pepper, grains of paradise, &c., in order to produce a burning sensation resembling that of alcohol; they are also aromatised with ethers and essential oils. The analysis of these essences presents certain difficulties: they froth during distillation for alcohol, owing to a high percentage of extract; the distillate is often cloudy; and on dilution for the estimation of fusel oil (Rose's method), a separation of resinous matter occurs, and the results are always too high. The authors recommend the following method:—The oils, resins, &c., are separated by shaking the essence, diluted with water to twice its bulk, with petroleum-spirit, and the alcohol is estimated by distilling the residue. The petroleum-spirit extract, which also contains the fusel oil, is filtered, and allowed to evaporate at the temperature of the room. Under these conditions practically all the fusel oil is volatilised, and the residue contains only the essential oils, resins, piperine, &c., which can then be identified. If the proportion of fusel oil be very high, it is estimated as follows:—20 c.c. of the essence are measured into a 100 c.c. flask, 75 c.c. of absolute alcohol are added, and the mixture made up to the mark with water at 15° C.; 25 c.c. of the mixture are then mixed with 200 c.c. of water and 5 c.c. of caustic potash solution, and distilled. The distillate is made up to 200 c.c., the percentage of alcohol is determined, and is then made up to exactly 30 per cent.; the fusel oil is estimated in Rose's apparatus.

With the other class of essence, not containing very m fusel oil, 50 c.c. of the essence are mixed with 40 c. absolute alcohol, and made up to 100 c.c.; 50 c.c. of mixture, 30 c.c. of alcohol, 130 c.c. of water, and 5 c. potash lye are distilled, and the distillate made up to 200 the fusel oil being determined as before. It is remai that, in the proportion (1 per cent.) in which they are u the simple grain essences containing fusel oil canno detected in brandy, but at the same time their employ is absolutely devoid of the effect desired.—J. F. B.

Cognac; Significance of the Furfural Reaction in Valuation of ——. Th. Wetzke. Zeits. öffentl. Cl **6**, 11—16. Chem. Centr. 1901, **1**, [7], 424.

The author finds that the furfural reaction does not a a satisfactory means of judging whether a cognac cont wine distillate or not. In most cases the strongest rea is obtained in the intermediate fractions, but a definite cannot be laid down. The author is not able to con Loock's statement that with a cognac to which furfural been added, the first and last fractions of the distillate an equally strong reaction. The higher the rectificatio a wine distillate is carried, the lower is the proportio furfural in the product; this accounts for the fact French cognacs give stronger furfural reactions German. In Germany, also, the wine freed from the is usually subjected to steam distillation, whilst in Fr the wine with the lees is distilled directly.—A. S.

"Saké"; Chemical and Biological Researches on Preparation of ——. Y. Kozai. Zeits. f. Unter der Nahr. und Genussmittel, 1901, **4**, 211—212.

The preparation of "saké" may be divided into stages:—(1) preparation of the "koji" (the materi which the mould develops—"pilz-malz"); (2) the (the yeast); (3) the fermentation; (4) the pres clarification, and pasteurisation. The enzyme of "koji" (*Aspergillus oryzæ*) forms dextrose from st dextrin, raffinose, cane sugar, and maltose, but does attack inulin or lactose; alcohol is detrimental to enzyme, which is completely inactive in solutions taining 28 per cent. of alcohol. As, however, during process of the preparation of "saké," there is never than 15 per cent. of alcohol present, this enzyme mus be active in the later stages of the process. A mould very similar to *Sachsia suaveolus* is also foun ferments cane sugar, raffinose, dextrose, levulose, maltose, but not trehalose, rhamnose, lactose, or meli The yeast of saké readily ferments cane sugar, ma mannose, levulose, dextrose, and methyl glucoside; lose and galactose with difficulty; does not ferment l or rhamnose; and splits up raffinose into melibios levulose.—J. L. B.

Fusel Oil; Separation of the Amyl Alcohols of — W. Marckwald. Ber. 1901, **34**, [3], 479—484.

In this communication, the author deals historicall theoretically with the three principal methods hi proposed for separating the two constituents of fuse inactive isoamyl alcohol and active amyl alcohol.

Pasteur's method consists in the preparation of th acid sulphates and the fractional crystallisation of barium salts. The salt derived from the inactive a is far less soluble than that from the optically isomeride, but its preparation in the pure state is a of great difficulty, requiring about 20 crystallisations, apparently to the formation of isomorphous mixed cr The more soluble salt cannot be obtained even approximately pure state. The method of Le Bel is upon the greater velocity of the esterification of the i alcohol when a current of hydrogen chloride is through the boiling mixture of alcohols. After treatment the unesterified residue becomes richer optically active isomeride, and the author calculates t Bel probably prepared a substance containing about cent. of the active alcohol.

ogers' method is a modification of the Le Bel process, nich the mixed alcohols are heated in closed vessels, very highly concentrated aqueous hydrochloric acid. 16 litres of fusel oil, Rogers obtained 250 c.c. of a act containing 88·5 per cent. of the active alcohol five operations. If the treatment had been carried er, the author calculates that Rogers should have got g. of a product of 99 per cent. purity.

om the results of the two last processes, it would ir that Le Bel's method is less wasteful than that of s.—J. F. B.

Oil; Separation of the Amyl Alcohols of ——. II. Marckwald and A. McKenzie. Ber. 1901, **34**, [3], —491.

main difficulty attending Pasteur's method of separa- (see preceding abstract) lies in the fact that the a salts of the derivatives of the two alcohols are phous. With the hope of finding a simpler method same principle, the authors prepared the acid amyl of several substituted phthalic acids, but in all cases ound that the derivatives of the two alcohols were phous, and yielded mixed crystals. The acid finally d as most convenient was nitrophthalic acid—

$$[COOH.COOH.NO_2 = 1.2.3].$$

ields two isomeric series of acid esters, differing in r 2 position of the amyl residue, according to con- By boiling 3 parts of amyl alcohol with 1 part acid and 0·3 part of sulphuric acid for seven hours, myl acid nitrophthalates were the main products. the products of esterification of commercial fusel e was comparatively little difficulty in separating ctive isoamyl derivative in the pure state. After d recrystallisations from carbon tetrachloride and nzene, it melted constantly at 95° C., and yielded ctive isoamyl alcohol on saponification. For the tion of the optically active isomeride, the authors from a product obtained from fusel oil after a ary treatment by a modification of Le Bel's method. oduct contained about 62 per cent. of the active ; it was converted into the l-amyl acid nitro- esters, and the optically active ester was separated elaborate series of systematic crystallisations from . This operation was rendered very complicated isomorphism of the components of the mixture, active isomer was finally obtained in a pure elting at 114° C. In acetone solution the ester optical rotation of $[\alpha]_D = + 6 \cdot 5°$, $c = 10$ at This ester is readily saponified in the cold by soda, yielding the pure optically active amyl Active amyl alcohol boils at 128° C.; its density, 0·816; and its specific rotation $[\alpha]_D = - 5 \cdot 90°$ at

ctive amyl alcohol differs in odour from the in- omer, and does not produce the characteristic ensation, although its narcotic effects seem to be erful.—J. F. B.

s; Determination of ——, by the Hydrochloric Acid-Phloroglucinol Method. E. Kröbler.

See under XXIII., *page* 396.

Determination of Starch in Mixed Pressed ——. H. Lange.

See under XXIII., *page* 395.

Detection and Determination of Salicylic Acid in ——. A. Ferreira da Silva.

See under XXIII., *page* 396.

95°; *Action upon Metals of ——.* Malméjac. J. Pharm. Chim. 1901, **13**, [4], 169.

See under X., *page* 365.

Selenium Compounds, the Marsh Arsenical Mirror, and the Beer-Poisoning Epidemic. F. W. Tunnicliffe and O. Rosenheim.

See under XXIII., *page* 390.

PATENT.

Spent Wash or Residues; Treatment of Distiller's ——. C. G. Sudre and C. V. Thierry, Paris. Eng. Pat. 3522, Feb. 22, 1900.

The invention relates to the recovery from distiller's spent wash of by-products consisting of nitrated substances in the form of ammonia, glycerin, tars, and mineral salts. The previously concentrated wash is delivered in the form of a continuous sheet on to an endless travelling surface, which is then subjected to the necessary degree of heat in a closed chamber. In this way frothing and the formation of scum, which give trouble when the wash is heated in bulk, are avoided. Various arrangements of travelling heating surfaces and means for separating the gaseous and liquid products from the solid residue are described.—J. F. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Butter; Low Reichert-Meissl Value of Dutch ——. L. T. Reicher. Zeits. angew. Chem. 1901, [6], 125—129.

The systematic researches of Nilson, Vieth, and other chemists have shown that there is an increase in the proportion of volatile fatty acids in Dutch butter at the beginning of lactation, and that at the end of that period the amount again becomes low. The author has made a still more comprehensive investigation in the Amsterdam public laboratory, analysing the butter from the same cows and herd month by month from 1894 to 1901. He, too, finds that the Reichert-Meissl value of genuine samples is frequently lower than that commonly accepted, the results during the autumn being invariably lower than those obtained during the rest of the year. The maximum, minimum, and mean results for each year are given in tabular form.—C. A. M.

Albumin; Transformation of ——, into Globulin. J. Starke. Zeits. Biolog. 1900, **40**, 494—525. Chem. Centr. 1901, **1**, [7], 402.

Hoppe-Seyler's statement that a globulin can be prepared from albumin is disputed by Neumeister. The author has succeeded in obtaining from albumin a body similar to globulin by subjecting egg albumin to prolonged dialysis at 75°—85° C. The substance obtained is coagulated by heating to 100° C., and by heating with salt solution. The products formed from the substance by boiling with hydrochloric acid have a greater cupric reducing power than those formed from albumin.—A. S.

Albuminoids; Precipitation of ——, by Chloroform. E. Salkowski. Zeits. physiol. Chem. 1900, **31**, 328—337. Chem. Centr. 1901, **1**, [6], 333.

The author has made a series of observations, from which it appears that albuminoids are precipitated by chloroform. Chloroform also appears to render albumoses insoluble. An aqueous solution of albumoses, prepared by peptic digestion of serum albumin, was converted by chloroform, on long standing, into a paste. From the separated matter dysalbumose and a small quantity of a body similar to globulin were isolated. Apparently, therefore, a separation of the dysalbumose from protalbumose and deutero-albumoses had been effected by the chloroform. From milk which was preserved for 13 years with chloroform, the casein had separated. From the filtrate no albumoses or peptones could be obtained. The albuminoids of milk, therefore, even on long standing with water, undergo no alteration with formation of albumoses and peptones.

—A. S.

Fruit Juices used in the Manufacture of Preserves, Syrups, &c.; The Composition of ——. Truchon and Martin-Claude. J. Pharm. Chim. 1901, 13, [t], 171—176.

The authors have examined the composition of the j of certain fruits; the results are contained in the follo table, expressed in grms. per litre of juice:—

——	Specific Gravity.	Invert Sugar.	Saccharose.	Saccharimeter. Before Inversion.	Saccharimeter. After Inversion.	Acidity calculated as tartaric acid.	Precipitated by Alcohol.	Mineral Matter.	K_2O.
				°	°				
Cherry, early	1·0404	83·6	..	− 9·0	− 9·0	4·95	3·40	3·00	0·44
„ season	1·0554	86·49	..	− 16·5	− 16·5	8·46	2·40	3·88	0·97
Strawberry, early	1·0262	45·18	..	− 7·0	− 7·0	9·15	10·00	5·96	0·46
„ season	1·0482	99·98	..	− 21·0	− 21·0	11·52	13·80	5·72	0·97
Raspberry	1·0303	88·19	..	− 15·0	− 15·0	17·82	9·60	4·32	0·86
Red gooseberry, not quite ripe	1·0404	63·68	..	− 11·0	− 11·0	28·50	8·60	5·49	1·25
White gooseberry..	1·0498	87·43	..	− 15·3	− 15·3	25·65	7·20	4·44	1·01
Black currant	1·0655	116·60	..	− 25·0	− 25·0	31·44	10·80	7·20	1·63
Peach	1·0540	33·50	19·80	+ 2·5	− 14·0	6·84	7·60	4·70	0·76
Pear.......................	1·0550	85·80	..	− 10·2	− 10·2	2·04	2·60	3·56	1·68
Quince	1·0480	75·90	..	− 7·4	− 7·4	9·60	4·60	4·20	1·81
Apple.......................	1·0680	102·80	6·60	− 8·0	− 13·5	7·44	6·80	3·72	2·09

Citric acid is present in all the fruits, with the exception of cherries of the season. Tartaric acid was absent from white gooseberries, pears, and apples, but present in all the others.

The shorter table contains the results of the examination of certain fruits from which the extraction of juice was difficult; the quantities are given in grms. per 100 grms. of fruit:—

——	Invert Sugar.	Saccharose.	Saccharimeter. Before Inversion.	Saccharimeter. After Inversion.	Mineral Matter.	K_2O.	P_2O_5.
			°	°			
Apricot ..	2·64	4·15	+ 29·6	− 4·8	0·59	0·126	0·05
Greengage	8·80	0·80	− 7·0	− 14·0	0·57	0·115	0·06
Mirabelle	6·57	3·04	+ 5·0	− 20·0	0·59	0·217	0·07

In testing for salicylic acid, a doubtful reaction is often given by ferric chloride. If the fruit juice be treated by the following process, no coloration is obtained in the absence of salicylic acid:—100 c.c. of liquid (preserve, syrup, juice, mixed with an equal volume of water) are shaken with 2 c.c. of strong ferric chloride solution, 10 grms. of calcium carbonate are then added whilst shaking. The mixture is allowed to deposit, and the liquid filtered. The filtrate is extracted with ether, the solvent evaporated, the extracted matter dissolved, and tested with dilute ferric chloride solution.

The colouring matter of the fruits mentioned above is not extracted by ammoniacal amyl alcohol (except that of the peach, which, though giving a rose-red solution in amyl alcohol, does not dye silk). These natural colouring matters cannot be confounded with those of archil, logwood, cochineal, &c.—A. C. W.

Foods; Detection of Artificial Sweetening Agents [" *Saccharin* "] *in* ——. Zeits. Ver. Deutsch. Zucker-Ind. 1901, [541], 95.

See under XXIII., *page* 393.

Solanine; Formation of ——, *in Potatoes under the Influence of Bacteria.* R. Weil.

See under XX., *page* 384.

PATENTS.

Sterilising or Pasteurising Liquids; Apparatus for ——. S. G. Nabouleix, Bordeaux, France. Eng. Pat. 13,749, July 31, 1900.

The apparatus comprises a heat exchanger, steriliser, and receiver, the latter being a chamber interposed between the steriliser and the cooling part of the heat exchanger, wherein the liquid is retained long enough to comple sterilisation. The steriliser is a coil of pipe, heate liquid-bath completely filled with liquid, the expansi contraction of which, or the pressure of vapour from works a regulator which, by controlling the amou liquid flowing through the steriliser, and also the amo gas passing to the burner, maintains a constant tem ture. This constant temperature may be varied certain limits by varying the capacity of the liquid the volume of liquid being fixed, which is effected by of a small auxiliary chamber connected with the chamber and containing a flexible rubber diaphragm by a screw.—L. A.

Milk; Diabetic Sugar-free ——. E. W. Morris, Lo Eng. Pat. 16,199, Sept. 12, 1900.

According to the directions of this patent, the c removed from 5 gallons of the milk by a cent machine and set aside. The milk is then heated to acidified with 200 c.c. of glacial acetic acid, and th cipitated casein filtered off through muslin, presse washed. The casein is now dissolved in about 200 c 25 per cent. solution of potassium hydrate, diluted pint of distilled water, the cream previously rem added, together with 12 grains of soluble " sacchar grains of sodium phosphate, 20 oz. of lime-wat minims of a solution of formaline, and distilled wate temperature of 90° F. sufficient to make 5 gallons.

Or casein may be obtained from separated milk, i case 4 per cent. of fat is to be added to the pro means of an emulsifier.—W. P. S.

Milk similar in Composition to Human Milk; Pro Producing Condensed ——. A. Sauer, Zwing Germany. Eng. Pat. 647, Jan. 10, 1901.

The process claimed is as follows:—1,000 litres milk are, after the addition of 5 grms. of sodium bica placed in a vacuum pan, heated to 35°—40° evaporated to about 500 litres. 200 litres are d and receive the addition of 45 kilos. of cooked, butter, and 120 kilos. of sugar. After stirring, the is run back into the vacuum pan and further conc to about 460 kilos. During this evaporation the con become thoroughly emulsified. The concentrated is then passed through sieves into receiving can 30 grms. of sodium bicarbonate, dissolved in 1 water, are added. The prepared milk is then seale and sterilised. For use it is diluted with 13 parts

—W

Milk; Separation of Casein and Whey from —. Székely, and E. Kovács, Buda-Pesth, Hungar Pat. 755, Jan. 11, 1901.

The process claimed consists in heating milk, sk or butter milk under pressure with carbon During the treatment the temperature is maint t blood heat and the milk is agitated. A suitable sure is 15 to 30 atmospheres. The precipitated casein be separated from the whey by filtration.—W. P. S.

3.)—SANITATION; WATER PURIFICATION.

iking Water; Examination of ——, with Amidonaphl - K - acid, by Erdmann's Method. A. Fernau. sterr.-ung. Zeits. Zucker-Ind. u. Landw. **29**, 861—3; Chem. Centr. 1901, **1**, [8], 475.

author refers to the doubts which have been raised in d to Erdmann's method for the qualitative and quan*te* detection of nitrous acid in drinking waters (this nal, 1900, 277), and he considers that Erdmann's nent that N_2O_3 is present in all waters contaminated nall quantities of animal matter, whilst every good ing water is free from N_2O_3, is at least, open to doubt. arative experiments with Erdmann's reagent and with nylene diamine show that the latter is less sensitive, indifferent to greater quantities of iron, N_2O_5 and oxidising substances; Erdmann's reagent in presence ch iron (50 mgrms. per litre) gives a wine-red color- The author concludes that *m*-phenylene diamine is est reagent for N_2O_3, particularly as its sensitiveness so high as to lead to false judgment as to the value rinking water.—A. S.

Water; Sterilisation of ——, by means of Ozonised [Abraham and Marmier Process]. F. Krull. Gasbeleucht. 1901, **44**, [6], 102—104.

lant for the sterilisation of drinking water according process of Abraham and Marmier, shown in operation Paris Exhibition of 1900, excited much interest in of the fact that the town supply of Lille had been l by it with satisfactory results (see this Journal, 930; 1899, 601; and 1901, 271). Hitherto, it has ound difficult to produce a sufficiently large pro- of ozone in the air treated, owing to the fac that the yield increases with the tension of the current l, the temperature rises simultaneously, and a high ature destroys a part of the ozone formed. More- he yield increases with the proximity of the poles to other, but the risk of sparking likewise increases, one is formed only under the silent discharge. The r consists of a tower to the top of which the water ped, and down which it passes in a fine spray, g an up-current of ozonised air. The unpurified t Lille contains from 1,000 to 4,000 organisms per entimetre; after passing this steriliser there remain to 100 non-pathogenic organisms per cubic centi- From 2 to 3 per cent. of the oxygen of the air is converted to ozone; a higher percentage is able, having regard to the palatableness of the water risk of forming oxides of nitrogen. Referring to e author assumes that 20 grms. of ozone can be d per horse-power-hour. The Lille trials have that 5·8 grms. of ozone per cubic metre of air are l to sterilise water completely; hence the power l to ozonise the air to this degree is 0·29 horse- our per cubic metre, and at 6 Pfennige per horse- our, the cost is 1·74 Pfennige per cubic metre. ars are, however, wanting as to how much of this l air, and how much water pass through the steriliser n time, and hence it is not possible to compute the cost of sterilising water by this process. But if e drawn from an adjacent river or lake, filtered by d then sterilised by this process, the author considers cost should be less than that of conveying spring rough long mains from a distance.—J. A. B.

ination in Distilled Water. P. P. Dehérain and moussy. Comptes Rend. **132**, [9], 523—527.

in 1875, concluded from his experiments that eds immersed in natural waters would germinate, mersed in distilled water would not, and that the salts in ordinary waters were necessary for ger- and growth. The authors show that seeds will e in pure distilled water absolutely free from salts, but that the minutest traces of copper prevent germination completely. Living organisms like mushrooms, algæ, and germinating seeds of higher plants, form reagents for the detection of traces of a metal like copper, of a far more delicate character than the ordinary chemical ones.—J. T. D.

PATENTS.

Air of Rooms; Purification of the ——. F. W. Howorth, London.—From O. Titel and Wolde, Berlin. Eng. Pat. 23,245, Dec. 19, 1900.

Diaphragms of caoutchouc or similar material are inserted in openings in the walls of rooms, through which noxious gases are eliminated by diffusion or osmosis without causing draughts.—L. A.

Sewage; Apparatus for the Treatment and Disposal of ——. D. Cameron, F. J. Commin, and A. J. Martin, Exeter. Eng. Pat. 4173, March 5, 1900.

In order to avoid the necessity for pumping sewage in flat districts, one or more septic tanks are placed as high up in the course of the outfall sewer as possible. The sewage is thus deprived of its solid matter, and may be conveyed to the outfall at a flatter gradient than would be necessary for the self-cleansing of the sewer if the crude sewage were to be passed along it. Such tanks also act as compensating reservoirs, and may render it practicable to make the outfall sewer smaller than would otherwise be necessary. Means for the automatic removal of deposit from septic tanks, dependent upon the rise and fall of the level of the liquid in such tanks, are also described.—L. A.

Bacteria Beds or Filters, Tanks and the like; Apparatus for Automatically Emptying ——. J. Graham, Carlisle. Eng. Pat. 13,658, July 30, 1900.

A cistern is so placed in the course of a valve-controlled outlet passage from a filter-bed, that when the valve is open, the outflowing liquid passes into the cistern and overflows therefrom, so as to maintain in a raised position a float in the cistern, by which the valve is operated. The cistern has a regulated self-emptying outlet, which lowers the float after the filter-bed has emptied itself, and a time-controlled flush which charges the cistern, and raises the float after the filter-bed has become full again, and has remained full for the requisite period.—L. A.

Effluents; Apparatus for Purifying ——. O. Schmidt, Dresden, Germany. Eng. Pat. 1777, Jan. 25, 1901.

This apparatus, designed especially for paper works, comprises a tall cylindrical settling tank, into which the effluent is admitted just below the upper level of the liquid, and flows downwards, the particles of fat and scum rising and overflowing at the top, whilst the heavy particles of sand, &c., settle into the conical bottom. The partially clarified liquid leaves this tank near the bottom, rises slowly through a vertical pipe of large diameter, and flows through one or more shallow settling tanks in which the fibrous, loading, and other material is deposited.—L. A.

(C.)—DISINFECTANTS.

Antiseptics; Influence of Glycerin as a Solvent on the Disinfecting Power of ——. O. von Wunschheim. Arch. Hyg. **39**, 101—141. Chem. Centr. 1901, **1**, [7], 408.

The author's experiments show that commercial glycerin exerts a certain bactericidal influence on *Staphylococcus pyog. aureus*, and *Bact. coli.* In mixtures of glycerin and water, the bacteria can exist for the longest time when the proportion of water is large; the effect of mixtures containing small proportions of water appears to vary according to the kind of bacteria used. Sulphuric acid, oxalic acid, caustic potash, phenol, the three isomeric cresols, creolin, saprol, lysol, thymol, formol, and tannin, possess less disinfecting power when dissolved in glycerin, than in aqueous solution of equal concentration. On the other hand, hydrochloric acid and acetone are more active in glycerin solution than in aqueous solution, whilst acetic acid has about the same disinfecting power with both solvents. The disinfecting power of aqueous glycerin solutions, containing 2·5 per cent. of phenol, increases, the greater the proportion of water present, and with a solution containing about 50 per cent. of water, is equal to that of a 2·5 per cent. aqueous solution of phenol. Phenol, o-cresol, lysol, and creolin, possess less disinfecting power in glycerin soap solutions than in aqueous soap solutions of the same strength.—A. S.

PATENT.

Antiseptics; Improved ——. A. Zimmermann, London. For Chem. Fabrik E. Schering, Berlin. Eng. Pat. 5931, March 30, 1900.

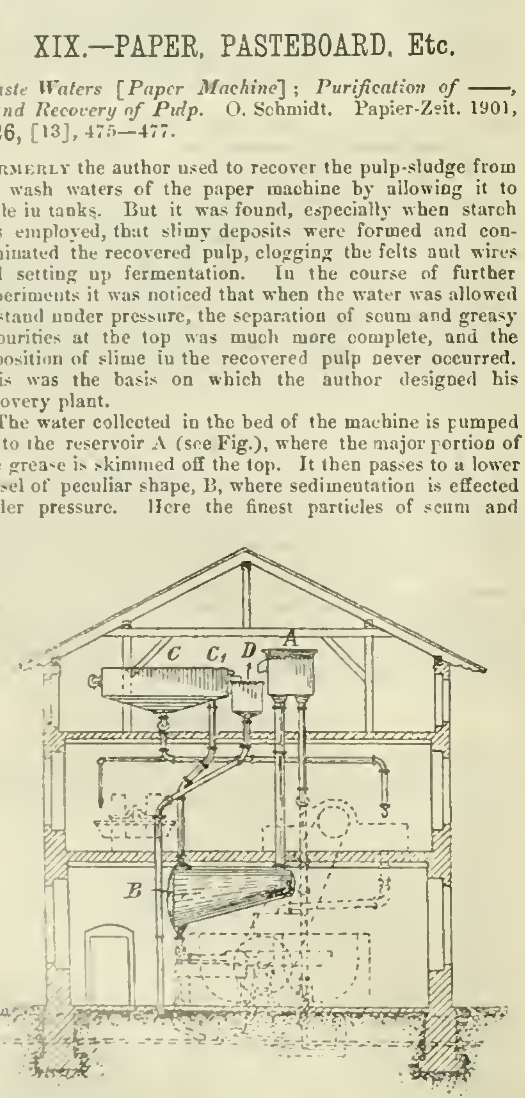
The inventor claims a new class of antiseptics with alkaline reaction, made by combining mercury salts with organic bases, which have no toxic action, and which do not coagulate albumin. Another claim particularly specifies the employment of ethylenediamine as the organic base. Instead of the free bases, the carbonates of the bases may be employed if more convenient. The compounds may generally be separated in the solid state by the addition of alcohol to their solutions. The mercury compounds with these bases have no irritating action, and may be used in more concentrated solutions than mercuric chloride; the mercury salts of organic acids are particularly applicable.
—J. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

Waste Waters [*Paper Machine*]; *Purification of* ——, *and Recovery of Pulp.* O. Schmidt. Papier-Zeit. 1901, **26**, [13], 475—477.

Formerly the author used to recover the pulp-sludge from the wash waters of the paper machine by allowing it to settle in tanks. But it was found, especially when starch was employed, that slimy deposits were formed and contaminated the recovered pulp, clogging the felts and wires and setting up fermentation. In the course of further experiments it was noticed that when the water was allowed to stand under pressure, the separation of scum and greasy impurities at the top was much more complete, and the deposition of slime in the recovered pulp never occurred. This was the basis on which the author designed his recovery plant.

The water collected in the bed of the machine is pumped up to the reservoir A (see Fig.), where the major portion of the grease is skimmed off the top. It then passes to a lower vessel of peculiar shape, B, where sedimentation is effected under pressure. Here the finest particles of scum and grease rise to the top, whilst the purified pulp sinks t bottom, and is drawn off to the paper machine for dil the pulp. The remainder of the water from B is raised to the tank C, and the finer particles of pulp, w settle out on further standing, are mixed with the stu the beater, whilst the clear water is passed away thr the tank D.



Except with very thin papers, it is not profitable to the "back waters" beyond those coming from the vacuum box. In the case of the waters from mill- and half-stuff machines, the author prefers to recove pulp by passing the waters slowly over a system of V-sh troughs.—J. F. B.

PATENTS.

Crystalline Bodies containing Water; The Solidificati ——. W. P. Thompson, London. From V. Harav Paris. Eng. Pat. 4556, March 9, 1900.

The process consists in "converting into solid m mineral substances insoluble in water containing chemically combined," and "in mixing said substance fibrous or powdery substances, and subjecting them high temperature while they are being strongly compre Also, hydrated alumina, silica, iron, and copper, hy oxides, and the like, may be similarly treated, whether mixed or combined with such fibrous or powdery subs as asbestos, graphite, paper-pulp, &c., or otherwise. pressure to which the substances are exposed may according to their nature and the qualities required product, from 100 to 1,000 kilos. per sq. cm. of st and the temperature from 100° C. to 1,000° C. or As the pressure is increased, the hardness of the sub increases and its elasticity diminishes. Artificial mal is obtained by subjecting the precipitate produced on sodium carbonate solution to a cupric solution, to ho pression at a temperature between 150° C. and 2 Hydrated aluminates and silicates mixed with graphit subjected to the process, yield a mass stated to be av in the manufacture of crucibles, pencils, crayons, c for electric lights, &c. Some of the examples given to mixtures of asbestos with certain salts, yielding hot compression, masses which may be rolled out into or used for making articles intended to receive a polis
—

Paper and Paper Board; Making Sheets or Cont Lengths of —— *from Pulp.* H. H. Lake. L. Weldon, New York. Eng. Pat. 18,786, Oct. 20

The paper-making machine claimed, consists essent a frame supporting two travelling "making wires," i towards each other at the bottom and forming two o sides of a hopper, into which the pulp is delivered distance between the wires may be varied according thickness of the sheet desired. The stuff, as it reac bottom of the hopper, is formed between two guid there, which are arranged at an angle to the movement of each wire. The wires, with sheet them, then pass through the usual series of rollers, and deliver the sheet of pressed pulp re drying. The advantage of this machine is said to be the fact that relatively larger pieces of scrap mater be incorporated in the sheet whilst still preserving a contour.—J. F. B.

Leather-Board; Making Sheets or Continuous of ——, *from Pulp.* H. H. Lake. From L. New York. Eng. Pat. 18,782, Oct. 20, 1900.

This invention is an extension of the principle emb the paper making machine described in Eng. Pat of 1900 (preceding abstract), to the production of boards.

The pulp is fed by means of a wire feed apron, t in a reverse direction to the inflow of material hopper of which two opposite sides are formed by t aprons of wire, adjustable at any angle. The conduct the sheet of pulp over suction boxes to t rolls.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

minium Chloride, Bromide, and Iodide; The Prepara- on of ——. G. Gustavson. J. prakt. Chem. 1901, **63**,], 110—112.

MINIUM chloride is obtained by passing dry chlorine ugh a hard glass tube, 40—50 cm. long and 1·5 cm. , filled throughout with large pieces of aluminium foil. le heating is sufficient to start the reaction; when it has nenced, further heating is unnecessary. The open end he tube fits into a wider tube, about 20 cm. long, in h the vapours condense. This shorter tube is removed eplaced by another as required. Aluminium chloride be kept in hermetically sealed vessels.

e bromide may be obtained in a similar manner. A ar current of bromine vapour is obtained by dropping ine from a tap funnel into a flask heated in an oil-bath 0°—120° C. The flask is connected to the combustion by a fused-on side tube and rubber stopper. A retort shortened neck may be used as receiver; it need not oled. Heating may be discontinued when the reaction e in progress, care must, however, be taken that the ide does not solidify in the tube. The product must distilled, preferably from the retort in which it was ted; the first portions of the distillate contain inc. Aluminium bromide must also be kept in sealed ls.

e author still makes aluminium iodide by the method ibed in Annalen, **172**, 173. The process is simpler the solution in carbon bisulphide is made. Aluminium d iodine are brought into a stoppered flask in the t proportions and with three times the weight of n bisulphide (aluminium iodide is soluble in about parts of carbon bisulphide). The flask is closed, n, and left in water at the ordinary temperature. On llowing day the flask is again shaken; after a further ars the reaction should be complete. The solution is s coloured by free iodine, even when excess of metal l. Aluminium iodide may be obtained in a similar r in benzene solution, but the reaction proceeds more .—A. C. W.

th Chloride with Organic Bases, Compounds of ——. anino and O. Hauser. Ber. 1901, **34**, [3], 416—420.

bismuth chloride is precipitated from its solutions by tic organic bases; either extensive decompositions or definite compounds are formed. Absolute alcohol is good solvent for bismuth chloride, it always produces solutions, which only become clear after large addi- f hydrochloric acid. Ordinary acetone dissolves the pidly, the solution is slightly turbid, and may be kept t change. If the salt be wet, it is shaken with a quantity of acetone; the turbid solution is thrown the residue then dissolves at once to a clear solution. , dimethyl- and diethyl-aniline and o- and *p*-toluidine, e in this acetone solution complicated reactions; the tates usually contain but little base. Well charac- precipitates are given by quinoline, pyridine, α- lamine, diphenylamine, morphine, and anhydroform- le-aniline. The following compounds were prepared amined:—

$iCl_3.C_9H_7N$; $BiI_3.C_9H_7N$; $BiCl_3.C_9H_7N.HCl$;
$_2(C_5H_4N)_3$; $BiI_3.C_5H_5N$; $(BiCl_3)_2(C_5H_5N.HCl)_3$;
$(BiCl_3)_3(C_{10}H_7.NH_2)_2$; $(BiI_3)(C_{10}H_7.NH_2)_2$.

the exception of the last three, these compounds ly stable towards water.

iodide compounds, which are red, were obtained by tion of potassium iodide upon the corresponding chloride compound.—A. C. W.

-Albuminoid Compounds; Preparation of ——. and Co., Biebrich a. Rh. Ger. Pat. 117,259, 20, 1899. Zeits. angew. Chem. 1901, [8], 202.

aim is for the preparation of bismuth-albuminoid nds by the action of bismuth nitrate, dissolved either in sodium chloride solution or in nitric acid, on solutions of albuminoids, the mixture being heated for some time after complete coagulation has occurred.—T. H. P.

Iron Saccharate Free from Alkali; Preparation of ——. E. Unger. Apoth. Zeit. 1901, **16**, 113; through Chem. Zeit. Rep. 1901, **25**, [7], 63.

THE *ferr. oxyd. sacch.* of the German Pharmacopœia IV., gives a *tinct. ferri. comp.* which contains a little alkali and does not therefore correspond to the Athenstädt preparation. The author neutralises the alkali with tartaric acid. The preparation is best made as follows: (1) 900 grms. of *liq. ammon. caust.*, mixed with an equal weight of distilled water, are added gradually to 1,200 grms. of *liq. ferri sesquichl.*, time being given after each addition for the precipitate at first formed to re-dissolve. (2) A mixture is made of 300 grms. of *liq. ammon. caust.* and 6,000 grms. of distilled water; solutions (1) and (2) are then poured slowly, with constant stirring, into 24 kilos. of distilled water. The washed precipitate is collected on a filter-cloth, well drained, and mixed with 1 kilo. of powdered sugar. 100 grms. of *liq. natr. caust.* are added, and the mixture is first warmed until solution is complete, and then evaporated down to a weight of 2 kilos. The resulting syrup contains 6 per cent. of iron. To prepare *tinct. ferri. comp.* from this, 100 grms. of *syr. ferr. oxid. sacch.*, 6 per cent., are mixed with 1,767 grms. of distilled water, and neutralised with 10 per cent. solution of tartaric acid. The solution is then mixed with a mixture of 633 grms. of *syr. simpl.* (hot), and 500 grms. of *spiritus*, and is then rendered aromatic with *tinct. aurant. cort.* 9 grms., *tinct. aromat.* 3 grms., *tinct. cinnam.* 3 grms., *tinct. vanillæ* 3 grms., and *ether. acet.* 6 drops.

—W. G. M.

Iron Saccharate; Alkali-free ——. W. Bruns. Apoth. Zeit. 1901, **16**, 123; through Chem. Zeit. Rep. 1901, **25**, [7], 63.

THE author mixes, with constant stirring, 1,500 grms. of *liq. ferri sesquichl.* and 10 kilos. of water with a solution of 1,300 grms. of sodium carbonate in 5 kilos. of water. The precipitate, in flannel bags, is washed first with tap-water, and then with distilled water, until silver nitrate gives but a faint reaction. The precipitate is next boiled in a copper vessel with 2½ kilos. of sugar, 1 kilo. of distilled water, and a sufficient quantity (about 40 grms.) of sodium tartrate until the whole is dissolved. The weight is then brought up to 10 kilos. with distilled water. 300 grms. of this *ferr. oxid. sacch. fluidum* are used to prepare 1 kilo. of *tinct. ferr. comp.* —W. G. M.

Œnanthylic Alcohol; Action of ——, *upon its Sodium Derivative. New Method for the Synthesis of Alcohols.* M. Guerbet. J. Pharm. Chim. 1901, **13**, [4], 179—181.

WHEN inactive amyl alcohol is heated with sodium amylate, di-amyl alcohol, isovaleric and divaleric acids result (this Journal, 1899, 387). By a similar reaction œnanthylic alcohol yields œnanthylic acid, β-di-œnanthylic alcohol, $C_{14}H_{20}O$, β di-œnanthylic acid, $C_{14}H_{28}O_2$, and a small quantity of tri-œnanthylic alcohol, $C_{21}H_{44}O$.

Di-œnanthylic alcohol is a colourless liquid, which boils at 286°—289° C., and does not freeze at – 20° C. Its specific gravity at 15° C. is 0·8105. *Tri-œnanthylic alcohol* is also a colourless liquid; it boils at 202°—206° C. under 13 mm. pressure, and does not solidify at – 20° C. At 15° C. its specific gravity is 0·8447. *Di-œnanthylic acid* crystallises at – 10° C., and melts at + 4° C., it boils at 190°—192° C. under 13 mm. pressure; at 15° C. its specific gravity is 0·8860.—A. C. W.

"*Sucramine*" [*Ammonium Salt of* "*Saccharin*"]; *a New Sweetening Agent* ——. J. Bellier. Ann. Chim. anal appl. **6**, 7. Chem. Centr. 1901, **1**, [7], 423.

THE "Société anonyme Trust Chimique" state that sucramine or "Lyons Sugar" possesses a sweetening power 700 times greater than that of cane sugar. Sucramine, which is the ammonium salt of saccharin, although not extracted by ether from aqueous solution, is removed by that solvent, if the solution be first acidified with sulphuric acid—A. S.

Antipeptone. F. Kutscher. Ber. 1901, **34**, [3], 504—506.

A REPLY to Siegfried (this Journal, 1900, 1141; Ber. **33**, 3564). The author digested fibrin in order to prepare peptone, for five weeks instead of four days, because Siegfried and Balke had endeavoured to show that their products were identical with Kühne's antipeptone. Siegfried has also found that antipeptone resists a digestion of six weeks' duration. Now however, Siegfried states that his antipeptone is not identical with Kühne's and that it is digestible by trypsin. It is, therefore, a "hemipeptone" not an "antipeptone." Siegfried has also found that pure "antipeptone", is either not precipitated by phosphotungstic acid, or very incompletely; it is thus different from his earlier preparations and from Balke's antipeptone, which must have been contaminated by substances precipitated by phosphotungstic acid—in the author's view, hexone bases. Finally, the older preparations gave analytical results agreeing with the formula $C_{10}H_{15}N_3O_5$: thus, the recent preparations, though giving concordant analyses, may not be chemical individuals.
—A. C. W.

Alkaloids; Solubility of ——, in Carbon Tetrachloride. J. Schindelmeiser. Chem. Zeit. 1901, **25**, 129.

THE author has estimated the solubility of certain alkaloids in carbon tetrachloride at 17° C. The alkaloids were finely ground and then dried over quicklime for two weeks. The sample to be tested, was taken in quantity considerably in excess of that which could be dissolved by the solvent, with which it was frequently shaken during 24 hours, the solution was filtered and after standing some time, a weighed quantity was evaporated in the air bath at 70° C. When the solvent had volatilised, the residue was left two hours longer in the air bath, then cooled and weighed. The solvent used had been previously carefully fractionated. At 17° C., 100 parts of carbon tetrachloride dissolve 0·032 part of morphine, 1·328 of codeine, 0·203 of papaverine, 0·011 of narceïne, 1·136 of atropine, 18·503 of cocaine, 0·645 of strychnine, 1·973 of brucine. With the exception of morphine, all the residues were crystalline; morphine gives a crystalline residue on evaporation at the ordinary temperature. Veratrine is very soluble in carbon tetrachloride; the solvent is entirely removed from the residue only with very great difficulty. Carbon tetrachloride is not suitable for the extraction of alkaloids from solutions (*e.g.*, obtained from corpses) since it forms emulsions even in the presence of much alcohol. It may, however, be used in the processes of Hilger and Küster, because it takes up very little impurity.—A. C. W.

Hydrocinchonine. E. Jungfleisch and E. Léger. Comptes Rend. **132**, [7], 410—412.

THE authors have made an exhaustive comparison of hydrocinchonine with their base *cinchonifine* (this Journal, 1891, 724). The rotatory powers of the alcoholic solution of hydrocinchonine, and of the aqueous solutions of its sulphate and hydrochloride, are identical with the corresponding figures for cinchonifine. The action of the two bases on potassium permanganate is practically the same. The basic sulphate of cinchonifine, though it crystallises with $2H_2O$ from warm concentrated solution, separates from a cold solution with 11—12 H_2O, and thus agrees with Forst and Böhringer's basic hydrocinchonine sulphate. The chlorozincates of the two bases are also identical. The identity of hydrocinchonine with cinchonifine, then, may be taken as established; and the authors' former process for extracting cinchonifine from cinchonine is really a process yielding hydrocinchonine.—J. T. D.

Solanine: Formation of —— in Potatoes under the Influence of Bacteria. R. Weil. Arch. für Hygiene, 1900, 330; through Zeits. für Spiritusind. 1901, **24**, [8], 80.

IN sound potatoes the poisonous alkaloid solanine is present in very small quantities or not at all. Its quantity only becomes appreciable during sprouting and it is then mainly confined to the embryos. In 1898 several persons were poisoned by eating potatoes, which showed on analysis 0·[illegible] per cent. of solanine, instead of 0·06 per cent. normally present. In the potatoes, greyish-black patches were observed which were full of fungoid growths. These bla portions contained about 33 per cent. more solanine th the rest of the potatoes. From the black portions the auth isolated 13 species of bacteria, only two of which, *B. solan ferum non-colorat.* and *colorat.*, were found to produ solanine.

The bacteria were grown for two months in a sterilis aqueous extract of potatoes at 15° C. After evaporati the liquors in the acid state, filtering and precipitating wi ammonia, a substance was extracted by alcohol from t precipitate giving the characteristic colour reactions solanine. From 6 litres of 50 per cent. potato extract, t first or *non-colorat.* species yielded 0·041 grm. and t second yielded 0·073 grm. of solanine, whilst the ster potato extract yielded none.—J. F. B.

Anethoïl [Anise Camphor]; Isomeride of ——, and Constitution. Béhal and Tiffeneau. Comptes Rend. 13 [9], 563—563.

MAGNESIUM methiodide, acting on methyl anisate, yie parapseudopropenylanisol and a polymer of twice the mo cular weight. The former is separated by steam distillati and yields crystals melting at 32° C., and forming a liq which boils at 222° C. It dissolves in alcohol, but is alm insoluble in water. The polymeride melts at 56° C., and wh heated to 350° C. dissociates into the simpler substan which distils over. The polymeride does not form a brom addition compound. The new substance, oxidised by iod and mercuric oxide, does not form the same aldehyde anethoïl similarly treated, but a ketone—

$$CH_3.O.C_6H_4.CH_2.CO.CH_3.$$

Anisic aldehyde, acting on magnesium ethiodide, yi anethoïl; the formula of which must therefore be—

$$CH_3.O.C_6H_4.CH:CH.CH_3,$$

while that of its isomeride just described is—

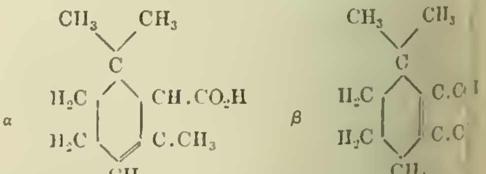
$$CH_3.O.C_6H_4.C(CH_3):CH_2.$$

—J. T. D

Cyclo-Citral Series; Compounds of ——. F. Tiema Ber. 1900, **33**, [19], 3703—3710.

THE compounds of the citral series are all converted, by action of acids, into isomeric cyclic compounds, *e.g.*, pse ionone yields ionone. Although several stereo-isomer of the former ketone (also of citral), exist, yet each f always produces a mixture of α- and β-ionone, the portions of the two constituents depending on the natur the acid by which the inversion is produced (this Jou 1898, 599; 1900, 687). In the papers abstracted belo is now shown that all the other compounds of the cy citral series exist in two isomeric forms, and that a mix is always produced in their formation. These two s are called the α- and β-series, corresponding to α- an ionone.

The adipic acid obtained by the oxidation of β-io is identical with the α,α-dimethyladipic acid obtained Blanc from dihydro-isolauronic acid (Bull. Soc. Chim. 273). The corresponding compound from α-cyclo-ge acid is β, β-dimethyladipic acid. Consequently isoge acid has the formula $CH_3.CO.CH_2.C(CH_3)_2.CH_2.C$ CO_2H, and geronic acid $CO_2H.C(CH_3)_2.CH_2.CH_2.C$ $CO \cdot CH_3$, whilst α- and β-cyclo-geranic acids have respective constitutions—



The compounds of the α- and β-series are cons according to these formulæ.—A. C. W.

'tral Series ; Inversion of the Compounds of the ——. F. Tiemann. Ber. 1900, **33**, [19], 3710--3713.

ANIOLENE is inverted, with a yield of 60—70 per cent., n shaken with 10 parts of 65 per cent. sulphuric acid three days. The cyclo-geraniolene boils between 130 140° C., principally at 138° C. It was oxidised by ing with permanganate solution for 15 hours, the cipal products of the reaction being a,a-dimethylglu- and a,a-dimethylsuccinic acids.

geranic acid be inverted by digestion with 65—70 per . sulphuric acid for several days at a temperature below . (Ber. **26**, 2725, and this Journal 1898, 598), it omes partially crystalline. By recrystallisation from leum spirit, pure a-cyclo-geranic acid, melting at C., is obtained. The sulphuric acid yields to ether d mixture of acids, from which a small quantity of a ure of the two cyclo-geranic acids is obtained. A larger is produced by digesting with concentrated sulphuric for four days below 0° C., slowly warming to 50° C. ouring into water.—A. C. W.

'yclo-Citral. F. Tiemann. Ber. 1900, **33**, [19], 3719—3725.

count of the reactivity of the aldehyde group, citral not yield a cyclic compound in the same manner as ter compounds of the series, but is converted into ne. Cyclo-citral is, however, obtained by the action alis on the two cyclo-citralidenecyanacetic acids (Ger. 108,335). The a-citralidenecyanacetic acid, melting ° C. (this Journal, 1899, 170) was boiled with dilute uric acid under an inverted condenser, the cyclo-acid, solidified on cooling, was dissolved in potash and the on dropped into a boiling solution of caustic potash, which separated being simultaneously blown over eam; the receiver contained acid to neutralise the nia in the distillate. After removing β-cyclo-geranic y dilute soda, the oil was fractionated and the fraction between 80°—110° C., converted into the semi- one, which, when pure, melted at 165°—166° C. β-cyclo-citral was obtained from the semicarbazone tilling with phthalic anhydride, shaking with dilute nd distilling; it is an almost colourless oil, resembling e in odour, it boils at 88°—91° C. (uncorr.) under . pressure. The specific gravity is 0·959 at 15° C. ference could be recognised between the two citrali- anacetic acids in this transformation into cyclo-citral. clo-citral is almost quantitatively converted into ne by adding 3 parts of acetone and a solution of art of sodium in absolute alcohol. On oxidation ermanganate, it yields geronic acid and β-cyclo- acid.

lo-geranic acid is formed in the oxidation of β-cyclo- air or by permanganate and in the inversion of the c geranic acid by sulphuric acid of 60—100 per cent. n. It forms large glassy prisms or tables, melting at ° C., readily soluble in all organic solvents, but soluble in water. On oxidation by permanganate ine solution, it yields an unsaturated hydroxy-acid, 3, and a ketonic acid, $C_9H_{12}O_3$, which melts at , and forms a semi-carbazone melting at 240° C. and isogeronic acids are not formed.—A. C. W.

e ; Constitution of ——. F. Tiemann. Ber. 1900, **33**, [19], 3726—3727.

E is shown to have the constitution derived from -cyclo-geranic acid, given in a preceding abstract.
—A. C. W.

e ; New Alcohol derived from ——. P. Genvresse. Comptes Rend. **132**, [7], 414—416.

NE is oxidised in a mixture of ice and salt by peroxide. Steam distillation of the product, after alkaline with sodium carbonate, brings over, first, limonene, then the crude alcohol (about 4 per the limonene used). This is freed from limonene ving in concentrated sodium salicylate solution, g from the undissolved terpene, and steam-distilling. *monenol,* dried by calcium chloride and distilled luced pressure, is a colourless liquid with agreeable odour, boiling at 135° C. under 15 mm. pressure, dextrorotatory ($a_D = + 19° 21'$: for the limonene used $a_D = + 43° 52'$), density at 18° C., 0·9669, refractive index for sodium light 1·497. It absorbs bromine to an extent indicating two double linkings, which agrees with the constitution deduced from its refractive power. It is a secondary alcohol, yielding, on oxidation, a ketone, *limonenone* ; this also is a colourless, pleasant-smelling liquid, $a_D = + 16° 4'$, density 0·9606 at 20° C., refractive index $\mu_D = 1·487$. It, too, contains two double linkings, and forms an oxime which appears to be identical with Wallach's carvoxime formed from carvone.—J. T. D.

Pharmacopœia Conditions, Strengths, &c. as Criteria or Tests; Notes on ——. C. G. Moor and M. Priest. Analyst, 1901, **26**, [2] 29—35.

Cardamom Seeds.—The authors find that the limits of ash given by the B.P. are too low, and have obtained considerably more than 4 per cent. from genuine seeds. The results from different samples were :—Ash on whole fruit, 5·3 to 8·2 ; ash on seeds, 3·3 to 5·9 ; and ash on pericarps, 7·1 to 13·5 per cent. They suggest that a determination of fibre may be used to supplement the microscopical examination recommended by Greenish for the differentiation of powdered seeds from powdered whole fruit. Determinations of the soluble ash and its alkalinity gave the following results :—Total ash : in seeds, 5·0 ; in husks, 13·3 ; Soluble ash : in seeds, 2·0 ; in husks, 7·1; and Soluble ash as K_2O : 0·52 in seeds, and 2·6 per cent. in husks. Several varieties of cardamoms, both wild and cultivated, are found in commerce.

Colocynth.—In the B.P. only the dried pulp free from seeds is recognised. The Colocynth apples of commerce are imported from Smyrna, Trieste, France, and Spain, in the peeled and dried condition. In this case, too, the authors have found the ash to sometimes exceed the official limit (9 per cent.). They confirm Squire's statement that the seeds contain 15 per cent. of oil, but they have found that ether extracts gummy matter in addition to oil. They have obtained the following results :—Ash from seeds, 1·7 to 3·2; ash from pulp, 7·8 from 12·1 ; ether extract of seeds, 11·5 to 15·3 ; and ether-extract from pulp, 1·4 to 12·5. The pulverised whole fruit is sold as a moth powder.

Oil of Nutmeg.—It is pointed out that the oil which satisfies the Pharmacopœia requirements is not the oil distilled from nutmegs, but oil fractionated so as to exclude the heavier portion.

Peppermint Oil.—An oil may not answer the official test for menthol, yet may still contain a considerable amount (which may be determined by acetylisation), and be genuine.

Castor Oil and Croton Oil.—From the authors' experience, mixtures of castor oil and sulphuric acid do become brown, though not blackish-brown. In the case of croton oil, a clear solution in alcohol is only obtained after the oil has been kept for some time.

Benzoin.—The authors suggest that a definite percentage should be assigned for the solubility in warm 90 per cent. alcohol. They have found Sumatra benzoin to contain from 6·5 to 18·1 per cent. of insoluble matter. They suggest that requirements for the amount of benzoic and cinnamic acid should also be included.

Myrrh.—7 per cent. is suggested as a limit for the ash, and 70 per cent. for the matter insoluble in alcohol.

Galbanum often contains woody matter, and the authors have found as much as 46 per cent. of foreign matter in one sample.

Ammoniacum.—It is suggested that limits for the ash and matter insoluble in alcohol should be added.

Strophanthus Seed.—In applying the sulphuric acid test to seeds of genuine *Strophanthus Kombé,* the authors obtained a mixture of both red and green colours with the tinctures, instead of only the dark green prescribed by the Pharmacopœia. They have found various tinctures to contain from 0·33 to 0·74 per cent. of solid matter, and to have a specific gravity varying from 0·837 to 0·894.

Arnica Root.—Clean specimens yield about 8 per cent. of ash, and dirty ones from 25 to 30 per cent.

Serpentary Root.—In the clean condition this also contains about 8 per cent. of ash. One specimen was found to contain 30 per cent., and two purchased in the form of powder, 18 per cent.

Valerian Root.—The ash in clean specimens is about 8 per cent. In three commercial samples the authors found 13 to 19 per cent, and 29 per cent. in a sample of powdered root.

Araroba.—The authors consider the Pharmacopœia requirement satisfactory.

Pyrethrum, Stavesacre, and Coccus Cacti.—These often contain excessive amounts of mineral matter. The authors find that the high ash in the case of *Coccus Cacti* is often due to adulteration with French chalk.

Saffron.—It is suggested that the transient blue colour given by each fragment on contact with strong sulphuric acid should be included among the tests of the Pharmacopœia. The authors have found dyed fragments to give a pink instead of a blue coloration.

Santal-wood Oil.—According to the authors, capsules of cedarwood oil or West Indian santal oil are sold under this name. They can be distinguished from the genuine oil by the colour test with tin bromide (Analyst, 1895, 174).

Scammony.—This is widely adulterated with starch. Of six samples the authors only found one to be genuine.
—C. A. M.

Bucco Leaves; The Essential Oil of ——. J. Kondakow and N. Bachtschiew. J. prakt. Chem. 1901, **63**, [2], 49—76.

The oil examined was obtained from two sources; its properties are given in the table :—

—	Schimmel.	Haensel.	
	Barosma betulina.	*Barosma betulina.*	*Barosma serratifolia.*
Specific gravity	0·9573 at 20·6° C.	0·9593 at 20° C.	0·9322 at 20° C.
Optical rotation	− 48′	− 31·57°	− 12·6°
Refractive index	..	1·4799	1·4811
Separation of stearoptene.	At the ordinary temperature.	On freezing	Not even at − 20° C.

The best oils are stated to contain 10 per cent. of hydrocarbons, 60 per cent. of ketone, 20 per cent. of diosphenol, 5 per cent. of resin, and 5 per cent. of other constituents.

The hydrocarbons, isolated by the process of Bialobrezeski, boiled at 175°—176° C.; $[\alpha]_D = +74° 53'$. The bromine compounds, obtained by any usual process, were separated by recrystallisation from a mixture of alcohol and ether, into the tetrabromides of *d*-limonene and dipentene.

The ketone, menthone, had the optical rotation $[\alpha]_D = -16° 6'$; a solid oxime could, however, not be obtained. On reduction by sodium in methyl alcohol solution, *d*-menthol was obtained, for which, after final purification $[\alpha]_D = +32° 37'$. From the menthol, *l*-menthene, $[\alpha]_D = -13°46'$, was obtained by the action of phosphorus pentoxide.

Diosphenol, the stearoptene of the essential oil, melts at 82° C., and is optically inactive. Its formula is $C_{10}H_{18}O_2$ or $C_{10}H_{16}O_2$; it contains one phenolic and one aldehydic group. On reduction by hydriodic acid it yields a hydrocarbon, which is probably hexahydro-*p*-cymene. When reduced by sodium in alcoholic solution it yields menthol, a crystalline glycol, $C_{10}H_{18}(OH)_2$, melting at 92° C., and an isomeric liquid glycol boiling at 141·5°—145° C. under 13 mm. pressure.—A. C. W.

Cassia Fistula; Volatile Oil of ——. Haensel. Pharm. Centralh. **41**, 773. Pharm. J. 1901, **66**, [1600], 191.

By steam distilling the finely powdered fruit of *Cassia fistula*, a dark yellow volatile oil, possessing a honey-like odour, is obtained. The oil forms an amorphous mass at ordinary temperatures, melts at 41° C., and has a faint acid reaction. The water which distils over with the oil, contains normal butyric acid.—A. S.

Gentianose; Constitution of ——. E. Bourquelot a H. Hérissey. Comptes Rend. **132**, [9], 571—574. (also this Journal, 1900, 846.)

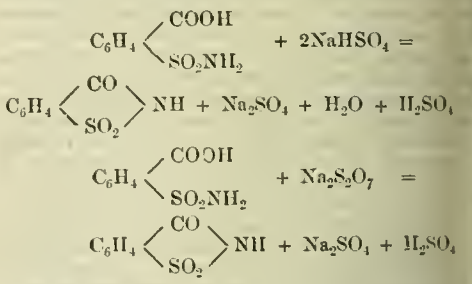
The ferment from *Aspergillus niger* hydrolyses gentian completely into 2 mols. of dextrose and 1 mol. of levulo the invertase of yeast hydrolyses it partially, yieldi levulose and a hexobiose, which, when further hydrolysed appropriate means (*Aspergillus* in the cold, or weak at 110° C.) yields 2 mols. of dextrose.

Sulphuric acid of 3 per cent. at 110° C. effects complete hydrolysis of gentianose, while 2 per cent. a at the ordinary boiling point yields only levulose and hexabiose. This latter gives an osazone melting at 142° soluble in warm water and readily crystallising on cooli it is dextro-rotatory ($\alpha_D = 7°·7$); and reduces Fehli solution (0·083 grm. = 0·05 grm. of invert sugar). authors propose to call it *Gentiobiose*. *Aspergillus* is kn to contain invertase; in all probability it also contain second ferment, which hydrolyses gentiobiose; and process of hydrolysis consists in the successive actio invertase and this second ferment. Did the second ferm exist alone, it would possibly hydrolyse gentianose dextrose and saccharose; this may account for the exist of saccharose in the fresh root.—J. T. D.

PATENT.

"Saccharin"; Manufacture of ——. W. P. Thompson. E. Gfeller, Berne, Switzerland. Eng. Pat. 7199, Apri 1900.

The process consists in heating 10 parts of orthosulphan benzoic acid, dissolved in 50 parts of ethyl alcohol, 40 parts of sodium bisulphate or 20 parts of sodium p sulphate for several hours at the temperature of a bath with a reflux condenser. Reaction takes according to the equation—



$$C_6H_4\left\langle\begin{matrix}COOH\\SO_2NH_2\end{matrix}\right. + 2NaHSO_4 =$$

$$C_6H_4\left\langle\begin{matrix}CO\\SO_2\end{matrix}\right\rangle NH + Na_2SO_4 + H_2O + H_2SO_4$$

$$C_6H_4\left\langle\begin{matrix}COOH\\SO_2NH_2\end{matrix}\right. + Na_2S_2O_7 =$$

$$C_6H_4\left\langle\begin{matrix}CO\\SO_2\end{matrix}\right\rangle NH + Na_2SO_4 + H_2SO_4$$

The sulphuric acid is neutralised, the alcohol recove distillation, and the residue consists of "saccharin," to with a certain amount of the ethyl ester of saccharin, is readily saponified by caustic soda solution at the or temperature. The yield is said to be 95 per cent. theoretical quantity.—J. F. B.

XXI.—PHOTOGRAPHY.

Allotropic Silver. M. Carey Lea. Brit. Jour. Phot **48**, [2130], 17—22.

By adding a solution of ferrous citrate to one of citrate, a deep red liquid is obtained, which, wit centrated solutions, deposits a dark lilac-blue preci the precipitate may be washed with a solution of amn nitrate; it dissolves in pure water, forming a de liquid; amalgamates with mercury by simple fricti contains 97·2 per cent. of silver, admixed with citrate, which cannot be eliminated entirely by w When the substance is brushed over paper an rapidly, it exhibits a succession of beautiful c almost any neutral substance precipitates it, som ever, changing it to an insoluble form of a purpl colour, which by repeated washings, darkens; this i form may be made to return to the soluble form a the addition of certain salts in dilute solution; borate does this forming a brown solution, sodi

otassium sulphate give a yellowish-red solution and am-
ionium sulphate a red one; the soluble form, however, is
soluble in concentrated solutions of these salts; ammonium
ydrate dissolves the insoluble form, producing a blood-
d solution; sodium nitrate renders the substance wholly
soluble, probably converting it into normal silver. By
rushing the insoluble form over paper, films are obtained
a greenish metallic colour.

Another form of silver was obtained by adding a solution
ferrous tartrate to one of silver tartrate; the substance
ies with the lustre of gold leaf. It contains 98·75 per
nt. of silver.

All these forms are sensitive to light, ultimately becoming
anged to normal silver; vibration also brings about the
ange into the golden-yellow form. They vary in stability
an unaccountable way; one specimen of the golden-yellow
riety has changed to normal silver of a dazzling whiteness
thout disintegration, whilst a similar specimen prepared
der the same conditions and in the same month still
hibits its deep red colour and golden lustre.

The stronger acids instantly convert all three varieties
o normal grey silver, without the slightest separation of
s; they all dry when brushed on any surface with their
rticles in optical contact, and when glass is used, form
rrors equally as good as those of mercury amalgam.
autiful colorations are produced by the action of the
logens. Their specific gravities are lower than that of
rmal silver. Other forms were obtained, every colour
ng represented, but the three described are the most
rked. In vividness of coloration, the author compares
m with coal-tar dyestuffs.—J. W. H.

ensifier; Mercuric Sulphocyanide ——. G. Eberhard.
hoto. Mittheil. 1901, **38**, 15, through Chem. Zeit. Rep.
901, [5], 48.

o hundred grms. of mercuric chloride are treated with
c.c. of hot water, and ammonium sulphocyanide solution
hen added until the mercuric chloride dissolves to a
ourless solution. By repeated addition of mercuric
oride and re-solution of the mercury sulphocyanide
ned, a fully saturated solution may be prepared, which is
ted for use. A slight excess of ammonium sulpho-
nide is advantageous, otherwise the mercury salt readily
arates out during intensification. After treatment with
solution the negative is thoroughly washed and then
kened in the ferrous oxalate developer. This intensifier
old under the name of "Agfa"; the intensification is
eptionally strong.—J. F. B.

lio-Active Substances; Action of Cathode Rays on
—. K. A. Hofmann, A. Korn, and E. Strauss. Ber.
4, [3], 407—409.

T action of cathode rays on a number of substances has
examined in order to see whether in this way inactive
es can be endowed with the property of emitting in-
le Becquerel rays. Mercuric sulphate, thallous sulphate,
nium sulphate, thorium sulphate, and especially thorium
e were made to fluoresce, but in no case was any action
photographic plate in the dark obtained. With barium
ate, niobate, titanate, and tungstate, gadolinium oxide
with the rare earths separated from samarskite, no
ge occurred. Bismuth hydroxide was slightly darkened
lour but remained inactive, and the same was the case
the bismuth (polonium) compounds obtained from
blende and kept for a long time until their activity had
peared. On the other hand, with lead (as sulphate),
h was prepared from pitchblende, bröggerite, cleveite,
rskite, uranium-mica or from euxenite and which no
r showed radio-activity, it was found that under the
nce of the cathode rays, the power of emitting in the
rays capable of acting on a photographic plate was
ered; the greatest effect was produced with the sul-
prepared from the more readily soluble fractions of
loride. The radiation thus obtained, which is retained
bout a week, is not appreciably weakened by trans-
n through an aluminium plate 1 mm. in thickness
capable also of passing through glass but not through
a. Since ordinary lead sulphate is only rendered
scent but not radio-active by cathode rays, the results obtained confirm the conclusion that the lead sulphate prepared from the above-named minerals contains an admixture of some foreign substance.—T. H. P.

Hydrogen Peroxide in Aqueous Solution; Researches on the Sensitiveness to Light of ——, *when Prussiates are added.* W. Kistiakowsky. Z. physik. Chem. **35**, 430; through Zeits. angew. Chem. 1901, **14**, [4], 85.

Light does not cause appreciable decomposition of dilute solutions of pure hydrogen peroxide, but if a little ferrocyanide be added to a 1 per cent. solution of the peroxide, the liquid, though quite stable in the dark, when exposed to direct light commences to evolve gas vigorously. Ferricyanide counteracts this decomposition. If the decomposition be started in the light, it proceeds in the dark with the same intensity. Increase of temperature accelerates the decomposition, which however, regains its former rate when the lower temperature is restored.—J. A. B.

Developer; Sulphite in the ——. R. E. Liesegang.
Brit. Jour. Phot. [1900], **48**, 104.

Plates after immersion in a normal developer containing sodium sulphite for 10 hours, appeared to be fixed and gave indications of physical development due to nascent silver, owing to the solvent action of the sulphite present. This solvent action is much greater on chloride than on bromide of silver and is very marked with chloro-bromide lantern plates in hot weather.—J. W. H.

Photography in Colours. Brit. Jour. Phot. [1900], **48**, 98.

Truchelut and Rochereau have devised a method of obtaining "3 colour" negatives for reproduction, by painting the original with pigments that may be got rid of, one at a time, when taking the photographs. Mercuric iodide is used for the red pigment, silver ferrocyanide for the yellow, and a lake of Aniline Blue and lead sulphate, ground up in albumin or other vehicle for the Blue. By immersing the picture in an alkali chloride solution the yellow will disappear, and since blues take as white, the photograph taken will represent the reds; potassium iodide solution may be used to dissolve the red, and the blue may be blackened by an alkali sulphide before being photographed.—J. W. H.

Trichromatic Photography; Optics of ——. Howard
Farmer. Brit. Jour. Phot. [1900], **48**, 68.

The author criticises the statement of Ives that photographic analysis for three-colour printing should conform to the Maxwell curves. Since the yellow pigment used in

Fig. 1.

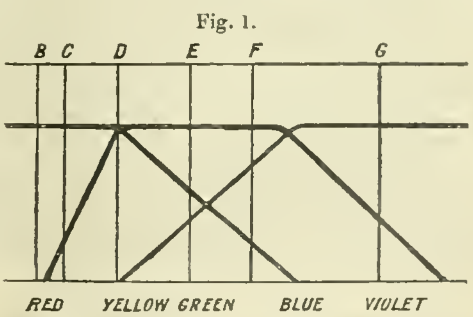
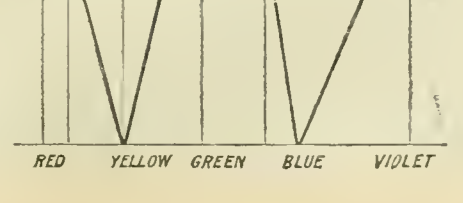


Fig. 2.



reproduction reflects far more red light than when the carmine is printed over it, and since the blue pigment reflects more violet than the violet formed by the blue and carmine, the problem is entirely altered; "we are not now using the same amount of each colour sensation for the reproduction of all hues" but are dealing with a problem in which "the relative luminosities of the colours in the reproduced spectrum are met by the mutual absorptions of the pigment". Fig. 1 will then represent the correct records for the reproduction of the spectrum by pigment printing. When dealing with the reproduction of paintings, the problem is complicated further, by the fact that pigment hues from red to yellow usually reflect all the rays which red alone reflects, and that a similar statement is true of other hues. Taking this into account, Fig. 2 gives true records for the reproduction of a painted spectrum.
—J. W. H.

PATENT.

Photographic Printing Surfaces; Impts. in and Relating to ——. O. Fulton and M. Gillard, Port Elizabeth, Cape Colony. Eng. Pat. 23,059, Nov. 18, 1899.

A FLAT surface, such as that of sheet glass, is coated with an adhesive mixture, prepared by softening and dissolving $\frac{1}{2}$ oz. of French glue in 8 oz. of water, and then, while still warm, adding 3 oz. of glycerin and 60 minims of formaline, and filtering through warm muslin. The mixture is spread on the glass with the aid of a warm rod. When cooled and set in a perfectly level position, a piece of celluloid sheet $\frac{1}{100}$ of an inch in thickness, with one side matt, is hand-pressed, rough side uppermost, into contact with the adhesive support, avoiding air-bubbles. The rough side is then coated with a gelatinous mixture, consisting of 180 grains of gelatin, soaked, and then dissolved at 120° F., in 4 oz. of water, to which are then added 15 minims of formaline and 5 grains of citric acid dissolved in 1 oz. of water. The mixture must be well stirred and filtered through warm muslin before use; it is applied warm with the aid of a warm rod, and is allowed to set in a level position, after which it is dried at 85° F. A plate $8\frac{1}{2}$ ins. × $6\frac{1}{2}$ ins. will require about 1 oz. of the solution. When quite dry, the celluloid is removed from the support by lifting it by one corner, and the support may then be used again many times successively. The celluloid sheet is sensitized in a bath containing 1 oz. of potassium bichromate, and 10 drops of ammonia in 40 oz. of water. The superfluous moisture is blotted off, and the sheet is dried in the dark. When dry it is used for contact printing, employing a mask to leave a "safe-edge" margin at least $\frac{1}{4}$-in. in width. When the printing is finished, the back of the film is exposed to the light for about one-fifth of the time of the full exposure, to harden it, where it is in contact with the celluloid. The film is now well washed in water, the superfluous moisture is removed by a cloth, and sufficient of a solution of 10 oz. of glycerin and $\frac{1}{4}$ oz. of ammonia in 5 oz. of water, just to cover the picture, is allowed to remain in contact with the film for 40—50 mins. After sponging and removing excess of water, the sheet is ready to receive the printing ink, which may be lithographic or typographic ink, mixed with varnish. The impressions may be taken by a hand roller or a letter press, the printing block being sponged from time to time with a mixture of glycerin and water in equal proportions.—W. G. M.

XXII.—EXPLOSIVES, MATCHES, Etc.

Potassium Chlorate; Explosion of ——. M. Berthellot. Mém. des Poudres et Salpêtres, 1900, **10**; Chem. Trade Journal, 1901, **28**, [720], 224.

ALTHOUGH potassium chlorate, considered with reference to oxygen and potassium chloride, is an endothermic compound, yet it is not ordinarily classed as an explosive body. The author finds that it can be made to detonate at the ordinary pressure by introducing it suddenly into a receptacle, which has beforehand been raised to and is maintained at a temperature much higher than that at which the decomposition commences. It is also necessary that the mass of material which constitutes the receptacle shall be so great that the introduction of the quantity of decomposable material (supposed to be introduced at the ordinary temperature) shall not be sufficient to sensibly reduce the general temp rature. The following experiment is similar to th previously described (Ann. Chim. Phys. 1889, **16**, [6], 2 by the author for effecting the detonation of picric acid. glass tube, of 25—30 mm. diameter, closed at one end, supported in a nearly vertical position, and heated in t flame of a large gas burner, until the lower part of the tu has attained a perceptible red heat. A glass rod is draw out at the end to the thickness of a coarse thread, th introduced into a quantity of pure potassium chlorat which has been melted in a porcelain crucible, withdraw and allowed to cool until the salt begins to solidify. T operation is repeated several times until a few decigr of solidified salt are accumulated in the form of an ov lump on the end of the glass thread. When the gl tube is quite red, the glass rod is introduced until potassium chlorate is within about 10 mm. of the botto care being taken that it does not touch the tube anywhe After a short time the chlorate melts and falls, drop drop, on to the red-hot bottom of the tube. Each dr causes an explosion at the instant it comes in contact w the glass, producing a very distinct sound and a cloud white smoke, consisting of dust and vapour of potassi chloride. The explosion does not extend to the portion liquid salt remaining on the glass thread. Both picric a and potassium chlorate can be made to detonate in manner in an inert gas; the former detonates better in atmosphere of air or oxygen; and the latter if it be hea in a hydrocarbon flame. The author points out that exact conditions of the experiment described above may realised in a large fire embracing the roof or walls o store containing a considerable quantity of picric acid potassium chlorate, such for instance, as the explosion chlorate at St. Helens (see this Journal, 1900, 1159).

The author points out that with other bodies also, increase of explosive properties is produced by analog circumstances. He states that in cases of this sort, unl the increase of temperature be limited by dissociation change of physical state, the velocity of the react combination, or decomposition increases also, followin law which is a logarithmic function of the temperature.
—A. S

Diazobenzene Sulphonic Acid; Explosion of ——. H. Wichelhaus.

See under IV., *page* 354.

PATENTS.

Smokeless Powder, Process of Manufacturing and Apparatus; Impts. in ——. P. M. Justice, Lon From International Smokeless Powder and Dyna Company, Philadelphia. Eng. Pat. 23,252, Dec. 19, 1

THIS patent refers to a smokeless powder consisting colloided nitrocellulose having a mean content of 13·1 cent. of nitrogen and a mean solubility in ether and alcoh 95 per cent. The dry cellulose is nitrated by treating 10 with about 2,000 lb. of a mixture containing 56—57 per of sulphuric and 28—29 of nitric acid and having a mini acidity of 85 per cent. The required amount of nitrati effected in 18—33 minutes at 35° C. After removing of the acid, reducing to a pulp, and treating with a 0· cent. solution of an alkali carbonate at 75° C., the ma pressed into moulds and treated with alcohol under pres A portion of the alcohol is pressed out and the br blocks then treated with ether in quantity sufficient to a mixture containing about 60 parts of ether and 3 alcohol. The amorphous, homogeneous, waxy mass obtained, is moulded into proper shape for use as po and the residual solvent evaporated at a low temper The drying apparatus consists of a drying room conn through a "revivifying" chamber containing a cond with a third room provided with a heater in such that air, gas, superheated steam, or other "fluid" m continuously circulated through the chambers.—E. W.

Detonators; Impts in ——. L. Wöhler, Karlsrul Eng. Pat. 21,065, Nov. 21, 1900.

THE improvements consist in the use of highly ni compounds as detonators. Highly nitrated derivati drocarbons, phenols and their salts, aromatic acids and eir salts, and aliphatic alcohols, may be used. Fulminate mercury is still required to insure ignition by the fuse, t the usual quantity may be greatly reduced; with trirotoluene, for instance, only one-sixth to one-tenth of usual quantity of fulminate is necessary. The materials contained in thin metal tubes, and a small perforated with its open end towards the inside is advantageously erted to keep the contents in place.—E. W. W.

plosive Compounds; Machines for Mixing ——. J. C. Schrader, Dover, New Jersey. Eng. Pat. 2650, Feb. 7, 1901.

MACHINE, by means of which it is claimed that nitrollulose, nitroglycerin, or other explosive may be safely ed in large quantities. The parts are so arranged that bearing or moving or movable elements liable to generate tion, are placed at a considerable distance above the eptacle in which the mixture is effected by horizontally ting sweeps.—E. W. W.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

raction Apparatus; New ——. W. Bersch. Zeits. ndw. Versuchsw. Oesterr. 1901, **4**, 30, through Chem. eit. Rep. 1901, **25**, [5], 37.

raction Apparatus.—The author describes the improved action apparatus depicted in Fig. 1. The vapours of boiling solvent come first into the space U and serve to the liquid in the inner space E, in which the extraction s place, at a temperature very near the boiling point. vapours then pass through the holes L into the space E re condensed by a condenser attached at K. The solvent collects in the space E, extracts the substance periodically removed by the siphon H. The efficiency to be very great.

Fig. 1.

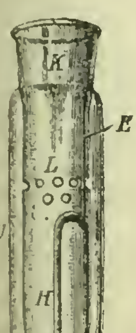
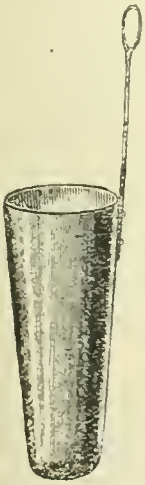


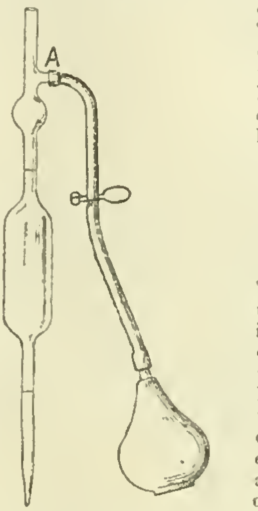
Fig. 2.



raction Thimble.—Instead of the usual paper thimbles, thor recommends one made of aluminium (Fig. 2). lightly conical in form and has a perforated sieve-ttom. The bottom is covered with a layer of purified wool, through which the extract is filtered, and thus vent cannot escape without coming in contact with the nce under treatment. The thimble can also be used filter pump if desired.—J. F. B.

; A New Farm of ——. D. Sidersky. Bull. Assoc. im. de Suc. et de Dist. 1901, **18**, [8], 557—558.

evice is intended for use with liquids such as acids, ia, &c. The pipette is of the ordinary form, but provided with a side tube, to which is attached a rubber tube and pinch-cock, the former terminating in a rubber blow-ball. In using the instrument, the blow-ball is compressed and the rubber tube clipped by the pinch-cock. The top of the pipette being closed by the fore-finger, the point is dipped into the liquid, and the pinch-cock opened, when the liquid will be sucked up.—H. T. P.



Fluoresceïn as an Indicator. H. Zellner. Pharm. Zeit. 1901, **46**, 100; through Chem. Zeit. Rep. 1901, **25**, [5], 40.

THE author advocates the use of Fluoresceïn as an indicator, especially for the estimation of ammonia, with which the reaction is absolutely sharp. In alkalimetric titrations where dark or coloured liquids have to be dealt with, Fluoresceïn is applicable. The presence of carbonates does not hinder the reaction. The author dissolves 0·4 grm. of Fluoresceïn in 50 c.c. of alcohol and then dilutes with 30 c.c. of water.—J. F. B.

INORGANIC CHEMISTRY.—QUALITATIVE.

Cobalt, Iron, and Peroxides; Some Reactions of ——, *and the Influence of Alcohols and other Organic Substances on the Electrolytic Dissociation of Salts in Aqueous Solution.* H. Ditz. Chem. Zeit. 1901, **25**, [11], 109—112.

THE author discusses the changes in colour of solutions of cobalt and iron salts produced by the addition of glycerin, alcohols, ether, acetone, &c., and refers them to an alteration of the electrolytic dissociation of the dissolved salts.

Detection of Small Quantities of Cobalt in Presence of Nickel.—If a solution containing 0·5 grm. of cobalt sulphate per litre together with some potassium thiocyanate be shaken with alcohol, no blue coloration is produced owing to the extreme dilution of the cobalt salt. A few cubic centimetres of ether added to the alcoholic solution produce a faint but distinct blue coloration, whilst the addition of acetone produces an intense blue colour. A solution of cobalt sulphate containing 0·1 grm. per litre still shows a blue coloration on the addition of acetone. Nickel salts do not give this colour test, and hence it may be employed to detect cobalt in the presence of nickel.

Detection of Cobalt in Presence of Ferric Salts.—Ferric salts interfere with the above test owing to the red coloration produced on the addition of the thiocyanate. In order to apply the test in this case, excess of potassium thiocyanate is first added, and then just sufficient of a very dilute solution of ammonium carbonate to destroy the red colour. Excess of ammonium carbonate must be avoided. An equal volume of alcohol is now added to the supernatant solution, and a few cubic centimetres of ether together with more potassium thiocyanate if necessary. A blue colour due to undissociated cobaltous thiocyanate indicates the presence of cobalt. The substitution of acetone for the alcohol and ether makes the test more sensitive.

Detection of Peroxides in Ether.—Cobaltous oxide warmed with a very concentrated solution of caustic potash yields a blue solution. Copper oxide yields a similar solution, but the two may be distinguished by shaking with alcohol and a little ordinary ether. The blue colour of the cobalt solution disappears instantly, and a brown precipitate is deposited whilst the blue colour produced by copper disappears very slowly (after some hours), and a reddish-yellow precipitate is thrown down. The author traced this decolorising action of ether on the alkaline cobalt solution to the presence of peroxides in ordinary ether.

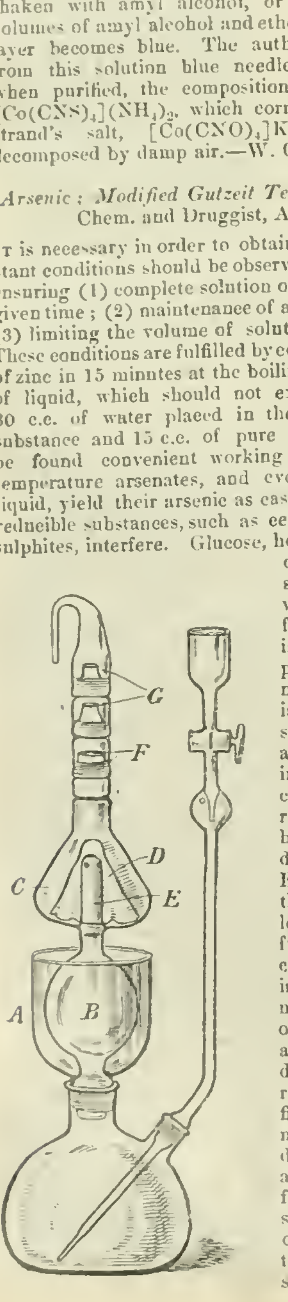
Ether purified by Brunner's method by agitating with powdered permanganate, still contained peroxide, and caused the disappearance of the blue coloration, whilst ether treated with solid caustic potash for 18 hours according to Borrigter's method was found to be free from peroxide, and did not decolorise the blue solution. The sensitiveness of this reaction makes it suitable for detecting the presence of peroxides in ether.—J. S.

Cobalt; Vogel's Qualitative Test for ——. F. P. Treadwell. Chem. Zeit. Rep. 1901, **25**, [10], 20; from Zeits. anorg. Chem. 1901, **26**, 108.

Vogel's test, described in 1879 (Ber. **12**, 2314) is not as well known as it should be, as it suffices to show the presence of traces of cobalt in nickel salts, even with iron present. A strong solution of ammonium thiocyanate added to the solution of a cobalt salt gives a blue colour, which is discharged on dilution. But if the solution be shaken with amyl alcohol, or with a mixture of equal volumes of amyl alcohol and ether, the alcoholic or ethereal layer becomes blue. The author and E. Vogt obtained from this solution blue needle-shaped crystals having, when purified, the composition indicated by the formula, $[Co(CNS)_4](NH_4)_2$, which corresponds to that of Blomstrand's salt, $[Co(CNO)_4]K_2$. The salt is rapidly decomposed by damp air.—W. G. M.

Arsenic; Modified Gutzeit Test for ——. F. C. J. Bird. Chem. and Druggist, April 13, 1901, 600.

It is necessary in order to obtain uniform results that constant conditions should be observed. These are best met by ensuring (1) complete solution of a given weight of zinc in a given time; (2) maintenance of a constant temperature; and (3) limiting the volume of solution in the generating flask. These conditions are fulfilled by completely dissolving 4 grms. of zinc in 15 minutes at the boiling temperature in a volume of liquid, which should not exceed 100 c.c. Generally 30 c.c. of water placed in the flask for dissolving the substance and 15 c.c. of pure HCl gradually run in, will be found convenient working quantities. At a boiling temperature arsenates, and even sulphide in an aqueous liquid, yield their arsenic as easily as arsenites; neither do reducible substances, such as certain coal-tar compounds or sulphites, interfere. Glucose, however, prevents the ready decomposition of arsenious sulphide. The apparatus which the author has devised for his improved Gutzeit test is illustrated in the accompanying drawing. The funnel-tube on the right hand is for delivering the acid slowly into the flask. A is a cup-shaped vessel containing water, which acts as a condenser to the vapour rising in the watch-shaped bulb B. The evolved hydrogen passes into the tube E, thence through holes at the top of the tube, and is led by means of the inverted funnel D through a 10 per cent. solution of lead acetate in C. The gas then passes upwards through two discs of mercuric chloride paper at G. The mercuric chloride discs are prepared by saturating pure white analytical filter-paper with 5 per cent. mercuric chloride solution, drying, and cutting out with a cork-borer. The discs are fastened gas-tight at G by smearing the ground edges of the glass with gum, so that the arsine passes, under slight pressure, directly through the substance of the mercuric chloride pape The diameter of the mercuric disc is 5 mm., and $\frac{1}{100}$ mgr of As_4O_6 produces on it a full yellow colour visible o the upper surface of the disc in about 10 minutes. Th diameter is limited so as to obtain the greater proportio of arsenic to mercury, which facilitates the subseque identification. F is an additional tube upon which a di of lead acetate paper may be placed, if thought necessar The quantity of pure hydrochloric acid used is to l in all cases half the volume of the liquid in the flas and it should be delivered in 10 minutes, after whic the contents of the flask receive five minutes' furth boiling. The flow of acid should be adjusted by tl stop-cock to a regular succession of drops in order maintain a uniform evolution of gas and a slig pressure in the apparatus equal to a column of liqu 5 or 6 ins. high in the vertical delivery tube. Absen of any means of identifying the stain obtained by th test has been held to be a fatal objection, but the auth has worked out what he believes to be a thorough satisfactory method, which sharply distinguishes betw the stains produced by arsine, phosphoretted hydroge sulphuretted hydrogen, and antimoniuretted hydrog Treated with pure boiling hydrochloric acid, the PH_3 sta on mercuric chloride paper becomes a bright lemo yellow, the SH_2 stain disappears, leaving the paper whi the SbH_3 stain is dissolved to a pale grey tint, whilst t arsenic stain takes on a very characteristic brick-red colo perceptible even in stains due to mixtures of the gases me tioned The stained disc or discs are detached from the ti of the tubes by slightly moistening the edges with a wet gl rod, and placed in a watch-glass. About 1 c.c. of pu hydrochloric acid is added, the whole warmed, and the a poured off. This method of removing the mercury salt repeated, the paper by this time being of a brick-red colo Half a c.c. of brominated hydrochloric acid is next added dissolve the arsenical deposit, which leaves the paper colo less. The resulting liquid is placed in a tiny test tu (3 ins. × $\frac{1}{4}$ in., graduated to 1 c.c.), and identified as arse by adding an equal volume of stannous chloride solut and warming. With as small a quantity as $\frac{1}{100}$ mgrm. As_4O_6 a pink-brown colour immediately appears. By tak $\frac{1}{100}$ mgrm. of As_4O_6 as unit and weighing out a quantity substance corresponding to a given limit, the test especially adapted for quickly finding out whether a s stance contains a quantity of arsenic exceeding that li and rapidly gives an approximate quantitative determinat according to the appearance of the brick-red tint with boil HCl and the depth of colour of the stannous chloride tes



Reagents: Brominated HCl.—Pure HCl tinted d yellow with bromine.

Stannous Chloride Solution.—Crystallised stann chloride, 30 grms.; pure HCl, 150 c.c. Boil down 100 c.c. with a few fragments of pure metallic tin.—C. T

Selenium Compounds, the Marsh Arsenical Mirror, and Recent Beer-Poisoning Epidemic. F. W. Tunnic and O. Rosenheim. Lancet, March 30, 1901.

The authors have previously drawn attention to the that certain samples of sulphuric acid contain selen (*ibid.*, Feb. 2nd and 9th); they have since detected element in a sample of invert sugar manufactured Messrs. Bostock. Quantitative estimations of selenium beer and brewing sugar have confirmed their prev conclusion "that selenium compounds have played a def rôle in the recent beer-poisoning epidemic, their part b however, subsidiary to that of arsenic." The sample beer examined by the authors contained selenium dio in quantities amounting to one-third to one-fourth of arsenic present.

W. H. Wilcox (*ibid.*, March 16) deals with the influ of selenium on the formation of arsenical mirrors obta by the Marsh test; these observations refer to the pres of selenium in large excess—from double to 20 times amount of arsenic. The retarding, or even com inhibitory influence of relatively large quantities of sele on the formation of arsenical mirrors had been obse however, by L. Dawydow in 1895 (J. Chem. Soc. 1896

19). Tunnicliffe and Rosenheim, whilst confirming Dawy-ow's observation, assert that when the selenium present mounts to one-third to one-fourth of the arsenic, it has ractically no effect on the formation of the arsenical mirror. With regard to their former statement that selenium in ie absence of arsenic is not shown by the Marsh test, the ithors point out that this is only the case when a lead etate wash bottle is used, whereby the selenium is retained lead selenide; otherwise it is possible to detect even 1 mgrm. of selenium by the Marsh test, a small red ring ith yellowish margin being found in the capillary tube. With regard to the identification of small quantities of lenium in organic fluids in the presence of larger quantities arsenic by means of Reinsch's test, the authors do not ink that anyone not specially directing his attention to it uld detect the selenium by microscopical examination of sublimate, the crystals being for the most part badly fined.

Their results have proved that selenium was present in of the Manchester beers in poisonous quantities, but in ther case did the amount reach that of the arsenic. ey therefore agree with Willcox that in the beers mined by him, selenium was not present in amounts or 10 times as great as the arsenic.

ORGANIC CHEMISTRY.—QUANTITATIVE.

senic; Rapid Method for Determination of Small Quantities of ——. A. Atterberg. Chem. Zeit. 1901, 5, [25], 264.

s method is based upon the facts that arsenious acid is dily volatilised on heating with strong hydrochloric acid, that the arsenious chloride can be quantitatively con-sed in water. On evaporating the solution with nitric, arsenic acid is left in the residue, and the arsenic can lentified by means of a hydrochloric acid solution of nous chloride or sodium hypophosphite by molybdic tion or by a solution of thio-acetic acid. In Sweden method of Fresenius and von Babo is used for the tion of arsenic in wall-paper, &c., and the author, ng found that the smallest amount which this would t in the legally specified amount of material (200 sq. of wall-paper and 100 sq. cm. of fabrics) was 0·2 n., has therefore adapted his new method so as to directly whether the amount of arsenic fell below or eded that limit.

e prescribed quantity of material is slowly heated in a necked flask with 50—100 c.c. of hydrochloric acid gr. 1·19), with the addition of 2 grms. of ferrous ate to reduce arsenic acid, and in the case of bronze er with the addition of 2—3 grms. of ferric chloride ing into solution the arsenic reduced by the metal. lask is connected by means of a tube with a 50 c.c. e, the lower end of which delivers into a 100 c.c. flask, is half filled with water and kept cool. On heating stillation flask the acid vapours are condensed in the, and by the time the pipette has become hot the of the arsenic will have passed over. The distillate ted to 100 c.c., and 3 c.c. of it evaporated to dryness ound-bottomed basin with 1 c.c. of nitric acid (sp. gr. When all odour of nitric acid has disappeared, c. of a solution of 1 grm. of sodium hypophosphite in c. of hydrochloric acid (sp. gr. 1·12) is added, and, in evaporating, a grey to black ring, according to the it of arsenic, is left. Simultaneously a determination e with 3 c.c. of a solution of 0·2 mgrm. of arsenic in ., and the ring compared with that obtained in the test. By diluting the test solution until the colours arsenic rings match one another, quantitative results obtained.—C. A. M.

ous Acid; Determination of —— by Means of Per-nganate. O. Kühling. Ber. 34, [3], 404—406.

ous acid may be determined by means of perman-solutions in two ways. (1) The arsenious acid o 0·2 grm.) is dissolved in caustic potash which has rified by crystallisation from alcohol and the latter l by repeated evaporation of the aqueous solution; tion of excess of potash must be avoided. 20 c.c of 10 per cent. zinc sulphate solution are then added and standard potassium permanganate solution run quickly in as long as it is decolorised in the cold. When from 70 to 80 per cent. of the arsenious acid has been oxidised, it is found that the reaction proceeds very slowly so that it becomes necessary to add the permanganate in quantities not greater than 0·2 c.c. at a time and to heat the solution for $\frac{1}{4}$ to $\frac{1}{2}$ hour between each addition. When the red colour of the permanganate persists after $\frac{1}{2}$ an hour's heating of the solution on the water-bath, the reaction is finished. In this method two molecules of permanganate give up three atoms of oxygen, so that $2KMnO_4 = \frac{3}{2}As_2O_3$. (2) About 0·2 grm. of the arsenious acid is heated with a small quantity of 30—40 per cent. sulphuric acid in a flask previously cleaned with permanganate and sulphuric acid and when solution is complete or only a few insoluble flocks remain, the liquid is diluted to about 100 c.c. and rapidly heated nearly to boiling; the standard permanganate is then added, at first quickly and afterwards more slowly, the flask being reheated from time to time. When the decolorisation is tardy, the solution is heated nearly to boiling after each addition of permanganate, and if the red colour be no longer destroyed by this treatment, the oxidation is complete. It is recommended that a rough experiment be first made, the permanganate being added 0·5 c.c. at a time, after which the exact determination can be more readily carried out. The sulphuric acid employed in this method must be free from oxidisable substances, otherwise it is necessary to determine the volume of permanganate solution decolorised by a known quantity of the acid under the conditions obtaining in the determination of the arsenious acid. In the presence of sulphuric acid, two molecules of permanganate give up five atoms of oxygen, so that $2KMnO_4 = \frac{5}{2}As_2O_3$. The amounts of arsenious acid obtained by either of these methods are in nearly all cases slightly in excess of the quantities taken.

—T. H. P.

Silver; Determination of ——, in Sulphide Ores. A. Hollard. Rev. Phys. Chim. 1901, 5, 55; through Chem. Zeit. Rep. 1901, 25, [18], 61.

The wet method described is found to give good results with ores that contain so little silver that they cannot well be assayed in the dry way. To take, by way of example, a poor copper ore: 100 grms. are treated with 100 c.c. of strong sulphuric acid and 300 c.c. of *aqua regia* (3 vols. of HNO_3 of 36° B. and 1 vol. of HCl of 22° B.). The whole is then evaporated until even the white fumes of the sulphuric acid have almost vanished, and is then treated with 75 c.c. of water, 5 c.c. of hydrochloric acid, and 20 c.c. of nitric acid (of 36° B.). The insoluble portion, containing all the silver and very little silica, is filtered, washed with hot water, and dissolved in potassium cyanide. After diluting to 250 c.c., the solution should contain 2 per cent. KCy; it is then electrolysed with a current of 0·05 ampère with small Hollard electrodes. After a few hours the deposition is complete, and the precipitate is dissolved in nitric acid, diluted with an equal volume of water, and titrated with thiocyanate (Volbard's process), thus: The silver is dissolved in 100 c.c. of the weak acid, boiled to expel nitrous fumes, cooled, mixed with 5 c.c. of a 20 per cent. iron-ammonia alum solution, and titrated to a red coloration with ammonium thiocyanate. Standard silver nitrate solution (2 grms. Ag per litre) is next run in until the red colour becomes pale, and then passes quickly into white. If much lead be present in the ore, it is difficult to dissolve the silver with cyanide from the mass of lead sulphate present. In this case the lead sulphate is dissolved in caustic soda of 12° B., after the treatment of the evaporation residue with nitro-hydrochloric acid, and then the further treatment is as above described.—W. G. M.

Chromium and Iron; Determination of —— by Potassium Iodide and Iodate. A. Stock and C. Massacin. Ber. 34, [3], 467—469.

The use of a mixture of potassium iodide and iodate for the determination of aluminium (see this Journal, 1900, 276) is now applied to the determination of chromium and of iron. An excess of the iodide-iodate mixture (consisting

of equal parts of a 25 per cent. solution of iodide and a saturated solution of the iodate containing 6 or 7 per cent. of the salt) is added to the faintly acid solution of the chromium or iron salt, and after a few minutes the separated iodine is decolorised by means of thiosulphate solution. A few c.cs. excess of the latter are then added, the liquid heated for half an hour on the water bath and the flocculent precipitate of chromic or ferric hydroxide filtered through a hot water funnel, washed, dried, and weighed. Previous oxidation of ferrous salts is unnecessary. The time occupied by a single analysis is from two to three hours. A series of test experiments shows that the method gives good results, the chief advantages over precipitation by ammonia being (1) that the precipitates obtained settle quickly and are more readily manipulated and (2) that precipitation is complete in dilute solutions containing only a few mgrms. of ferric or chromic oxide per 100 c.c. Two solutions containing, one 0·0729 grm. FeO and 1·0 grm. $MgCl_2$ and the other 0·0729 grm. FeO and 0·5 grm. $CaCl_2$ gave by this method 0·0734 and 0·0729 grm. FeO respectively.
—T. H. P.

Zinc; New Method for the Quantitative Determination of ——, by the Action of Substituted Ammonium Bases on Solutions of Zinc Salts. W. Herz. Zeits. anorg. Chem. **26**, 90—93. Chem. Centr. 1901, **1**, [7], 363.

The reaction between ammonia and zinc sulphate is incomplete, owing to the fact that the basicity of the ammonia is weakened by formation of ammonium sulphate. The stronger bases, methylamine and dimethylamine precipitate the whole of the zinc in the form of hydroxide. The precipitated zinc hydroxide is soluble in excess of methylamine but not of dimethylamine. The latter can therefore be used for the determination of zinc, and can afterwards be recovered from the filtrate by making alkaline and distilling.
—A. S.

Zinc from Nickel (and Cobalt), Separation of ——. F. P. Treadwell. Zeits. anorg. Chem. 1901, **26**, 104—107. Chem. Centr. 1901, **1**, [8], 476.

The separation of zinc from nickel after addition of alkali acetate, by sulphuretted hydrogen in almost neutral solution is a difficult operation, as in case of too large an addition, nickel sulphide may be precipitated, whilst with too small an addition, some zinc remains in solution. Zimmermann's sulphocyanide method gives better results. The ammonium sulphocyanide does not act by diminishing the concentration of the hydrogen ions, but simply exerts a "salting out" action. Equally good results can be obtained by the use of ammonium chloride or sulphate or potassium chloride and potassium sulphate. A 0·25 per cent. solution of the sulphates or chlorides of zinc and nickel is treated with 8—10 drops of twice normal hydrochloric acid and about 2 per cent. of one of the above-mentioned salts. Sulphuretted hydrogen is led into the solution at 50° C., the precipitate allowed to settle, filtered off, and washed with sulphuretted hydrogen water containing 2 per cent. of the ammonium salt and a few drops of a mineral acid —A. S.

Sulphuric Acid; Preparation of Standard Solutions of ——. R. K. Meade. J. Amer. Chem. Soc. 1901, **23**, [1], 12—15.

It is stated that highly accurate results can be obtained by electrolysing copper sulphate, the copper being deposited upon the cathode, and the sulphuric acid separated at the anode and remaining in solution.

It is shown by a series of experiments that the decinormal solution prepared by this method is always of the required strength. (See C. A. Kohn, this Journal, 1900, 962.)
—C. A. M.

Phosphoric Acid; Kilgore's Method of Determining ——. C. B. Williams. J. Amer. Chem. Soc. 1901, **23**, [1] 8—12. (This Journal, 1897, 1044.)

The following rapid modification is recommended for the analysis of fertilisers, the reagents used being the same as those prescribed by the Association of Official Agricultural Chemists, with the exception of the nitric acid and potassium hydroxide, of which 1 c.c. = 0·5 mgrm. of phosphoric acid. 2 grms. of the sample are boiled sand bath in a 200 c.c. flask with 30 c.c. of concentr nitric acid and 10 c.c. of concentrated hydrochloric until the liquid is reduced to 8 or 10 c.c. In the of fertilisers containing much iron and alumina, howe 30 c.c. of hydrochloric acid are first added, and after bo for 30 to 40 minutes and slightly cooling, 30 c.c. of acid are introduced, and the boiling continued until excess of hydrochloric acid has been expelled. solution is diluted to a definite volume, and after ha stood for some time, the supernatant liquid can be drawn with a pipette without filtration.

20 c.c. of the solution (or 10 c.c. in samples conta more than 20 per cent. of phosphoric acid) are mixed 50 c.c. of water, and 10 to 12 grms. of ammonium in a 500 c.c. Erlenmeyer flask, the neck of which is 40 m.m. in diameter. The excess of acid is neutr with ammonium hydroxide, and after cooling, 30 c. recently filtered molybdic solution introduced, and the closed with a rubber cork, and shaken for 30 minutes Wagner's shaking machine at a velocity of 45 to 55 re tions per minute. The liquid is then filtered with th of suction through a filter, consisting of a 16 oz. Erlen pressure bottle, through the rubber cork of which the small end of a carbon filter; a perforated disc is in the bottom of this, and to it is attached a No. 19 c wire, projecting downwards into the bottle. A thin of asbestos covers the disc.

The precipitate is washed six times on this filter, which the stopper is removed and the exterior of the filter washed. It is then reversed into the mouth original flask and the disc, asbestos, and precipitate out into the flask, by means of the copper wire. interior of the filter is washed, and the contents flask titrated whilst thoroughly agitated with a gla during the process.

For the insoluble phosphoric acid, 40 c.c. of the s are taken, and the precipitation, &c., carried out prac in the same manner as with the total acid, with the ex that little or no water is added in preparing precipitation. The results thus obtained are shown in close agreement with those yielded by the grav method of the Association.—C. A. M.

Tungstic Acid; Determination of ——, and its Sep from Silica. O. Herting. Zeits. angew. Chem. [7], 165—166.

The author disapproves of McKenna's method of an chrome and tungsten steels (this Journal, 1900, 851 shown that the determination of the sulphur togeth the silicon gives low results, moreover all meth faulty, in which the sulphur contained in iron is libe hydrogen sulphide, unless the gas is passed throug hot tube before absorption. The removal of sil means of hydrofluoric acid is objected to, inasm tungstic acid and silica yield, on ignition, a silico- acid, which, when treated with hydrofluoric acid, is

For the analysis of ferro-tungstens, the following is recommended:—The steel is dissolved in *aqu* twice evaporated to dryness with nitric acid, dried at taken up with dilute nitric acid, filtered, and wash the same acid. The residue of tungstic acid, sil some iron is fused with sodium carbonate, extrac hot water, and the iron separated by filtration. (T cipitate should be tested for silica). The filtrate evaporated to dryness with nitric acid, taken up wi acidified with the same acid, and filtered. The re tungstic acid and silica is ignited and weighed. It carefully fused with five parts of hydrogen p sulphate, and the tungstic acid extracted with am carbonate, silica remaining in the residue.—D. B.

Sulphides, Hydrosulphides, Polysulphides, and phates; Determination of ——, co-existing in especially in Sulphurous Mineral Waters. A. Comptes Rend. **132**, [9], 518—523.

A glass flask of 250 c.c. capacity carries a cork right-angled tubes, one reaching to the bottom of the other communicating with a Cloez absorption-t nd wash-bottle, which contain a half-saturated solution ilver sulphate. The ends of the tubes from the flask e stop-cocks or pinch-cocks, and the whole apparatus is austed by aspiration at the wash-bottle end. To the er end is then connected a long, narrow tube, filled with ed water, the further end of which dips well into the liquid er examination. By opening the stop-cock, a quantity his liquid is made to enter the flask, and its amount ermined either by weight or measurement. Distillation is carried on at a temperature not above 30° C., till one-atieth of the whole has passed over: the stop-cocks are ed, the wash-bottles disconnected, and the silver sulphide contain is collected and weighed. This corresponds to free hydrogen sulphide present in the water, that arising the dissociation of hydrosulphides, and that pro- ed by the decomposition of alkali sulphides by any on dioxide present in the water. The wash-bottles are refilled with silver sulphate solution and replaced, the uum is re-established, and while the aspiration is kept up, w stream of oxygen-free carbon dioxide is allowed to ble through the apparatus, still at a temperature not e 30° C. Alkali sulphides are thus completely decom- d, and a corresponding quantity of silver sulphide is ed, which is collected and weighed. Should there be sulphides (a rare occurrence in mineral waters), their lus sulphur is precipitated during this reaction, and boiling the liquid (with or without addition of a little acetate), can be collected, oxidised, and determined. In iltrate from this sulphur, any thiosulphates present can etermined by iodine in the usual way.—J. T. D.

RGANIC CHEMISTRY.—QUALITATIVE.

on's Reagent; Applicability of ——. O. Nasse. lüger's Arch. 83, 361—368. Chem. Centr. 1901, 1,], 538.

lace of mercuric nitrate, the author uses mercuric te, to the solution of which he adds a few drops of a cent. solution of sodium or potassium nitrite. Of the le "hydroxylated" benzene derivatives, in which only ydrogen atom is substituted, ortho compounds give a nish red coloration; para compounds, a bluish red, red in more dilute solutions; and meta compounds, oration which cannot be clearly described. Phenol alicylic acid almost invariably give the para reaction, onsequence of contamination with paracresol and ydroxybenzoic acid respectively.

e phenol-aldehyde reaction, which is obtained best concentrated sulphuric acid and a few drops of ldehyde, affords a means of distinguishing between ine and albumin. Tyrosine when warmed with c.c. of the reagent, is coloured brownish red, changing reen on the addition of glacial acetic acid, whilst ainoids and peptones give no coloration.

ia's tyrosine-iron reaction is of no significance, as it en by *m*-, as well as by *p*-hydroxybenzoic acid.—A. S.

Naphthol and Aldehydes; Reaction between ——. M. Rogow. Ber. 1900, 33, [19], 3535—3538.

sen found that β-naphthol reacted with benzaldehyde acetaldehyde in the proportion of 2 mols. to 1 mol., hat a second molecule of water was eliminated, with roduction of anhydrides of the type $R.CH(C_{10}H_6)_2O$ aien, 237, 261). Since different proportions of alde- to phenol in similar condensations have been found by , the author has studied the action of β-naphthol upon in, piperonal, cumic, anisic and salicylic aldehydes. ondensation products may be obtained by heating in a tube at 200° C. with glacial acetic acid, or by boiling etic acid solutions with a few drops of sulphuric The products of the latter process are much more lt to purify, and may also possess correct melting when far from analytically pure. The compounds ed from the aldehydes mentioned are all constituted ling to the above formula; they are insoluble in c soda solution, and give a pale red (the piperonal ound a dark red) coloration and green fluorescence warmed with sulphuric acid.—A. C. W.

Halphen's Reaction for Detecting Cotton Seed Oil; and the Behaviour of Some American Lards. P. Soltsien. Zeits. öffentl. Chem. 7, 25. Chem. Centr. 1901, 1, [9], 539.

As the proposal of the author (see this Journal, 1899, 611 and 865) to omit the amyl alcohol in Halphen's reagent, has met with general opposition, and as his own experiments show that the reagent loses in delicacy by this omission, he now returns to the use of the original reagent. He confirms Raikow's observations as to the influence of light on the Halphen reaction (see this Journal, 1900, 856). The author points out that he has met with American lards which give a very weak reaction with Halphen's reagent, equivalent to about 1 per cent. of cotton-seed oil. He is of the opinion that such lard is obtained from pigs which had been fed with cotton-seed meal.—A. S.

Oxycellulose; Detection of ——. M. Philip. Chem. Zeit. Rep. 1901, 25, [3], 20. From Zeits. öffentl. Chem. 1900, 6, 524.

The property of oxycellulose of becoming dyed by basic dyestuffs, such as Methylene Blue, without the preliminary treatment with tannin that is required by cotton, is found not to be sufficiently sharply defined for the purpose of detection. The power possessed by oxycellulose of reducing Fehling's solution may be utilised with advantage. The fabric to be tested is thoroughly washed, and is then heated on the water-bath for a quarter of an hour with about 10 per cent. Fehling's solution, and is finally well rinsed with water. Oxycellulose fibres will be found coloured red by the reduced cuprous oxide.—W. G. M.

Sweetening Agents [" Saccharin "] in Foods; Detection of Artificial ——. Zeits. Ver. Deutsch. Zucker-Ind. 1901, [541], 95—97.

The Russian Customs authorities have issued a circular giving methods for the detection of "saccharin" in foods and beverages. Solid and syrupy substances are first warmed gently with water (50—100 mgrms. with 100—200 c.c. of water), then filtered, and the filtrate examined for saccharin. Beer, porter, and similar materials, which contain the bitter principle of hops (lupulopicrin), are freed from the latter by adding, drop by drop, in the cold, a saturated solution of copper nitrate till no further precipitate is formed. If the substance under examination contain tannin, the latter is removed by adding ferric chloride solution, and then making the liquid faintly alkaline by the addition of calcium carbonate.

The following methods are recommended for the detection of "saccharin" and its salts:—

(1.) 100 c.c. of the liquid are acidified with hydrochloric acid, treated with an excess of bromine water, well shaken, and filtered. The filtrate is freed from excess of bromine by means of a current of air, and extracted with ether. The ethereal extract is treated with a few drops of sodium bicarbonate solution, and the ether driven off. In presence of saccharin, the residue will possess the characteristic taste, and, after fusing with caustic potash, will give an intense salicylic acid reaction.

(2.) 100 c.c. of the liquid are made strongly acid with hydrochloric acid, and then shaken out three times with a mixture of equal parts of ether and petroleum spirit. The extract is treated with a small quantity of caustic soda, evaporated to dryness, the residue heated on a glycerin bath for half an hour to 250° C., then dissolved in water, and the solution, after acidifying with sulphuric acid, extracted with ether. The ethereal extract is examined for "saccharin."

(3.) In presence of salicylic acid, the liquid under examination is extracted with ether, the evaporation residue of the ethereal extract treated with hydrochloric acid, and bromine water added. The salicylic acid is thus separated in the form of bromosalicylic acid. The excess of bromine is removed from the filtrate by means of a current of air, and the saccharin extracted as before with a mixture of ether and petroleum spirit.

The following reactions for the detection of "saccharin" and salicylic acid are given:—

(*a*) The residue from the ethereal extract in which the presence of "saccharin" is suspected, is warmed with resorcinol and concentrated sulphuric acid, and the melt dissolved in excess of caustic soda solution. The presence of "saccharin" is indicated by the production of a strong fluorescence. The presence of succinic acid interferes with this reaction.

(*b*) The substance is treated with concentrated nitric acid, the solution evaporated to dryness, and a few drops of a solution of caustic potash in 50 per cent. alcohol added to the residue. If "saccharin" be present, there is formed on warming, a blue coloration changing to violet, purple red, and finally to red.

(*c*) A 10 per cent. solution of nitrate of mercury in dilute nitric acid, gives an intense red coloration with salicylic acid.

(*d*) A neutral solution of a salicylate gives a green coloration with copper sulphate.

(*e*) The substance containing "saccharin" is warmed with concentrated nitric acid, and then treated with excess of ammonia. The salicylic acid is converted into picric acid, which can be easily recognised by a dyeing test.

—A. S.

ORGANIC CHEMISTRY—QUANTITATIVE.

Cresol; Determination of ——. F. Russig and G. Fortmann. Zeits. angew. Chem. 1901, [7], 157—160.

ALTHOUGH the method of estimation described by Raschig (this Journal, 1900, 857) has given satisfactory results in the authors' hands, they have for some time used a French method, which gives slightly higher figures. Like Raschig's method, it is not, however, applicable when the mixture of cresols contains more than 10 per cent. of phenol.

Fifty grms. of cresol are weighed into a small Erlenmeyer flask and 125 grms. of sulphuric acid (66° B.) are added. It is not necessary to apply heat as the temperature of the mixture rises to 60°—70° C. during this operation. After standing for one or two hours, the contents of the flask are transferred to a separating funnel, by inverting the flask into the neck of the funnel, so that only part of its contents is displaced. The nitration apparatus consists of a tubulated glass retort of about 1 litre capacity heated by means of a sand bath. The distillation tube communicates with a wash-bottle and suitable aspirator. The stem of the funnel passes through an india-rubber stopper fitted into the tubulure of the retort. 400 c.c. of nitric acid (40° B.) are poured into the retort, and after raising the temperature to 60° C. the flame is removed. The sulphonic acid is then added gradually from the separating funnel drop by drop in the course of $1\frac{1}{2}$ to 2 hours. After standing for a further period of 20 minutes, the retort is emptied into a porcelain dish containing 200 c.c. of water and is rinsed out with another 200 c.c. of water. The next day the trinitrocresol is collected on a filter, washed with 200 c.c. of water, dried at 95°—100° C., and weighed. 50 grms. of pure metacresol gave 87·8 grms. = 175·6 per cent. of trinitrocresol, as compared with 174·0 per cent. obtained according to Raschig's method, the higher yield being due to more complete nitration.

The fact that Ditz (this Journal, 1901, 73) has recently adversely criticised Raschig's method, and still advocates the retention of the bromine process first described by himself and Cedivoda (Zeits. angew. Chem. 1899, 873 and 897) has induced the authors to make a comparative study of the different methods, and from a large number of test analyses, it is shown that even with pure cresol mixtures the bromine method is less suitable than the nitration process.—D. B.

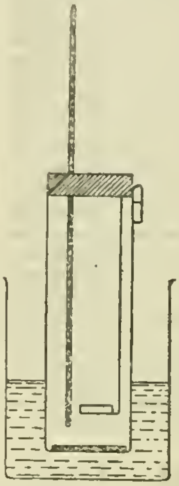
Cresol; Determination of ——. H. Ditz. Zeits. angew. Chem. 1901, [7], 160—165.

A REPLY to Russig and Fortmann's criticism of the bromine process devised by the author and Cedivoda (see preceding abstract). It is pointed out that the differences in the results which induced Russig and Fortmann to reject the bromine process, are due to certain departures made by them in their investigations. By strict adherence to the author's description, concordant results are invariably obtained, and the opinion is again expressed that the process in question is superior to the nitration method.

—D. B.

Asphalts; New Method for Determining the Mel Points of ——. C. F. Mabery and O. J. Siep J. Amer. Chem. Soc. 1901, **23**, 16—20.

FOR the purpose of obtaining comparable results u constant conditions, the authors have devised the appar shown in the figure. It consists of a glycerin bath, which is introduced a narrow beaker closed with a through which passes a thermometer, and also a stri metal, half an inch wide, which tends to within half an inch of bottom. The upper part is over the edge of the beaker, w the lower is bent at right a and has its corners bent up to form a support for the asp The necessary constants are distance of the thermometer the sample ($\frac{1}{8}$ inch), the dist of the metal from the botto the beaker, the width of the strip and the dimensions of asphalt. The authors moulde latter so as to project $\frac{1}{4}$ inc either side of the metal sup and the temperature was not which it became sufficiently so just touch the bottom. It found that a difference of minutes in the duration of h had no appreciable effect o results. A disc of copper is p at the bottom of the beak facilitate the cleansing. samples of asphalt were fou have the lowest melting points. The variation i results of duplicate determinations was at most 2° to and usually there was no variation. For higher m points an air-bath must be used.—C. A. M.



Basic and Acid Dyestuffs; Qualitative and Quant. Determinations of Colouring Matters based upon Precipitation of ——. A. Seyewetz. Rev. Gé Mat. Col. 1901, **5**, [50], 44—52.

THE author proposes a new scheme for the qual recognition of the soluble coal-tar dyestuffs, based fact that in most, but not all, cases, an insoluble comp formed when a basic and an acid dyestuff in dilute a solutions are mixed. He finds that almost all aci stuffs are precipitated by Auramine, and most basic d ammonium picrate. But certain basic dyestuffs, *e.g.*, Orange R, Brilliant Green, Pyronine A, Toluidine Celestine Blue, New Phosphine G, Night Blue, and Bi Brown have a selective action: each of them preci some of the acid dyestuffs and not others. Similarly, the following acid dyes, Fluoresceïn (ammonium salt) Magenta, Orange III, and Orange IV., precipitate of the basic dyestuffs and not others. The author ingly uses the dyes named as reagents (in 1/1000 a solutions), and has tabulated most of the soluble d in such a way as to show at a glance whether any them is or is not precipitated by each "reagent." split up his table into a number of easily recognised defined by acidity or basicity, dyeing properties, c solution, and chemical character. To identify any d it must first be referred to its proper group, and then with the several reagent dyestuffs. Owing to the f allied dyestuffs often behave differently towards one of these reagents, this examination is sometimes suffic exact identification. If not, further tests must be ma oxidising and reducing agents, mineral acids, &c. however, are not tabulated by the author, whose therefore need to be used in conjunction with others.

Given a simple dyestuff of known designation, its (purity) may be determined by titration with an dyestuff which completely precipitates it. C. Raws Journal, 1888, 592) applied the method to the valu Night Blue and Naphthol Yellow S, and Roy and yard (*idem*) titrated Picric acid with Night Blu hor employs Magenta as a convenient reagent for the ermination of acid dyestuffs, either volumetrically by isuring the Magenta solution run in until precipitation ses, or gravimetrically by weighing the precipitate. composition of the compound must of course be wn. To prove that ordinary adulterants do not affect accuracy of the process, the author titrated pure throsin mixed with 20 per cent. of sodium sulphate 30 per cent. of dextrin. Assuming that 1 molecular portion of Erythrosin combines with 2 molecular proions of Magenta, the volumetric determination was less 2 per cent., and the gravimetric determination less 1 per cent. low.—T. A. L.

erin : Determination of ——. J. Lewkowitsch. Analyst, 1901, **26**, [2], 35—36.

LORDE (Ann. Chim. anal. appl. **4**, 76, 110) published a hod for determining glycerin in wine based on the reaction $O_3 + H_2SO_4 = C_3 + SO_2 + 5H_2O$, the carbon being ted with hydrochloric acid, treated with ammonia, d to volatilise the ammonium salts, weighed and lated into glycerin. This method has recently been mended by F. Jean (*ibid.* **5**, 211) for the determination ycerin in fats and soaps. The author has made a of determinations in accordance with Jean's directions, hows that the results are absolutely unreliable.

—C. A. M.

Powder ; Report to the International Association of ather Trades Chemists on Results of Comparative periments with Freiberg ——. J. Paessler. Lederrkt, 1901, **2**, [1].

hide powder was prepared according to Cerych's ription (Gerber, 1896, 62), and contained about r cent. of cellulose. Five different batches were sent. o six members of the International Association of er Trades Chemists, along with samples of oakwood t, Quebracho extract (pasty and solid), and valonia. oints requiring elucidation were—

Whether the results obtained by the same analyst ifferent hide powders correspond.

Whether the mean values obtained by different ts agree.

y the *non-tannin* figures are given, as these are not d by factors other than the hide powder. The show—

That the differences between maximum and minimum t important. They are not so great as with Vienna r.

The differences in the case of Quebracho extract are portant. In the case of oakwood extract and valonia, re somewhat greater. The differences appear to be due to the different ways of packing the filter.

concluded that the Freiberg hide powder is quite e for tannin analysis.

recommended that the filter be so packed that the y of filtrate required may come through in about urs.

——	Oakwood Extract. Per Cent. Non-Tannins.	Pasty Quebracho's Extract. Per Cent. Non-Tannins.
……………………	14·7	2·4
……………………	14·8	2·3
……………………	14·7	2·8
……………………	14·8	3·0
……………………	14·9	2·7
ce between maximum inimum.	0·2	0·7
……………………	14·8	2·6

—J. T. W.

Kjeldahl's Method for the Determination of ——. oy. Zeits. öffentl. Chem. **6**, 514—519 ; Chem. . 1901, **1**, [6], 343.

hor describes the advantages of Kjeldahl's method determination of sugar (this Journal, 1895, 896), sen-Hansen's extension of the method for the determination of invert sugar in presence of cane sugar (this Journal, 1899, 1058).

(1.) The Kjeldahl method is the only one of its kind in which the different varieties of reducing sugars are reduced under similar conditions, and which consequently permits of comparisons by means of the copper values found.

(2.) The manner of carrying out the method is so simple, that identical results can be obtained by different analysts.

(3.) A source of considerable error, however, is the absorptive power of the alkali solution for carbon dioxide. The author states that what is needed is the working out of tables analogous to those of Kjeldahl, but using sodium carbonate in place of caustic soda.—A. S.

Starch in Mixed Pressed Yeasts ; Determination of ——. H. Lange. Brennerei Zeit. **18**, [398] ; through Zeits. Spiritusind. 1901, **24**, [6], 50.

FROM a series of experiments with pure yeast and with known mixtures of yeast and starch, the author has come to the conclusion that the method of inverting the starch by boiling the mixture with hydrochloric acid is absolutely useless for the estimation of starch in yeast. Pure yeast alone gave cupric reducing bodies, after heating with hydrochloric acid, equivalent to from 1 to 3·5 per cent. of starch.

In view of this fact, the author has tested Kusserow's method in a similar manner. This method consists in washing the mixture with water in long cylinders, and thus removing the yeast by levigation from the heavier starch. In order to control the washing, the starch is coloured blue by iodine, and afterwards bleached with a little ammonium thiosulphate. According to Kusserow's method, about 1 lb. of the mixed yeast is sampled by grinding up with a little water. 10 grms. of this mixture are then weighed out for the estimation of dry substance. The mixture is dried for two hours at 60° C., and then for four hours longer at 120° C. A second quantity of 20 grms. is also taken for levigation, it is mixed with water and coloured with a little iodine and hydrochloric acid, the starch is allowed to settle, and the suspended yeast poured off. About three washings are sufficient for the separation, and the starch is then collected on a tared filter, decolorised, washed, and dried in the manner described above. The author finds that the results are accurate to within 1 per cent. (Compare a somewhat similar method, this Journal, 1899, 525.)

—J. F. B.

Dextrose ; Birotation of ——. Y. Osaka. Zeits. physik. Chem. 1900, **35**, 661—706 ; Chem. Centr. 1901, **1**, [5], 252.

THE course of the decrease of optical rotation with solutions of sugars, which exhibit multirotation, may be expressed by the formula for reactions of the first order. The author gives the constants of this formula for *d*-fructose, 0·096 ; rhamnose, 0·39 ; *l*-arabinose, 0·031 ; fucose, 0·022 ; *l*-xylose, 0·022 ; *d*-galactose, 0·0102 ; maltose, 0·0072 ; milk sugar, 0·0046 ; and dextrose, 0·0102. These constants were derived at 20° C. from decadal instead of natural logarithms. Cohen has stated that dextrose behaves as a weak acid, the sodium salt of which, $C_6H_{11}O_6Na$, undergoes hydrolysis to a considerable extent. The author's experiments on the decrease in rotation of dextrose in alkaline solutions (NaOH), confirm this view, the value $5 \cdot 9 \times 10^{-13}$ being given. According to Trey, the conductivity of caustic soda solution is reduced by glucose, that of ammonia increased. These effects correspond not only qualitatively but almost quantitatively with the view that glucose is an acid. In a solution containing 0·0488 mol. NaOH and 0·125 mol. of glucose per litre, there are present, actually, 0·0389 $C_6H_{11}O_6Na$, 0·0099 NaOH and 0·0961 $C_6H_{12}O_6$; whilst in ammoniacal solution the ammonium glucosate undergoes further hydrolysis. The change of rotation in solutions of dextrose is accelerated both by hydroxyl ions and by hydrogen ions, but not to the same extent, the catalytic effect of the former being much greater than that of the latter. The velocity of the retrogression of the rotation is approximately directly proportional to the concentration of hydroxyl ions (the constant of the reaction equation is about 0·00012 C_{OH}, where

C_{OH} is the concentration of the hydroxyl ions), but to the square root of the concentration of the hydrogen ions. Neutral salts appear to increase the catalytic influence of the hydroxyl ions, but only to a very small extent, that of the hydrogen ions.—A. S.

Salicylic Acid in Wine; Detection and Determination of ——. A. Ferreira Da Silva. Ann. Chim. anal. appl. **6**, 11; Chem. Centr. 1901, **1**, [7], 424.

In replying to Pellet's criticism (this Journal, 1901, 284), the author points out that he lays chief stress not on the composition of the extracting liquid, but on the fact that not more than 50 c.c. of the wine are taken for the test. If 200 c.c. of wine be taken, disturbing colorations may be met with, even if a mixture of ether and petroleum spirit be used for the extraction.—A. S.

Pentosans; Determination of ——, *by the Phloroglucinol Method.* E. Kröber. J. f. Landw. **48**, 357—384; Chem. Centr. 1901, **1**, [8], 477.

The author has made an investigation as to the causes of the variable results obtained in the determination of pentosans by the above-named method. He draws the following conclusions:—The result is not influenced by the precipitate being left to stand for a long time. The precipitate should be collected in a Gooch crucible, and the washing water should be added in small portions, whilst the surface of the precipitate is still quite moist. The precipitate must be washed perfectly free from chlorine, otherwise, on drying, oxidation will ensue, leading to high results. The phloroglucinol, which is dissolved in dilute hydrochloric acid (sp. gr. 1·06), is added in quantity equal to at least twice that of the furfurol present. An uniform period of drying of four hours at 98·5°—100° C. is recommended. As the phloroglucide is strongly hygroscopic, care needs to be exercised in the weighing. The author allows the Gooch crucible to cool in a well-stoppered weighing bottle in the exsiccator, and then weighs with the weighing bottle.

By precipitation of pure furfurol, arabinose and xylose with phloroglucinol, the author obtained fundamental numbers, and has calculated therefrom a table for the determination of furfurol, arabinose, araban, xylose, xylan, pentose (mean between arabinose and xylose) and pentosan from the amount (from 0·03 to 0·3 grm.) of phloroglucide obtained. With higher and lower amounts, the corresponding values may be calculated by the aid of formulæ. From the numbers obtained, it appears that equal molecules of furfurol and glucinol enter into reaction, with liberation of two molecules of water. No other condensation products could be obtained.—A. S.

Butter Fat; Determination of Commercial ——. W. v. Klenze. Zeits. landw. Vers. Wes. Öst. **4**, 77—80; Chem. Centr. 1901, **1**, [8], 479.

The author finds that Leffman-Beam's modification of Meissl's method invariably gives higher results than those obtained by the original method. He attributes this to the fact that with the glycerin-soda lye, readily volatile fatty acids are formed. In 10 tests, the difference was less than 0·5 in six cases, 0·5 in one case, 0·8 in two cases, and 1·4 in the remaining case. For the distillation, the author uses a copper-flask of about 400 c.c. capacity, which is heated directly by a small flame. The soap is dissolved in 50 c.c. of hot water, the solution poured into the flask and the vessel rinsed with the remaining 85 c.c. of water. The flask is cleaned by boiling alkali solution in it after each determination.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Sulphuryl Fluoride. H. Moissan. Comptes Rend. **132**, [7], 374—381.

If sulphur dioxide be led into fluorine, explosion occurs as each bubble enters; but if a slow current of fluorine be led into a vessel of sulphur dioxide, so that it must pass over a hot platinum wire at its entrance, quiet combustion ensues. The resulting gas after well washing with water to remove
fluorine and sulphur dioxide, drying with potassium fluo
and liquefying at −80° C. (allowing all gas not conden
at this temperature to escape), gives a liquid which boil
−52° C. furnishing a colourless gas, completely absorb
by caustic potash, and having the composition expre
by SO_2F_2. The same gas can be obtained by the actio
fluorine on moist hydrogen sulphide, or (if in a glass ve
where decomposition of the glass furnishes water) on
hydrogen sulphide.

Sulphuryl fluoride is a colourless, inodorous gas, liquef
at −52° C., and solidifying near −120° C., and havin
15° C. a density of 3·55 (air, 1; theory, 3·53). It diss
in 10 times its volume of water or one-third of its volum
alcohol. Water has no action on it, even in a sealed
at 150° C. It is absorbed rapidly by alcoholic po
slowly by aqueous potash, lime-water, or baryta-w
forming metallic sulphate and fluoride, and water.
not decomposed by a red heat, but at that temper
attacks the silica of glass, forming silicon fluoride
sulphur trioxide: if sulphur be also present, sulphur di
is formed instead of trioxide, while selenium yields sul
and selenium dioxides. Fluorine, oxygen, phosph
arsenic, boron, carbon, have no action on the gas. So
acts on it only above its melting point, but then abso
completely, forming oxide, fluoride, and sulphide of so
(this reaction was used for the analysis of the
Hydrochloric acid gas has no action at a red-heat
hydrogen sulphide causes a deposition of sulphur a
contraction of volume. Ammonia slowly acts on th
at the ordinary temperature, forming a white soluble
$SO_2F_2.5NH_3$.

In its stability, this compound resembles the hexaflu
SF_6; if it be really a sulphuryl compound, the flu
obviously influences the sulphuryl group so as to g
greater stability, and here again shows its charact
intermediate between the halogens and oxygen.—J. T.

Radium Salts; Radio-Activity Induced by ——. P.
and A. Debierne. Comptes Rend. **132**, [9], 548—

Active radium salt was placed in a small open-mo
flask in a closed space. Plates of different ma
were placed in various positions in the enclosure,
singly, some facing one another and in contact,
separated from the flask by a thick lead screen.
became active, though on those surfaces only to
the air had access; the effect was independent
material of the plates. They all lost their a
rapidly in the light and open air: much less rapidly
closed box. When the experiment was repeated wi
flask closed, there was no effect. When the plate
municated with the reservoir of active substan
capillary tubes, the effect was still produced, and, pr
the whole apparatus was small, the length of the ca
tube seemed to be without influence. These resu
in accord with Rutherford's theory of material ema
but the authors reserve judgment on this point.—J.

Nitro-Anthracene. J. Meisenheimer. Ber. 1900,
[19], 3547—3549.

According to Liebermann and Lindemann (Be
1584), the red vapour obtained by the action of nit
on arsenic trioxide converts anthracene into two d
compounds, $C_{14}H_{10}.HNO_3$ and $C_{14}H_{10}.N_2O_4$, accor
the conditions. On treatment with caustic soda, the
compound gives partially, the latter exclusively,
anthrone, $C_{14}H_9NO_2$. The author now shows th
nitroso-anthrone is really nitro-anthracene.—A. C.

Research Scholarship, Iron and Steel Insti

Andrew Carnegie Research Scholarship.

A research scholarship or scholarships, of such
as may appear expedient to the Council of the Ir
Steel Institute from time to time, founded by Mr.
Carnegie (Vice-President), who has presented to t
and Steel Institute 32 1,000-dollar Pittsburg, Be
and Lake Erie Railroad Company 5 per cent. de
bonds for the purpose, will be awarded annually, i
tive of sex or nationality, on the recommendation
Council of the Institute. Candidates, who must b

years of age, must apply, on a special form before the of April to the Secretary of the Institute.

he object of this scheme of scholarships is not to litate ordinary collegiate studies, but to enable students have passed through a college curriculum or have trained in industrial establishments, to conduct reches in the metallurgy of iron and steel and allied jects, with the view of aiding its advance or its applion to industry. The National Physical Laboratory, on governing body of which the Iron and Steel Institute epresented, would for many reasons be a very suitable e in which such a research could be carried out. There owever, no restriction as to the place of research which be selected, whether university, technical school, or ks, provided it be properly equipped for the prosecution etallurgical investigations.

e appointment to a scholarship shall be for one year, he Council may at their discretion renew the scholar- for a further period instead of proceeding to a new ion. The results of the research shall be communicated e Iron and Steel Institute in the form of a paper to be itted to the annual general meeting of members, and Council consider the paper to be of sufficient merit, Andrew Carnegie gold medal shall be awarded to its or. Should the paper in any year not be of sufficient t, the medal will not be awarded in that year.

By Order of the Council,
BENNETT H. BROUGH,
Secretary.

, Victoria Street, London,
April 3rd, 1901.

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is "a book of reference, giving brief descriptions of rious chemicals and other substances employed in the colour, and varnish trades." It contains 370 pages oject-matter and an alphabetical index. The treat- in the text is also more or less according to the etical order of the subjects, these being arranged to the paragraph headings. The latter part of the e is devoted to Hydrometer and Specific Gravity tables of Thermometer Degrees, &c.

IC. By J. ALFRED WANKLYN. Kegan, Paul, Trench, ner, and Co., Ltd., Paternoster House, Charing Cross d, London. 1901. Price 2*s.* 6*d.*

8vo volume, containing preface, table of contents, 9 pages of text. The subject is treated in three rs, and as follows:—I. CHEMISTRY OF ARSENIC. senic in General and in the Free or Metallic State. rsenious and Arsenic Acids and their Salts. (iii) de and Hydride of Arsenic. (iv) Organo-Metallic ounds of Arsenic. (v) Kakodylic acid and its Salts. TECTION AND MEASUREMENT OF ARSENIC. (i) 's Test. (ii) Reinsch's Test. (iii) General Testing stimation of Arsenic. (iv) Special Organo-Metallic ion of Arsenic, &c. III. THE MANCHESTER EPIDEMIC SENIC POISONING, AND THE LESSONS TO BE LEARNT T.

Trade Report.

TARIFF CHANGES AND CUSTOMS REGULATIONS.

UNITED STATES.

Customs Regulations.

Preparations of Ether or Ethyl Chloride.—Ether or ethyl chloride with small percentages of menthol oil, sinapis (or mustard), cocaine, eucaine, iodine, &c., dissolved therein, so as to form a medicinal preparation, is dutiable at the rate of 1 dol. per lb. (or at not less than 25 per cent. *ad valorem*), under the provisions of paragraph 21 of the Tariff, and not as a medicinal preparation under paragraphs 67 and 68.

Drawback on Films, Dry Plates, and Photographic Paper.—On the exportation of "transparent negative films," the body of which is of domestic manufacture, and of "dry plates," and "photographic paper," manufactured, respectively, with the use wholly of imported glass, or of paper imported either in the plain state or baryta coated, all having been subjected to the sensitizing process by the application of an emulsion in which imported gelatin entered as an ingredient, a drawback will be allowed equal in amount to the duties paid on the imported materials so used, less the legal deduction of 1 per cent.

Wool Grease.—Refined wool grease is not dutiable at the rate of ½ cent. per lb. under the provision for wool grease in paragraph 279 of the tariff, but is dutiable as a rendered oil, under paragraph 3, at the rate of 25 per cent. *ad valorem.*

ITALY.

Temporary Free Importation of Leather.

An Italian Royal Decree, dated January 6th last, grants temporary free importation of English buffalo leather for use in the manufacture, for export, of articles of military equipment, subject to the following regulations:—The importation must be effected through a Custom House of the first class; the quantity of leather allowed to be imported at one time is not to be less than 50 kilos.; and the term assigned for re-exportation in a manufactured condition is not to exceed one year. The "temporary admission" obligations are to be discharged by the exportation of a weight of leather wares equal to that of the leather imported after deducting the weight of materials other than imported leather which enter into the composition of the articles. No fine will be inflicted in cases where the weight of the leather exported is less than that of the leather temporarily imported, provided the difference does not exceed 20 per cent., but import duty will be charged on the quantity found to be deficient.

I.—GENERAL.

MINERAL PRODUCTION IN CANADA IN 1900.

Eng. and Mining J., April 6, 1901, 430.

We are indebted to the courtesy of the Geological Survey of Canada for advance proofs of the summary statement of the mineral production of the Dominion for the year 1900, as prepared by the Section of Mineral Statistics, under charge of Mr. Elric Drew Ingall. The statement with the comments made by the Survey, are given below:—

Product.		Quantity. (*a*)	Value. (*a*)
METALLIC.			Dols.
Copper(*b*)	Lb.	18,919,820	3,063,119
Gold, Yukon	Dols. 22,275,000		
,, all other	5,441,752		
		..	27,916,752
*Pig iron	Tons	35,387	583,158
Lead (*c*)	Lb.	63,169,821	2,760,521
Nickel (*d*)	,,	7,080,227	3,327,707
Silver (*e*)	Oz.	4,446,505	2,730,598
Zinc	Lb.	212,800	9,342
Total metallic		..	40,391,197

* *See* Note (*) on next page.

Product.		Quantity. (*a*)	Value. (*b*)
			Dols.
NON-METALLIC.			
Arsenic	Lb.	606,000	22,725
Asbestos and asbestic	Tons	30,641	763,431
Chromite	„	2,335	27,000
Coal	„	5,332,197	12,668,475
Coke (*f*)	„	157,131	619,140
Fireclay	„	1,245	4,139
Graphite	„	1,922	30,940
Grindstones	„	5,549	53,450
Gypsum	„	252,091	259,009
Limestone for flux	„	52,966	39,332
Mica	„	..	166,000
Mineral pigments:—			
Baryta	„	1,331	7,575
Ochres	„	1,966	15,398
Mineral water	..	..	75,000
Natural gas (*g*)	..	..	417,094
Petroleum (*h*)	Bls.	710,498	1,151,007
Phosphate (apatite)	Tons	1,415	7,105
Pyrites	„	40,031	155,164
Salt	„	62,055	279,458
Soapstone	„	420	1,365
Talc	„	1,000	5,000
Tripolite	„	336	1,950
STRUCTURAL MATERIALS AND CLAY PRODUCTS.			
Cement, natural rock	Bbls.	125,428	99,994
„ Portland	„	283,124	545,826
Flagstones		..	5,250
Granite		..	80,000
Pottery		..	200,000
Sewer pipe		..	231,525
Slate		..	12,100
Terra-cotta, pressed brick, &c.		..	259,450
Building material, other		..	4,850,000
Total structural materials and clay products.		..	6,284,145
Total all other non-metallic		..	16,799,748
Total non-metallic		..	23,083,893
Total metallic		..	40,391,197
Estimated value of mineral products not returned.		..	300,000
Total 1900		..	63,775,090

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* The total production of pig iron in Canada in 1900 from Canadian and foreign ores amounted to 96,575 tons, valued at 1,501,698 dols., of which it is estimated 35,387 tons, valued at 583,158 dols., should be attributed to Canadian ore, and 61,188 tons, valued at 918,540 dols. to the ore imported.

(*a*) Quantity or value of product marketed. The ton used is that of 2,000 lb.

(*b*) Copper contents of ore, matte, &c., at 16·19 c. per lb.

(*c*) Lead contents of ores, &c., at 4·37 c. per lb.

(*d*) Nickel contents of ore, matte, &c., at 47 c. per lb.

(*e*) Silver contents of ore at 61·41 c. per oz.

(*f*) Oven coke, all the production of Nova Scotia and British Columbia.

(*g*) Gross return from sale of gas.

(*h*) Calculated from inspection returns at 100 galls. crude to 54 refined oil, and computed at 1·62 dols. per bbl. of 35 imp. galls.

II.—FUEL, Etc.

INFLAMMABLE LIQUIDS, TRANSPORT OF—(*concluded*).

Chamber of Commerce J., April, 1901, 85 (see this Journal, 1901, 295).

GERMAN REGULATIONS.

Extract from the Regulations for the Construction and Management of Tank-Waggons.

1. Tank-waggons are such open or covered waggons as are constructed for the carriage of certain liquids in casks, tanks, metal cylinders, or other receptacles firmly and permanently connected with the frame of the waggon. A difference is made between *Railway Tank-Waggons* which belong to a railway administration, and which are not given to private persons for permanent use, and *Private Tank-Waggons*, which belong to private persons, or which are given to them by the railway administration for permanent use. These must bear, besides the marks of a railway administration, the name of a firm or private person (owner or lessee), and the name of the home stat Tank-waggons are permitted to carry the follo liquids:—

Petroleum, lignite oils, shale oil, coal oils (benzol, to xylol, cumol, &c.), nitrobenzol, petroleum-naphtha distillates from petroleum and petroleum-naphtha, pe leum spirit and similar preparations from petroleum-nap or lignite oils, inflammable products, articles usually ployed for the denaturing of spirits, wood spirit, liqu gases (carbonic acid, nitrous oxide, ammonia, chlo anhydrous sulphur acids, and phosgene gas), spirits of alcohol, gas liquor, tar, beet molasses and the refuse left extracting sugar from molasses, acids of all kinds, f matter, liquid water-glass (see also Paragraphs XI., XX., XXI., XXII., XLIV., LII. of the Railway T Regulations).

2. *Construction.*—As regards the construction of t waggons, the general regulations for the constructio means of locomotion apply (traffic order for the main ways of Germany, directions for the construction an equipment of the main railways of Germany).

3. *Tonnage, Brake-power.*—The tonnage for the n introduced tank-waggons is not to exceed 15,000 Each tank-waggon of 15,000 kilos. tonnage mus provided with a brake, otherwise its taking over ca refused.

4. *Costs of Up-keep and Repairs.*—The owner shall all expenses for up-keep and repairs.

5. *Safety Regulations.*—When tank-waggons are despatched, whether full or empty, their apertures for f or emptying, or any others they may have, must be ti closed, and they must be provided with safety appa against opening themselves. Any work on these aper with a naked light is strictly forbidden.

The tank-waggons when loaded must be so far fill to avoid a one-sided loading, or any harmful pressure an expansion of the liquid in consequence of changes i temperature.

When there are two tanks, one on the top of the the under one must be first completely filled, and the other two or more tanks, lying one on the other, must equally filled.

6. *Responsibility of the Railways.*—The railway tak itself no responsibility for loss or diminution of the in consequence of leakages or of a break in the waggon, in so far as no blame can be attached railway.

7. *Management.*—The following regulations are in as regards the management of tank-waggons read despatch, which are used for inflammable liquids:—

(*a*) Tank waggons in which are placed for conve those liquids mentioned in Paragraphs XXI. and XX the Railway Traffic Regulations of Germany, mu marked by the consigner plainly with the following printed on a red ground, "Inflammable," or if in Ger "Feuergefährlich."

(*b*) Tank-waggons which are intended for the conve of petroleum-spirit and similar easily inflammable pr —articles named in Paragraph XXII. of the Traffic R tions—must be provided with air-tight covers.

(*c*) The filling and emptying of tank-waggons ma take place on those sidings which have been notif suitable by the Railway Administrations and duri day, all fire and naked lights being kept at a distance.

(*d*) The filling and emptying of tank-waggons in from reservoirs may only be carried out by means of hose or pipes. The filling and emptying of tank-wa from and into casks must be carried out by means o appliances as effectually prevent any leakage o inflammable liquid during the operation.

(*e*) The thawing of frozen taps of charged or of tank-waggons used for inflammable liquids, must ne effected by means of a direct application of fire; hot steam or hot cloths should be used for the purpose.

(*f*) Entering empty tank-waggons may only be per some time after the emptying has taken place, and only when it is certain that the gas has entirely es and then also on the condition that there is no fire or light.

7) In no circumstances is the making of a fire or king permitted in the neighbourhood of charged or apty tank-waggons used for inflammable liquids.

ulations for the Calculation of Freight Rates for Liquids in Tank and other Waggons for the Transport of Liquids. (Translation.)

aragraph XXXV. of the general regulations in tariff ters contained in the German Railway Goods Tariff, ion B. (page 12), provides as follows :—

'hen liquids of all kinds (tar, ammonia water, petroleum s, spirits of wine, wines, &c.) are transported in tank or r kind of waggons, the freight, for quantities of at least 00 kilos. in each waggon, is charged on the net weight ie liquid contained therein according to the tariff class r which the goods carried fall. If, however, the osic weight of the waggon used is greater than the ht on which freight is payable, then one-third of the weight is to be added to the weight on which freight be paid. The empty waggons are returned free of ge. The waggons sent to be filled will also be desied free of charge if they return loaded to the station which they were despatched. Tank or other waggons arrying liquids are defined to be such as are specially ged for the purpose, in which the boiler-shaped or appliances for carrying the liquid take the place of overed truck, or such as (after removal of one or more e sides of the waggon) have the boiler-shaped tanks, l cylinders, barrels, or other receptacles so attached e floor of the waggon that they cannot be removed out considerable difficulty.

r the articles mentioned in the note of the British assy, the following rates of the goods classifications German Railway Goods Tariff will be applicable :—

der Special Tariff I.—Mineral oils, of medium t, which, with a temperature of 20° C., have a weight least 0·825, or at most 0·835.

der Special Tariff III.—Mineral oils, heavy (coall from lignite, shale oil, boghead oils, heavy oils profrom petroleum, &c.), which, at a temperature of ., have a specific weight of more than 0·835, and , at the same temperature, have a viscosity, calculated Eugler viscosimeter with a unit of one for water, or st 2·6.

mineral oils which at a temperature of 20° C. have a r viscosity than 2·6, or which at the same temperature a less specific weight than 0·825 (for mineral oils of m weight of a specific weight of 0·825 up to 0·835 most, and viscosity of which always remains under ee Special Tariff I.), as also raw petroleum, belong classification for general waggon-loads. (Mineral sed for the purpose of lubrication and mixtures of al oils have, almost without exception, a viscosity of ·6.)

l-tar oils, unmixed, which, at a temperature of 14° R. a specific weight of 0·950 and over, also fall under l Tariff III.

those liquids which do not fall under the aboveoned tariff rates belong to the classification of general n-loads (Class B.).

Memorandum. (*Translation.*)

cially constructed goods waggons, usually called -waggons," are permitted on the German railways for rriage of certain liquids, *viz.*, acids, spirits, mineral c.

zol, crude naphtha, coke oven oils and such preons, delivered in casks and receptacles, are accepted riage on the German railways only when the concomplies with the regulations contained in Para- XX. to XXII. of the Railway Traffic Regulations bahn Verkehrsordnung), page 74. For the carriage liquids in tank-waggons, there are no special reos in the Railway Traffic Regulations, but it is, er, supposed that the general regulations laid down management of such waggons are observed.

amount of the freight varies according to the class iff to which the goods with which the waggon is loaded belongs. The uniform rates which form the bases of the freight rates, are composed of distance rates and despatch fees together.

I. Uniform Rates (Einheitssaetze).

(A.)

Distance rates per ton (1,000 kilos.) and per kilometer for the general waggon class (B)	6
For the special tariff I.	4·5
For the special tariff III. :—	
For distances up to 100 kilometers	2·6
" over "	2·2

(B.)

Despatching fees per 100 kilos. for the general waggon load class (B) :—	
Up to 10 kilometers	8
From 11—20 "	9
" 21—30 "	10
" 31—40 "	11
Over 40 "	12
For the special tariffs I. and III. :—	
Up to 50 kilometers	6
From 51—100 "	9
Over 100 "	12

(For distances over 100 kilometers varying rates exist on South German lines.)

II. Calculated Freight Rates.

For a Distance of	Basis Rates per 100 Kilos. in Marks.		
	General Waggon Load, Class B.	Special Tariff I.	Special Tariff III.
Kilometers.			
50	0·42	0·29	0·19
100	0·72	0·54	0·34
150	1·02	0·80	0·45
200	1·32	1·02	0·56
250	1·62	1·25	0·67
300	1·92	1·47	0·78
350	2·22	1·70	0·89
400	2·52	1·92	1·00
450	2·82	2·15	1·11
500	3·12	2·37	1·92

ENGLISH RATES.

The following are some of the rates to Manchester for purposes of comparison with the foregoing rates abroad :—

Miles.	——	Tanks or Drums. 3rd Class. Rate per Ton.	Cost per Gallon.	
			In Tanks.	In Drums including Empties Returned.
		s. d.		
191	Bristol	42 0	2·08	2·94
168	Cardiff	46 6	2·30	3·25
102	Darlington	31 8	1·59	2·20
225	Glasgow	35 0	1·84	2·45
52	Lancaster	21 10	1·13	1·51
110	Middlesbrough	31 8	1·68	2·22
59	Queensferry	18 7	0·96	1·30
144	Sunderland	38 4	1·89	2·68
41	Sheffield	21 0	1·08	1·47
77	Ulverston	27 10	1·41	1·94
82	West Bromwich	25 11	1·33	1·82

Third class benzol or naphtha giving inflammable vapours over or under 73° F.

III.—TAR PRODUCTS, PETROLEUM, Etc.

PRODUCTION OF BITUMEN IN TURKEY.

Bd. of Trade J., April 18, 1901, 140.

The Acting British Vice-Consul at Janina gives information as to the production of bitumen in the neighbourhood of Janina. At Selenitza, a village in the Janina district, about two hours' journey from Volona, there are bitumen quarries. This bitumen varies in quality according to its purity, the first quality being known as "brilliant." This is a solid bitumen of a deep-black colour, and very friable. It is superior to the Judæan bitumen, and is used for making varnish. It is found only in small quantities. The second quality, which is very abundant, is known as natural bitumen; this contains from 10 to 20 per cent. of earthy matter. It is solid, black, with a reddish sheen and concoidal fracture. The third quality of bitumen is called "melted"; this consists of fragments of refuse bitumen melted together and cast in cylindrical moulds. A short time ago liquid bitumen, which was held in great repute, was also obtained, but the River Vojussa having invaded the wells, the work of extraction had to cease.

The quantity of bitumen annually extracted from the Selenitza quarries averages from 3,000 to 4,000 tons. In 1898, 2,886 tons were exported; in 1899, 4,988 tons; and in 1900, 6,540 tons. The exportation in 1900 was larger than in previous years, owing to the fact that there was on hand a large stock, which had accumulated for several years past. At Volona, bitumen is usually loaded in bulk, small quantities being sent in barrels and very rarely in blocks. From Volona, the bitumen is exported to Marseilles, Rouen, Hamburg, Trieste, and Ortona (Italy). Small quantities are also shipped to Constantinople and Greece. Bitumen for Marseilles and Ortona is carried by sailing vessels, for Hamburg in German steamers, and for Trieste in the vessels of the Austrian-Lloyd. The bitumen shipped to Ortona is sent on to Lo Homanoppello, where there are quarries of bituminous stone, from which a very dark liquid bitumen is extracted. This bitumen, which is of a better quality, is mixed from that from Selenitza to make asphalt blocks, which fetch a good price.

IV.—COLOURING MATTERS, Etc.

Dyewoods at Havre.

Foreign Office Annual Series, No. 2562, *March* 1901.

Dyewoods are one of the most important of the articles imported into Havre. They are mostly used by the manufacturers of dyewood extracts in this part of France.

Logwood.—The imports of logwood amounted to 60,409 tons, against 64,383 tons in 1899. The falling-off in the use of this dyewood is really greater than would appear to be the case from these figures, as there were important stocks remaining unconsumed at the end of 1900. The competition of aniline dyes has brought about a reduction of about 30 per cent. in the use of logwood, and prices of the latter have fallen from 10 to 15 per cent.

Fustic.—The imports of fustic amounted to only 7,042 tons, against 13,730 tons imported in 1899. The quantity of fustic received at Havre in 1900 was less than in any year since 1887. The falling-off in the use of this dyewood is attributable, as in the case of logwood, to the competition of artificial colours.

Quebracho.—The imports of quebracho amounted to 22,995 tons, against 13,458 tons in 1899. This wood was first imported into Havre in 1887, when 2,657 tons were received. It will be seen that the increase has been considerable. Notwithstanding the exclusion of this wood from the tanning contracts of the French Government, it is much in favour with many of the principal tanners.

Alizarin.

Pharm. J., March 30, 1901.

Alizarin is very largely used in India, the imports being many thousands of cases per annum. The Customs have previously accepted alizarin imported, marked as containing a certain percentage of commercial alizarin. Towards the end of 1899 the Government analyst of Bombay refused to pass any of the samples submitted to him for analysis, stating that each was below the standard. This procedure immediately put a complete stop to the importation of alizarin into India. Samples of the various rejected supplies were then submitted to Mr. T. De G. Derry, the analytical chemist of Messrs. Kemp and Co., Ltd., Bombay, and were reported by him to be perfectly genuine. The reports were forwarded to the Government, who still up the dictum of their own expert. The German manu turers, however, did not let the matter rest, but sent t reports, together with those of their own expert chem to the Home Government authorities, and were a referred back to the head authorities of India. Durin this period, a matter of 15 months, the importatio alizarin was at a standstill, and consequently, a important industry was practically crippled. The lo authorities, after receiving the opinion of the experts, having heard the lawyer, and also the partner in the la German alizarin firm, eventually ordered all the ali to be passed as perfectly correct, and consequently, importation has again commenced.

Indigo Research.

Chem. and Druggist, April 20, 1901, 637.

For the purpose of carrying out a scheme of experim and scientific research, the Lieutenant-Governor of B has intimated the willingness of the Bengal Governme grant 50,000 rupees annually for three years to the I Indigo planters' Association and the Indigo Improve Syndicate, contingent on these bodies spending from own funds 75,000 rupees per annum also for three year

VII.—ACIDS, ALKALIS, AND SALTS.

Acid Waste Neutralisation.

Chem. Trade J., April 13, 1901, 338.

An important joint conference of Midland manufac and representatives of the county councils of Staffor and Worcestershire was held recently in Birmingha the purpose of considering the question of the dispos acid waste. The subject has for some years engage attention of the two county authorities, in consequen the practice of certain manufacturers turning the acid untreated, into rivers and sewers, thereby causing s and dangerous pollution. It was, however, general that if any great or permanent improvement was brought about, there must be with the public gov authorities the co-operation of the manufacturers. A ingly, a joint conference took place in Birmingham s months ago, at which a resolution was adopted requ the manufacturers to prepare a report as to the met which they were prepared to deal with the disposal o waste. In response to this desire, the manufacturers whom Mr. A. M. Chance presided, met on January 3 the Queen's Hotel, to consider the situation. Invit were issued to forty-six firms, and eleven represen attended. In the report of that conference it was that the chairman laid stress on the fact that whil county authorities had shown every desire to aff galvanisers all reasonable time to effect improveme which to render harmless the passing of their acid liquors into the sewers or watercourses, the time wa approaching when such authorities might have t stringent measures to compel galvanisers to adopt t practicable means of abating the nuisance arisin allowing their acid liquors to pass in an untreated co into the sewers and watercourses. It was reported t firm of Messrs. Chance and Hunt were, after inc considerable expense, working a process which th devised for converting into solid chloride of calci sale a certain quantity of acid waste, but that the c the process must be cheapened and the market f article be largely increased before the treatment considerable proportion of the acid waste produced could be undertaken by that company. Most members present expressed themselves in favour following recommendations being submitted to th conference:—(1) "That the local authorities sho required to deliver, free of cost, to each galvaniser t required to neutralise the acid waste before running the sewers. As acid liquors on reaching the outf now neutralised at the expense of the local authorit same authorities might reasonably be required to b cost of the lime for neutralising such liquors before ing the sewers." In this connection expression was the feeling that the sewers were constructed at the ense of and for the general use of all ratepayers, includ- galvanisers, and that the sewers should have been so structed as to receive the acid waste without any detri- it to the pipes. The other recommendations were :— "That the Canal Company should assist galvanisers by charging nominal tolls for the removal in boats of waste to works at which it might be manufactured into l chloride of calcium or other products. (3) That, ect to the galvanisers in Staffordshire and Worcester- e consenting generally to their works being visited by ecial inspector of experience, to be appointed by those ities, the conference be asked to recommend the appoint- t of such an official provisionally, for a period, say, of years, whose duties shall be confined to visiting such anisers' works as the owners might desire, and to assist i in the application of the best practicable means of ng the acid waste nuisance according to local mstances."

r the consideration of this report, manufacturers, sentatives of the two county councils, and of local orities in whose districts acid waste is produced, now ded the conference in strong force. The proceedings, h were private, were presided over by Mr. Alexander hance, and after a lengthy discussion, the following ution was adopted :—"That the manufacturers under- to neutralise the acid waste before discharging into the s; and they accept the proposal than an independent ctor should be provisionally appointed by the county ils to inspect their works and collect samples, giving anufacturers the benefit of any suggestions he may be to make from his experience in regard to such alisation." The secretary was authorised to forward solution to the sanitary committees of the two county ils.

X.—METALLURGY.

Output of Minerals (other than Gold) in Western Australia.

Bd. of Trade J., April 4, 1901.

supplement to the *Government Gazette* of Western alia for 4th February last contains statistics of the t of minerals (other than gold) in the colony in 1899 00, from which the following table is compiled :—

nerals.	1899.		1900.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
....	2,964	35,938	6,183	46,673
....	12,852	8,939	12,251	9,258
....	335	25,270	823	52,712
....	54,336	25,951	118,410	54,835
ne	17,593	2,838	15,927	3,594
....	83	912	43	348

XI.—ELECTRO-CHEMISTRY, &c.

lectro-Chemical and Electro-Metallurgical Industries of the World.

J. B. C. Kershaw. Electrician, **46**, 388, 428.

year 1900 was not marked by any striking discovery elopments, but, while advance in some directions is et on the whole considerable progress was made. e processes for the manufacture of alkalis and bleach, es and hypochlorites, as well as for copper, silver, ld refining have all been materially improved; in er industries, the production of ozone and aluminium, ment is retarded by the limited use to which these present be put, though the consumption of aluminium ually increasing. The processes for the extraction and copper direct from their ores are still in the ental stage, while the heavy fall in the price of carbide which occurred during 1900 seriously l the production. The total number of works in electrical processes are at present in operation is estimated to be over 230, of which only 21 are situated in the United Kingdom. The majority of these employ water power to generate the electricity, but it is beginning to be realised that in many cases this is not the most economical arrangement in the end, since it often necessitates a remote situation for the works, and in future the use of blast furnace gases for power generation may lead to the establishment of many successful works in manufacturing districts destitute of natural water power. The power actually utilised in the electro-chemical and electro-metallurgical industries of the world during 1900 is estimated to be 215,000 h.p., and the following table shows the number of works, with the corresponding power, engaged in the four chief branches, both in the United Kingdom and the world.

—	United Kingdom.		All Countries.	
	No. of Works.	H.P.	No. of Works.	H.P.
Alkalis and bleach......	3	7,020	27	52,000
Aluminium.............	1	2,000	8	28,000
Chlorates of potassium and sodium.	0	..	11	24,000
Copper	7	1,500	42	16,000
Total	11	10,520	88	120,000

There are over 100 calcium carbide works in existence, but owing to the unsettled state of the industry few, if any, of these were able to fully use their available power, and 85,000 h.p. probably represents the total power actually employed. The remaining industries, the manufacture of hypochlorites, ozone, gold, silver, nickel, and zinc, do not utilise power on a large scale, and 10,000 h.p. is an ample estimate for these.

Aluminium.—During 1900 eight works were producing this metal by electrical methods, but, since the European manufacturers refuse to give the amount of their output, no official figures of the total production are available. Unofficial estimates range from 5,000 to 7,500 tons, the lower figure being probably nearer the truth. The works are situated at Niagara Falls (2), Foyers, Neuhausen, Rheinfelden, Lend Gastein, Le Praz, and St. Michel, and between them command 56,000 h.p., not more than half of which was utilised for the production of the metal, the remainder being chiefly devoted to the manufacture of calcium carbide. The fall in price of the latter has made its production unremunerative, and in future a much greater proportion of the power will probably be devoted to the metal. The Pittsburg Reduction Company, of Niagara Falls, is still the largest producer, the output in 1899 from its two works being officially given as 2,990 tons, while that of 1900 will exceed this by several hundred tons. The Pittsburg Aluminium Company are building a factory at Shawinigan Falls, in Canada, to utilise 5,000 h.p., which is expected to be ready for operation in 1901.

No new aluminium process has been introduced during 1900, and all the works use either the Herault or the Hall process. It may be noted that the English Herault patent expires in 1901, and that the British Aluminium Company have filed an application praying for its extension. The applications of the metal have likewise not undergone any large extensions during the past year. The metal has been employed in America for overhead electrical transmission, and its use in printing is slowly making headway in this country, more quickly in Germany and the United States. The applications of the metal itself being somewhat restricted, considerable attention is being paid to its alloys, and in France many of the latter are coming largely into use. "Partinium," an alloy containing aluminium and tungsten, is used for portions of the structural work of motor cars; "Albradium," an alloy of aluminium, copper, nickel, zinc, and phosphorus, takes a polish equal to that of silver; and a series of alloys of aluminium, tin, copper, and zinc, varying in specific gravity from 2·8 to 7·1, are employed for casting the more delicate parts of instruments and machines, which have hitherto been mad entirely with the lathe. The most important development in connection with the use of aluminium, however, has been the introduction of a new method of autogenous soldering by Heraeus, of Hanau, in Germany. The difficulty of soldering the metal has always been a drawback, and though many solders have been invented, none, with the exception of that of Richards, gives a strong and durable joint. Heraeus utilises the fact that at a temperature far below its melting point aluminium becomes plastic and can be kneaded. The edges of the plates or ends of the wires to be joined are raised to and maintained at this temperature, and are worked together until a homogeneous mass of metal has been produced at the joint. A wire 5 ft. long, made up of 12 shorter pieces soldered together by this method, was shown at the Paris Exhibition, and a vessel with a capacity of 27 cubic feet, which stood an internal pressure of five atmospheres without leaking, has been constructed out of five separate pieces of aluminium plate 10 mm. thick. This invention is expected to prove of great utility in working with the metal.

Copper.—Of the world's production of copper, amounting in 1899 to 470,000 tons, it is estimated that 44 per cent. is electrolytically refined. In all, there are 42 refineries at work, distributed as follows :—America, 8 ; Germany, 9 ; France, 8 ; England, 7 : Austria, 4 ; Russia, 3 : Japan, 2 ; Australia, 1 ; and it is estimated that these together refined 210,000 tons of copper during 1900, the greater part of which, 172,330 tons, was the share of the United States. Only one of these works, that at Papenburg, in Germany, starts with the ore as raw material, the method used being that of Hoepfner, combined with a nickel-extracting process. Very few details have been published regarding this (see under Nickel), and its success has yet to be demonstrated, while the establishment of a similar works at Hamilton, Ontario, has for the present been suspended. In the United States, the Arlington Copper Company propose to extract the copper from a poor New Jersey ore containing 2 per cent. of copper by roasting, crushing, extracting with sulphuric acid, and electrolysing the solution of copper sulphate thus obtained, a 90 per cent. yield being anticipated. Several other new processes have been described, but none of them are yet at work on an industrial scale.

Nickel.—This metal is now being largely used in the steel industry, and many methods have consequently been devised for extracting and refining it by electrolysis. The world's production of nickel in 1899 was estimated at 7,350 tons, the mines of New Caledonia and of Sudbury, in Canada, being the chief sources of ore. At present, the metal is chiefly extracted by purely metallurgical methods, but is being electrolytically refined in England, Germany, and Canada. The methods in use resemble those employed for copper refining, the chief difficulty being that nickel has a tendency to foliate when thick plates are electrodeposited; but this, according to Foerster, can be overcome by working at an elevated temperature. Hoepfner has introduced a method of obtaining the metal direct from its ores, which are roasted, crushed, treated with a mixed solution of calcium and cuprous chlorides, and the solution obtained electrolysed with carbon anodes and copper cathodes to remove the copper. After the nickel in solution has risen to 10 per cent., the copper, iron, and lead remaining are removed by chemical methods, and the solution of pure nickel chloride thus obtained is electrolysed with nickel cathodes in order to obtain the nickel. This process is in operation at Papenburg, but it is too early to judge of its success. At Hamilton, Ontario, another method, that of Frasch, is about to receive trial, while at Saulte Sainte Marie, ferro-nickel alloys are said to have been obtained direct from the Sudbury ores by treatment in the Clergue electric arc furnace. These alloys contain 7 per cent. of nickel, but silicon and other impurities are present, and it remains to be seen whether they are sufficiently pure for the manufacture of nickel steel.

Zinc.—In this country the only electrolytic process for zinc extraction in operation during 1900 was that of Hoepfner, concerning which great secrecy is maintained. It is supposed to depend upon the electrolysis of zinc chloride solution, using carbon anodes and diaphragms, and is worked by Brunner, Mond, and Co., at Winningto Cheshire. The plant has been extended during the so that the process appears to be a success, and a samp the metal produced, containing 99·5 per cent. of zi exhibited at Paris. Many other processes have devised, but the majority of these have not yet got be the experimental stage, and of the others definite inform is lacking.

Calcium Carbide.—The chief event in connection this industry was the heavy fall in price which oc during 1900, due to over-production. At the beginni the year carbide was selling at 15*l*. to 20*l*. per ton a various places of manufacture in Europe : six months it could be obtained f.o.b. at Hamburg or Rotterda 10*l*. 10*s*. per ton, including packages. At this price of the factories were unable to make any profit, and of them closed for an indefinite period, while other devoting attention to other electro-chemical industries is considered probable that the future price of carbid not rise above 12*l*. per ton. In this country the manufa of carbide is chiefly in the hands of the British Alumi Company, who can produce, if required, 3,000 ton annum at Foyers, while the United Alkali Company recently commenced to produce it in Lancashire.

Alkalis and Bleach.—The number of factories at in this department during 1900 was 27, of which thr situated in this country. The process most widely ad is that introduced by the "Elektron" Company of F fort, and first worked at Griesheim in 1890, which present in operation at 10 different works. No o details have been published regarding this process, has been stated by Ahrens that it is a mercury on carbon anodes are used, and that a current of air is u separate the amalgam from the unaltered mercury leaves the cell. Next in importance is the Castner-K process, which is in operation at Weston Point i country, also at Osternienberg and Niagara ; while a mo form of Castner cell has been devised by Solway and Brussels, and is now being used at Genappe in Belgiu at Donetz in Russia. This process is also a mercur and as operated at Weston Point has been very succ The Hargreaves-Bird process is at present only in ope at Farnworth in this country, and at Chauny, near but a large works is being erected at Middlewi Cheshire, which will be commencing work at an early Many other processes are being worked with varying s at the present time, and in America important develop are taking place in the industry.

Chlorates of Potassium and Sodium.—It is diffi give an estimate of the amount of chlorate produc electrolytic methods, since most of the factories also facture calcium carbide and other chemicals in additio it seems probable that the amount is steadily increasi displacing the older process. In France the total p tion in 1899 was 3,850 tons, of which 3,000 ton supplied by the two electrolytic works at St. Mich Chedde in Savoy. Recent improvements in the have nearly doubled the yield (the efficiency of the c cell as originally worked was only 20 per cent.), a will doubtless largely increase the output in future.

Hypochlorites.—The electrolytic production of chlorite solutions has been widely adopted in Ge Austria, and Russia for bleaching wood-pulp and goods, but no trustworthy figures are available. No firm has yet adopted this process, but experiments ar conducted at Bradford with this object in view.

ELECTROLYTIC REFINING OF METALS IN TH UNITED STATES.

Titus Ulke. ***Electrician*, 46**, 582.

The first electrolytic copper refinery was establi the United States in 1879, up to which date the part of the copper ore obtained in the country was Europe to be smelted and refined. At present, h practically the whole of the ore produced is dealt the States, and since refining costs less there than in considerable quantities of ore and crude copper ar imported for electrolytic treatment. In 1889 the es produced 80,000 metric tons of fine copper, of which than 25,000 tons were obtained electrolytically; five s later the amount of the latter had risen to 57,000 ric tons, nearly one-third of the world's supply, while year it exceeded 200,000 metric tons or half the world's ly. The cost of refining copper at the present time is half of what it was ten years ago, and it is stated that ntly contracts have been made for refining crude copper dols. per ton. From the copper thus treated there was ined in 1900 nearly 19,500,000 oz. of silver (more than third of the United States output) and 174,000 oz. of . There are three electrolytic silver refineries in ition in the United States, using the Moebius process having an estimated daily output of 160,000 oz., while nt for producing chemically pure gold by Wohlwill's od is being installed at the new Mint at Philadelphia.

XII.—OILS, Etc.

Oil Seeds from India in France.

reign Office Annual Series, No. 2562, *March* 1901.

regards the supplies of various kinds of oil seeds from , there has been a marked increase in the quantities of icated ground-nuts, the shipments of which had t entirely failed a few years ago. The imports into e of these nuts, which during the year 1898 had 4,764 tons, rose in 1899 to 11,787 tons, and in 1900 296 tons. Recent reports from India indicate for the g year a further material increase in the supplies of it, the oil from which is much valued by the French aakers, and preferred to American cotton-seed oil, had taken its place in 1899.

otton Seed Products in the United States.

eign Office Annual Series, No. 2566, *March* 1901.

he last few years the use of cotton-seed has increased lously, and what was once a source of expense to the to get rid of, is now a saleable article, and becoming every year.

e are a few cotton-seed mills in the Chicago district, reat quantity of the oil is brought to Chicago, where ed in the manufacture of butter and lard substitutes.

e Eastern States great quantities are used for salad e higher-priced sorts being mixed with a small y of olive oil as a flavouring, but this business has not ken up here.

e is a large export trade in these lard substitutes, re made of cotton-seed oil mixed with beef or lard l are sold under trade names.

eat quantity of cotton-seed oil is also used here in ufacture of soap.

XIII. A.—PIGMENTS, PAINTS, Etc.

lations controlling Poisonous Colours in Japan.

Ch. of Comm. J., April 1901, 90.

ave been favoured by the Yokohama Chamber of ce with a copy of the following regulations (the epartment Notification, No. 17, 1900) relating to rol of poisonous colours in Japan :—

. Poisonous colours are divided into two kinds as (1) The following articles or those which contain senic, barium, cadmium, chromium, copper, merd, tin, antimony, uranium, zinc, gamboge, picric trocresol, curarin; (2) sulphate of barium, cadmium oxide of chromium, red mercuric sulphides, lead ld, zinc oxide, zinc sulphate, copper, tin, zinc, and ture, bearing natural colour.

. Poisonous colours or paints shall not be used in beverages or eatables for selling purposes.

I. Anything painted with poisonous colours shall sed as a receptacle or cover for beverages or for selling purposes, except the following: (1) glass, enamel, or a mixture of enamel and a colour; (2) a receptacle or cover for a beverage or an eatable, painted with any of the colours belonging to No. 2 class, mentioned in Art. I., and whose contents are free from any intermixture of a prohibited colour.

Art. IV. The colours of No. 1 class mentioned in Art. I., shall not be used in manufacturing or painting toilet articles, tooth wash and powder, toys (including picture books, printed pictures, coloured paper for selling purposes). The following shall be excepted however: (1) lacquer, glass, enamel, or a mixture of enamel and poisonous colours. (2) Mixture of antimony golden sulphide and gum.

Art. V. No colour containing arsenic shall be used in dyeing cloths or accessories or their materials, with the exception of those which contain arsenic below 2 mgrms. in quantity, per 100 sq. cm. of cloth.

Art. VI. Any article manufactured and painted contrary to the provisions of Art. II. or receptacles or covers mentioned in Art. III. or any beverage or eatable contained in any receptacle or cover mentioned in Art. III. or any article or materials manufactured or painted contrary to Arts. IV. or V. shall not be allowed to be sold, or exhibited or stored for selling purposes.

Art. VII. As to the articles mentioned in the preceding article, the local Governor may, in accordance with the provisions of Art. I. of the Law No. 15 issued in February, the thirty-third year of Meiji (1900), decide the question and also in case a dealer infringes these regulations.

Art. VIII. With regard to the operation of these Regulations, the local Governor may exercise the powers conferred upon him by Art. II. of Law No. 15, issued in February, the thirty-third year of Meiji (1900).

Art. IX. Any person who contravenes the provisions of Arts. II.—VI. shall be ordered to pay a fine not exceeding Yen 25.

Supplementary Rules.

Art. X. These Regulations will be put into operation on and after July 1st, the thirty-third year of Meiji (1900).

Art. XI. Lead oxide (Oshiroi or Japanese toilet powder) may, for the time being, be used for toilet purposes, in spite of the provisions of Art. IV.

Art. XII. In the Tokyo-fu, the official duty of the local Governor shall be discharged instead by the Superintendent of the Metropolitan Police Board.

Paint Industry of the United States.

Bd. of Trade J., April 18, 1901, 115.

The Board of Trade have received, through the Foreign Office, copy of a report on the paint industry of the United States, drawn up at His Majesty's Consulate at Chicago, as follows :—

The paint industry in the United States is a very important one, and perhaps in no country in the world is there a larger consumption of paint than in the United States.

The competition for the supply to meet this demand is very great, and expenses have to be kept down in manufacturing; the very best of machinery is used for crushing, mixing, and grinding the pigments; no slow process is any longer profitable; thus double-decked mills are in use for grinding lead.

The last few years have brought about great changes in the paint trade, and every large city in the United States has from one to three paint factories, while the largest have from six to twenty, all grinding every conceivable article convertible into paint. Competition has become very keen, and, whilst it does not seem possible that British paint manufacturers can find a market for their wares in the United States, a report on the method of paint manufacturing in that country may be of use, and serve to induce the British paint manufacturer to use every effort to secure the Colonial and African market before the American competitor enters seriously into the field with mixed paints, which, up to the present time he has only supplied to his own countrymen.

Strong red oxides, Tuscan reds, and Indian reds come largely from Great Britain. These are, together with French ochres, Italian siennas, German umbers and siennas, the principal importations, and are used in the best grades of colours in oil or japan, whilst the domestic goods are rarely used in the best grades by paint grinders, but are sold extensively for primers.

The ingredients most in use and their cost are as follows, the pigments all in a dry state :—

White lead (Dutch process) is 2½*d*. per lb., and is considerably used. It is ground in pure linseed oil, 1 gall. of oil being used to 100 lb. of dry lead, or an average of about 8 per cent. of oil.

Sublimed white lead, or sulphate of lead, is a pigment greatly in favour.

Galena, or native lead sulphide, when heated to nearly white heat, vaporises slowly, and the vapours, in contact with air, burn into lead sulphate; but simply heating a bulk of galena ore to vaporisation is not practical.

If the lead ore is properly prepared, it burns rapidly when treated in a specially adapted furnace. The temperature required is far below that of vaporisation of lead sulphide. The ore is rapidly heated, and under favourable conditions will burn at a cherry-red heat.

The direct product from the combustion of galena is, however, not yet sublimed white lead, but after combustion it passes through hot flues kept at the temperature which, by experiment and practice, has been found to be effective. This densifies the particles and changes them into sublimed white lead. At the same time, a part settles down in the flues and carries with it whatever impurities may have entered the furnaces. On leaving the hot flue, we have true sublimed white lead suspended in the air. This is drawn through a series of cooling flues, where a further purification takes place by part of the product settling and carrying down small quantities of impurities escaping the hot flue, and then the sublimed white lead is arrested by forcing the gases and lead into strainers of textile fabrics, where the gases escape by filtration. It is taken from the strainers and packed in barrels for shipment. It absorbs a great quantity of oil. It has peculiar properties, and must be treated by paint grinders in a special manner. If ground as a stiff paint with linseed oil, it has a tendency to become dry and cake, but by a change in the process of grinding the difficulty is overcome and the paint does not cake.

Mixtures of sublimed white lead and zinc have a special interest as an iron paint under water. It protects the iron perfectly, does not soften and absorb the water, nor does it peel off, like zinc. Price, 2⅛*d*. per lb.

Oxide of Zinc.—Oxide of zinc maintains a very prominent place, and has become indispensable in paint manufacturing for many reasons. Its whiteness enables the manufacturer to produce the more delicate tints. It is also very light and bulky, and in combination with other material adds value to them. Present price, 2*d*. per lb.

Barytes.—Barytes is used in very large quantities, its specific gravity being about the same as carbonate of lead. Composition leads, or "off brands," as they are called, contain various proportions of barytes; mixed paints also contain more or less. Barytes, when used moderately, does not depreciate the value of the paint from the standpoint of durability. Price, 3*l*. 6*s*. 3*d*. per ton.

Silex or Silica.—This article is preferred in many instances to barytes, on account of its not being so heavy. It is much higher in price, ranging from 5*l*. 3*s*. 6*d*. to 9*l*. 6*s*. 4*d*. per ton, according to fineness.

A number of white minerals are used.

Carbonate of Lime.—Carbonate of lime, such as ground marble, finely bolted, is bulky and sold at 2*l*. 17*s*. 11*d*. per ton.

English Paris White.—English Paris white furnishes a very large part of many mixed paint formulæ. Present price, 3*l*. 6*s*. 3*d*. per ton; in barrels, 1*s*. extra each; all tons are 2,000 lb.

English Chalk.—English chalk, crushed and floated from one cistern to another, makes various grades of whitening :—

1st precipitation is called commercial whitening; 2nd precipitation, finer grade, gilders' whitening; 3rd precipitation, still finer, extra gilders' whitening; 4th precipitation, best grade, Paris white.

Carbonate of lead, sulphate of lead, oxide of zinc, bary silica, marble flour, Paris white, whitening, and China are some of the white pigments entering into paints.

Deposits in the United States.—As to the deposits in United States, white lead made from metallic lead is fo in many States, particularly in Missouri. Sublimed or phate of lead is manufactured in Joplin, Missouri, w there is a large factory, and the lead is made from th mined in that district.

Oxide of zinc is found in large quantities throughout States. Several large furnaces are erected in the east west. The finished product is controlled by the New Je Zinc Company.

Barytes is extensively mined in and near St. L Missouri, where two large plants are in operation; al Quincy, Illinois, where one large plant is at work. (large quarries are located in Lynchburg, Virginia. I these points shipments are made to the paint grinders.

German barytes, which at one time was much prefe has ceased to compete in the American market.

Silex is found as pure rock crystal, and vast quarri found in New Milford, Connecticut. It is hydrated, crushed and milled to a fine powder. From this fa comes the best for paint manufacture, and the only pr suitable for scouring soap. Large contracts are e into yearly for this article.

Decomposed silex is found in many places, but it satisfactory as an ingredient for paint.

Marble dust is made from the marble quarried in This quarry has not yet developed good block marl the stone is crushed and ground to a very fine powd is found to be very satisfactory in the composit paint.

A white mineral of very fine quality comes from Girardeau, on the Mississippi river. It is a carbon lime, and worth 2*l*. 17*s*. 11*d*. per ton.

Chalk is imported in very large quantities. No art the paint manufacture is used more extensively.

Cookson's Venetian red at one time was most exte sold. It is now being manufactured by the America Wire Company, who use up their scraps, converti same into an oxide and supplying the market with V red and copperas.

A good iron paint is known as Prince's mineral, used in considerable quantities for painting roof freight cars, &c. It is mined, crushed, and roaste it becomes a bright red colour. It is then bolted. 3*l*. 10*s*. 4*d*. per ton. The mines are situated at Valley Gap, Pennsylvania.

Colours in oil are used mostly for tinting, and are v according to strength and tone.

Chemical colours, chrome greens, yellows, ver and blues, are made by a number of manufacturers. is hardly a city without one or more colour works.

Orange mineral, litharge, and red lead are manuf by the National Lead Company and others, pric lower than the English or German goods. English mineral is much preferred for manufacturing vermil but the high tariff debars the use of same to a larg A large variety of paints are made to suit various p Brands of lead are ground and sold according to A pure white lead ground in linseed oil, when bea maker's label, is known to be pure goods. Th combination leads or "off brands." To illust quality of goods, a few formulæ for lead in oil, als paints, are here given :—

Strictly pure white lead ground in linseed oil: lead, 8 lb. of oil.

Strictly pure zinc in refined linseed oil : 100 lb 22 lb. of oil.

Combination lead ground in linseed and corn oil

One-third carbonate of lead or sublimed lead, of oxide combination lead.

100 lb. of oxide of zinc, 40 lb. of sublimed lead.

60 lb. of English Paris white, 1 gall. of benzene

6½ galls. of linseed and corn oil mixed in equal q

Strictly pure lead : 70 lb. of sublimed lead, carbonate of lead.

ombination lead : 75 lb. of sublimed lead, 75 lb. of oxide
inc, 425 lb. of barytes.

olutions for mixed paints :

Dissolve enough sugar of lead in lime water to make
olution (Baumé). Make silicate solution 8° B. Mix
ve in equal parts, as may be necessary.

Slake 1 bushel of lime in 40 galls. of water, let it
d 24 hours, decant, and use clear liquor.

To make a silicate of soda solution, 8° B., requires
. of soda to 1 gall. of water.

White sugar of lead, 2 lb.; sulphate of zinc, 4 lb.;
olve in 6 galls. of water.

mulsion : Linseed oil, 3 galls.; 2 solution, 3 galls.;
galls.; c, 1½ galls.; naphtha, 5 galls.

l dryer.—Take 5 galls. of raw linseed oil, place in
ish kettle, heat to 80° F., and 10 lb. of powdered flake
rge, 1 lb. of varnish lime. Heat three or four times
t has a consistency equal to thick molasses and will
g strongly. Cool to 250° F., add 150 galls. of naphtha
1 quart of ditronella.

ixed paint formula :

.) 400 lb. of sublimed lead and 100 lb. of corroded
ground to a paste, with 12 galls. of linseed oil. To
inned with 7 galls. of oil dryer, 14 galls. of raw
ed, and 7 galls. of emulsion.

) 250 lb. of sublimed lead, 150 lb. of oxide of zinc,
b. of corroded lead ground to paste, with 14 galls. of
linseed oil. Thinned with 14 galls. of oil dryer,
lls. of raw linseed, and 3 galls. of 300° headlight oil.

) 1,400 lb. of sublimed lead, 340 lb. of oxide of zinc,
b. of Paris white, 100 galls. of linseed oil, 25 galls. of
ne, 40 galls. of silica solution, 4 galls. of oil dryer,
5 galls. of turpentine.

) 600 lb. of sublimed lead, 600 lb. of oxide of zinc,
. of carbonate of lead, and 250 lb. of raw linseed oil
d to a paste and thinned with 44 galls. of boiled
d oil, 32 galls. of raw linseed oil, 11 galls. of oil dryer,
galls. of headlight oil, 63°, and 16½ galls. of silica
on.

size cans used for packing the paint are 1, ½, ¼, ⅛,
gall. The labels are attractive, and colour contained
cans is shown on colour cards on which numbers or
denote the colours.

milionettes are made from many formulæ varying in
y, as per example : 200 lb. of orange mineral, 200 lb.
ytes, 25 lb. of china clay, 25 lb. of zinc oxide, 15 lb.
sine, and 15 lb. of mordant (for fixing colours).
nt is made by mixing 200 lb. of litharge, 250 lb. of
lic acid, and 200 lb. of barytes.

milionettes vary like other colours, according to the
ration fixed by the chemically pure colours.

ch colours are ground in Japan, and the colours are
ported. None but the best will answer the purpose.
s and greens may be excepted from imported
s.

sumption of paint by the large agricultural implement
ns is very great. An illustration of one year's
t will suffice.

ons of dry vermilionette at 9*d*. per lb.
ons of dry vermilionette at 5*d*. per lb.
ons of primer ground in oil, at 2½*d*. per lb.

is for red painting, the colour adopted by most
tural implement makers. There are some very large
cturers in Illinois, Wisconsin, Ohio, and New York
many of them using as much as 50 tons of ver-
tte. Considering the small amount used on a single
e, an idea can be formed of the vast number made
tributed throughout the world.

gons are next on the list of farm implements made
vely, and mostly coloured green.

e.—Under separate cover, with the above report,
ceived a specimen set of sample cards, also samples
ts, *viz.*, (*a*) samples of imported English, German,
ench colours; (*b*) samples of American chemical
; (*c*) samples of American earth paint; (*d*) samples
erican white paints; all of which may be seen at
mmercial Intelligence Branch, Board of Trade,
liament Street, S.W., any day, between the hours of
and 5 p.m.

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

ANTHRAX TRACEABLE TO TANNERY REFUSE.

H. L. Russell. Seventeenth Report of Wisconsin Agricultural Experimental Station (see this Journal, 1899, 1035).

A severe outbreak of anthrax occurred in the vicinity of Medford, Wis., U.S.A., that was limited to the banks of the Black River. The virus of the disease undoubtedly came from tannery refuse, and was in all probability due to the use of "murrain," or infected hides imported from China. Probably the lowland meadows were infected by inundation during high water, at which time particles of diseased hide and hair were deposited on the surface of the ground. About 30 cattle and horses died and several human beings contracted the disease. Experiments made with formaldehyde in order to disinfect the hides, showed that solutions sufficiently strong to kill anthrax spores, injure the hides, and at present no treatment is known that will enable tanneries to disinfect hides before subjecting the same to the tanning process.

XV.—MANURES.

ARTIFICIAL MANURES IN INDIA.

Imp. Inst. J., April 1901, 105.

The suggestions as to improving the quality and increasing the yield of indigo by adopting scientific methods of manuring have led to the formulation of a scheme for the manufacture of artificial manures in India. In this connection the discovery of phosphates, which has been made in the Malay Archipelago, will be of value. The location is a small island under the British flag, and large quantities of phosphate are now being raised at a profit. It is pointed out that not only does the undertaking offer possibilities of supplying an indefinite amount of the dressing needful for the indigo fields, but the process of preparing the raw article for application means a demand for sulphuric acid, which may not be without effect on the question of making the mining of the sulphurous copper ores of Western Bengal remunerative.

EFFECT OF ARTIFICIAL MANURING ON WOOL.

Comm. Intelligence, March 30, 1901.

Australian contemporaries are discussing what is undoubtedly a very important matter concerning the gradual depletion of the soil of some of its most fertilising elements by the steady export of wool and meat.

It has been calculated that from 1893 to 1899 something like 12½ million lb. of potash was exported in the form of wool, and 70 million lb. of phosphate of lime taken from the land in the form of meat.

The sweat of the wool is composed to a great extent of soluble potash salts. Where there is an insufficiency of sweat the fibre of the wool is dry, hard, and weak, and the whole fleece becomes thin and hairy, whereas with a sufficiency of sweat the wool is soft and oily, rich and strong.

We know by experience in this country that the constant grazing of milch cows quickly exhausts the phosphoric acid salts and potash in the soil, and the only way to keep the meadows in good condition is to return to the soil the constituents taken from it in the form of milk.

The question for Australian pastoralists, therefore naturally arises as to how far their pastures might be improved by judicious applications of artificial manures containing the chemical constituents taken from the soil, and the probable results of manuring in the improved quality of the wool.

THE PHOSPHATES OF CHRISTMAS ISLAND.

Bd. of Trade J., April 11, 1901, 72.

The following report on the phosphates of Christmas Island, especially in reference to their export to Japan, by H.M. Consul at Yokohama, has been received at the Board of Trade through the Foreign Office (see also this Journal, Feb. 1901, 167):—

"An attempt has been made in the last year to introduce into this country artificial manure in the form of fossilised bird deposit or phosphate of lime, from Christmas Island, two cargoes, or about 8,000 tons, of which has been brought to this port by the British steamship 'Ayr,' and from all accounts this article of import shows considerable promise.

"Christmas Island is situated in latitude 10° S., longitude 105° E., about 220 miles south-east from Java Head. Its concessionaires are the Christmas Island Phosphate Company, Limited, of Billiter Buildings, London. The island is about 12 miles long from east to west, and 10 miles wide from north to south, is densely wooded, and attains an altitude slightly over 1,100 feet. The cliff at the water's edge varies in height from 20 to 40 feet, is steep all round, so that a vessel might strike the face of the cliff before bringing up. Water is obtainable on the island, wild pigeons are very numerous, and fish are plentiful in the water around the island.

"The island was taken possession of in the name of the British Government in the year 1888, and is administered by the Government of the Straits Settlements.

"The bird deposit found on the surface of the island is said to contain 86 per cent. of phosphate of lime, in lumps weighing from 1 to 30 lb. Besides the phosphate of lime found on the surface of the island, which alone is at present worked, one other seam at least is known to exist from 5 to 6 ft. under the surface.

"A further seam, however, is supposed to exist below the one that has already been opened out. The thickness of the seam already discovered ranges from 2 to 3 ft.; it is of a gravelly nature, and is said to contain 96 per cent. of phosphate of lime. The theory in regard to the presence on the island of this phosphate of lime is that many ages ago, before vegetation appeared, millions of birds not only made this island their breeding and depositing ground, but doubtless died there, their remains adding to the general whole.

"The soil being thus enriched, vegetation began to appear, and became so dense as to prove inconvenient to the birds, driving them to some other and more barren place. After accumulating and decaying for another long period of years, by some convulsion of nature, or owing to some chemical action in the phosphate itself, the vegetation seems to have been destroyed. Another long interval intervened after which swarms of birds again made their appearance, making use of the island again as has been already described. Hence the reason given for the presence on the island of alternate seams of bird deposit or phosphate of lime and rich black soil.

"Flying Fish Cove, the only anchorage in the island, is situated at the north-east corner, its extreme width being 5 cables and 2½ cables depth, measured from a line drawn from Smith Point to Loading Point, and contains room for three vessels of the size of the 'Ayr' (1,955 tons register). On a pinch four vessels might be accommodated.

"Since writing the above, the steamship 'Ayr' has arrived here again, 18th January, from Christmas Island, laden with phosphate, making altogether 12,000 tons imported from that island since August last."

XVI.—SUGAR.

BEET SUGAR INDUSTRY IN THE UNITED STATES.

Dipl. and Cons. Reports, No. 548, *Feb.* 1901.

It has been shown by statistics that the United States consumes more sugar than any other nation, or approximately one-quarter of the world's product. The conditions of soil, climate, and other advantages, are quite as good in the United States, and especially in Colorado, Nebraska, and Illinois, for the development of the beet and its sugar extraction, as in any of the countries of Europe or Asia.

A factory has been built at Colorado, and equipped at a cost of 200,000*l*. This factory when running at its full capacity will work 1,000 tons of beet daily, which it will convert into 100 tons of refined sugar. The beets reach maturity with a high percentage, and seldom go below 15 per cent.; 12 per cent. is taken as the buying basis, with an addition or reduction in price for each 1 per c above or below this amount. 15 tons of sugar beet acre, is considered a fair average crop, sometimes, howe it reaches 20 tons per acre. It is estimated that to duce one acre of sugar beet, an outlay of 7*l*. 6*s*. 10*d* required to cover all expenses. The sugar comp employs experts for every beet-growing district, who with the farmers during the entire season, advising them to the proper manner of taking care of beet land growing beets, and that without cost to the farmer.

—J. L.

UNITED STATES OF AMERICA.

Countervailing Duties on Dutch Sugars.

The Board of Trade have received a copy of a circ addressed by the Treasury Department of the United St Government on the 8th ultimo to officers of the Cus and others concerned respecting the rates of additi duties to be levied on sugars produced in the Netherla The circular is to the following effect:—

"In pursuance of the provisions of Section 5 of the of 24th July 1897, the following net amounts of bounties paid or bestowed by the Government of Netherlands on the export of sugars produced in country are hereby declared for the assessment liquidation of additional duties:—

"1. On raw sugar produced from beet roots, 1·50 fl 100 kilos. of hard refined. (The output of refined sugar raw is computed by deducting from the polarisation of raw sugar twice the glucose, four times the ashes, 1½ per cent. for loss in refining.)

"2. On sugar refined from beet-root raw sugar prod in the Netherlands, 1·72 fl. per 100 kilos.

"3. On sugar refined from imported raw sugar, 0· per 100 kilos., in addition to bounty, if any, allowed o raw sugar by the country of production.

"The liquidation of entries covering sugars produc the Netherlands after 1st September 1900, may be suspe at the request of the importers under the next assess ment and declaration under the provisions of the section 5, and the additional duties on such susp entries be estimated on the basis of the bounties h specified"

Countervailing Duties on Belgian Sugar.

The following circular was issued by the United Treasury Department on the 14th ultimo:—

"In pursuance of the provisions of sect. 5 of the 24th July 1897, the following net amounts of bounties or bestowed by Belgium on the export of sugars are h declared for the assessment and liquidation of addi duties, *viz.*, for raw sugar, 3·90 frs. per 100 kilos refined sugar, 4·40 frs. per 100 kilos."

Countervailing Duties on Russian Sugar.

The following circular, issued by the United Treasury Department, under date 14th February re-imposes at from that date additional (or counterv duties on Russian raw sugars:—

"In pursuance of the provisions of sec. 5 of the 24th July 1897, the following net amounts of bountie or bestowed by Russia on the export of sugars are declared for the assessment and liquidation of add duties, *viz.*:—

"1. On sugar testing not less than 99 per cent. rouble per poud.

"2. On sugar testing not less than 88 per cent rouble per poud.

"3. On sugar testing less than 88 per cent., 0·38 per poud."

BEHAR SUGAR COMMISSION.

Imp. Inst. J., April 1900, 105.

Last October a Commission was appointed, in v the crisis in the indigo industry, to report on the pro of cane-sugar as an alternative crop. Their report ha issued with commendable promptitude. The first qu as to whether Behar could be made a cane-growing swered emphatically in the affirmative. There is gh land of a suitable quality to grow cane equal to ieing 60,000 tons of sugar at a cost of Rs. 100 a ton. rding a market, it is pointed out that there has been nual average importation into India of refined sugar four years ending 1899—1900 amounting to 170,235 about three times the quantity which the Behar planters be expected to produce for some years to come. Moreover the demand is an expanding one. With respect to ation, the existing conditions in Behar are considered raging and, with improved methods, most promising. r is cheap, irrigation is not necessary, almost all the ies are located within a short distance from the railnd the season for sowing the cane comes on before ne for sowing indigo. In the opinion of the Commisowever, the present methods of sugar cultivation and acture are susceptible of immense improvement and r immediate reform. Reference is made to the system d in Queensland and New South Wales, where the acturers and cultivators arrange together so that st possible results are attained. The Commission mend the adoption of central mills and refineries, ropose, by way of a beginning, that, at each factory where sugar is grown on an area of about cres, the planters should crush the cane with the tus for producing grey sugar, furnished with the ary evaporating pans and centrifugal. This plan has ried and has proved satisfactory. It turns out two f dry (muscovado) sugar in a working day of 12 with 35 gallons (equal to 510 lb.) of molasses to the d is capable of treating the cane from 200 acres; machines, capable of dealing with more extensive can, however, be obtained at a comparatively small e of cost. It seems, therefore, that pending the tion of the more perfect organisation which is needne utmost economy and efficiency are to be secured, s may with confidence set up such machines as the ted. Particular stress is laid upon the need of a agency for the purchase, sale, and distribution of the nade by the planters. The report suggests that the ment might assist in establishing instruction and nental stations under a competent director and , for indigo, sugar, and other crops. In concluding eport, the Commission devote a paragraph to the ts of the indigo industry. It contains little new tion, but serves to emphasise the desirability of an early start in the direction of the Commissioners' endations.

BEET AND CANE SUGARS IN EUROPE.

U.S. Cons. Reps., April 1901, 473.

entral committee of the sugar industry has recently iblic its estimate of the crops in Europe for 1900— There was a 5 per cent. increase in the acreage in beets in Austria-Hungary last year, making a 325,000 hectares (803,000 acres) sown during 900. The crop amounted to 8,400,000 metric tons, 00 metric tons more than in preceding years. ume of the output of beet and cane sugars in a countries may be made as follows :—

ountry.	1898-99.	1899—1900.	1900—1901.
r :—	Tons.	Tons.	Tons.
....	1,042,000	1,099,000	1,070,000
y	1,720,000	1,791,000	1,900,000
....	782,000	919,000	1,070,000
....	755,000	898,000	900,000
....	209,000	270,000	320,000
....	150,000	170,000	170,000
k............	40,000	41,000	50,000
....	60,000	81,000	110,000
ia, Italy, and .	40,000	110,000	160,000
l	4,798,000	5,379,000	5,750,000
r............	2,654,000	2,442,000	2,907,000
d total.....	7,452,000	7,821,000	8,657,000

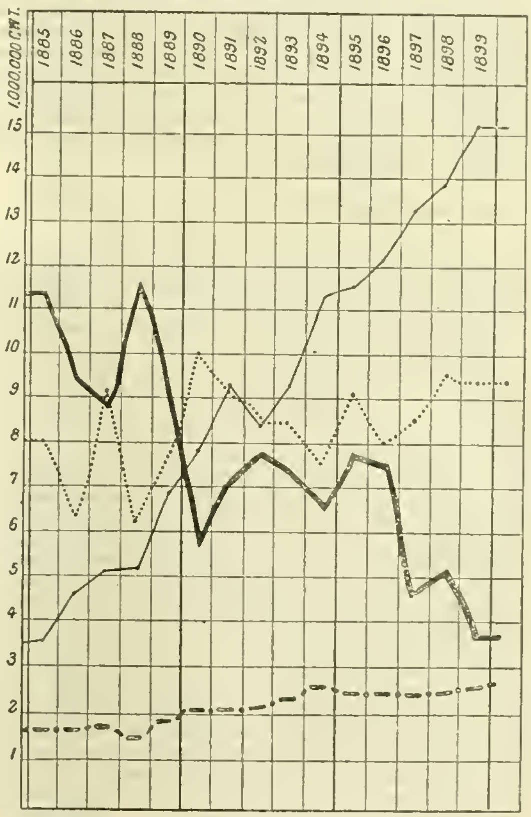
These figures show an increase of 371,000 tons of beet sugar and 465,000 tons of cane sugar over previous years.

The market price of sugars is almost a fixed quantity, the fluctuations being exceedingly slight; and, as long as the sources of supply can be approximately estimated, the price of this staple article can be assured.

SUGAR IMPORTATION 1885 TO 1900.

Pall Mall Gazette, April 16, 1901.

The following table gives the imports of the different sugars for the last fifteen years, and shows how the bounty-paid sugar has damaged the cane sugar industry. The thick line ▬▬ represents the imports of cane sugar, which amounted to 11,365,943 cwt. in 1885, and fell to 3,722,337 cwt. in 1899. On the other hand, the thin line ——— gives the quantity of other sugars, except lump and beet, most of which receives a bounty, 3,616,738 cwt. in 1885, which rose to 15,179,974 cwt. in 1899 by this unfair competition. The dotted line ········ gives the amount of beetroot sugar for the past fifteen years, while the broken line at the bottom of the diagram shows the quantity of loaf sugar imported during the same period.



XVIII. A.—FOODS.

BUTTER SUBSTITUTES IN THE UNITED STATES.

Foreign Office Annual Series, No. 2566, *March* 1901.

The amount of butterine or oleomargarine manufactured in the United States in 1900 was 107,045,028 lb. of which 3,376,764 lb. were exported. In the Chicago district 67,211,304 lb., of which 605,050 lb. were exported, were manufactured, the wholesale price ranging from 5*d*. to 8*d*. per lb. Under the present law there is a tax of 1*d*. per lb., and a license is required costing manufacturers, 1,000*l*.; wholesale dealers, 96*l*.; and retailers of under 10 lb., 9*l*. 15*s*. per annum. Oleomargarine is made of (1) oleo oil, a selected beef fat, from which the stearine has been extracted; (2) neutral, leaf lard of the hog thoroughly cooked; (3) cotton-seed oil; (4) milk; (5) salt. The best butterine is composed of 25 per cent. creamery butter, 40 per cent. neutral, 20 per cent. oleo oil, the balance milk, cream, and salt. In the lower grades cotton-seed oil is much used.

There is also exported 165,000,000 lb. of oleo oil, valued at 2,400,000*l*., five-sevenths of which goes to Holland and Germany.

Oleomargarine is coloured to look like butter, otherwise it has been found unsaleable, and although there are stringent regulations regarding its sale in many of the States, there is no doubt that much is passed off as butter.

The manufacturers are disturbed at the possible passage of a Bill taxing all coloured butter substitutes at 5*d*. a lb., which they consider would put them out of the market entirely, leaving them only the export trade, which may at any time be restricted by importing countries legislating on the subject.

XIX.—PAPER, PASTEBOARD, Etc.

Paper-Making Industry in Japan.

Bd. of Trade J., *March* 28, 1901, 786.

According to the *Moniteur des Intérêts Matériels* for the 28th ult., a new industry has just been started at Betsuhoumura, Kushiro and Hokkaido—that of making so-called "Kushiro" paper. Owing to the abundant supply of the tree which furnishes the raw material for the manufacture, a daily output of 2,700 lb. of pulp is expected. At the present time 180,000 reams of paper, valued at 800,000 yen, are imported into Hokkaido each year from one of the principal Japanese islands.

An Acid-Proof Mineral for Paper-Makers.

Chamber of Commerce J., *April* 1901, 90.

The *Journal de la Chambre du Commerce de Constantinople* calls attention to a stone which, when crushed, is superior to all the chemicals used in the manufacture of paper. Numerous tests have shown that this stone is acid-proof, and does not contain a particle of iron, which qualities eminently qualify it for use in the manufacture of paper. It is found in the quarries of Villers-le-Temple, in Belgium, where its qualities have been appreciated for some time. It is of a compact texture, and formed of silica and silicates which cannot be decomposed. Microscopic examination of the same shows a considerable quantity of mica. It has a greyish-white colour, and its hardness is very great. A block of it, weighing exactly 2,782 kilos., has been subjected to tests of cold water, hot water, sulphuric acid, &c., and, after having been dried at a stove, has been found to have retained precisely the same weight, the same hardness, and the same colour as before its immersion. What makes the Villers-stone, apart from its extreme resistence, really practical and useful to industry, is that it is found in the quarries not in layers or in small irregular blocks, as silicated stones are generally found, but in masses 20 to 25 cm. in thickness and covering sometimes a surface of 12 sq. m. These can easily be sawn in plates and slabs of large dimensions, which can be used for reservoirs, &c., in a few pieces, the parts of which are jointed together by a new cement, which is patented, and which consists of the stone, crushed, and mixed with a fusible matter which is acid-proof.

XX.—FINE CHEMICALS, Etc.

German Perfumery Industry.

Bd. of Trade J., *April* 18, 1901, 147.

The German perfumery industry, according to a report of the United States Consul-General at Frankfort, is growing steadily, and gains customers who formerly dealt exclusively in French and English perfumery. During the period of commercial treaties the export of German perfumeries has largely increased. While for 1891 the value of the exports of soaps and perfumeries amounted to but 9,400,000 marks, it had grown to about 17,000,000 marks in 1899. In 1900, the exports of soaps show considerable decrease, while those of perfumeries show a gain. The value of perfumery exported in 1900 was 11,000,000 marks, against 10,300,000 marks in 1899 and 8,60 marks in 1898. The large increase in the export perfumeries dates from 1895. They have met with fa in England, in British Africa, and in India. Holl Russia, Austria-Hungary, Turkey, Egypt, China, C and Australia use German perfumery.

The chemical odours and artificial ethereal oil German manufacture have entered into close compet with the French flower-field industry, as the prices fo artificial odours are much less than those of the na ones.

The export trade in toilet soaps is less flouris mainly, it is claimed, on account of low prices cause keen competition. It is said, besides, that there still a popular prejudice in favour of French and English soaps. Still, if the exports of toilet soaps in 190 compared with those of 1891, a great gain is obse *viz.*, 3,922 tons in 1900 against 1,262 tons in 1891.

BOARD OF TRADE RETURNS.

Summary of Imports.

Articles.	Month ending 31st M	
	1900.	19
	£	
Metals	2,712,290	2,4
Chemicals and dyestuffs	666,646	7
Oils	999,229	9
Raw materials for non-textile industries.	4,632,465	3,9
Total value of all imports	45,002,131	46,4

Summary of Exports.

Articles.	Month ending 31st	
	1900.	1
	£	
Metals (other than machinery)	4,101,617	3.
Chemicals and medicines	933,498	
Miscellaneous articles	3,293,663	3.
Total value of all exports	25,316,821	25,

Imports of Raw Material for Non-Texti Industries for Month ending 31st March

Articles.		Quantities.		Valu	
		1900.	1901.	1900.	
				£	£
Bark, Peruvian	Cwt.	4,752	2,819	10,013	
Caoutchouc	"	59,853	46,043	1,033,896	
Gum:—					
Arabic	"	6,952	4,983	18,112	
Lac, &c.	"	12,240	10,017	41,307	
Gutta-percha	"	8,905	7,857	112,051	
Hides, raw:—					
Dry	"	52,333	46,583	138,180	
Wet	"	53,955	62,690	121,710	
Ivory	"	1,001	376	42,513	
Manure:—					
Guano	Tons	3,051	3,686	27,121	
Bones	"	4,585	3,255	21,461	
Paraffin	Cwt.	112,153	62,793	154,158	
Linen rags	Tons	1,537	1,238	14,347	
Esparto	"	19,969	12,837	79,827	
Pulp of wood	"	32,507	33,788	200,776	
Rosin	Cwt.	190,400	222,483	44,200	
Tallow and stearin	"	165,659	158,746	228,728	
Skins:—					
Goat	No.	1,948,154	1,287,232	189,173	
Sheep	"	1,003,801	1,082,292	97,785	
Nitrate of soda	Tons	6,590	9,749	53,166	
Phosphate of lime	"	30,123	24,205	47,444	

Ports of Metals for Month ending 31st March.

Articles	Quantities.		Value.	
	1900.	1901	1900.	1901.
er :—			£	£
e.............. Tons	6,105	0,832	54,978	73,028
gulus .... ,,	8,339	5,835	329,477	228,902
wrought...... ,,	7,597	5,296	574,628	429,571
l, pig and sheet ,,	17,186	18,328	285,751	255,688
tes.......... ,,	78,122	54,685	121,969	101,340
ury.......... Lb.	22,500	6 5,390	2,675	78,740
r ore....... Value £	..	..	106,660	101,891
.... Cwt.	47,955	54,694	326,368	328,709
.... Tons	5,829	6,652	127,883	117,847

Ports of Chemicals and Dyestuffs for Month ending 31st March.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
compounds... Cwt.	25,986	17,273	13,542	3,510
hing materials ,,		20,026		7,421
:............ ,,	21,021	49,542	10,381	19,721
stone........ ,,	14,937	47,353	3,855	11,800
te of potash.. ,,	24,688	22,628	20,273	19,089
icals, other Value £	..	.	139,411	130,021
and gambier. Tons	1,379	2,264	31,022	49,810
:—				
arin.......Value £	..	..	19,041	16,851
line and other ,,	..	.	41,345	49,534
.... Cwt.	9,006	18,884	166,267	282,084
.... ,,	21,124	24,060	7,812	9,345
a........... Tons	4,809	2,851	49,393	29,266

Ports of Oils for Month ending 31st March

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
nut....... Cwt.	60,159	14,425	71,765	18,946
.... Tuns	1,781	1,032	64,486	40,275
.... Cwt.	64,332	104,666	79,218	119,673
um :—				
ninating.. Gall.	18,059,359	17,131,110	404,296	346,428
icating... ,,	5,604,100	4,127,534	148,402	119,687
.... Tons	3,500	6,357	81,046	137,829
&c. ...... Tuns	711	1,050	13,810	19,964
tine ..... Cwt.	34,076	42,443	63,487	57,309

Ports of Miscellaneous Articles for Month ending 31st March.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901
			£	£
.... Tons	5,401	12,449	12.213	21.556
and earth- re. Cwt.	30,059	35,154	85,728	92,296
.... Value £ -	..	..	96,103	92,672
.... Cwt.	158,852	76,414	81 880	43,109
.... ,,	52,636	57,778	56,976	61,784
.... ,,	37,276	38,914	72,156	69,876
es .... Gross	153,470	155,481	66,131	69,577
.... Cwt.	25,476	22,260	41,868	46,568
ze, gelatin ,,	20,693	18,472	44,838	42,960
, unmanu- ed. ,,	117,825	126,301	757,462	745,921
l cake .... Tons	49 127	37,502	320,761	230,334
and pig- Value £	..	..	124,549	112,062
pasteboard Cwt.	582,261	634,863	398,495	399,875
le instru- Value £	..	..	61,059	43,955
and soap Cwt. er.	19,259	24,420	23,597	27,482
manufac- ,,	43,618	47,070	58,527	54,013

Exports of Metals (other than Machinery) for Month ending 31st March.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Brass............ Cwt.	10,679	9,957	56,121	50,384
Copper.......... ,,	64,262	78,942	245,311	305,658
Lead............. Tons	3,454	2,891	65,859	52,355
Plated wares... Value £	..	..	32,198	42,612
Tin.............. Cwt.	8,245	8,264	57,913	52,180
Zinc........... . ,,	15,061	10,705	15,733	9,251

Exports of Drugs and Chemicals for Month ending 31st March.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Alkali .... Cwt.	374,788	..	113,573	..
Bleaching materials ,,	148,291	72,265	43,551	24,653
Chemical manures Tons	31,373	26,168	228,237	186,795
Copper sulphate .. ,,	7,606	8,963	174,587	214,798
Medicines....... Value £	..	..	101,868	111,942
Soda compounds :—				
Ash............. Cwt.	..	95,744	..	21,774
Caustic .... ,,	..	76,380	..	36,194
Bicarbonate .... ,,	..	19,610	..	6,810
Crystals .... ,,	..	14,054	..	2,221
Sulphate..... .. ,,	..	55,831	..	4,174
Other sorts ..... ,,	..	18,771	..	6,052

Exports of Miscellaneous Articles for Month ending 31st March.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Gunpowder. ... Lb.	575,900	Cwt. 4,248	13,624	12,390
Candles......... ,,	2,027,100	2,068,500	35,827	37,463
Caoutchouc..... Value £	..	..	133,165	95,674
Cement......... Tons	30 346	27,442	57,198	54,307
Products of coal. Value £	..	..	176,959	107,081
Earthenware ... ,,	..	.	174,822	161,183
Stoneware ...... ,,	..	..	14,627	15,445
Glass :—				
Plate .... Sq. Ft.	198 673	Cwt. 4,497	10,137	8,964
Flint .... Cwt.	7,842	9,078	20,711	21,149
Bottles .... ,,	75,683	79,841	37,501	39,536
Other kinds ... ,,	21 052	16,804	22,619	17,921
Leather :—				
Unwrought .... ,,	11.019	10 674	125,125	116,084
Wrought......Value £	..	..	36,944	41,398
Seed oil .... Tons	4,076	3,684	97,985	93.767
Floorcloth.......Sq. Yds.	2,855.500	2,930.700	126.700	140,346
Painters' materials Val. £	..	.	203,673	167,783
Paper............ Cwt.	90 966	107.274	144,149	167,886
Rags............. Tons	6 583	5,780	39.928	37,544
Soap .... Cwt.	92,192	78,011	87,467	81,378

Monthly Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

Applications.

6071. H. A. Smith and The Kingsburgh Motor Construction Company, Ltd. Improvements in or connected with vaporisers. March 22.

6216. J. Birkett and J. Thornton. *See* Class XVII.

6248. G. Scholer. Improvements in refrigerating or cooling apparatus. Complete Specification. March 25.

6428. J. Kirkaldy. Improvements in or relating to portable distilling apparatus. March 27.

6492. W. J. Gillespie and J. Gillespie. Improvements in smoke-consuming furnaces. March 28.

6507. W. G. Jones. Decomposer. March 28.

6510. R. Jones. An improved filter. March 28.

6614. J. McRae and J. C. Broadbent. Improvements in or relating to apparatus for use in refrigerating, heating, drying, impregnating, or otherwise treating goods. March 29.

6627. M. K. Bamber and J. Roger. An improved method of filtering and the separation of suspended solids from a fluid. March 29.

6700. G. Scheld. Apparatus for mixing warm and cold fluid or gaseous liquids. March 30.

6737. M. Güttner. Improvements in centrifugal separators. Complete Specification. March 30.

6792. W. S. Rawson. An improvement in apparatus for sterilising liquids. April 1.

6801. F. W. Parker. Improvements in processes and apparatus for cooling or condensing fluids. Complete Specification. April 1.

7043. A. G. Enock. Improvements in apparatus for compressing gas or air. April 3.

7063. K. Enzinger. Improvements in filter presses. April 3.

7186. S. C. Early. Improvements in and connected with refrigerating apparatus. April 4.

7237. Per W. Lindberg. Improvements in centrifugal apparatus. April 6.

7330. B. J. B. Mills.—From B. Lande, United States. Improvements in furnaces. Complete Specification. April 9.

7336. C. Groll. Improvements relating to rotary furnaces. April 9.

7339. G. Desaulles. Improvements in and relating to the separation of liquors from solid matters. Complete Specification. April 9.

7470. W. M. Williams. An improvement in sterilization of liquids. April 11.

7479. J. M. Wilson. Improvements relating to furnaces. April 11.

7643. J. M. Wilson. Improvements relating to furnaces. April 13.

Complete Specifications Accepted.*

1900.

5374. E. J. Preston, of the firm of J. Stone and Co., and F. L. Conway. Apparatus for intensifying and reducing fluid pressure. March 27.

5591. G. Kobes. Prevention and removal of boiler incrustation. April 3.

5985. C. Groll. Rotary furnaces. April 3.

6921. H. H. Lake. From the firm of M. Scuvero and Co., Italy. Continuous gas muffle kilns or ovens. March 27.

8763. J. McNeil and C. McNeil. Evaporating or concentrating apparatus. April 11.

9164. S. E. Alley. Air compressors. April 11.

9254. Per W. Lindberg. Centrifugal separator. April 3.

17,396. P. Nézeraux. Condensing apparatus. March 27.

1901.

2484. C. W. Vollmann. Freezing apparatus. April 3.

2892. H. Hildebrand. Heating or cooling vessels for liquids or gases. April 17.

3557. O. P. Ostergren. Refrigerating apparatus. April 17.

4393. E. Edwards.—From Krauschwitzer Thonwaarenfabrik für Chemische Industrie vormals L. Rohrman, Actien-Gesellschaft, Germany. Apparatus for distilling and evaporating liquids. April 11.

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* See Note (*) on previous page.

II.—FUEL, GAS, AND LIGHT.

Applications.

5662. A. R. Leask and P. M. Bellis. Improvement electric heaters. March 18.

5689. S. Danner and G. Kubelka. A process of means for the purification of gases. Complete Speci tion. March 18.

5730. F. S. Cripps. Improvements in covers for purifiers. March 19.

5742. R. Hanson. Generating heat and consumptio smoke. Complete Specification. March 19.

5757. A. Hayes. Improvement in vaporising burning hydrocarbon oils. Complete Specifica March 19.

5810. E. Fulda. Improvements in apparatus for u high-pressure incandescent gas lighting. March 19.

5826. A. Vosmaer. An improved ozonising appar March 19.

5845. W. James. An anti-vibration apparatus for fittings used for incandescent gas lighting. March 19.

5948. R. W. B. Creeke. Improvements in apparatu washing and cleansing gas from ammonia and impurities. March 21.

5980. A. F. Spooner.—From V. L. Longuemare A. Lechesne), France. Improvements in and relatin carburettors. March 21.

5996. J. H. Lancaster. Process of and apparatus fo generation of acetylene gas. March 21.

6180. A. Boake, Roberts and Co., Ltd., and R. Ste Method of treating fuel to render traces of arsenic i March 25.

6212. R. C. Wild. Improvements in connection solidified spirit to be used as fuel. March 25.

6260. G. Hartmann. A new or improved process fo manufacture of peat blocks. March 25.

6272. H. Koppers. Improvements in or relating to treatment of gas liquors. Complete Specification. Marc

6344. G. R. Bond, A. C. Buell, and C. D. Washl Improvements in acetylene gas generators. Com Specification. March 26.

6357. A. J. Boult.—From F. Chavenon, France. provements in or relating to gas generators. March 2

6364. S. Falk.—From E. Hildebrandt, Germany. provements in or connected with incandescent gas bur March 26.

6365. H. de Thiersant and W. A. Coulson. Imp ments in or connected with apparatus for gener acetylene gas. March 26.

6526. A. Bayer and G. Wallanschek. Improved pr for generating and producing illuminating gas. March

6569. J. W. Ward. Improvements in or relatin burners for incandescent gas lighting. March 29.

6613. W. T. Sugg. Improvements in burners for i descent gas lighting. March 29.

6650. W. Hooker. Improvements in or connected burners for incandescence gas lighting. March 29.

6698. W. Garrett and J. C. Cromwell. Improveme gas producers. Complete Specification. March 30.

6726. C. A. Allison.—From A. H. Bronson. U States. Process of manufacturing gas, and apparatu use in practising the same. Complete Specifica March 30.

6735. F. Sasse. Improvements in or relating to purifying apparatus. Complete Specification. March

6744. J. J. Rathbone. Improvements connected incandescent gas burners. March 30.

6860. C. G. Richardson Improvements in the a incandescent gas lighting. Complete Specification. A

6861. W. T. Lambourne and J. C. Wood. Improve in acetylene generators. April 2.

6904. H. D. Thiersant and W. A. Coulson. Imp ments in apparatus for generating acetylene gas. Ap

52. J. Janz. Improvements in apparatus for burning o incandescent light mantles. April 2.

00. A. MacCallum. An incandescent smokeless coal-fire. April 3.

47. C. E. Squier and H. S. Halford. An improvement relating to illuminated signs. April 3.

34. S. G. Watson. Improvements in generators for nanufacture of acetylene and other gases. Complete ification. April 6.

86 J. Sharpe and R. G. Code. Improvements in lene gas apparatus. Complete Specification. April 9.

61. G. F. Priestley. Improvements in incandescent ers and gas lighting. April 10.

Complete Specifications Accepted.

1900.

. E. W. Lancaster. Apparatus for purifying acetylene April 11.

6. O. Knöfler. Incandescence bodies or media for gas ig. March 27.

0. C. Wegener. Method and apparatus for the less combustion of fuel and production of heating gas rom. April 3.

3. P. Naef. Method of recovering products from April 11.

7. W. T. Purves and The Notkin Syndicate, Ltd. d of carburetting air or gas in varying proportions, paratus therefor. March 27.

. B. Cochrane. Manufacture of coke. March 27.

94. J. W. Robinson and R. Corsham. Means y the light in incandescent lamps may be improved. 3.

37. W. J. R. Sims and A. L. Davis. Processes for g and drying peat. April 11.

0. A. G. Brookes.—From The Incandescent Gas Company, United States. Apparatus for so-called scent gas lighting. March 27.

1901.

R. Beese. Self-igniting attachment for gas burners. 1.

F. W. C. Schniewind. Regenerative coke-ovens.

M. Martin. Apparatus for automatically generating e gas. April 17.

A. Laughlin. Gas producers. March 27.

A. Rudolph. Air-carburetting apparatuses. April

J. J. Hendler and E. K. Reeves. Apparatus for ng and burning acetylene and other gases. April 17.

A. J. Boult.—From Société Lumière, Boule, Burners for incandescent gas lighting. March 27.

I.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Application.

L. Gaster. Improvements in and connected with lation or utilisation of tar, pitch petroleum, and rocarbon mixtures, and the extraction of carbon or the manufacture of electrodes, calcium carbide, industrial products. March 30.

Complete Specification Accepted.

1900.

E. Wirt. Process for purifying anthracene and recovering the purifying agent. March 27.

OLOURING MATTERS AND DYESTUFFS.

Applications.

. D. Abel.—From Actiengesellschaft für Anilin-n, Germany. Manufacture of acid dyestuffs to the diphenylnapthylmethane series. March 18.

5811. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of new anthracene derivatives. March 19.

5880. O. Imray.—From Die Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of black sulphurised dyestuffs directly dyeing cotton. March 20.

6515. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of colouring matters containing sulphur. March 28.

6546. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of a new black colouring matter and of a material for use therein. March 28.

6643. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of mordant dyeing colouring matters. March 29.

6651. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of colouring matters belonging to the naphthacridine series. March 29.

6878. T. R. Shillito.—From J. R. Geigy and Co., Switzerland. Improvements in the manufacture of artificial indigo from a-isatineanilide. April 2.

7194. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture and production of colouring matters of the anthracene series. April 4.

7250. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Process for the manufacture of new azo components, and azo dyestuffs. April 6.

7398. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of new anthracene derivatives. April 10.

7541. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of dyestuffs of the anthracene series. April 12.

7560. A. Haagen. Improvements in the manufacture of colouring matters. Complete Specification. April 12.

7632. J. Y. Johnson.—From Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture and production of azo colouring matters and their after treatment on the fibre. April 13.

Complete Specifications Accepted.

1900.

7261. O. Imray.—From Die Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of a blue sulphurised dyestuff. March 27.

7333. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of a black colouring matter directly dyeing cotton. March 27.

7477. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation. Manufacture of a black colouring matter directly dyeing cotton. March 27.

8229. G. W. Johnson.—From Kalle and Co., Germany. Manufacture or production of substantive dyes or colouring matters. March 27.

8873. C. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of a brown dyestuff for cotton from 1 : 8-dinitronaphthalene. March 27.

9287. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of mixed diazo colouring matters from 1 : 5-napthylenediamine. April 3.

10,127. O. Imray. — From Die Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of substantive dyestuffs for cotton fast to alkali acid and light. April 3.

10,293. C. Rudolph. Manufacture of condensation products from para-amidophenol or its homologues and of colouring matters therefrom. April 3.

10,294. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of mordant-dyeing azo-colouring matters. April 3.

10,843. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of a sulphurised leucocompound. April 17.

11,040. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of salicylate of 4-dimethyl-amido-1-phenyl-2 : 3-dimethyl-5-pyrazolone. April 3.

11,348. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of a dyestuff for wool. April 11.

11,676. W. P. Thompson.—From E. Gfeller, Switzerland. Manufacture of toluol-sulfo-chlorides. April 11.

1901.

4507 O. Imray.—From The Basle Chemical Works, Switzerland. Manufacture of a new silver paranuclein. April 11.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Applications.

6129. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in preventing the weakening of dyed cotton fibre. March 27.

6543. R. Ziersch. Process and apparatus for producing on woven fabrics a gloss resembling that of silk velvet. March 28.

6644. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the treatment of raw silk and fabrics containing raw silk. March 29.

7480. H. H. Lake.—From K. Weldon, United States. Improvements relating to apparatus for use in the mercerisation of yarn. Complete Specification. April 11.

Complete Specifications Accepted.

1900.

8799. J. Duquesnoy. Artificial silk suitable for the production of thread. April 11.

8874. C. D. Abel.—From The Actiengesellschaft für Anilinfabrikation, Germany. Mordanting wool March 27.

17,464. H. H. Lake.—From W. C. Baxter, United States. Machines for de-linting cotton and like seed. April 3.

1901.

2283. R. Weiss. Apparatus for treating textile materials with circulating fluids. April 3.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, and BLEACHING.

Applications.

5655. F. T. Könitzer. Improvements in centrifugal machines for dyeing purposes. March 18.

5746. N. N. Shaw. Improvements in or connected with dye pans and other similar vessels. March 19.

6666. E. Hindley, S. Walker, and M. Rose. Improved cop-dyeing machine and extractor. March 30.

Complete Specifications Accepted.

1900.

3288. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Discharging of dyed textile fabrics. Jan 16.

5057. F. M. Spence, D. D. Spence, and A. Shearer. Manufacture of certain products used in mordanting and for other purposes. March 27.

7829. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Indigo vat dyeing. April 11.

8237. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Process for obtaining on the wool fibre blue to black, blue dyes fast to light from mono azo-dyestuffs and copper salts. March 27.

9722. J. Brandwood. Apparatus for bleaching, dyeing, and otherwise treating yarns in cop, cheese, bobbin, or other compact form. April 11.

20,136. J. T. Morgan and W. Menzies. Dyeing and mercerising machines. March 27.

23,668. P. Schirp. Apparatus for dyeing, washing, and bleaching textile materials. April 3.

VII.—ACIDS, ALKALIS, and SALTS.

Applications.

5606. W. Newton. A new system for the manufac of borax, nitrates, &c. March 18.

5661. G. J. Atkins. Improvements in the manufac of chlorine and in the treatment of metallic ores ther Complete Specification. March 18.

6057. D. Crispo and A. Mols. Improvements i manufacture of alkaline meta-silicate. March 22.

6226. E. C. Rossiter, H. W. Crowther, and (Albright. Improvements in the manufacture of cya of the alkalies. March 25.

6464. R W. James.—From G. Eberle, Germany. cess for the production of complex compounds of oxi chromium. March 27.

6704. W. Eschweiler and H. C. Woltereck. Proc producing ammonia and ammonium salts. March 30

6705. W. Eschweiler and H. C. Woltereck. Proc producing hydrocyanic acid and cyanides. March 3

6706. W. Eschweiler and H. C. Woltereck. Proc producing cyanides and ferrous cyanides. March 30.

6795 L. O. Helmers. Improvements relating production of sulphonic acids and their salts. April

6828. J. Y. Johnson.—From The Badische Anili Soda Fabrik, Germany. Improvements in the manuf and production of porous bodies suitable for use as c bodies in chemical operations. April 1.

6829. J. Y. Johnson.—From The Badische Anil Soda Fabrik, Germany. Improvements in the manuf of sulphuric acid. April 1.

6857. J. Swinburne and E. A. Ashcroft. Treatn fused chlorides. April 2.

7193. G. W. Johnson.—From The Verein Chen Fabriken in Mannheim, Germany. Improvements manufacture of hydrochloric acid gas and alkaline su April 4.

Complete Specifications Accepted.

1900.

9334. E. W. Lancaster. Method of protecting and other carbides from atmospheric moisture and ing the decomposition thereof. April 11.

10,196. J. Wetter.—From the firm of E. Haen, Ge Manufacture of chemically pure hydrochloric April 11.

10,317. A. Carey, O. Heslop, and The United Company, Ltd. Recovery of sulphur compounc waste gases. April 11.

17,031. The Actiengesellschaft für Zink - I vormals W. Grillo and M. Schroeder. Appar making sulphuric acid by catalysis. March 27.

1901.

2504. G. F. Jaubert. Manufacture of alkali dioxides. April 3.

3392. J. G. Behrens. Process for manuf chemically pure acetic acid. April 3.

3582. A. J. Rossi, J. MacNaughton, and W. D. E Process and method for producing concentrates c high percentages of titanic oxide. April 17.

VIII.—GLASS, POTTERY, and ENAME

Applications.

5733. The Bath Cabinet Makers' Compa "Faience-Intarsia." March 19.

6185. H. K. Barker. Improved method of d the surfaces of earthenware articles to represen March 25.

6338. P. Lambert. Improvements in glass March 26.

Complete Specifications Accepted.

1900.

5673. S. H. Ellis and T. Holt. Machines or for use in dipping ceramic ware, glassware, and into glaze or colour. April 3.

288. H. Watkin. Method of and means for indicating temperatures in pottery and similar kilns. April 11.

482. R. Zeiller. Furnace for use in the manufacture ress glass. March 27.

002. L. Koerfer. Glass bricks or blocks. April 3.

353. L. Ziegenbruch. *See* Class XIII.

0,017. W. Bettaney and W. F. Bettaney. Potters' ns and kilns. April 3.

),482. C. Junge.—From O. Hirsch, Germany. Manuure of moulds for glass. April 11.

3,818. W. Drake and B. W. Kemp. Apparatus for the ufacture of glass bottles and the like. April 3.

2,596. N. Meurer. Process for colouring glass yellow, brown, and black. April 11.

.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Applications.

15. E. C. Brice. Improvements in or in connection the manufacture or production of building bricks or ts, or other building material. Complete Specification. ch 19.

69. G. Bowers. Improvements in machinery for the facture of concrete slabs. March 23.

99. G. E. Clare. Improvements in combined metal concrete walls, floors, and roofs for buildings, and the March 25.

23. I Isserliss. Improvements relating to lime, cement, ike kilns. March 29.

)0. G. Butchard. Improvements in apparatus for the facture of cement. April 1.

31. S. Schougaard and J. Evans. An improved method king artificial stone. Complete Specification. April 4.

24. W. P. Thompson.—From H. P. Dodge, United . Improvements in or relating to the treatment of Complete Specification. April 9.

4. L. Schlentheim. Improvements in concrete and oorings. April 10.

Complete Specifications Accepted.

1900.

9. W. Wright. Setting for cements used for conive and other purposes, including Portland, Roman, ther cements, and concrete or mixtures in which ts for constructive or other purposes are used. 3.

8. H. Watkin. *See* Class VIII.

330. J. Tuckwell. Manufacture of imitation marble e like. April 17.

1901.

3. A. Mack. Gypsum, cement, and like slabs. 11.

X.—METALLURGY.

Applications.

1. G. J. Atkins. *See* Class VII.

. S. O. Cowper-Coles. Improvements in and relating ninium welding. March 18.

. D. McKechnie and The United Alkali Company, Improvements in the recovery of metallic copper pper precipitate. March 18.

. G. Hatton. Improvements in the manufacture of d steel. March 20.

. A. Reynolds. Improvements in the converter nt of metals and their compounds, and apparatus t purpose. Complete Specification. March 20.

. J. Soler. Improvements in the obtainment or ion of aluminium from ores, or materials containing rch 20.

. J. Pointon. Improvements in and connected with, nufacture of iron and steel and other metals. 21.

5995. E. Casper. Improvements relating to the smelting of ores and metals. March 21.

6090. R. A. Hadfield. Improvements in the manufacture of steel. March 22.

6237. J. B. de Alzugaray. Improvements in and connected with the manufacture of metallic alloys. March 25.

6322. Sir A. Hickman and W. Hutchinson. Improvements in the manufacture of steel and ingot iron. March 26.

6323. A. J. Lustig, L. Kahn, and I. Lehman. Improvements in apparatus for use in casting ingots. Complete Specification. March 26.

6330. A. J. Lustig, L. Kahn, and I. Lehman. Improvements relating to the casting of ingots. Complete Specification. March 26.

6375. F. S. Seagrave. Improvements in and relating to casting apparatus. Complete Specification. March 26.

6465. A. M Chance, jun., and H. W. Crowther. Improvements in the manufacture or recovery of zinc. March 27.

6519. A. S. Elmore. An improvement in separating mineral substances by the selective action of oil. March 28.

6655. W. H. Wheatley.—From Société Général des Aciers Fins, France. Improvements in the manufacture of steel. Complete Specification. March 29.

7021. H. C. Davis. Improved treatment of complex zinc iron ore. April 3.

7028. J. Swinburne and E. A. Ashcroft. Extraction of heavy metals. April 3.

7052. G. Gin. The manufacture of iron alloys from slags resulting from metallurgical operations. April 3.

7053. J. W. Swan Improvements in and apparatus for the extraction of zinc from ores, or materials containing zinc. April 3.

7084. D. Bates and G. W. Peard. Improvements in and connected with the annealing of metals. April 4.

7157. H. L. Sulman and H. F. Kirkpatrick-Picard. Improvements in or relating to the treatment of ore slimes. April 4.

7316. H. H. Lake.—From J. E. Hewitt and C. T. Coe, United States. A new or improved alloy and process for the production thereof. Complete Specification. April 9.

7568. V. Fattelay. Improvements in and relating to the manufacture of steel. April 12.

Complete Specifications Accepted.

1900.

3462. J. Armstrong. Treating zinc ores and apparatus therefor. Feb. 27.

6554. J. Essner and E. Laurans. Melting furnace. April 11.

6735. J. Y. Johnson.—From the Firm of W. C. Heräus, Germany. Uniting aluminium to aluminium or other metals. April 17.

8363. C. O. Harz and H. von Miller. Coating or overlaying with gold, silver, and other metals. April 17.

21,416. T. N. Muller. Manufacture of open-hearth steel. April 17.

22,777. O. Forsbach and E. Clerc. Crucible smelting furnace. March 27.

22,826. J. L. Stevenson. Direct continuous process for the manufacture of open-hearth steel. April 11.

22,827. J. L. Stevenson. Blast furnaces, and casting the metal therefrom. April 11.

22,828. J. L. Stevenson. Open-hearth tilting furnaces. April 11.

1901.

3009. E. M. Totten. Composition of matter for uniting or soldering aluminium parts. April 11.

4039. J. C. Clancy and L. W. Marsland. Process for the elimination of zinc from sulphide ores, and the extraction and recovery of lead, silver, gold, and other metals therefrom, and from other sulphide ores. April 3

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

Applications.

5764. L. Mond. Improvements in obtaining zinc by electrolysis and apparatus for that purpose. March 19.

6070. F. E. Elmore. (Partly by J. O. S. Elmore, India.) Improvements in apparatus for the generation and electrolytic application of electric currents. March 22.

6102. A. F. Harris. Improvements in anodes. March 23.

6164. E. Franke. Improvements in and relating to accumulator plates. March 23.

6352. B. M. Drake and J. M. Gorham. Improvements in electric accumulators. March 26.

6363. A. Carter. Improvements in eletric accumulators. March 26.

6454. E. J. Clark. A new or improved grid or electrode for retaining plumbic oxides in accumulators to prevent disintegration during charging and discharging. March 27.

6648. W. Longham.—From P. Barv, France. Improvements in the process of electrically pulverizing metals. March 29.

6723. T. Prescatore. Improvements in means for applying the active material to the plates of secondary batteries. March 30.

7270. E. Bailey. The production of white lead by the electric arc. April 9.

7397. A. Brochet and G. Ranson. A new or improved process for the electrolytic production of caustic alkalies. April 10.

7629. I. Celestre and F. Gondraud. Improvements in and relating to secondary batteries. Complete Specification. April 13.

Complete Specifications Accepted.

1900.

2783. J. Y. Johnson.—From The Deutsche Gold and Silver Scheide Anstalt vormals Roessler and Birger Carlson, Germany. Electrical arc furnaces. Feb. 13.

5569. W. P. Thompson.—From E. A. Sperry, United States. Electric storage batteries. April 3.

5751. E. A. Sperry. Storage batteries. April 3.

6244. L. David. Apparatus for manufacturing plates for secondary electric batteries. April 11.

6671. E. Franke. Machine for filling accumulator plates with active material. April 17.

6701. O. C. Strecker. Process of electrolytically preparing metals or alloys for lithographic purposes. April 17.

7768. E. W. Jungner. Negative accumulator electrode. March 27.

9563. C. D. Abel.—From La Société des Piles Electriques, France. Electrolysing process for zinc and other salts with soluble anodes. March 27.

10,375. J. Garassino. Construction of plates for accumulators or secondary batteries discharging heavy currents. April 17.

10,437. A. Mackenzie. Electrodes for batteries. April 17.

10,511. The Electrical Power Storage Company, Ltd., H. W. Butler, and J. H. May. Manufacture of negative or spongy lead plates or elements for secondary batteries or electrical accumulators. March 27.

11,571. H. Blumenberg, jun. Battery compounds. April 17.

19,686. G. de Roussy de Sales and F. Guengnon. Accumulators. April 17.

1901.

393. P. A. Newton.—From The National Electrolytic Company, United States. Electrolysis and apparatus therefor. April 3.

3313. W. P. Thompson.—From Société Mangano E trique pour la purification des eaux et des boissons, Frac Purifying beverages and liquids by means of mangan under influence of the electric current. April 11.

3370. J. Liddle.—From The Globe Electric Comp United States. Battery electrodes. March 27.

4509. H. J. H. Pickard and J. S. Evans. Composition paste for filling the cells of reticulated accumulator pla April 11.

XII.—FATS, OILS, AND SOAP.

Applications.

6509. C. Weygang. Improvements in the treatm of oils and fats for soap-making and other purpo March 28.

6521. Sir H. Wardlaw, Bart. Improvements in con tion with the manufacture of detergents. March 28.

6622. H. Delarne. Improvements relating to saponi tion of fats. March 29.

Complete Specifications Accepted.

1900.

2369. C. D. Abel.—From La Société dite De'ai Verviétois Peltzer et Cie., Belgium. Process and appa for extracting fatty matters from wool, sheep-skins, other textile fibres. April 17.

9796. J. S. Stewart-Wallace and W. B. Cowell. T ment of mineral or vegetable oils or the distillate residuals thereof. April 3.

10,899. E. Rocca. Method of and apparatus for refi animal and vegetable oils. March 27.

10,912. T. P. fu Riccardo. Manufacture of April 17.

1901.

1386. A. Kronstein. Oxidising wood oil and mix thereof. March 27.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, Etc.

Applications.

5873. W. J. Williams. Improvements in or relati to anti-fouling compositions. March 20.

6140. G. Mitchell. Improvements in the obtainin r manufacture of gutta-percha. March 23.

6959. C. Paulitschky, R. Paulitschky, and F. W Improvements in the manufacture of rubber substi April 2.

7159. A. O. Bourn. Improvements in the art of v nizing. Complete Specification. April 4.

7242. A. S. Ramage. Improvements in or relati the production of oils applicable for use in the manuf of paints and varnishes. Complete Specification. A

7258. E. Geoffroy. Improvements in the manuf of compositions for removing paints and the like. A

7625. J. Welter.—From the Elektrizitäts Aktien schaft vormals Schuckert and Co., Germany. Proc hardening colophony and other soft resins. Co Specification. April 13.

Complete Specifications Accepted.

1900.

8567. H. Hamet. Apparatus for vulcanising arti caoutchouc. April 11.

8993. G. L. Mohr. Process for the manufact lacquer or enamel for leather and similar material. A

9353. L. Ziegenbruch. Preparation of pigments, c ing matters, or "lustres" for or on porcelain, glass, e or the like. April 3.

1901.

2116. O. Imray.—From International Acheson Gr Company, United States. Process for manufac graphite. March 27.

IV.—TANNING, LEATHER, GLUE, AND SIZE.

APPLICATIONS.

746. W. R. Lake.—From A. J. Durand, France. Im vements relating to the treatment of leather to render aterproof. March 30.

815. R. W. James.—From W. A. Hall, United States. improved composition of casein glue. Complete Spe- ation. April 1.

46. A. J. Boult.—From Trenckmann and Co., Germany. roved manufacture of waterproof leather and articles from. April 6.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

50. W. T. Forbes. Method of treating hides and skins, pparatus connected therewith. April 3.

1901.

70. N. B. Powter. Process and apparatus for extract- il, grease, glue, and the like from waste products and substances. March 27.

XV.—MANURES, ETC.

APPLICATION.

2. A. Hartley. A new process of preparing a manure waste brewers' or other yeast. March 18.

COMPLETE SPECIFICATION ACCEPTED.

1900.

4 D. M. Nelson and G. R. Nelson. Fertiliser. 1.

XVI.—SUGAR, STARCH, AND GUM, ETC.

APPLICATIONS.

. A. Fielding. Improvements in or relating to the cture of viscose. March 19.

L. M. Lafontaine. Improvements in the treatment r, and apparatus therefor. April 1.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

H. Claassen. Process of obtaining sugar in crystals ups. April 3.

. R. Schrader. Process for making a molasses nd apparatus therefor. March 27.

. W. P. Thompson.—From J. H. Lavollay and Bourgoin, France. Purifying and decolourising e solutions. April 11.

II.—BREWING, WINES, SPIRITS, ETC.

APPLICATIONS.

J. Heaton. Improved sparger. March 19.

A. J. Oxford. Improved process for utilising larch 21.

. Birkett and J Thornton. An improvement in malt or the like. March 25.

. E. R. Newlands. Improvements in means to ed in connection with the drying or roasting or f malt, hops, hams, or other alimentary matters.

. Kirkaldy. *See* Class I.

. Briant. The Conversion Company (Billing's and Process), Ltd., and H. C. Rigaud. Im- s in the manufacture of beer. April 4.

OMPLETE SPECIFICATIONS ACCEPTED.

1900.

. House and E. W. Lancaster. Apparatus for ing and sterilising hops. March 27.

22,592. A. Müller. Process of dealcoholising fermented beverages and the like, and apparatus therefor. April 17.

1901.

735. J. Heaton. Sparger. April 11.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

APPLICATIONS.

A.—Foods.

6372. B. E. R. Newlands. *See* Class XVII.

6417. E. von Bühler and A. Bernstein. Improvements in the manufacture of butter and other alimentary fats. Complete Specification. March 27.

7236. F. C. Kullak. Improvement in the preservation of foods and in media therefor. Complete Specification. April 6.

7545. L. O. Ferson. Improved food products and processes of preparing the same. Complete Specification. Filed April 12. Date applied for Sept. 13, 1900, being date of application in United States.

7620. G. C. Marks.—From Force, Société Anonyme, France. A process for preserving butter and animal fats. Complete Specification. April 13.

B.—Sanitation; Water Purification.

6121. B. Teufer. Improvements in processes for eliminating iron from water and aqueous solutions. Complete Specification. March 23.

6217. F. Breyer. Improved process for softening water. March 25.

6931. I. Fischel. Improvements relating to the treatment of liquid waste products. Complete Specification. April 2.

7170. R. Scott and W. Paterson. Improvements in water softening and liquid purifying apparatus. April 4.

7388. P. D. Hahn and O. Lenz. An improved process for deodorising and clarifying sewage and effluents from breweries and technical establishments. Complete Specification. April 10.

C.—Disinfectants.

7418. A. Pallière. The manufacture and production of a new antiseptic and disinfecting compound. Filed 10th April. Date applied for, 12th Sept. 1900, being date of application in France.

COMPLETE SPECIFICATIONS ACCEPTED.

A.—Foods.

1900.

11,352. M. Trier and A. Wilkinson. Preserving hops and other organic substances. April 3.

12,231. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Process for rendering cows' and goats' milk digestible. April 17.

B.—Sanitation; Water Purification.

1900.

7240. E. G. Weddell. Purification of greasy water. April 17.

8224. T. I. Goldie. Structures for the bacterial treatment of sewage, and apparatus connected therewith. April 3.

XIX.—PAPER, PASTEBOARD, ETC.

APPLICATION.

6534. W. R. Lake.—From C. X. A. Berget, France. Improvements relating to the manufacture of paper pulp. Complete Specification. March 28.

COMPLETE SPECIFICATION ACCEPTED.

1900.

6831. M. Krause. Process for the production of purified and bleached peat fibre, for use in the manufacture of paper or paper pulp. April 17.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Applications.

6464. R. W. James.—From G. Eberle. *See* Class VII.

6537. R. Reitmeyer.—From J. Volmar, Germany. Improvements in and relating to the manufacture of saccharin. Complete Specification. March 28.

6626. J. Roger and M. K. Bamber. Improvements in producing a pure soluble extract of tea. March 29.

6771. O. Schütz and G. Dallmann. Process for producing quinate of urea. April 1.

6937. J. Heron. Improvements in the manufacture of a vegetable extract. April 2.

7471. W. M. Williams. Manufacture of a stimulating and sustaining vegetable extract. April 11.

Complete Specifications Accepted.

1900.

11,818. C. D. Abel.—From Bayerische Aktiengesellschaft für Chemische und landwirtschaftlichchemische Fabrikate, Germany. Manufacture of an improved fungicide. April 3.

1901.

3217. L. Weil. Obtaining saponine from horse chestnuts. April 17.

XXI.—PHOTOGRAPHY.

Applications.

6106. G. D. Reid and F. J. R. Macfayden. Improvements in photographs, and the mode of producing same. March 23.

6307. F. R. Vandyke. A process of direct photo zincography. Complete Specification. March 26.

XXII.—EXPLOSIVES, MATCHES, Etc.

Applications.

5967. W. C. Roberts-Austen, K.C.B. Improvemen in detonators. March 21.

6039. A. Luck. Improvements in the manufactu of nitrocellulose. March 22.

6159. W. Kirsanow. Improvements in blasting cartr March 23.

6513. Sir W. Crookes, Knight. Nitroexplosive or artillery. March 28.

7148. M. Bielefeldt. Improvements in detonati priming compositions for explosives. April 4.

7377. K. Maslenka. Improvements in matches. Ap

22,651a. A. W. Marshall. Improvements in fuse exploders. Filed March 22. Date claimed Dec. 12,

Complete Specification Accepted.

1901.

5231. J. V. Skogland. Manufacture of expl April 17.

XXIII.—GENERAL ANALYTICAL CHEMIST

Application.

7014. S. S. Bromhead.—From The Chemische Helfenberg Actiengesellschaft (formerly E. Diet Germany. A process for producing reagent pape is sensitive to several chemical substances at the sam Complete Specification. April 3.

PATENT UNCLASSIFIABLE.

Complete Specification Accepted.

1901.

2679. A. Kronstein. Process for rendering a proof against the action of moisture and of chemical March 27.

* * *

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industr

THE JOURNAL
OF THE
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Dr. Walter C. C. Pakes. "Chemical Aspects of Bacteriology."

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Note.—The names in *italics* are those of Members of Committee who retire at the end of the current session.

NOTICES.

Annual General Meeting.

Annual General Meeting will be held in Glasgow, on sday, July 24th, and following days. A programme ed with this number. Tickets of membership will be in time for the meeting.

ccordance with the provisions of Rule 18 of the ws, notice is hereby given that those Members whose are placed in *italics* in the list of Council will retire heir respective offices at the forthcoming Annual g.

Ivan Levinstein has been nominated to the office of nt; Mr. Jos. W. Swan, F.R.S., has been nominated President under Rule 11; and Mr. Robert Irvine, Messel, and Mr. J. M. C. Paton have been nominated esidents under Rule 8.

Hon. Treasurer and Hon. Foreign Secretary have minated for re-election to their respective offices.

bers are hereby invited to nominate fit and proper to fill four vacancies among the Ordinary Members cil. Forms for this purpose can be obtained, on ion, from the General Secretary, or from the Hon. cretary of the New York Section.

ct from Rule 18:—"No such nomination shall be less it be signed by at least ten Members of the who are not in arrear with their subscriptions, nor t be received by the General Secretary, at the Office, at least one month before the date of the General Meeting, to the election to take place at refers. Nor shall any such nomination be valid if n nominated be ineligible for election under Rules No member shall sign more than one nomination

Changes of Address.

notifying new addresses, members are requested to n distinctly, and state whether they are temporary nent. Multiplication of addresses is also to be as tending to create confusion. When sending ons, the use of the form attached to the application the verification of addresses, on which the safe f the Journal depends.

of communications read before the Society, or Local Sections, are requested to take notice that e 43 of the Bye-laws the Society has the right of publication for three months of all such papers. ent of this Bye-law renders papers liable to be y the Publication Committee, or ordered to be for the Journal, in which case no reprints can ed to the author.

cretary would be glad to receive offers from nd others who may have complete copies of Vol. , of the Society's Journal to dispose of.

Arsenic.

of the great public interest which has been the Arsenic Epidemic, it has been decided to in pamphlet form, uniform with the Journal, the ussions, and abstracts dealing with the detection ination of Arsenic and other associated elements, appeared in the Journal since the beginning of To these have been added extracts bearing on from other sources, including a description, from new book on Arsenic, of the Marsh test, in the wn words, and dated 1836. Copies, price 1*s*. e obtained from Messrs. Eyre and Spottiswoode.

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Davies, Leyshon, l/o Kames; 256, West George Street, Glasgow.
Dunn, W. H., jun., l/o Reckitt and Sons; 38, Peel Street, Hull.
Ede, H. E., l/o Sheffield; Cordite Works, Arklow, Ireland.
Ferguson, W. B., K.C.,; retain Journals until further notice.
Fisher, Henry, l/o East 70th Street; 57, East 83rd Street, New York City, U.S.A.

Goodchild, J. Herbert, l/o Brazil; Rosslyn, Haslemere Road, Crouch End, N.

Hale, Albert C., l/o Putnam Avenue; 352A, Hancock Street, Brooklyn, N.Y., U.S.A.

Hall, Jos., l/o Hammond; 414, Fifth Avenue, Cedar Rapids, Iowa, U.S.A.

Harrison, Prof. J. B.; Journals to Government Laboratory, Georgetown, Demerara.

Heckman, J. Conrad; Journals to c/o Larkin Soap Manufacturing Co., Seneca Street, Buffalo, N.Y., U.S.A.

Holgate, Thos.; Rockleigh, Savile Park, Halifax, *not* Dewsbury.

Huntington, Dr. Harwood, l/o East 50th Street; University Club, 54th Street, New York City, U.S.A.

Lett, Stephen J., l/o Rhodesia; retain Journals until further notice.

Lewis, A. F., l/o Mulgrave Street; 56, Thomas Lane, Knotty Ash, Liverpool.

Linton, J. H., l/o Ensley; c/o Fraser and Chalmers, North 12th Street and Washtenaw Avenue, Chicago, Ills., U.S.A.

Luck, Alf., l/o Tunbridge Wells; Luck's Explosives, Ltd., Stowmarket, Suffolk.

Moody, Herbert, l/o New York City; 111, Bellingham Street, Chelsea, Mass., U.S.A.

Morgan, J. J., l/o Wednesbury; 23, New William Street, Blaenavon, Mon.

Nelson, E. K., l/o Grand Boulevard; 4311, Ellis Avenue, Chicago, Ills., U.S.A.

Parker, C. H., l/o Tettenhall; Craigside, Clark Street, Wolverhampton.

Rees, Dr. Chas. L., l/o Newark; c/o New Jersey Zinc Co. (of Penna.), Palmerton, Carbon Co., Pa., U.S.A.

Reuter, Dr. L. H., l/o Brussels; 434, East 87th Street, New York City, U.S.A.

Roller, H. C., l/o Roselle; Ampère Electrochemical Co., Niagara Falls, N.Y., U.S.A.

Scrutton, W. J.; Journals to Elkhart Mine, Chloride, Mohair Co., Arizona, U.S.A.

Smith, Dr. E. Ellsworth, l/o East 29th Street; 262, Fifth Avenue, New York City, U.S.A.

Smith, Francis P., l/o Los Angeles; 124, Sansome Street, San Francisco, Cal., U.S.A.

Stephens, M. E.; Journals to 57–60, Aldersgate Street, London, E.C.

Thomsen, A. L., l/o South Holliday Street; 612, Continental Trust Building, Baltimore, Md., U.S.A.

Thomson, Jno., l/o Stalybridge; Overlee, Alexandria, N.B.

Turney, F. N., l/o Nottingham; 76, Rue Wilson, Brussels.

Van Gelder, A. P., l/o Rustic; c/o American Forcite Powder Manufacturing Co., Landing, N.J., U.S.A., Assistant Superintendent.

Waterhouse, Robt., l/o Manchester; c/o W. A. Bishop and Co., Ltd., Dial Mills, Warrington.

Watson, H. A., l/o Cavendish Road; Ashwood, North Hill Road, Headingley, Leeds.

White, B. Newport, l/o Marple; Alnwick, Prestwich Park, Manchester.

Wilson, A. Poole, l/o Royal Arms Hotel; 2, James Street, Omagh, Co. Tyrone, Ireland.

Wilson, Gordon, l/o Calle de Gante; 1A, Independencia, No. 36, Mexico, D.F.

Yates, Arthur, l/o Johannesburg; Lebong Donok, Bencoelen, Sumatra, Netherlands Indies.

CHANGES OF ADDRESS REQUIRED.

Frick, O. O'Donnell, l/o Briton Ferry, South Wales.

Margetson, J. Charles; l/o Struan, Wexford Road, Wandsworth, S.W.

Deaths.

Green, Mr. Alderman Samuel, 28, St. Swithin's Lane, London, E.C.

Johnstoun-Coombes, Dr. W., Pilmuir, Falmouth.

Mewburn, J. C., 55–56, Chancery Lane, London, W.C. April 25.

Rothwell, R. P., "Engineering and Mining Journal," New York; and 20, Bucklersbury, London, E.C. April 17.

Liverpool Section.

Meeting held on Wednesday, April 24th, 190

THE PRESIDENT (MR. JOS. W. SWAN, F.R.S.) IN THE

THE TRANSPORT OF CHEMICALS.

BY MAX MUSPRATT.

In the chemical industries, while scientific manufa
of course a principal factor in successfully competi
foreign rivals, good patent laws, efficient technical
ment, intelligent labour, commercial efficiency and
gence, convenient internal communication, fa
conditions of export, all contribute materially to
although the more general factors of sound money,
tranquillity, and the commercially necessary but u
condition of peace are of as great importance to the
as to other industries.

While scientific manufacture has always enga
attention of this Society, and the improvement of t
law is associated with the Manchester Section, the
subject which has not recently received the attenti
it merits, namely, that of the transport of chemical

In the case of the staple heavy chemicals tho b
the railway companies has been fought and larg
while with the larger shipping companies much
done; but it is well known that the recent develop
the chemical industry consist largely in the manuf
sale of a large number of products, none of them
great importance, but in the aggregate forming an
total both in quantity and value.

Of these a considerable number from their na
certain difficulties of transport, either from the
package used, their actual danger, their potential
their possible action on other goods in case of bre
leakage.

As manufacturers cannot immediately hold out
of a large tonnage in these articles the railway
view them with disfavour and suspicion, have not
to distinguish between real and imaginary danger
any regard to the limits of possible danger. T
insisted, and rightly insisted, on special regula
these regulations are frequently arbitrary and indi
ing, and even where the regulations are rigidly
with the classification, and therefore the ch
prohibitive to a degree.

Though many of the grievances are too much
of detail to be treated within the limits of this p
main classes stand out for special discussion.

Size of Consignment.—The classes A to C
goods most of which pass over the railways in la
ties. For the purposes of this section of the pap
necessary to consider these in detail, except to n
rational principle of more favourable rates for
signments than for small is accepted. In the cla
however, this principle is abandoned: the rate is
basis of 3-cwt. parcels, and for all articles which
within the favoured classes A to C, whether
5 tons, are sent at a time, the rate chargeable i
It is true that for lots of 1 ton and upwards, if
senders, that part of the charge which represents
for handling at the sending station should be re
often in practice it is difficult to enforce even t
provision.

This state of affairs is distinctly an injustice a
to the manufacturers. An injustice in that the
consignment the less is the expense to the railwa
and, in addition, that the conveyance of goods
shipped in sufficient quantity to form waggon lo
profitable to the railway company than that in
3-cwt. parcels. A handicap to the manufac
the following considerations: a customer comm
a small order, and expects a reduction in price
it a large one, which cannot be done unless

permit it, or the manufacturer has started by over-ging, which is scarcely a sound method of opening up). England being an island with many ports, our petitors ship large consignments to the leading towns a, aided by through rates, and competition on the part e home manufacturers is difficult, if not impossible.

examples, too, of the arbitrary working of this rule, ollowing instances of English classification, confined e sodium salts, is instructive :—

dium acetate, Class 1.
dium bicarbonate, Class C. or 2, according to package.
dium bichromate, Class 1 or 3, according to package.
dium carbonate, Class C.
lium hypochlorite, Class C., 2 or 3, according to ge.
lium manganate, Class C.
lium prussiate, Class 2.
dium cyanide, Class 3, 4 or 5, according to package.

us, wagon loads of acetate of soda may be charged same rate as a single cask ; 2 tons of bicarbonate in must be charged at a lower rate than 3 cwt., but if d in boxes no reduction on the larger quantity need ade; manganate in 2-ton lots is favoured, prussiate cyanide are not; hypochlorite in an impracticable ge is favoured, in the package actually used is not.

o the justification of this classification I am not going, far as the disability under immediate discussion is rned, the anomalies are patent.

is interesting to note that both Germany and the d States adopt the principle of reduced rates for large ities, as explained in the summary of the various fications appended. In Germany there is an uniform or small packages, discrimination applying only to n loads. Instances of the United States method of ng are: acid in carboys, small parcels Class 1, -loads Class 5; calcium carbide, small parcels 3, wagon-loads Class 5. What these differences of mean can be seen from the table of rates.

ngerous and so-called dangerous Goods.—It is under ead that the chief grievances of the chemical manu-er are to be found. Bodies which are liable to fall is category are those which are, actually or po-ly, explosive, inflammable, corrosive, poisonous or ciating. The usual practice with such goods is to insist stringent conditions, classification in high classes or ition of special rates, and owners' risk conditions.

ct conditions are not only legitimate, but imperative; e charging of high rates, though plausible on the e, on examination resolves itself in many cases into lackmail.

ny of the so-called dangerous articles can be so l that the danger is reduced to the vanishing point. for instance, calcium carbide. The conditions for re "sealed tins in cases of $\frac{5}{8}$ in. wood, bound with ron, or air-tight drums." In either of these packages nger is extremely remote. That the conditions should idly enforced, and possibly an increased terminal for supervision made, is reasonable, but once the have been loaded up they are no more trouble to the y company than, say, caustic soda. This article is, er, in Class 3, involving almost double the rate on soda (Class C.), losing all concessions for large s, and in practice making it almost impossible for a acturer to compete with continental makers, except immediate neighbourhood. Whether calcium carbide ltimately be as important an article of commerce as ly predicted remains to be seen, but at present English acturers are seriously handicapped in taking part development. An interesting letter on this point red recently in the Chemical Trade Journal.

e again inflammable liquids, such as acetone, benzol, a, petroleum, &c. If these are packed in iron drums nger is infinitely small. Some slight additional care terminals, such as the affixing of special labels, and unloading only by daylight, storing in the open d the goods are absolutely harmless.

these articles Class 3 rates and conditions apply acked in drums, Class 5 in hermetically-sealed tins les packed in sawdust.

A third class of goods, called dangerous, consists of chemicals carried in glass packages. There is no question that there are certain inconveniences about such goods; the handling is more awkward and the terminal charges attached to high-classed goods are justifiable, though sufficient; but once loaded the only point in which these goods differ from others is the liability to breakage. As these goods are almost invariably carried at owners' risk, the only matter affecting the railway company is the possible damage to the rolling stock; this will vary with the product carried, but in no case can it be very large if the wagon is even superficially cleaned after a breakage. Examples of this class are sulphuric, hydrochloric, and acetic acid, bleaching liquor, &c.

The two former are such important bodies that for large quantities exceptional terms have been obtained for them, but on the less common acetic acid the pressure of the rate is enormous. It is placed in Class 5 with the extreme rates shown on the table, and carried only at owners' risk, hence the railway companies incur no disadvantage to justify these high rates, as the possible damage to wagons is practically nil with such an acid.

An idea of the enormous handicap to English manufacturers will be given by the fact that it costs from 20*s.*—25*s.* per ton to put acetic acid f.o.b. Liverpool from Widnes, of which the railway companies share is from 18*s.*—22*s.* The German manufacturers would put on board at Hamburg for a maximum of 7*s.* 6*d.* per ton. The various examples given above have come under my personal notice, but I believe they can be reduplicated many times over from the personal experience of others.

A word must be said about "owners' risk." That this should apply to the dangerous character of the goods is reasonable, but the fact that goods may be inflammable, corrosive, &c., is no reason why the railway companies should relieve themselves of all ordinary responsibility, but the following is an extract from the rules governing the carriage of such articles: "The railway company are not responsible for any loss or damage, nor for any discrepancy in delivery, as to either quantity, number, or weight, nor for the condition, nor for overcarriage, detention, or delay, except upon proof of gross neglect or fraud on the part of the Company's servants." This limiting clause is valueless, unless a detective were sent with every truck. Accordingly, once out of sight, all such goods are at the mercy of any careless or dishonest servant of the company. It is true that the companies do not take deliberate advantage of this iniquitous clause, but there is no question that it is an incentive to carelessness, a convenient shelter against any charges of neglect or rough handling, and a standing danger to the manufacturer. A humorous incident will exemplify the danger of the rule: a claim was received for a suit of clothes, doctor's bill, lost time, &c., for a railway servant damaged by hypochlorite of soda; we were on the point of paying the amount, about 5*l.*, when, in the course of a lengthy correspondence with the railway superintendent, we elicited the details of the injury, from which it was clear that the damage could only have arisen through the man trying to drink the hypochlorite, which was packed in a whisky jar. We called the attention of the superintendent to this, and the correspondence ceased.

Gross Weights.—In classifying goods the proportion between gross and net weight seems to have been largely ignored, and this often becomes a serious matter in the more highly rated classes. The absence of this consideration of gross weight is clear in the case of bicarbonate of soda; this product, if packed in bags, will weigh for the net ton about 1 ton 1 qr., if packed in boxes, about 25 cwts. Yet in the first case it is in Class C, in the second Class 2. That is, the shipper who sends 1 ton of bicarbonate a distance of 20 miles pays in the first case 4*s.*, in the second 8*s.*, or an increase of 100 per cent. on the carriage for only 25 per cent. rise in the weight. It is, however, in the higher classes that this is so important; for instance, a liquid which must be carried in glass may be packed in carboys, carboys in crates, or demijohns in crates, from acetic acid the gross weights on the net ton being 24, 27, and 28 cwt. respectively. Already in carboys alone the prohibition rate is on 20 per cent. more than the weight of the so-called dangerous substance, while in the latter where the danger of breakage is very much reduced (and it is only in this danger that these goods are different to others from the companies' point of view), the sender has to pay the fancy rates on 35—40 per cent. more weight than that of the so-called dangerous substance. In other words he is fined for trying to meet the railway companies' objections by having timber which is on its own account carried in Class C. charged at the rate of Class 5.

In the case of products carried in jars the gross weight is approximately double the net weight, but, if the liquid is so-called dangerous, in spite of the greater safety of the package the exorbitant rate is charged on the total weight.

The foregoing are some of the leading points in which the railway companies have failed to meet the necessities of the development of the chemical industry. It may be contended that these criticisms are theoretic; to this I reply that on the three articles I have specially dealt with, I speak from personal experience, and a low estimate of Germany's trade in these articles alone is half a million sterling per annum. That the grievances are not merely academic the instance given will prove; that they are a serious handicap to the development of many branches of the chemical industry in this country is patent; that it is time for this Society to smartly take up this matter will, it is to be hoped, be realised.

The broader question of the rates themselves as compared with those of Germany and the United States, as shown by the tables, is common to all branches of business, and here the duty of the Society is to co-operate with and support the action of other industrial bodies in striving after remedy or finding other means of transport.

I must gratefully acknowledge the assistance given me in obtaining details as to the classification and rates of the three countries to Mr. O. M. Edwards, the Commercial Intelligence Bureau of the Board of Trade, and Mr. Murray of New York.

Export.—The transport of chemicals over sea is of even greater difficulty to deal with than railway carriage. The railways are monopolies over which the community has a certain, if slight and difficult to invoke, control. In the case of shipping companies, not only is this shadowy control absent, but each company is a law unto itself, and what one considers, if not meat, at any rate a harmless table adjunct, another considers the rankest poison. In addition, any possible danger is of much more vital importance on board ship, where the safety of the ship and danger of damage to other cargo has to be taken into account. Still, after making the greatest allowance for legitimate precaution and prudence, there remains a not inconsiderable hampering of the chemical industry through indifference, want of system, and want of knowledge.

As instances of this may be mentioned the refusal to carry caustic potash because it is highly inflammable; the carrying of acetic acid from Hamburg to Manchester in carboys, but the refusal to carry from Manchester to Hamburg, except in jars packed in whitening; and the refusal to carry hypochlorite of soda liquor, because it is explosive.

In these days of Imperial fervour, too, it is discouraging to find that in many cases there are far cheaper rates of freight from Hamburg or Antwerp than from Liverpool or London to British colonies.

Instances of this may be given:—Of a certain raw material produced in North America, the whole Canadian production, amounting to several thousand tons, goes to Germany, because the freights are from 20—40 per cent. lower than those to Liverpool, while only the United States' product can be bought for Liverpool.

In exporting, both conditions and rates often make competition impossible, one amongst many instances being a rate of 50*s.*, and conditions representing 12*l.* 16*s.* per ton for packages, in face of a rate of 37*s.* 6*d.*, and conditions representing 4*l.* 6*s.* per ton from Antwerp to a far Eastern port.

What has been said about weight and "owners' risk" on the railways applies with even greater force to export business where calculation of freight is based on me ment, by which the normal 36 cb. ft. of product, i packed, is converted into 150—250 cb. ft. gross, th differences of freight as instanced above are multipl four, five, or six.

The chance of competing on such terms is son remote.

As to "owners' risk" it is a common joke among s and even some shipowners, that goods carried on terms go overboard on the first opportunity, and alt it is a mistake to take a joke too seriously, exp amply proves that there is considerable point to th for everyone but the shipper.

The absolute want of uniformity in conditions is great hindrance to the opening up of new business. of three lines running to different parts in the United two will carry a certain product, the third will not, a American merchant, who wishes delivery at the points as convenient, passes the order to the more syst Germans. Some of the books of reference used by sh companies are open to severe criticism, as being antiquated or amateur compilations of undigested m one indeed resembling the nightmare of an overcr candidate for an examination in elementary science.

Can order and system be evolved out of the chaos? It is incumbent upon this section, locate great seaport, to attempt the work of inducing the sh companies to come into line with the most progres home and abroad.

The work is necessarily of considerable delicacy, a sub-committee has decided to make no definite mendations until the General Council of the Societ taken the whole question of transport of chemica consideration.

English Classification and Rates.

All goods are divided into eight classes:—

Class A applies to 4-ton consignments in t trucks.

Class B applies to 4-ton consignments in con trucks.

Class C applies to 2-ton consignments.

Classes 1—5 applies to 3-cwt. consignments.

Goods classified under A drop to B in 2-ton lots.
" " A " 1 in 3-cwt. lots.
" " B " C in 2-ton lots.
" " B " 1 in 3-cwt. lots.
" " C " 1 in 3-cwt. lots.

Other things being equal, the question of value mines the class, but exceptional bulk difficulty or in transport also leads to adverse classification.

The subjoined list of rates gives the maximum chargeable, fixed by Act of Parliament. Consi remissions of these are frequently allowed, but f articles, or those which do not offer a large tr business, the maximum rates are usually charged.

The maximum rate is composed of (1) terminal c (2) conveyance charges. When goods are loa private sidings, the terminal charge should be ent partially omitted at the end in question.

The subjoined table gives the maximum rate for distances, the column T representing the amount, should be subtracted if no handling of the goods ha done by the railway company at either end. In there is always a small terminal charge, even in th to cover shunting, &c., cost.

Class.	T.	20 Miles.	100 Miles.
		Per Ton.	Per Ton.
	s. *d.*	*s.* *d.*	*s.* *d.*
A	0 6	2 1	6 4
B	1 0	3 1	9 0
C	2 0	5 10	14 5
1	3 0	7 11	18 3
2	3 0	9 4	22 4
3	3 0	10 6	25 6
4	3 0	12 2	30 6
5	3 0	14 2	37 0

ie rates on some of the railways are higher than rs. The foregoing table represents those applying to ɔup of the largest systems, and are also, on the whole, owest.

German Classification and Rates.

rdinary Goods Train and Express Goods Train.

ɪdinary.—Small parcels (under a waggon load).

uss B.—All goods not specially favoured in big ;on loads.

uss A 1.—All goods not specially favoured in small on loads.

ecial Class I. } Specially favoured goods, according to
„ *II.* } schedule, in large waggon loads.
„ *III.* } Most chemicals are in these classes.

iss A 2.—Goods of Special Class I. and II. in small on loads. Goods of Special Class III. in small on loads are carried at the rate of Special Class II.

ɪpress.—Small parcels, special rates. Waggon loads e those by ordinary goods train.

cial rates are also given, particularly for export .

Class.	20 Miles.	100 Miles.	200 Miles.
	Per Ton. *s.* *d.*	Per Ton. *s.* *d.*	Per Ton. *s.* *d.*
parcels	5 0	19 3	34 1
1.............	3 6	13 3	24 4
....	3 1	11 3	21 3
2..............	2 4	9 6	17 9
....	2 1	8 8	16 3
....	1 10	7 0	12 11
I..............	1 6	4 11	8 5

United States Classification and Rates.

e are six classes of normal rates, with the usual terms in exceptional circumstances.

;oods are classified in one class for small parcels, in favourable class for waggon loads.

ass.	20 Miles.	100 Miles.	200 Miles.
	s. *d.*	*s.* *d.*	*s.* *d.*
1	8 4	20 6	31 8
2	8 4	16 9	27 0
3	6 6	14 0	20 11
4	5 7	11 2	17 0
5	5 0	9 10	14 0
6	4 8	8 10	11 2
nodity approxitely.	2 6	6 0	8 0

Discussion.

ustace Carey thought that the anomalies which in connection with the carriage of chemicals might e of time be overcome by bringing well-considered fore the railway and shipping companies. His own ice was, that when cases were fairly made out, the companies usually gave way after a time, as they o in the case of many of the anomalies which had ntioned. But the companies paid little attention to als, and unless there was a considerable traffic, the es took a long time to come to any satisfactory . He welcomed the suggestion made by the author roved by the sectional committee, that the council ociety of Chemical Industry should be asked to e various anomalies before the railway and shipping es. He hoped that the section would adopt the n on the subject of which notice had been given, the council would give it their careful consideration. ouncil would take up the matter thoroughly, the hich they had in view would be achieved very much idly than in any other way.

. **Wade Deacon** agreed that some authoritative s wanted which could from time to time meet the companies and explain to them the non-dangerous character of articles which they believed to be dangerous. They all knew that railway companies had chemists of their own, and they no doubt followed the advice of these chemists in the classification of the articles which they called dangerous. It would be a good thing for the chemical trade if the railway companies would agree to meet representatives of the council of the Society of Chemical Industry and consider whatever they might have to put before them. In regard to a comparison of the railway rates in the various countries, there was one point to be borne in mind, and that was the enormous amount of capital sunk in England in the construction of railways as compared with those of America and the Continent. The standing charges on the English railways must accordingly be always greater than on those of the Continent and America.

Mr. **George E. Davis** gave instances in which the sum paid to the railway companies for carriage was altogether out of proportion to the value of the materials carried, and argued that the rates charged on chemical substances were much in excess of what they should be. Another serious matter was the difficulty of getting the railway companies to quote through-rates in anything like a reasonable time. A case came under his notice only a few weeks ago where some material was wanted in Scotland from the Midlands. The railway company was approached for a through rate, but four weeks elapsed without its being quoted, and so the material was eventually sent on without the sellers having the slightest idea of what amount they would be charged. Of course it would be easy to reckon out the maximum charges capable of being imposed on the sellers by the railway companies, if the mileage were known, but unfortunately the route was not always known to the sender. It was true that the companies were bound to give this information when it was asked for, but by the time the sender had received his reply (generally weeks after the inquiry) all necessity for the question itself had long since passed away. As to the carriage of dangerous goods and, in fact, the transport of chemicals generally, he had given his ideas on the subject in the Chemical Trade Journal as early as 1889, where a classification of chemicals for transport purposes would be found. When the sender of dangerous goods did his best to make the companies' work easy and as free as possible from risk, it was rather galling to him to find himself charged more than if he had sent them in a less careful manner, but a case of this kind had come under his notice. Vitriol travelling in a tank waggon was charged more than if the article had been sent in carboys and when the purchasers, who had to pay the carriage, remonstrated with the company, they could get no redress and found it better to go on paying an unjust and illegal rate rather than incur the expense, annoyance, and loss of time and business in appealing to the Board of Trade. Seeing that the mere haulage of a train load of goods did not cost more than five-hundredths of a penny per ton mile hour, he for one would much like to know what became of the difference between this sum and the price that chemical manufacturers as a rule paid for the transport of chemicals.

Mr. **A. Carey** thought that under the existing conditions of the railway system of the country it was not very probable they would get any material reductions in the rates of transport for heavy chemicals. The Society, however, could do a great deal of good by taking up special cases in which particular goods were hampered by really unjust restrictions, or cases in which foreign competition threatened to kill an industry in this country. He thought that a comparatively disinterested body, such as a strong committee of the Society of Chemical Industry would be, would have a great deal more influence in tackling the railway companies than the individual manufacturer. One could not be surprised at the railway companies inclining to the opinion of their own experts rather than to the opinion of an interested stranger who wished to send goods with which the companies were not well acquainted. With regard to the particular cases in which the cheap foreign through rates threatened to damage the manufacture of any particular article—especially by preventing the article from being sold against foreign competition in the neighbourhood of the ports into which the foreign countries were importing their materials—he thought that strong representations to the railway companies showing the effect of the handicapping of the home industries would have considerable effect. Very often the railway companies forgot, when they were carrying what were considered dangerous articles, that their interest in the manufacture was very much more than the actual freight on these finished articles. As a rule the raw material from which any finished article was made weighed considerably more than the finished article itself, and the railway companies, if they lost the freight on the finished article, would also lose the freight on the raw material. Strong representations on these lines would, he thought, have considerable effect, and perhaps lead to the obtaining of special rates for particular localities where foreign competition was likely to be specially severe. There was another point, which had not been mentioned that evening, and which he hoped the committee of the Society would be able to take up. That was the improvement of our antiquated and neglected inland water communications. This country was most deplorably behind the Continental countries in its inland water ways. The total length of our canal system—including canals of all classes, down to the smallest waterway—was something like three thousand miles. How much of that was really derelict he did not know, but over one-third of it was in the hands of the railway companies, who presumably had bought up these canals for the purpose of causing goods to be carried by their railways instead of by water. He trusted that the committee of the Society which was to be appointed to deal with rates of transport would also devote its attention, to some extent, to an agitation in favour of an improvement of the inland water communication of England.

Mr. Thomas H. Barker, Secretary to the Liverpool Chamber of Commerce, said that if the Society of Chemical Industry would embody the recommendations agreed upon in a memorial, and lay it before the railway companies or the chambers of commerce, he was sure the case would receive great attention. The attitude of the railway companies probably arose through ignorance of details, and would be modified when the matter was properly explained to them. If the Society of Chemical Industry could not induce them to make reasonable concessions, then a deputation representing the chemical industries, and backed by the Chambers of Commerce, might wait upon the President of the Board of Trade, and he had no doubt the Board of Trade, in virtue of the powers given them under the Railway and Canal Traffic Act, 1888, would assist in endeavouring to bring about a better state of things. In regard to the matter of inland waterways, he was one of a deputation last December to the new President of the Board of Trade, Mr. Gerald Balfour, on the subject, when it was proposed that a Royal Commission should be appointed to inquire into the question of the waterways of the Kingdom. On that occasion the President of the Board of Trade stated that if traders had any recommendations to make with reference to the waterways in any particular part of the country, it would be well to formulate them, and he would have the matter looked into. So far as the Liverpool Chamber of Commerce was concerned, it had great sympathy with any body of traders or manufacturers who suffered from excessive transport rates, and he was satisfied the Chamber would be glad to assist in any movement calculated to stimulate the trade of the country.

Mr. F. C. Tipler said he was the chemist to one of the railway companies, and in that capacity it was his duty to advise his company with regard to the carriage of chemicals. He assured the meeting that the companies' chemists were in full sympathy with the traders, and endeavoured, in formulating the conditions of package or carriage, not to hamper the trade needlessly. If he understood Mr. Muspratt aright, the question of rates was the chief complaint; but with that the chemists had nothing to do, as they had simply to say whether certain articles were dangerous or not, and if dangerous, the conditions under which they should be carried.

The President said he doubted whether any question of greater importance than the one so ably brought before them by Mr. Muspratt had ever occupied the attention of any section of the Society of Chemical Industry. It was a question of national importance, in which the public as as the manufacturers were concerned. They had Mr. Muspratt's paper, and also in the discussion, am evidence of the need for serious reform in the rates conditions of the transport of chemicals. There was doubt something in what Mr. Deacon had said regard the great cost of constructing British railways as comp with other countries, who had profited by our experie But the unavoidable disadvantage arising from that e was aggravated by the unnecessary and vexatious rest tions, and excessively high rates imposed on the trans of particular chemicals reputedly dangerous, and t restrictions and rates were often the result of errone ideas as to the nature and degree of the risk, and indifference with which the question of actual risk commonly treated. The effect was a most serious hindr to commerce, and the time had come when the influen the Society of Chemical Industry might most properly usefully be brought to bear, to obtain a rectification of abuses which existed, and which operated not only to great disadvantage of the manufacturers and the rai companies, but also of the public. The question had brought before the council of the Society on the pre day, in a circular addressed to the council by the Liver Section, and he might say that the initiative taken by Liverpool Section was heartily welcomed. It was mediately recognised by the council that this was a in which the influence of the Society ought rightly to itself felt. In Germany a society similar to their performed the function which it was suggested our So should perform in this country. In all cases where tions arose as to the regulations affecting the carria reputedly dangerous chemicals, the Society of Che Industry of Germany was the recognised authority fo settlement of such questions, and was appealed to what restrictions should be imposed, and their advic treated with the greatest respect. He was very gla subject of canal transport had been mentioned. It app to him that we did not make full use of the opportu we had in this direction, and that these opportunitie in a large degree lost by the railway companies b control of many of those inland waterways. The Pre then formally moved the adoption by the section following resolution, which had been passed by the committee on the Transport of Chemicals: "That th "of opinion that certain modifications as to rates an "ditions of carrying are desirable and reasonable "interest of chemical industries; and, in order to giv "to this view of the sub-committee, it is proposed th "Liverpool Section of the Society of Chemical In "request the council of the Society to appoint a Com "to inquire into the whole question of the Trans "Chemicals, with the object of bringing such press "bear upon the railway companies and other authori "may be deemed desirable." The resolution was a unanimously.

In connection with the foregoing discussion,

Mr. A. L. Jones (Messrs. Elder, Dempster, an Liverpool) wrote as follows: The transport of ch is a most important matter to us as carriers. I thin scheme should be drawn up by an authority sayin particular chemical is harmless and which is not. not experts in chemicals. Therefore I think we som decline articles that might be carried safely.

Mr. Chas. Bingham (London) wrote as follows a great interest in the subject, not only because large quantities of chemical products, both on the C and here, but also because, as consulting goods to one of the Dutch railways, I know that on the C generally the rates for the carriage of chemicals lower than in this country, and that every ende made to facilitate the carriage of such goods, espec export. As an instance I may mention my chief calcium carbide. The rates from our works, near to Havre, Antwerp, Genoa, and Rotterdam, are fron to 2*l*. 3*s*. per ton, the average distance being over 5 from Thames Haven to Birmingham, distance a miles, I pay 1*l*. 19*s*. 8*d*.

r. E. Shrapnell Smith, Hon. Secretary of the Liver- Self propelled Traffic Association, wrote, inviting the tion of the Society to the possible application of self- elled road vehicles to the carriage of many classes of s within a radius of delivery not exceeding 40 miles. pointed out that a load of four tons could be carried ailes in one day at a cost, inclusive of wages, fuel, est, depreciation, repairs, and stores, of 1*l.* 7*s.* 6*d.*, and a lorry capable of dealing with this weight had a plat- area of about 75 sq. ft. The platform could be loaded ay reasonable height, so that, for instance, carboys t be carried in tiers, if a proper superstructure were d.

London Section.

Meeting held at Burlington House, on Monday, May 6th, 1901.

MR. OTTO HEHNER IN THE CHAIR.

TION OF CAUSTIC POTASH AND SODA ON STANNOUS SULPHIDE.

BY F. MOLLWO PERKIN, PH D.

ny books on qualitative analysis it is recommended to y potassium or sodium hydrate instead of ammonium ide for separating the sulphides of the arsenic from of the copper group. Caustic alkalis certainly have dvantage over ammonium sulphide, on acidifying to ipitate the sulphides, sulphur is not thrown down; as with yellow ammonium sulphide the large quantity phur which is precipitated, if not actually a source of is at any rate inconvenient. The following abnor- es with regard to stannous sulphide which I have d while testing some of the methods recommended for ting the metals of the arsenic group may be of st.

en employing a stannous salt I repeatedly found a lty in dissolving the sulphide in caustic alkali. On casion, out of six precipitates of sulphide, only one ved in caustic soda; on another occasion four ens dissolved readily and two did not. Again, when g with the mixed sulphides of tin (stannous) antimony rsenic, the sulphides of antimony and arsenic always ed with ease, whereas stannous sulphide was often d upon. As I have generally employed ammonium de in analysis, this behaviour of stannous sulphide ot previously been brought to my notice, neither is it ned in any of the text-books which I have consulted; it is generally stated that the sulphide is readily in sodium hydrate with production of sodium anite and sodium stannite, thus :—

$$\mathrm{nS} + 4\mathrm{NaOH} = \mathrm{Na_2SnS_2} + \mathrm{Na_2SnO_2} + 2\mathrm{H_2O}.$$

peculiarity of the case is, that sometimes the sulphide es with the greatest of ease, when probably the n represented by the above equation does take place; r times apparently the stannous sulphide is quite d upon. It appeared to me that very likely the manner ch the sulphide was precipitated might account for abnormalities. In order to test this, sulphuretted en was passed into boiling weakly acid solutions of us sulphide, and the resulting precipitates were care- ashed with hot water. Out of four seemingly parallel nents in only one case was the precipitated stannous le soluble in caustic soda. In another set of three ents the precipitate dissolved quite readily each Experiments were then made with hot strongly acid ns, when practically similar results were obtained. was there any marked difference when sulphuretted en was passed into cold solutions, nor when a ed aqueous solution of sulphuretted hydrogen was ed. I next endeavoured to see whether the strength caustic soda solution was the cause of these ncordant results. It seemed, however, to make little or no difference whether a dilute solution of sodium hydrate or a moderately concentrated one was employed. But on continued boiling with concentrated solutions of caustic soda, specimens of stannous sulphide, which at first seemed insoluble, appeared partially to dissolve, and after a time metallic tin separated out. In Dammer's *Handbuch der Anorganischen Chemie*, it is stated that when stannous sulphide is suspended in caustic potash, a balanced reaction takes place, which may be expressed thus:—

$$2\mathrm{KOH} + \mathrm{SnS} \rightleftharpoons \mathrm{K_2S} + \mathrm{Sn(OH)_2};$$

but that a concentrated solution of caustic alkali decomposes the sulphide with production of metallic tin, a similar result being also obtained when concentrated solutions of potassium sulphide are employed. It is further stated that in presence of air, a dilute solution of potassium sulphide will gradually dissolve stannous sulphide.

It is a well-known fact colourless ammonia sulphide has practically no action on stannous sulphide, but it appears to be generally the impression, according to text books, that it is readily soluble in caustic potash or soda, with production of an alkaline stannite and thiostannite. Now, although this reaction probably does at times take place, it cannot, as I have already pointed out, be depended upon. And no method of separation can be considered satisfactory which is liable at any time, and apparently without reason, to be a failure. If one were dealing with a mixture containing only metals of the arsenic group (Sn, Sb, As) the fact of stannous sulphide not being dissolved by the action of caustic alkali would be of very little importance; this very insolubility indeed would point to the presence of tin in the mixture under examination, when, however, the problem of separating tin from the metals of the copper group arises, the fact becomes very important.

Probably the solubility or insolubility of the precipitated stannous sulphide is due to the state of aggregation in which the sulphide is thrown down; because the strength of the solution of caustic alkali seems to have very little effect upon the solubility, except that when the caustic soda is very concentrated and boiling, there is a tendency for metallic tin to be deposited. This seems to point to partial solution taking place in accordance with the equation already given, and to a subsequent reaction between two molecules of the stannite with production of one molecule of stannate, and separation of metallic tin, thus:—

$$2\mathrm{K_2SnO_2} + \mathrm{H_2O} = \mathrm{K_2SnO_3} + 2\mathrm{KOH} + \mathrm{Sn}.$$

Indeed, on two occasions when stannous sulphide had readily dissolved in caustic soda and the solutions had been allowed to stand overnight, metallic tin was found to have separated out. This is known to happen when concentrated solutions of stannous hydrate in caustic alkalis are boiled.

It might perhaps be mentioned that when the stannous sulphide failed to dissolve in caustic alkali, the addition of a little peroxide of hydrogen or of sodium caused it to go into solution at once, although at times, after standing, small quantities of a white flocculent precipitate separated out, which had the appearance of stannic hydrate. One would, however, hardly expect stannic hydrate to remain undissolved in a strongly alkaline solution.

Stannic sulphide and the sulphides of antimony and arsenic always dissolve readily in caustic alkalis and are reprecipitated on acidifying with hydrochloric acid, thus:—

$$\mathrm{K_3SbS_3} + \mathrm{KSbO_2} + 4\mathrm{HCl} = \mathrm{Sb_2S_3} + 4\mathrm{KCl} + 2\mathrm{H_2O}.$$
$$\mathrm{K_3AsS_3} + \mathrm{K_3AsO_3} + 6\mathrm{HCl} = \mathrm{As_2S_3} + 6\mathrm{KCl} + 3\mathrm{H_2O}.$$

From these equations it would appear that the whole of the antimony or arsenic present is reprecipitated as sulphide. It will often be noticed, however, that an odour of sulphuretted hydrogen is produced upon acidifying. Now, one would suppose that, if any of the sulphur escapes as sulphuretted hydrogen, the whole of the metal could not be reprecipitated as sulphide, but that some of it must remain in the acidified solution. In order to see whether this was the case or not, I dissolved the thoroughly well-washed sulphides in caustic soda and reprecipitated the sulphides by acidifying with *dilute* hydrochloric acid—in which the sulphides are insoluble. After allowing to stand a few minutes, the sulphides were filtered off and sulphuretted hydrogen was passed into the solution; a precipitate of sulphide varying in quantity was always produced. When arsenic sulphide was dissolved in ammonium bicarbonate, similar results were obtained. If ammonium sulphide is employed, the whole of the sulphide is invaribly precipitated, this being of course due to the liberation, on acid being added, of sulphuretted hydrogen from the thio-acids and from excess of ammonium sulphide which has been employed, *e.g.*:—

$$(NH_4)_3SbS_3 + 3HCl = 3NH_4Cl + [H_3SbS_3]$$
$$2H_3SbS_3 = Sb_2S_3 + 3H_2S$$

In cases where there is no possibility of a stannous salt being present, caustic alkali of moderate strength is certainly the more satisfactory solvent for the sulphides of the arsenic group, but if it is employed, sulphuretted hydrogen should be added before filtering, after reprecipitating the sulphides by hydrochloric acid. If this is not attended to, complete precipitation does not take place, so that a very small quantity of one of the metals of this group present with a large quantity of another may very probably escape detection. For general analysis yellow ammonium sulphide is, I think, to be recommended; copper sulphide is certainly slightly soluble in an excess of ammonium sulphide, but if the solution is diluted with water after the mixed sulphides have been boiled with the ammonium sulphide, practically the whole of the copper sulphide remains undissolved.

Discussion.

Mr. E. Grant Hooper was somewhat surprised that the author had not referred to what was known as Clark's process for the separation of these sulphides. From a considerable experience of that process, he could recommend it generally. Two or three papers on the subject had been published in the Society's Journal and another in the Journal of the Chemical Society, but the process did not appear to be as well known as it deserved to be. For the separation of the tin, arsenic and antimony members of the second group, the use of sodium sulphide was undoubtedly to be recommended rather than caustic potash or soda, and the subsequent separation of the arsenic, antimony and tin by Clark's process was readily carried out.

The Chairman said that the meeting ought to feel grateful to Dr. Perkin for calling attention to a fact that might lead to serious errors in working a common analytical separation. He himself always used sodium or ammonium sulphide, no the hydroxide, a good orthodox method, and he could see no adequate reason for substituting caustic alkali, which led to the troubles described by the author. More important was the fact that from a solution of arsenic sulphide in ammonium carbonate the whole of the arsenic was not reprecipitated by acid unless an addition of sulphuretted hydrogen were made. With regard to Mr. Hooper's remarks, Clark's method was very admirable in quantitative analysis, but it was hardly a students' process to be recommended for qualitative separations.

Dr. G. T. Morgan inquired whether the author had made any experiments to ascertain whether precipitated stannous sulphide became less soluble in caustic soda after exposure to the atmosphere. Both the hydrated sulphides of tin underwent dehydration and became less soluble in yellow ammonium sulphide, the change being apparent in the case of the yellow hydrated stannic sulphide owing to its conversion into the brownish black compound H_2SnS_3. The fact that stannous sulphide behaved like a heterogeneous substance towards caustic soda was paralleled by F. W. Schmidt's observation (Berichte, 1894, 2739) that stannic sulphide dissolved to the extent of 10 per cent. in ammonium hydrogen carbonate, a white oxysulphide being precipitated on acidifying the solution. The correlation of these facts rendered Dr. Perkin's paper all the more interesting.

Dr. F. M. Perkin, in reply, said that it was more to prove the value of the different methods that he had experimented on the use of caustic soda; and the result of careful examination had been to discover the peculiarities to which he had referred. He knew Clark's process well, and, with regard to the oxalic acid part, usually recommended it for the separation of antimony and tin; but as for distillati it was rather too long for students. With reference Dr. Morgan's remarks, he had not noticed any differe in the solubility of stannous chloride after standing 24 hours in presence of caustic soda. But he had not us it in the moist condition, and therefore could not speak to that.

THE RELATIVE LEATHER-FORMING VALUE THE DIFFERENT TANNING MATERIALS, THEIR SPEED OF TANNING AND WEIGHT-GIVING, WITH NOTES ON THE QUALITY.

(*Leather Sellers' Company's Research. From the Lon Leather Industries Research Laboratory, Herold's Institute, S.E.*)

BY JOHN YOUL AND R. W. GRIFFITH.*

(READ BY DR. J. GORDON PARKER.)

This research was undertaken at the instance Mr. C. E. Parker, who, in conjunction with the Worshi Company of Leathersellers, Col. S. B. Bevington, and Technical Education Board, provided the necessary fu for the carrying out of the work and the salary of research assistants.

The lines on which we set ourselves to work, in orde find which material produced the best leather for diffe purposes, and the speed of tannin, had necessarily to checked over throughout the whole process by chem analysis. Therefore, the first part of the work had to done on laboratory lines, in order to find out whether modern method of tannin analysis with hide-powder on lines laid down by the International Association of Lea Trades Chemists was correct, whether it could be re upon as giving the tanning value of an extract or tan material, and whether the results obtained in an anal of a sample of tanning material was borne out in practi

By the ordinary hide-powder method of analysi solution of tannin, or a solution of the material t analysed, is taken, of a strength not much excee three-tenths of a per cent. of tannin. Obviously, as some 100 c.c. of the liquor are used in the detann process, and 7 grms. of hide-powder, there is a very l excess of hide-powder used, far more than sufficie absorb every trace of tannin or leather-forming mat Therefore it was resolved to test the accuracy of process by using on a given weight of hide-powder a excess of tanning liquor of known strength, ascertaini weight of leather so produced, determining by Kjeld method the proportion of nitrogen present in the resu leather, and then calculating from the weight of hide-po used the weight of leather which should have been prod and also determining by analysis what amount of so matter had been absorbed from the liquor, to see wh these results coincided. If they agreed with any degr accuracy, it was claimed that this should be a perfec absolute proof that the hide-powder method of analysis present used constituted an accurate method of ana and gave to the tanner the absolute value of an ex or tanning material.

Another point which it was hoped to elucidate, which had not previously been investigated, was wh the soluble non-tannin matters of a tanning materi extract played any important part in leather formi and, further, to determine what amount of tannin w combined with the hide or hide-powder that it could washed out; and, on the other hand, how much tanni merely physically attracted and mechanically deposite the surfaces of the fibre and in the cavities.

This preliminary work was carried out, firstly, us solution containing two per cent. of tannin matters four per cent., and then ten per cent.; firstly carried o hide-powder, and secondly on coarse hide raspings. practical working was carried on as follows:—

250 c.c. of tan liquor was taken, of such strength it contained exactly four per cent. of tannin matter,

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* The first two years' work of the research was done by M Youl, the third year's work by Mr. R. W. Griffith, and the checked and tabulated by Dr. J. Gordon Parker.

lass cylinder, of a capacity of two litres, was placed 10 ıs. of hide-powder; to this was added 250 c.c. of water. glass cylinder was fixed in a churn, and churned for hour until the hide-powder had become thoroughly lled. Then at intervals of half an hour, with regular ement, 50 c c. of the stock liquor was added until all liquor had been added. The churn was then rotated for rther hour; thus, at the end of three hours the total age was complete. It was ascertained that this was cient. Other experiments were carried out for six rs, but gave the same result. It will be seen, therefore, 250 c.c. of a four per cent. solution plus 250 c.c. of r make 500 cubic centimetres of a two per cent. tion of tannin on 10 grms. of hide-powder.

e whole was now removed from the cylinder, put on to ge filter funnel plugged with glass wool. and allowed ip for 12 hours, and well pressed down. The mass ather was then weighed, a portion taken for the mination of moisture, and calculated on the dry ht. A portion of the leather so formed was taken washed through a funnel with a litre of distilled , the remaining leather again weighed after dripping, the moisture determined. We thus get the actual ıt of dry leather produced, and, secondly, the actual nt of leather after washing, or, in other words, the at of tannin combined permanently with the hide- er.

filtrate from the first dripping was analysed, and ıcted from the original strength of the liquor, gave e amount absorbed by the hide-powder, and the ngs give the amount washed out. These calculated s will be seen from the following Table A, coincide nely closely.

leather before and after washing was then examined jeldahl's method, and from the results obtained the ty of tannin absorbed was calculated from the original of hide-powder.

ıparing these three results side by side in Table A, on per cent. solution, it will be noticed that the figures le with a degree of accuracy which critics of the owder method of analysis could never have expected.

TABLE A.

per Cent. Solutions and 10 *grms. Hide-powder.*

Material.	Total. Weight got by Analysis.	Weight got by N. estimation.	Actual Weight.	Gain of Weight.
	Grms.	Grms.	Grms.	Per Cent.
l extract................	21·6	21·5	21·7	141
t „ (undecolorised)	20·7	20·9	20·9	132
„ (decolorised)...	20·2	20·0	20·1	123
ho „	26·0	26·0	25·9	187
„ (crude)	22·2	22·1	22·1	145
„ (decolorised)..	23·2	22·7	23·2	157

Material.	After Washing. Weight got by Analysis.	Weight got by N. estimation.	Actual Weight.	Loss by Washing.
	Grms.	Grms.	Grms.	Per Cent.
extract	15·9	16·2	15·8	27
„ (undecolorised)	16·8	17·3	17·3	20
„ (decolorised)..	15·8	15·5	15·2	22
o „	20·2	19·4	19·7	24
„ (crude)	17·8	17·7	18·0	19
„ (decolorised)..	17·7	17·9	18·2	22

ilar series of experiments was carried out on lines, but using a four per cent. solution, and ten per cent. solution. Comparing these tables, a similar correspondence is noticed between the actual weight, the Kjeldahl results, and the loss in strength shown by analysis.

TABLE B.

4 *per Cent. Solutions.*

Material.	Total. Weight by Analysis.	Weight by N estimation.	Actual Weight.	Gain of Weight.
	Grms.	Grms.	Grms.	Per Cent.
Valonia........................	23·8	24·5	24·5	181
Myrobalans.....................	20·3	20·5	20·5	135
Oak bark.......	26·3	26·7	26·7	207
Mimosa..........................	21·6	21·3	21·3	145
Quebracho wood................	23·1	23·1	23·2	166
Canaigre root..................	28·6	33·1	33·5	274

Material.	After Washing. Weight by Analysis.	Weight by N estimation.	Actual Weight.	Loss of Weight by Washing.
	Grms.	Grms.	Grms.	Per Cent.
Valonia........................	15·9	16·4	16·4	33
Myrobalans.....................	14·9	15·0	15·1	26
Oak bark	19·0	19·0	19·0	29
Mimosa	15·2	14·9	14·5	32
Quebracho wood................	17·5	17·8	17·8	24
Canaigre root	18·6	19·9	20·3	39

10 *per Cent. Solutions.*

Material.	Total. Weight by Analysis.	Weight by N estimation.	Actual Weight.	Gain of Weight.
	Grms.	Grms.	Grms.	Per Cent.
Oakwood extract	30·3	29·8	30·8	242
Chestnut extract (undecolorised)	28·6	28·8	30·2	235
„ „ (decolorised) ..	28·0	28·5	29·6	229
Quebracho „	40·7	40·9	40·9	354
Hemlock „ (crude)	31·8	31·6	34·3	270
„ „ (decolorised) ..	34·3	34·8	34·9	313

Material.	After Washing. Weight by Analysis.	Weight by N estimation.	Actual Weight.	Loss of Weight by Washing.
	Grms.	Grms.	Grms.	Per Cent.
Oakwood extract	17·8	17·9	18·8	39
Chestnut „ (undecolorised)	17·7	17·7	18·3	39
„ „ (decolorised) .	16·9	17·3	17·3	40
Quebracho „	27·1	27·3	27·2	33
Hemlock „ (crude).......	22·9	22·4	23·4	31
„ „ (decolorised) .	19·9	19·7	19·9	58

To make the work still more accurate, a second series was carried out on a somewhat larger scale. In this case hide chips or raspings were taken in slightly larger quantity, and a larger volume of water. In this case 15 grms. of hide raspings were taken and treated with a litre of four per cent. solution of 12 different tanning materials. The whole procedure was carried out identically with the former that is to say, the shavings were swelled with water, and gradually in successive quantities the tan liquor was added. As the pieces of leather were coarser, longer time was given, and the weight obtained, the amount of tannin uncombin and the amount combined were ascertained exactly same as above. The following table shows the results.

TABLE C.—HIDE SHAVINGS.

4 per Cent. Solutions.

Material.	Total Weight.			After Washing.		
	By Analysis.	Actual Weight.	Gain in Weight.	Analysis.	Actual Weight.	Loss Washi
						Per C
Valonia	33·8	35·8	190	24·0	24·2	32·
Myrobalans	29·1	28·3	126	20·7	20·1	29·
Oak bark	51·0	51·8	322	30·2	30·2	41·
Mimosa	40·8	40·4	223	27·6	27·0	33·
Quebracho wood	40·0	40·8	226	17·9	17·2	57·
" extract	40·9	41·4	227	29·6	29·8	28·
Canaigre root	37·8	38·2	205	31·1	31·2	19·
Chestnut extract (decolorised)	32·0	32·3	164	25·4	25·6	27·
Oakwood " (decolorised)	39·9	39·8	223	27·8	27·2	31·
" " (crude)	41·1	40·8	231	28·4	28·7	29·
Hemlock " (decolorised)	44·0	43·8	251	20·9	20·6	55·
" " (crude)	42·0	42·5	245	30·4	30·5	28·

On comparing the analysis of the liquor before and after, it was found that the non-tannin matters certainly do play an important part in tanning, and in some form or another they enter into combination to form leather. But in several cases it was noticed that the amount of insoluble matter frequently increased during the process of tanning. To find out the cause of this opened up another line of research, which was carried out as follows :—

A quantity of strong valonia liquor was freshly prepared during the summer months from good Smyrna valonia, and

Analyses from the Cask.

Valonia.	Freshly prepared Liquor.	56 days after.	91 days after.	132 days after.	153 days after.	191 days after.
Tanning substances.	14·64	11·97	11·40	10·76	10·98	10·80
Non-tanning matter.	6·60	6·64	6·72	6·88	6·70	6·80
Insoluble matter	0·64	2·81	3·08	3·84	4·34	4·52
Water	78·12	78·58	78·20	78·52	77·98	77·88
	100·00	100·00	100·00	100·00	100·00	100·00
Percentage of loss in tanning strength		18·24	23·13	26·64	25·00	26·25

Analyses from Laboratory Sample.

Valonia.	Freshly prepared Liquor.	56 days after.	91 days after.	132 days after.	153 days after.
Tanning substances	14·64	13·16	12·74	12·22	12·04
Non-tanning matter	6·60	6·56	6·12	6·46	6·36
Insoluble matter	0·64	1·78	1·76	2·28	2·38
Water	78·12	78·50	78·88	79·04	79·22
	100·00	100·00	100·00	100·00	100·00
Percentage of loss in tanning strength		10·11	12·98	16·53	17·75

Further Analysis of Laboratory Sample 6. Exposed for 14 days after standing five months.

Tanning substances	12·34
Non-tanning matter	6·34
Insoluble matter	2·58
Water	78·74
	100·00

analysed. The specific gravity of the liquor was A sample of this liquor was taken from the cask and into a bottle, which was kept in the laboratory, ti corked, in a warm place, but away from the light. bulk of the liquor was kept in the cask, covered layer of oil about one quarter of an inch thick to pr evaporation. Every few days the liquor was well plu so that the air should have free access, the cask being in a cool place. No mould or decomposition showed during the experiment. From time to time fresh an were made from both cask and bottle, the last being in mid-winter. The laboratory sample, after standi five months, was placed outside for 14 days in th light and cold. The tables in previous column sh analytical results obtained.

As will be seen from the last table, the exposure to cold and air for 14 days of the laboratory sample after standing for five months does not seem to have appreciable effect upon it. This sample, however, sh loss of 17·75 per cent. of tannin strength after i months' standing, and even this loss, considerable th is, does not equal the loss of tannin strength in th after standing for less than two months. The loss case of the cask liquor would seem to have attai maximum after about 19 weeks' exposure.

Myrobalans.	Freshly prepared Liquor.	11 days after.	53 days after.
Tanning substances	14·66	12·66	11·96
Non-tanning matter	5·98	7·44	7·58
Insoluble matter	1·52	2·06	2·81
Water	77·84	77·84	77·65
	100·00	100·00	100·00
Percentage of loss in tanning strength		13·64	18·42

Myrobalans.	129 days after.	150 days after.
Tanning substances	11·30	11·22
Non-tanning matter	7·46	7·46
Insoluble matter	3·24	3·44
Water	78·00	77·88
	100·00	100·00
Percentage of loss in tanning strength	22·92	23·46

A similar set of experiments was carried ou myrobalans liquor, freshly prepared, which showe lensity of 1·096. Precisely the same precautions were :en with the myrobalans liquor. The results are expressed tabular form in the second column of preceding page.

Again here is shown a very great loss of tannin strength, ough the loss is not so great as with valonia, and the ximum quantity does not appear to be deposited until it stood for about three weeks. It is, however, of interest note the rapid increase of non-tannin matters after ading only 11 days, an increase of 24 per cent.

Mimosa bark was then tried in similar manner with a shly prepared liquor at a density of 1·058. It will be iced that this liquor behaves quite differently from the ers. Its total loss of tannin strength after standing nine nths was slightly less than two per cent.

Mimesa Bark.	Freshly prepared Liquor.	118 days after.	254 days after.
ning substances..........	11·16	11·14	10·94
-tanning matter..............	4·92	4·80	4·58
luble matter..................	0·10	0·12	0·56
ter..............................	83·82	83·94	83·92
	100·00	100·00	100·00
entage of loss in tanning strength.......		0·179	1·97

he analyses given in the above tables were each done uplicate, the same hide-powder being used throughout, being kept in a well-stoppered bottle.

he three materials selected are characteristic of their s; the myrobalans being one of the commonest materials he pyrogallol series of tanning materials, the mimosa esenting the catechol tannins, and valonia, like oak t, possesses the characteristics of both these classes of ing materials.

he insoluble matter deposited from these liquors was d, as was expected, to be ellagic acid, otherwise known bloom" in tanning. To the leather manufacturer this extremely important matter, as hitherto in practical es it has been more generally supposed that the bloom, llagic acid, was formed by the decomposition or splitting of the non-tannin matters, and not at the expense of the in substances. The above results show, however, that whole of the decomposition is at the expense of the in matters only, which explains why a liquor after ding either on the goods in the tan pit or in a pit without er becomes mellow and less astringent; and also ains why, when a pack of tanned butts are put into a ly-made strong liquor of valonia, and allowed to stay his for a month, the butts on being finished have not ased to any practical extent in weight, but if the r be analysed before and after, it will be found that it ost about 10 per cent. of its tanning strength. Hitherto ers generally have been under the impression that a deal of tannin was lost either by fermentation or by means, but the above results show that the tannin is lost, except in the sense that it is decomposed into ble ellagic acid, which deposits itself in and on the er and in the liquors.

nother important practical inference to be drawn from bove results is that as a fresh tanning liquor rapidly sits bloom, the liquor should be leached as rapidly as ble and used fresh upon the older goods in the layers. probably not advisable for the purposes of sole er tanning to pump layer liquors back upon the leaches used over and over again, as by this means the bloom, is a weight giving substance, is filtered out in the es, and the liquor on returning to the goods does not ss the same weight-giving powers as if it were a ly-extracted liquor. For this reason, as well as the s, it is better to work layer liquors out through the rd, instead of returning them to the leaches.

the above work was carried out in duplicate, and in cases in triplicate. Each analysis, both tanning and jeldahl's method, was done in duplicate on duplicate es, and entailed over a year's work.

We claim that we have succeeded in proving, within the ordinary experimental error, that the hide-powder method as now used is an accurate representation of the leather-forming quality of a tanning material; that the excess of tannin used makes no practical difference upon the results, with the exception, of course, of producing greater weight; but throughout the work the results are proportionate. It is, however, freely conceded that the matter reported by leather trades' chemists as soluble non tannin matters may largely add to the weight of leather by being held in the interstices of the hide fibre, but these do not actually combine with the fibre, and can be washed out. Therefore, a larger percentage of these soluble non-tannins will, as a rule, add to the value of any tanning material by the formation of organic acids, which plump and swell the hide, and so facilitate the deposition of more tannin within the fibres of the leather.

Practical Part.

With a view of ascertaining what relation the results obtained in the laboratory bore to results actually obtained in working on a practical scale, a series of experiments was entered upon with this object.

For the purposes of the experiments, 24 hide butts, all in a uniform condition from the lime pits, and as far as possible similar in character, uniform in size, weight, and thickness, were procured. They were placed in a solution, technically called "borophenol" (prepared by dissolving 2 per cent. boric acid and ½ per cent. phenol), with a view of removing the lime from the surface of the hides, preparatory to being placed in the "suspender liquors."

In practice, this treatment with a deliming agent is becoming more general. Until recently, the liquors referred to were relied upon as being of sufficient acidity to neutralise the lime, but the practice of using borophenol or other deliming agent is to be recommended. The hides were scudded and well washed after this treatment.

The hides for our purpose were specially selected, well-grown, all as nearly equal in weight and quality as possible, and arrived in our yard in what is known as the limed condition. Each hide had been cut, or, as it is called, "rounded," *i.e.*, the heads and belly removed; and the butts as they arrived were exactly 6 feet long by 4 feet broad. Each butt was cut into six pieces, 24 inches square, and no two pieces from the same back or hide went into the same pit; so that each pit contained a "pack" of 12 small butts, each piece representing a different hide.

Before placing the "butts" in a decoction of tannin known as a "suspender liquor," each butt, as has been stated, was cut into six pieces, making a total of 144 pieces of hide butt, each measuring 24 inches by 24 inches. As 12 different tanning materials were concerned, it was necessary to have 12 distinct pits corresponding to the tanning materials, and the process of tanning was carried out to the end in each pit.

Working on the large scale in the tanyard, the leather in process of tanning is generally moved forward from pit to pit into liquors of greater strength. In the above case, owing to lack of space, it was found more convenient to continually strengthen the liquors in the same pits.

The strength of each of the suspender liquors was made the same throughout, *i.e.*, 0·25 per cent. of tannin, as determined by the hide-powder filter method. This without regard to the barkometer strength. The liquors were uniformly strengthened at the same time. After three days in the suspender liquors the liquors were strengthened by the addition of ⅛ per cent. of tannin; after a further two days the strength was increased by ¼ per cent. of tannin. The liquors were strengthened at intervals of three to four days by ¼ per cent. tannin up to the 34th day in "suspenders," when the goods were taken off the poles upon which they were suspended, and the "handler" stage commenced.

An analysis of the suspender liquors, as shown in the following table, will no doubt be interesting as bearing upon the condition of these liquors; but owing to their being decomposed to an extent, forming acids, &c., it is impossible to take the evidence of their analysis as the exact measure of the abserption of tannin matters by the hide.

	Barkometer.	Tanning Substances.	Non-tannin Matters.	Insoluble.	Water.
		Per Cent.	Per Cent.	Per Cent.	Per Cent.
Valonia	12½	1·48	1·12	0·48	96·92
Myrobalans	12½	1·82	1·30	0·32	[illegible]
Oak bark	9	1·17	0·89	0·26	97·68
Mimosa	5	1·13	0·37	0·08	98·42
Quebracho wood	4	1·02	0·40	0·06	98·52
„ extract	4	1·01	0·35	0·16	98·48
Canaigre	11	1·22	1·46	0·21	97·11
Chestnut extract	9	1·36	0·74	0·22	97·68
Oakwood „	12½	1·56	1·26	0·26	96·92
„ „	13	1·70	1·38	0·24	96·68
Hemlock	9	1·32	1·12	0·11	97·42
„ extract	9	1·15	1·21	0·14	97·50

The amount of tanning which the suspender liquors perform is to strike through the hides, the main feature being the colouring of the goods evenly by suspension, fixation of the pelt, and swelling of the hide. A reference to Table 4 will show the extent to which leather is formed up to the 34th day.

As the result of the breaking up of the tannin and non-tannin matters, a certain amount of acid is generated, and the amount of acidity produced differs according to the tanning material used. This acidity consists of a mixture of acetic, propionic, and lactic acids, and is extremely important, the swelling of the leather in the early stages being largely dependent upon this.

On the completion of the "suspender" stage in the process each of the twelve tannin liquors had their respective acidities estimated by titrating 10 c.c. of the liquor with standard lime water by Procter's method. The following are the results obtained :—

TABLE 1.

10 c.c. *Liquor.*

Material.	Lime Water.	Expressed as grms. of Acetic Acid per litre.
	C.c.	Grm.
Valonia	3·8	1·14
Myrobalans	14·4	4·32
Oak bark	4·0	1·2
Mimosa	1·7	0·51
Quebracho wood	2·3	0·69
„ extract	1·9	0·57
Canaigre root	2·3	0·69
Decolorised chestnut extract	2·4	0·72
„ oakwood „	3·8	1·14
Undecolorised „ „	3·9	1·17
Hemlock fluid essence	3·8	1·14
„ extract	7·5	2·25

The temperature of the suspender liquors was 20° C.

For the "handler" stage the goods were laid flat one upon another in the pits, and the tanning liquors considerably freshened, and to each pit was added sufficient fresh liquor to raise the strength ½ per cent. of actual tannin matter. The liquors were systematically strengthened every five to six days with ½ per cent. tannin matter on volume. Upon every addition of fresh tannin liquor a corresponding amount of the old liquor was taken out. In this stage, as the name implies, the goods were "handled" frequently by drawing them out of the pit, allowing them to drain on the edge for a short time, then returning them to the liquor. In practice, the hides are moved into the next pit, there being a series of pits used in this stage. The length of time employed in this "handler" stage was 40 days. The temperature of the liquors had gone down to 17° C., owing to colder weather.

The following table shows the character of the liquors a the end of the "handler" stage :—

TABLE 2.

	Barkometer.	Tanning Substances.	Non-tannins.	Insoluble.	Water.
	°	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Valonia	22	2·27	1·77	1·04	94·9
Myrobalans	25	3·02	2·08	0·81	94·0
Oak bark	19½	1·72	2·20	0·45	95·6
Mimosa	11	2·00	0·84	0·24	96·9
Quebracho wood	7	1·66	0·43	0·06	97·8
„ extract	7	1·33	0·79	0·13	97·7
Canaigre	20	1·92	2·08	0·81	95·1
Chestnut	15	1·98	1·12	0·55	96·3
Oakwood extract	19	2·20	1·96	0·34	95·5
„ „ (decolorised).	20	2·49	2·01	0·32	95·1
Hemlock essence	13½	1·98	1·50	0·16	96·3
„ extract	13½	2·13	1·42	0·04	96·4

The final stage in the tannage was now begun. Th series is known as the "layers," or "lay away pits." Th object of the layers is to impart firmness to, and to increa the weight of, the leather, and to deposit ellagic acid "bloom." In this process the goods were laid flat, wi a layer of pumice stone between each piece. This su stance was chosen to take the place of the ground tanni material usually employed. The pumice stone answers t same purpose by allowing the liquors freely to circula between the butts. But from its inert character it did n complicate the question by adding to the tanning streng of the liquors, or by the deposition of bloom in and on t hide, confuse the question of weight.

In the "layer" stage the strength of the tannin liqu is increased systematically at definite periods, which known technically as the first layer, second layer, third lay fourth layer, and so on.

The strength of the liquors for the first layer was creased by only ½ per cent. of tannin matter, and allow to remain at this for 6 days, which period completed first layer. For the second layer the strength was increa by 1 per cent. of tannin, and the butts remained in this 7 days. Previous to the third layer the whole of the liquors were run out, the pits cleaned, and fresh liquor r in. Each of the fresh liquors was of the same streng *i.e.*, containing 4 per cent. of tannin matter. The goo remained in this layer for 15 days. For the fourth final "layer" the liquors were strengthened by 1½ per ce of tannin, and allowed to remain in this for 16 days, a which the tannage was complete.

The following table is an analysis of the fourth la liquors, when the tanning was complete :—

TABLE 3.

	Barkometer.	Tanning Substances.	Non-tannins.	Insoluble.	W
	°	Per Cent.	Per Cent.	Per Cent.	P Ce
Valonia	33	3·13	2·75	1·56	[illegible]
Myrobalans	33½	2·56	3·92	1·36	[illegible]
Oak bark	45	3·42	5·30	1·24	[illegible]
Mimosa	24	3·96	1·84	0·60	[illegible]
Quebracho wood	15½	3·40	0·56	0·28	[illegible]
„ extract	13	2·71	0·53	0·28	[illegible]
Canaigre	40	3·24	3·64	2·38	[illegible]
Chestnut extract	27	3·64	1·48	0·80	[illegible]
Oakwood „	32	3·26	3·18	0·88	[illegible]
„ „ (decolorised).	33	3·28	3·58	0·84	[illegible]
Hemlock essence	24	3·46	2·38	0·48	[illegible]
„ extract	24	3·18	2·54	0·30	[illegible]

In tabulating the analytical results of liquors obtained at completion of each stage in the process, our object is t to attempt to account for the tannin added, by a stematic analysis of the liquors, because, as we have eady pointed out, such a method could not be adopted h any degree of accuracy, and also because at each lition of fresh liquor a corresponding volume of the old uor was taken out, which further tends to complications. e interest in the tables lies in a comparison of the three.

Attention has recently been drawn in technical circles to question of barkometer readings as representing the ength of tanning liquors. The practice of using bark- eters and basing calculations upon their readings is gely in vogue amongst tanners. The barkometer is a m of hydrometer, the readings of the barkometer corre- nding to the last two figures of the specific gravity: s, 1·060 specific gravity would be 60 deg. bk., 1·024 cific gravity would be 24 deg. bk. Therefore, while the kometer gives no indication of strength of tannin tent, the differences indicate loss with fair accuracy in ctical work. A comparison of the barkometer's readings h the percentage of tanning matters in the above tables ves conclusively that there is absolutely no relation ween the barkometer readings and the strength of the or in actual tanning matters.

The tanning materials other than those in extract for- rly had to be leached before using. Leaching is an ration which consists in extracting the tannin matters h water. The aqueous solutions of tannin so obtained er entirely from one another, both in their action and in changes they undergo on the effect of standing or ex- ure. For instance, the valonia liquor turned sour re using, and the myrabs liquor quickly followed suit. h these liquors also deposited a considerable quantity of gitannic acid. The remaining leached liquors remained e fresh and clear.

he goods were now dried out "rough," and then ghed, an average sample being taken for moisture. y were then returned to their respective layers, and ained there a week. The butts were then washed in er at 45° C., and allowed to drain, then hung up to dry. following day it was found that a heavy mould growth set in overnight on the leather tanned with canaigre. s butt was immediately taken down and wiped over with rbolic acid cloth and re-hung. Four days afterwards same butt was found again covered with a heavy mould, the leather tanned with myrobalans was also in the e condition. Both butts were treated with carbolic acid as before. Three days later the same butts again showed indication of a mould growth, and were again treated with carbolic acid.

The drying proceeded very slowly, and took place in a fairly dark room, no oil being used, as is usually the case when drying leather. Heat was used only when the drying was nearly complete. The canaigre and myrobalans butts appeared to shrink on drying, the latter contracting considerably and becoming exceedingly hard and horny. All the leather was very firm after having been dried. The valonia and chestnut tannages appeared to have deposited the most "bloom."

In practice, the butts are frequently sumached to improve the colour. This was omitted so as not to affect the analytical results.

The butts from each pit were evenly divided into three portions to allow of finishing in different ways. One lot was simply oiled over on the grain with cod oil, and hung up to dry. This constitutes "rough finishing." Another lot was scoured and pinned out. This operation is carried out with stone slickers by working on the grain side, the object being to stretch the leather, take the creases out, and remove grit, bloom, dirt, &c., from the surface. After this the leather is oiled carefully on the grain with cod oil, and hung up until "sammed," *i.e.*, till in proper temper (semi-dry), then stretched out by hand or machine to lay grain and remove further bloom, re-oiled, and again partly dried, afterwards rolled with a heavy brass roller, and once more dried, re-rolled, and the drying completed in a warm room.

The third portion was curried, an operation which consists in "stuffing" grease into leather to render it pliable and waterproof.

Throughout the whole process of tanning, samples were periodically taken from each butt, always from the same portion of the butt, so as to ensure uniformity in the samples. The method adopted was that of punching small sections out of the butt (about half-inch circles). These samples were analysed and the amount of leather formed calculated in each case. Table 4 shows the results obtained.

Each process in the tanning operations was carefully checked by weighing.

Table 5 shows the amount of leather obtained from a definite amount of hide substance, and the percentage gain in weight in the leathers formed from the respective tanning materials.

TABLE 4.

Material.		1st Day.	3rd Day.	6th Day.	11th Day.	22nd Day.	34th Day.	52nd Day.	79th Day.	86th Day.	121st Day.	Final Liquor.
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
nia............	Hide substance	96·0	91·9	89·0	85·5	76·2	67·0	60·0	59·4	55·4	51·6	50·6
	Tannin	4·0	8·1	11·0	14·5	23·8	33·0	40·0	40·6	44·6	50·4	49·4
balans........	Hide substance	97·9	93·2	88·1	86·9	82·2	69·6	66·2	63·2	61·3	59·0	58·6
	Tannin	2·1	6·8	11·9	13·1	17·8	31·4	33·8	36·8	38·7	41·0	41·4
bark	Hide substance	98·6	94·0	90·1	84·5	80·9	69·4	67·0	59·9	54·6	49·4	47·3
	Tannin	1·4	6·0	9·9	15·5	19·1	30·6	33·0	40·1	45·4	50·6	52·7
sa............	Hide substance	95·6	89·8	86·0	81·5	76·6	68·5	58·8	56·3	54·4	52·4	51·8
	Tannin	4·4	10·2	14·0	18·5	23·4	31·5	41·2	43·7	45·6	47·6	48·2
racho wood ...	Hide substance	95·0	89·2	87·6	81·8	72·7	60·3	59·2	57·1	54·9	49·6	48·1
	Tannin	5·0	10·8	12·4	18·2	27·3	39·7	40·8	42·9	45·1	50·4	51·9
„ extract.	Hide substance	95·1	88·6	87·1	82·3	74·7	61·6	58·7	54·2	53·7	48·4	47·5
	Tannin	4·9	11·4	12·9	17·7	25·3	38·4	41·3	45·8	46·3	51·6	52·5
gre	Hide substance	96·2	91·0	89·0	85·3	70·3	60·1	57·3	56·2	55·8	54·6	53·8
	Tannin	3·8	9·0	11·0	14·7	29·7	39·9	42·7	43·8	44·2	45·4	46·2
nut extract ..	Hide substance	96·0	90·4	89·4	84·2	77·2	66·9	60·2	58·4	56·7	53·0	51·4
	Tannin	4·0	9·6	10·6	15·8	22·8	33·1	39·8	41·6	43·3	47·0	48·6
ood „ ...	Hide substance	95·7	89·6	87·0	80·3	73·8	66·1	65·1	58·6	56·4	52·6	50·3
	Tannin	4·3	10·4	13·0	19·7	26·2	33·9	34·9	41·4	43·6	47·4	49·7
„ (un-o'orised).	Hide substance	94·8	90·6	88·4	79·3	72·6	68·3	60·7	56·8	54·5	51·5	50·6
	Tannin	5·2	9·4	11·6	20·7	27·4	31·7	39·3	43·2	45·5	48·5	49·4
ck clarified..	Hide substance	95·6	92·8	90·2	87·3	74·2	61·2	56·6	54·9	52·1	50·6	50·5
	Tannin	4·4	7·2	9·8	12·7	25·8	38·8	43·4	45·1	47·9	49·4	49·5
extract ..	Hide substance	96·9	94·2	92·2	86·3	78·6	67·3	61·3	56·4	53·6	52·9	51·0
	Tannin	3·1	5·8	7·8	13·7	21·4	32·7	38·7	43·6	46·4	47·1	49·0

e results obtained, and shown in Table 5, form an sting comparison with the results obtained by analysis in the laboratory, as shown in Table 6. It will be admitted that in this case science bears out practice remarkably close.

TABLE 5.

Tanning Material.	Wet Weight of Hides.	Percentage of Water.	Calculated Dry Weight of Hides.	Weight of Rough Leather produced.	Per Cent. of Moisture in Rough Leather.	Calculated Dry Weight of Leather.	Per Cent. Gain in Leather Formation.	Weight of Curried Leather.	Per Cent. of Water in Curried Leather.	Dry Weight of Curried Leather.	Per Gai Cur
Valonia	23,630	72	6,568	16,299	18	13,365	103·4	2,165	17	1,792	
Myrobalans	23,772	72	6,599	14,120	18	11,579	75·6	2,045	17	1,693	
Oak bark	23,081	72	6,407	16,065	18	13,174	105·6	2,310	17	1,917	
Mimosa	23,298	72	6,467	15,327	18	12,569	94·5	2,385	17	1,980	
Quebracho wood	23,439	72	6,507	15,750	18	12,915	98·4	2,210	17	1,834	
„ extract	23,419	72	6,501	15,791	18	12,949	99·1	2,410	17	2,000	
Canaigre	23,328	72	6,476	15,349	18	12,587	94·3	2,165	17	1,797	
Chestnut extract	23,[illegible]00	72	6,385	15,547	18	12,750	99·6	2,175	17	1,805	
Oakwood „	24,001	72	6,662	16,304	18	13,370	100·7	2,380	17	1,975	
Undecolorised oakwood extract.	23,222	72	6,446	15,939	18	13,070	102·7	2,360	17	1,958	
Hemlock essence	24,166	72	6,708	16,065	18	13,175	96·4	2,355	17	1,954	
„ extract	23,750	72	6,593	15,558	18	12,755	93·4	2,339	17	1,934	

TABLE 6.

Showing the Composition of the Rough Leather as obtained by Analysis and as calculated from Weight.

Material.	By Analysis.		By Weight.	
	Hide Substance.	Tannin.	Hide Substance.	Tannin.
Valonia	50·6	49·4	49·1	50·9
Myrobalans	58·6	41·4	56·9	43·1
Oak bark	47·3	52·7	48·6	51·4
Mimosa	51·8	48·2	51·4	48·6
Quebracho wood	48·1	51·9	50·3	49·7
„ extract	47·5	52·5	50·2	49·8
Canaigre	53·8	46·2	51·4	48·6
Chestnut extract	51·4	48·6	50·0	50·0
Oakwood extract	50·3	49·7	49·9	50·1
„ „ decolorised	50·6	49·4	49·3	50·7
Hemlock essence	50·5	49·5	50·9	49·1
„ extract	51·0	49·0	51·6	48 4

The question which now arises is: To what extent do the tannin matters actually combine with the hide fibre to form leather? To answer this, a sample of each of the 12 tannages in the "rough" state was taken, and after having ground them up, a portion was washed with a litre of distilled water, cold. This sufficed to wash out all non-combined tannin matters. The ground leather was then dried, and the amount of tannin retained is shown in Table 7.

TABLE 7.

Showing the Analysis of Leather after Washing, also the non-combined Tannin Matters.

Material.	Hide Substance.	Tannin.	Washed out.
	Per Cent.	Per Cent.	Per Cent.
Valonia	58·65	41·35	8·0
Myrobalans	61·23	38·77	2·6
Oak bark	56·29	43·71	8·0
Mimosa	55·50	44·5	3·6
Quebracho wood	54·9	45·1	5·8
„ extract	52·7	49·3	3·2
Canaigre	56·9	43·1	3·1
Chestnut extract	57·9	42·1	5·4
Decolorised oakwood extract	57·3	42·7	7·1
Undecolorised „ „	58·65	41·35	8·1
Hemlock	52·8	47·2	2·3
„	56·7	43·3	5·8

From the results given in Table 4 it would appear that oak bark liquor possesses the greatest affinity for hide substance, combining with it to form leather to the extent of 52·7 per cent., of which over one-half is absorbed during the first 34 days of the process. The reputation of oak bark as an excellent leather-forming material is supported by our experiments. Quebracho extract follows closely, being present in leather tanned with it to the extent of 52·5 per cent. It possesses quicker penetrating than oak bark. The aqueous extraction of quebrach follows next in order of leather forming value, combi the extent of 51·9 per cent. of the leather tanned Decolorised oakwood extract is a little ahead of colorised oakwood in its combining value, the forme 49·7 per cent. and the latter 49·4 per cent. of th leather produced with it. Their penetrating po exceedingly good; in both cases over 50 per cent. tannin is absorbed during the first 22 days.

Hemlock essence is on a par with the oakwood e as regards its maximum combining value, but its p tion power is much inferior to oakwood. This extr mixed extract, 30 per cent. of its strength being from quercitron bark. Valonia has a good co value, being 49·4 per cent., but it is very slow in p ing. Hemlock extract falls a trifle below this, h combining value of 49 per cent., but has not so g affinity for hide substance. Chestnut extract p excellent penetrating properties, but its maximum c tion value falls a little lower than the other extract only 48·6 per cent. of the total leather produced. forms leather with hide substance to the extent of 4 cent. of that produced, of which nearly one-half is a during the first three weeks.

The penetrating power of canaigre is also re combining to the extent of nearly 30 per cent. o maximum 42·2 per cent. in three weeks.

It is evident, then, that the length of time in tann this material was far in excess of that necessary to leather, and that the small gain in tannin matter by the hide does not compensate for the excess of

Myrobalans comes last, with a leather-forming va per cent. Its poor combining value is not compen by its penetrating power, which is about equal to o

The fair uniformity between the results arriv analysis and those obtained by calculation from weight of hide substance on to the dry weight o obtained, as shown in Table 6, has already been re The percentage of tannin matter obtained fro weighing, as shown in Table 6, bears a direct relati results in the column showing the percentage gain in Table 5, the variation being probably due to the of accurately determining the amount of dry hide from wet hide. It would appear from these result *combining value* of a tanning material does not of indicate its *weight-giving* value.

Oak bark still maintains its supremacy in re weighting properties. Quebracho extract, howe not follow. It must be borne in mind that this virtually pure tannin matter, and consequently possess constituents which are capable of imparti The aqueous extraction of valonia comes seco respect. Undecolorised oakwood ranks third weighting qualities, immediately followed by d oakwood extract, which is what would be expect these materials naturally possess weighting prope

It should be explained that the weighting cons a tanning material are the non-tannin matters soluble products which are formed by a splitting up of the annins. As was shown in the first part of this paper, alonia possesses this power to a very great degree, no less han 14 per cent. of the tannin matters being transformed nto insoluble substances in four weeks. The small insoluble articles which are ever present in commercial tan liquors robably also play a very small part in giving weight to the eather. By reason of valonia possessing this characteristic is largely used in practice as dusting material, *i.e.*, put in etween the butts in the form of dust as they lie in the quor The goods are left in these layers for some time, hus depositing this insoluble bloom both in the leather and pon its surfaces.

Chestnut extract ranks fifth, followed in order of the eight-giving qualities by quebracho extract, quebracho ood, clarified hemlock, mimosa, canaigre, and crude emlock extract. All the foregoing rank between 12 per ent. of one another. Myrobalans, as usual, comes a poor st, with a difference of 17 per cent. between it and hemlock tract, or exactly 30 per cent. less than oak bark.

Turning to the discussion of Table 7, it appears that the rcentage of tannin capable of being washed away by ld water differs according to the material. We will, wever, confine ourselves to a consideration of the tannin atters which are retained by the hide substance. Quebracho tract offers the greatest resistance to washing, remaining ith the hide substance after the process to the extent of ·3 per cent. Clarified hemlock comes second, followed quebracho wood with 45·1 per cent. of the washed ather being composed of it. Mimosa is about 2 per cent. ead of oak bark in this respect, the latter having a mbining value of 43·7 per cent. Canaigre and hemlock tract rank together with 43·2 per cent.

These are followed in turn by decolorised oakwood tract, having the combining value of 41·3 per cent. estnut extract follows closely with 42·6 per cent. Uncolourised oakwood comes next with valonia, each having e same combining value of 41·3 per cent. Myrabs ses up the list with 38·7 per cent.

In estimating the practical value of these figures, it must kept in mind that the leather was ground to shreds fore washing. In the usual washing and scouring the s will not be nearly so great, but the proportions will ll hold good.

Regarding the curried leathers, these were all treated gether in exactly the same way. Glancing at the column wing the percentage gain in weight after currying, in ble 5, it appears that the respective tannages have erent capacities for absorbing grease and other ighting matters. Hemlock extract gains the most by rying, increasing 25 per cent in weight. Hemlock is national tannage of America, and it is said that erican curriers can increase the weight of the leather 50 per cent., whereas 20 per cent. is the average gain an English tannage. Our experiments seem to point the fact that hemlock possesses natural tendencies to orb grease. Canaigre appears to increase in weight least of the twelve tannages, increasing only 16 per t. in weight after currying.

t should, perhaps, be pointed out that gain in weight much influenced by the method of stuffing used, also the kind of grease employed. The important practical at is how much grease can be carried without the her appearing over-stuffed. In the above work the ts were all curried in exactly the same manner, using same grease, and quantity, and the same methods for butt, so as to make the results comparative.

Colour.

s the colour of a tannage plays a most important part e valuation of leather from a commercial point of view, deemed it advisable to record the effect of light upon colour of the different tannages. For this purpose exposed samples, partially covered to prevent exposure ght, and the other half of each sample was freely sed to the action of daylight. The different tannages allowed to remain in this condition exposed to a hern light for six months, from April until November.

The tannages least affected by light are the oakwoods decolorised and undecolorised. Next comes the chestnut extract, followed closely by valonia. The oak bark tannage is darkened to a certain extent. Both the quebracho tannages are considerably darkened; both the hemlocks are even more so, as might be expected from a tannage that is not originally very light. Canaigre and mimosa, both originally light coloured tannages, darken by exposure to light to the greatest extent. This is one of the features of all tannins of the catechol series.

Quality.

With a view of obtaining the quality of the various tannages from a commercial standpoint, the opinion of several well-known tanners, curriers, and leather merchants was solicited. The consensus of opinion is to the effect that the oakwood extract tannages were superior as representative of good all-round tannages. Oak bark is described as being fairly firm, well filled, and suitable for strap or sole. Hemlock extract tonnage is recorded as being good for strap or sole: valonia as being spongy, and only suitable for straps. This is probably due to the liquor used having already deposited most of its bloom. If the valonia had been applied direct, the leather would have been firm by the deposition of bloom in the fibres.

Myrobalans is described as being very soft and badly filled, and quebracho as being suitable for a cheap class of goods. Canaigre is condemned as the poorest of the set.

The above is, however, an opinion of the finished leather, but in practice no tanner uses only one material, but uses several in mixture, or different materials at different stages. For instance, it does not follow that because canaigre-tanned leather is condemned that canaigre should not be used in the early stages of tanning. Practical men place great reliance on myrobalans, because it is known to produce acid, and plump the leather, added to which it also gives a good light colour to the leather. No tanner uses myrobalans in the late stages, but uses oakwood extract or valonia to give the firmness and weight. Some use hemlock extract after the handler stage.

With a view of determining to what extent the natural tanning material resisted the penetration of moisture, a series of experiments was carried out by means of a brass cylinder, measuring 12 inches by 2 inches, at one end of which was attached a screw clamp, between which a piece of the leather was placed. The cylinder was then filled with cold water and the time was taken. The penetration of the water through the leather was carefully observed, and as soon as a drop of water accumulated the time was again noted. The penetration of the water took place from the grain side.

Material.	Thickness of Leather.	Time of Penetration.
	Inches.	Minutes.
Valonia	0·25	17
Myrobalans	0·25	60
Oak bark	0·27	6
Mimosa	0·25	11
Quebracho wood	0·25	3
„ extract	0·25	2
Canaigre	0·25	9 hours 30 mins.
Chestnut extract	0·22	13
Oakwood „	0·31	12
„ „ undecolorised	0·22	9
Hemlock essence	0·27	11
„ extract	0·25	10

The above table scarcely necessitates any explanation, except, perhaps, with reference to the large difference between canaigre and the other materials. The immense superiority of canaigre as a water-resisting tannage is in all probability due to the deposition of a large amount of carbohydrates which are contained in canaigre, and which when thoroughly dried offer great resistance to the penetration of moisture.

In view of the reputation that myrobalans possess for producing a spongy and porous leather, it is rather curious to find that it possesses water resisting properties far in excess of other materials.

The following table will, no doubt, prove interesting as showing the relative tensile strength of the different tannages, when finished for sole leather, and when curried :—

Material.	Rough Sole Leather. lbs. to sectional sq. in.	Curried Leather. lbs. to sectional sq. in.
Valonia	2,713	2,982
Myrobalans	2,882	2,534
Oak bark	1,980	2,578
Mimosa	2,485	3,727
Quebracho wood	2,385	3,777
„ extract	3,031	3,180
Canaigre	2,286	2,882
Chestnut extract	3.167	4,411
Oakwood „	1,926	2.767
„ „ undecolorised	2,488	3.450
Hemlock essence	2,302	3,130
„ extract	2,584	3,280

In presenting this research, representing as it does, over two years of close study to the subject, to the consideration of this Society, and to the leather trade of Great Britain, the authors, while conscious of the many shortcomings of the work, trust that it will prove of value to the tanner as aiding him to a more thorough knowledge of the intricacies which underlie the principles of the art of tanning; and further, that its advent will mark the approach of further scientific investigation into the complex problem which the transformation of hide into leather presents. Only those chemists who have attempted to investigate this problem can be fully conscious of the many difficulties with which the authors have to contend, dealing throughout with materials the constitution of which is not yet determined, and which are sensitive to the slightest change.

In conclusion, a work of this description must of necessity require outside assistance, and the authors take this opportunity of thanking those members of the leather trade who have throughout the research rendered most valuable assistance in the supply of the various tanning materials and for their practical advice.

The authors' thanks are specially due to Dr. J. Gordon Parker, Director of Herold's Institute, under whose direction the research was carried out, for his constant help and advice.

Discussion.

The Chairman had listened with great interest to Dr. Parker's careful epitome of the paper, and was very glad that under his stimulus something was being done in this great metropolis in a department of chemical manufacture upon which the chemist had hitherto been able to shed but little light, so little that tanners often were of opinion that they could do better without a chemist than with one. Tanning was still an industry in which the operations were carried out mostly on empirical lines, with a consequent loss of good tanning material. He felt sure that this paper would go far towards altering the state of things that existed at the present time.

Prof. H. R. Procter said that, although he had had the advantage of glancing through the paper in the rough, he found it exceedingly difficult to criticise it, because it contained so large a mass of figures and depended so much on an exact comparison of a number of different things; but he hoped to be able to make a more careful examination of it when it was before him in print. There were, however, one or two points to which he would like to refer—not in a spirit of adverse criticism. Firstly, with regard to the proof, which was attempted in the early part of the paper, of the accuracy of the hide-powder method of analysis; he thought the results very striking. The agreement was excellent, and gave conclusive proof of the accuracy of the work and the constancy of the results of the methods employed. But, though he would like to believe it, it did not afford any proof that the substance absorbed, and called "tanning matter," really was matt permanently absorbed by the hide and converted in leather. One determined, by a method capable of givi constant results, the quantity of the substance in the liqu at first; one absorbed a portion by tanning, and determin the quantity left, and no doubt the difference between t two must correspond with the amount taken out and ma into leather. But with regard to the substances estimat in the first instance and left in the liquor at last, t method did not prove at all that they were capable making leather. With regard to the accuracy of t Kjeldahl method, he thought the evidence very strong a the results obtained most gratifying to all who had work with it. The experiments on the relative weights giv by different materials and their other properties must taken with a certain limitation, since they had been ma by purely liquor-tannage, no solid materials having be brought in contact with the leather, but all having b done entirely with the matters retained in the soluti Now, many of those liquors deposited quantities of so substances, most of them ellagic acid, others anhydrid To a large extent those matters must have been deposi before the experiment began, or perhaps during the exp ment in the pits; but at least they did not find their w into the leather. In the ordinary process of tanning m of these difficult soluble matters did find their way i the leather to a certain extent. Ellagic acid was deri from a special form of tannin of which the constitut was unknown. If that ellagic-tannic acid had deposited ellagic acid before, it could not do so in the leather. in the ordinary conditions a good deal of the deposit took place in the leather and added to its weight. He not think it possible to distinguish between matter depos in that way and material which was "tanning matter." thought that possibly these were points which might strike chemists who were not conversant with tann materials and processes, and that ignorance of them m lead to unfair criticism or lessen the practical value a most useful paper.

Mr. C. Parker thought that the special point to w Mr. Procter had referred, namely, the hide taking a g deal of the ellagic acid, or bloom by the hide being in d contact with the tanning material, was one of the valu features of their research. Prof. Procter being a prac man, as well as a chemist, would know the different met employed in using such substances as valonia, and i began to tan again he would no longer leach valonia i way many tanners did, keeping the liquor depositing b for days, but would doubtless bring his tanning mat and liquors into very direct and immediate contact his leather. That point seemed to him to suggest t practical tanner a more profitable method, one by which would no longer lose so much tanning material as hith The value of this research seemed to him to be th tanning value as given in tanning matter by the hide-p method was very untrustworthy if used to compar tanning values of different materials, because the lesson of the research was that a good deal of the tannins was absorbed by the hide; and that while the powder process was valuable in comparing the analys say, myrobalans with myrobalans, if one compared with the analysis of valonia, the figures were quite leading. He thought it would be possible to giv tanner a more accurate idea of the value as sugges this research. He himself had made a serious mist the past, because he considered that a chestnut e testing by hide-powder 31 per cent. would do more than an oak-wood extract testing 27 per cent.; wher found that the reverse was the case. He therefore to the chemist whether it would not be possible further into the non-tannins and give some idea of value as tannins; for if they went into the leath helped to tan it, to call them non-tannins seemed misnomer.

Dr. S. Rideal congratulated the Society on the va paper which had been laid before it by the reade Parker, before it was criticised by the Society of T Chemists. It was some time since he had practical ence of the question, but the general conclusions put f emed to show that one could regard as the future tanning aterial for boots, canaigre ; for belts, chestnut. This was early shown by the experiments, and if the methods analysis and the relative values were to be taken as absote, that brought one to the bottom of the whole subject, ether the absorption of tanning material by the hide bstance was not a function of the molecular weights of e tannic substances. It was well known as a general rule at about 60 per cent. of hide substance combined with out 40 per cent. of tanning material. The variation in e hide substance was very small. This was especially arked when one looked at Dr. Parker's third and fourth bles on the results of the analysis of washed material, en the uncombined substances were washed out of the ished leather, and it was seen that the ratio between the le substance and the tanning substance was still closer to and 40. The molecular weight was not necessarily 60 d 40, but somewhere about that ratio, and it occurred to n to ask gentlemen engaged in this particular work ether the methods of analysis did not give greater riation than that shown in the tables put forward by . Parker. There must be a variation in the weight the materials, but the variations shown on the tables re not so great as to warrant the belief that there was : some definite compound between hide substances and nins. Some years ago, in a paper written in conection with Mr. Trotter, he had ventured to bring forrd some experiments in electrical tanning, and in that er he had described what was practically the method of lysis that had been described that night, namely, a ldahl of the substances as combined with tannin and cked by the decrease in the tannins in the pit liquors by hide-powder method proposed by Mr. Procter. He ad that after a while, when the nitrogen decreased, there an absorption of tannin in the finished material which useless. There was a limit to the quantity of tanning erial which hide substance could take up to make a sfactory article, and though one could put tanning erial into hide substance and so get a greater percentage, that increase of tanning material was of no use whatever e finished material. That was some 10 or 15 years ago. ther important conclusion in that connection was as to ther it was desirable for the trade to continue to buy her by the pound. Leather must be made suitable for s, or belting, or some other special industry. If the er put into the leather above a certain increase of ght of tanning material, it was just as much a useless edient as the actual intentional adulterants, such as ose, and, therefore, when a manufacturer bought leather eight, he was not looking after his own interests. It ld be bought by the actual combination of gelatin subce with tannin. This was especially important when considered the price of tanning material as compared hide substance. Therefore the leather manufacturer put in over 40 per cent. of tanning material was not fiting himself either. In fact, from both the tanner's the buyer's point of view, it seemed a curious way of ing on an important industry.

r. E. Grant Hooper thought it would be of great ntage if the reader of a paper on any subject would be enough to sum up, at the end of it, the conclusions ed as the result of the investigation, and he would ially like to hear Dr. Parker's conclusions with ence to the various tanning matters which had been so ughly tested. From the tanner's point of view, no weight production was an important point, but he it, that from the user's point of view that was by no s the most important consideration. Dr. Parker had sted two or three points from which to view this ion—strength, penetration of water, &c. Consideration, ver, could hardly be limited to one of these without g regard to the others, and he thought it would be dingly interesting if the reader of the paper could tell eeting what material or materials produced leather in its combination of good qualities might be bed as the best.

W. F. Reid regarded the paper as considerably eing knowledge on the subject of tanning. It was ime that the quality of leather should be improved. Most people who wore leather would hold the opinion that its quality did not improve from year to year. It used to be proverbial that there was nothing wore like leather, but that was no longer the case. As Dr. Rideal had pointed out, weight-giving properties were not necessarily valuable ; in fact, he regarded them as a distinct disadvantage. The only substance of value to the user of leather was the tannin that combined with the gelatin of the hide. If the tanner added substances that gave weight without strength, he was not only adding an adulterant, but at the same time making the leather denser. He himself at one time thought that compressing sole leather would make it more durable, and having a powerful press at command, he reduced the leather by 50 per cent. in thickness ; but the result was that the soles wore only about half the usual time. Some light was thrown upon the subject by experiments in connection with linoleum subjected to considerable traffic. He tested linoleum and oak under the same conditions, and the oak wore out in a much shorter time than the linoleum, although it was very much stronger. There was more to be considered than mere weight and bulk, and he thought that if tanners would direct their attention to producing a porous waterproof material, more elastic also, they would find a large demand for such a leather. He was himself connected with a substitute for leather which wore a great deal longer than leather, and he wished to say that there were materials which would wear twice as long as the best leather obtainable. He had visited the Bradford Technical Institute, and seen a number of tests of materials used for machine belting, and among them leather. He asked the gentleman who had the direction of those tests what sort of leather he considered to give the best belting, and he found that this possessed less than half the strength of belting made from vegetable fibre mixed with other substances. Therefore he thought that in cases, where one had materials that gave merely weight to the leather, they should be rejected by the tanner. Dr. Parker had referred in his paper to the plumping or opening out effected by some of the materials. The tanning ingredients that effected this were rendering a great service to the tanner ; they made the leather more elastic, and consequently it wore better. The use of hemlock seemed to have been taken up in America, but whether the combination of hemlock and grease mentioned by the author was advantageous was open to question. Personally, he thought it a step backward, not forward. Then the slow rate of penetration of water through leather tanned by canaigre gave one a good hint. If leather could be waterproofed in such a way, it was a distinct advantage, and anything of that kind that could be used would certainly increase the sale of that particular kind of leather.

Mr. A. Seymour-Jones said that the question of moisture penetration and tensile strength were extremely interesting. The last speaker had afforded him considerable amusement by his reference to hemlock and oil for sole leather. If anyone were to offer a shoe manufacturer a curried hemlock butt for sole leather, he feared that he would not succeed. The question of the use of canaigre for sole purposes was quite beside the mark ; one had only to ask oneself the question : How long would it take for moisture to penetrate through a sheet of iron ? Canaigre was simply a mass of horny matter which prevented the moisture from going through. There was one phase of the question which they certainly ought to penetrate for themselves, namely, the microscopical observations as to how the various tanning materials not only penetrated, but combined with the hide substance. He had seen some micro-photographs taken by Dr. Andreasch, which he looked forward to the publication of with great interest. Two of them had greatly struck him—one showing the penetration of oak bark through hide substance, and the other, the penetration of quebracho. These photographs showed that the oak bark diffused itself equally throughout the whole fibre and the whole structure without any difference of shade ; but in the case of quebracho it seemed to flow in ducts between the fibres in dark layers, and in no sense could one say that it combined with the hide substance. What was wanted was a series of photo-micrographs showing the penetration of all the materials used for tanning, and not till they had that could they express an opinion on their value. The question of weight-giving quality was important to the tanner, who was compelled to buy substances that would put weight into his leather. Therefore this work which Dr. Parker had laid before them had thrown valuable light on the question. His father had demonstrated years ago that an old tanning liquor could tan, by the fact that tannin itself was almost absent. He took a very old liquor, and it gave 27 grains of tanning material to the gallon. It was strongly volatile with acids, yet in six weeks sheep-skins were tanned by it most successfully. Nothing was added to the liquor, and at the end of the time there was 22 grains of tanning material per gallon still left. Usually, one would require to have 24 per cent. of extract added. Yet here was good leather made by a very old and weakly liquor. That indicated that the non-tannins were matters that required to be looked further into and discussed.

Mr. H. S. Elworthy agreed with the last speaker as to the great interest which would attach to a series of micro-photographs of the action of the various tanning materials; but thought that though these would afford information from a chemical point of view, their practical value to the tanner would not be very great. The result which they wished to obtain was first the weighting of the leather, a very practical point for the tanner, and next the tensile strength and wearing qualities, which were very important from the user's point of view. These results could be obtained better from practical tests than from photographs. Another important matter for consideration was the time required to obtain a given increase of weight.

Dr. Parker, replying for Messrs. Youl and Griffith, said that he must thank Professor Procter for his remarks on the paper, and especially on one or two of the salient points which he had missed in the short abstract of it which he had given. He was glad that Prof. Procter approved of the Kjeldahl method of analysis as giving accurate results from the practical standpoint in tanning. He, himself, quite agreed that the present method of hide-powder analysis was not all that could be desired, and every tanner shared that opinion. But no better method than the hide-powder process was at present available, and as that had been standardised, they had to put up with it. They had, however, been working under the best conditions, having had the same hide-powder from beginning to end, and that had no doubt kept the results given in the paper closer than they otherwise might have been. Prof. Procter referred to its being a purely liquor tannage. He ought to have pointed out in his abstract that it was not the object of the authors to produce great weight, nor to produce the maximum weight; the object was to find out the amount of tannin which would combine with the leather, using the twelve different tanning materials, all of exactly the same strength. The object was not to find out the amount of insoluble bloom, &c., which was deposited on and in the fibres.

Mr. Charles Parker had checked this research, and, as a practical tanner, had followed the work from beginning to end, and much was owing to his kindly criticisms and suggestions.

With reference to his remarks on the age nt which tanners used their liquors, he might point out that some tanners use their liquors over and over again, simply pumping them over the leaching pits to clarify and strengthen them. This research had proved that to be far from the best method for the production of sole leather. The best plan was to extract the tanning materials as rapidly as possible, get the fresh liquor containing the weight-giving properties in the layer pits quickly, and when the goods were taken from these liquors, not to return the liquor to the leaches, but to work it down through the weaker pits out through the tanyard. In this way the bloom and insoluble substances were deposited on and in the leather, instead of being filtered off in the leaches, and thus being lost.

Mr. Parker had said that one could not compare the tanning strength of one material against another by the hide-powder analysis. That was correct, and one could not say that because a sample of myrabolans analyse 30 per cent., that that material would produce an equ result with oakwood extract analysing 30 per cent. Th research had shown that these two materials, even of t same analytical strength, would produce different result But the present method of hide-powder analysis did for a gauge for testing any number of samples of the sa material one against another, and with an accuracy whi was borne out in practice.

Dr. Rideal was the first chemist in this country to apply t Kjeldahl method of analysis in gauging the speed of tanni He himself was in Germany at that time, and had learn the method from von Schroeder, and so had used the meth before Dr. Rideal communicated his paper, but Dr. Rid was the first to apply the method in England. He co not quite agree with Dr. Rideal when he said that 60 cent. of hide substance would only combine with 40 per ce of tannin to form leather. He had frequently tested samp in which 54 per cent. of tannin had combined with 46 cent. of hide substance. He, however, quite agreed Dr. Rideal that it would be better if leather were sold measure instead of by weight. The system had had advantages, but had also many disadvantages, as at pres the object was to get as much weight as possible into leather, and some tanners stooped to the use of metallic other weighting materials, and as long as leather merchs and shoe manufacturers would buy by weight, tanners we sell by weight, and try to obtain as great a weight possible. He had intended to give his conclusions ba on the different results of the experiments. These sho that the greatest weight was got from oak bark, and worst from myrobalans and canaigre. The best ten results were got from chestnut extract, and the worst f oak bark. The best resistent to the penetration of water canaigre, and the worst was hemlock.

Mr. Hooper said it was rather the combination of t advantages that he sought to know than the actual figu He would get these later from the paper itself.

Dr. Parker, continuing, said that one could not combine all these results and say which were the bes one factor would be the best for a shoemaker and per the worst for a belting-maker. Weight-giving was claimed in the paper; they had only tried to claim leather-forming qualities, but, of course, some bloom been deposited, and thus given weight. That could no avoided. He was interested in Mr. Reid's remarks a the material which was so superior to leather. He not met with it yet, although he had tested many so-c substitutes, not only materials for bookbinding, sole, bel and other purposes. Probably he had not met with perfect material of which Mr. Reid spoke. With rega Mr. Reid's remarks on hemlock-tanned leather absor the most grease, Mr. Reid's criticism on that point evidently from want of knowledge, as grease was not for sole leather, but for belting and strap purposes, a long as this material was sold by weight, curriers buy the leather which would carry the most grease wi showing it, and would put glucose and Epsom salts in and the leather which would carry the most of materials without losing in appearance and finish was the best. If Mr. Reid could convert the English manufacturer to the sole use of English-made leather in of American hemlock-tanned, he would do a great s to the British tanner.

Mr. Seymour-Jones had referred to the desirabil producing a series of micro-photographs, showing the of the various tanning materials, and in what form penetrated into the leather. They had made a begi at that; as samples had been drawn each day in the p of tanning and had been preserved, sections had been but as yet they had not had time to do the photog work. This work should be undertaken as soon as permitted. He trusted that the results communica the paper would be of value to the tanning trade that they would realise that this paper, althoug complete in every detail, gave at least a line of re which he hoped others would assist in working out in direction.

ARSENIC IN COAL AND COKE.

BY R. F. WOOD SMITH AND R. L. JENKS.

ck the presence of arsenic in beers brewed only from lt and hops, and also in the malt itself, has been proved ond a doubt, the question of how far the fuels used in lting are capable of introducing this impurity has assumed ortance. A conceivable method of determining the total enic present in the fuel is to deflagrate a sample in manner employed for the estimation of sulphur, and to mit the residue, after it has been suitably reduced, to ntitative examination by the Marsh-Berzelius-Hehner hod. Experiment makes it clear, however, that such a hod gives results that are of little use to the maltster, se only concern is as to the amount of arsenic that will its way into the malt during the drying processes. amount undoubtedly differs from the total arsenic ent in the raw fuel, part of this being "volatile" and dangerous, whilst the other part remains "fixed" in fuel ashes and is, therefore, far less dangerous.

or these reasons it appears desirable to lay before this ety a method of analysis which imitates as closely ossible the conditions that obtain in the malt kiln itself, which makes it possible, without the use of any nical reagent other than dilute sulphuric acid known to rsenic free—a point itself of particular importance—to with considerable confidence whether or not a given or coke may be safely employed as a malting fuel.

iefly the method is as follows:—A piece of hard com- on tubing about 20 inches long is selected, one end of h is left open; about four inches from the other end tube is drawn before the blowpipe flame into a riction about 2 mm. in diameter. The next inch is o form a bulb or reservoir, and the last three inches rawn into a long tapered nose-piece of convenient bore 2—3 mm.) and bent at right angles so that it can be d through the rubber stopper of a wash-bottle of any able shape or size. This wash-bottle is partly filled dilute sulphuric acid arsenic-free, and air can then be ated through the whole apparatus by means of a short piece passing out from the stopper and connected suction pump. If more convenient, air may be forced gh the tube by positive pressure at the other end, but her case volatile products are to be condensed in the or the acid contained in the wash-bottle.

e use of oxygen or any special oxidiser to assist com- on does not appear desirable, as being too great a ture from normal conditions.

o 15 grammes of the sampled fuel are broken into ents of about the size of a pea, placed in the com- n tube near the free end and heated on an ordinary stion furnace, when the pump has been started and king smoothly.

current of air should be fairly rapid in order to as complete combustion as possible. The layer of ould be from six to eight inches in length, loosely ontinuously packed and consisting of the small ents described above. The conditions of a kiln fire are airly closely reproduced, and experiments show that id sampling and minute pulverising usually observed eral analyses are unnecessary and disadvantageous purpose in question.

whole tube is now cautiously heated to remove re and the fuel then strongly ignited inch by inch ding from the end at which the air enters the tube. further end is judiciously heated, all condensation place in the bulb beyond the constriction, or in the f the wash bottle. Care must be taken that the al vapours are not allowed to pass over any length ined material, in which case the results obtained are ntly lower than when this treatment is avoided; as r, the fuel glows brightly in the region of combustion ot difficult to adjust the speed of ignition so as to the required conditions. The heating usually lasts e three hours, the ash being then left for the most a nearly colourless or ruddy powder. It is probable the volatile arsenic is obtained in a much shorter ut the ash is difficult to treat unless thoroughly burnt. The operation requires little attention if the pump can be relied upon to work automatically.

When the tube is cold the ashes are carefully withdrawn and laid aside for determination of "fixed" arsenic, whilst the contents of the bulb are washed into the bottle with dilute acid by means of a pipette long enough to reach down to the constriction. In this way only deposits beyond the constriction are removed, any dust on the walls of the main part of the tube being left to be washed into the ashes. A simpler method is to sever the tube at the constriction, proceeding at once to examine the volatilised products and leaving the rest of the tube to cool in the furnace. The contents of the wash bottle are made to a definite bulk, and an aliquot part added to the Marsh apparatus, the results calculated on the amount of fuel used being returned as "volatile arsenic."

The ashes are then tritutrated in a clean mortar, washed with dilute sulphuric acid into a small flask, gently warmed for a few minutes and then allowed to stand for at least 12 hours. In this way any arsenic compounds present are reduced practically completely to the arsenious condition by the hydrogen sulphide, which is always observed to be evolved in appreciable quantity. The liquid is then diluted to a suitable bulk and an aliquot part, previously warmed on the water bath to remove excess of hydrogen sulphate, passed into the Marsh apparatus.

This result is returned as "fixed arsenic." Three fuels used for malting purposes gave the following results when examined as described above:—

——	Volatile Arsenic.	Fixed Arsenic.
	Grains per lb. of fuel.	Grains per lb. of fuel.
(*a*) Anthracite...........	1/250	1/35
(*b*) Coke breeze	1/90	1/2
(*c*) Gas coke.............	1/45	1/2

The ashes removed from the kilns themselves, eight in number, after a mixture of anthracite (two parts) and coke (one part) had been burnt for some days gave the following amounts:—

No. 1................	1/8	grain of arsenic	per 1 lb.	of ashes.
„ 2................	1/2	„	„	„
„ 3................	1/3	„	„	„
„ 4................	1/5	„	„	„
„ 5................	1/4	„	„	„
„ 6................	1/3	„	„	„
„ 7................	1/7	„	„	„
„ 8................	1/4	„	„	„

It will be seen that the actual kiln ashes contain amounts of arsenic that are in close agreement with amounts that might have been predicted from the quantities of "fixed arsenic" found in the original fuels.

The amounts of arsenic found in the malts dried with the same fuels also averagely correspond with the amounts indicated by the volatile arsenic figures.

Another point in proof of the fact that the malts derive their arsenic almost solely in the volatile form is that the organic dusts which settle on the beams of the drying kiln, immediately over the malt, contain, on the average, two grains of arsenic per pound of dust—a proportion which could never have been obtained by the mechanical admixture of ash dust, which only contained ½ grain of arsenic per pound.

It seems evident that a useful distinction can be drawn between the volatile and fixed arsenic present in malting fuels when determined in the manner described, and that comparatively little value can be attached to an estimation of the total arsenic only.

It might be added in conclusion, that these results seem to confirm the possibility of retaining all the arsenic in fuels in the "fixed" form as had, in fact, been suggested by Mr. Newlands some time back, who has applied for patents in this connection.

A SIMPLE METHOD FOR OBTAINING A SATURATED AQUEOUS SOLUTION OF SULPHURETTED HYDROGEN, OR A CONSTANT SUPPLY OF THE GAS.

BY F. MOLLWO PERKIN, PH.D.

Sulphuretted hydrogen, either as the gas or in aqueous solution, is a necessary reagent in all laboratories in which analytical chemistry is conducted. Generally the gas is used, because an aqueous solution, beside being troublesome and unpleasant to prepare, very rapidly decomposes and becomes useless. In most laboratories the gas is generated by means of a Kipp's apparatus. There are, however, several disadvantages connected with the "Kipp." Firstly, when large quantities of the gas are required, it is constantly necessary to recharge the apparatus—cleaning and charging a "Kipp" is not a pleasant operation, and in my experience a great many "Kipps" get broken during the operation of washing. Secondly, they are not economical, because there is always a very considerable waste both of acid and ferrous sulphide.

During the last few years I have employed "De Koninck's" apparatus, with a consequent *great* saving in acid and ferrous sulphide. This apparatus, when once properly charged, can be used constantly for three or four months without further attention.

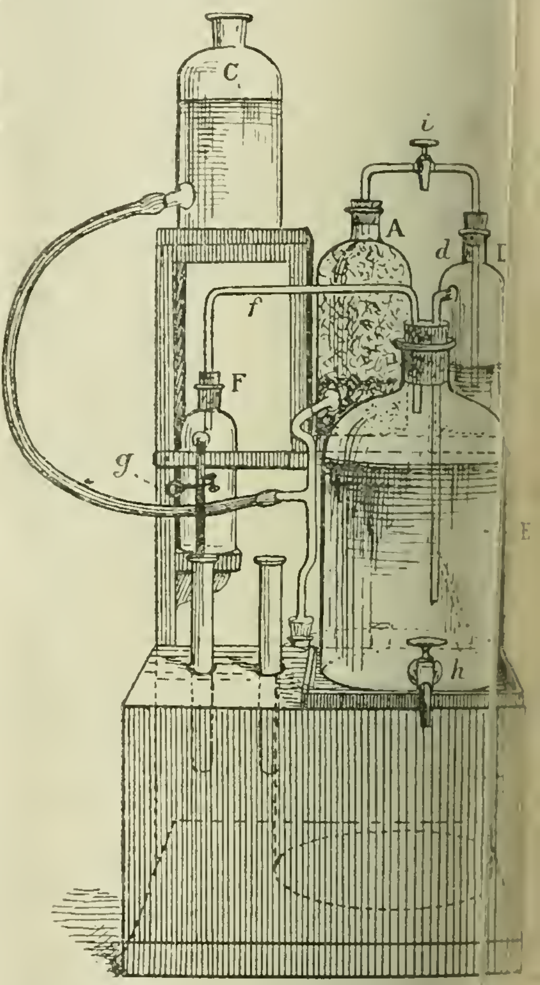
For some purposes it is more satisfactory to use a saturated aqueous solution of sulphuretted hydrogen than to employ the gas. This is especially the case in quantitative analysis. In the first place, I am of the opinion that precipitates produced by means of an aqueous solution are more granular, and therefore more readily filtered and washed, than when the gas is employed. Secondly, when the gas is used there is always a tendency for some of the precipitated sulphide to adhere to the sides of the tube through which the gas is being passed, and it is often a matter of considerable difficulty to remove the last traces. But, as I have already mentioned, it is under ordinary circumstances impossible to keep a solution of sulphuretted hydrogen, even for a few days, without very considerable decomposition taking place.

In some laboratories, in order to get over this difficulty, the bottle containing the solution is fitted with a double-bored cork, through one of the holes of which a syphon, for drawing off the solution, is passed; and through the other a bent glass tube, which is connected with a gas supply tap. The gas tap is kept always turned on, so that when the solution is drawn off its place is occupied by coal gas, and thus oxidisation is prevented. But even in this arrangement it is first necessary to prepare the aqueous solution, and should a supply of the gas be required, it is not possible to obtain it without employing a separate apparatus.

To overcome the foregoing difficulties I have designed an apparatus from which either a constant supply of sulphuretted hydrogen gas or a saturated aqueous solution can be obtained. The generating part of the apparatus is a slightly modified "De Koninck's." Whereas in the original form of the apparatus all the connections are made by means of rubber stoppers and glass tubing; I have had a tubulus blown on to the sides of the bottles, so that all the fittings can be made with rubber tubing, and thus risk of leakage is minimised.

The accompanying diagram explains the apparatus, which consists of a bottle A containing ferrous sulphide, and having a tubulus on either side, near the bottom, by means of which it is connected with the reservoir B (represented in the sketch by the dotted lines) and the flask C. D is a wash bottle containing a little water, the outlet tube of which is connected with a tube *d* passing nearly to the bottom of the bottle E (about 3 or 4 litres capacity) filled with distilled water. A second tube *f*, which does not dip below the surface of the water, passes into a small "catch" bottle F. This bottle has an outlet tube to which is attached, by means of a piece of rubber, a glass tube about 8 inches long; *g* is a small brass clip which serves to close the rubber tube.

Should an aqueous solution of sulphuretted hydrogen e required, it can be obtained by turning on the tap , whereas one can get a supply of the gas by opening e clip *g*. When the apparatus is freshly charged, the t i and the clip *g* should both be opened and a rapid curren f the gas bubbled through the water in E for a few minu . By this means the air on the surface of the water is dr out, and on closing the clip the gas will be absorbed



the water is saturated. As soon as the water is com saturated, the pressure of the gas drives the acid up o and all action ceases. As there is no air present i oxidisation can take place, and the solution, eve apparatus is standing in strong light, deposits only of sulphur.

All the rubber connections of the apparatus sh d carefully wired on, so that no leakage can take plac have usually found it best to keep the apparatus bottle C always in the position represented in the and the tap *i* open. By so doing, the aqueous sol sulphuretted hydrogen is always saturated. The the "catch" bottle F is to guard against any soluti accidentally drawn into the bottle E. This does so happen if one neglects to turn on the tap *i* before the clip *g*. For convenience the stand contains tw in which test tubes may be placed whilst pas gas.

Hydrochloric acid (2 parts acid and 3 parts water h be used to generate the gas, because when sulphuri employed there is a tendency for ferrous sul crystallise out and to clog the apparatus.

Manchester Section.

Meeting held at the Chemical Club, on Friday, May 3rd, 1901.

DR. GROSSMANN IN THE CHAIR.

PRODUCTION OF SOLUBLE POTASH SALTS ROM POTASSIUM FELSPAR (ORTHOCLASE).

BY J. G. A. RHODIN, F.I.C.

ANTS require from the soil only a few mineral sub- nces, namely, potassium salts, phosphoric acid, and rogen; and nearly every plant can be grown in sterile d, if these are supplied. These salts must therefore m the most important item in the manure trade, and have eady sale.

f we trace the potash salts from the soil to their origin, shall in every case find that it is the same mineral, par (orthoclase), which is a double silicate of alumina potash. Rain-water, with the aid of dissolved carbon xide, forms out of the felsphatic rock, silicate of alumina, potassium carbonate or a similar salt. The whole of products are washed down into the valleys, where they n a clayey fertile soil. To do this, however, centuries e to pass, and it would be hopeless, or probably so, to try mitate nature in this respect, although for many years eriments have been carried out in this direction. fessor Bergstrand, of Stockholm, has, for instance, been ug out composts of lime and felspar, and subjecting them he influence of the weather for years, and he has found soluble potash salts are actually formed, but so far, a small amount of the quantities contained in the spar e thus been made available. It has also been proposed ecompose the felspathic rock with carbonate of soda, and nts have been taken out for the purpose some 30 years . All these processes, however, have no commercial ie, being in the first place too expensive, and in the nd place they have to compete with Stassfurt salts. ice the method to be adopted must be extremely cheap, at the same time it must be such as to get some value of the aluminium silicate contained in the spar. A hod which will be described later on, perfectly mplishes these things.

efore describing the process we shall discuss where par can be found in sufficient quantity and pure igh to be utilised for a process of manufacture. As a ral rule we have to look for places where the primary goes to the surface, felspar always occurring in lodes n into the gneiss. Sometimes it occurs in serpen- , as for instance in South-Eastern Pennsylvania, in the ster county. In Europe the Scandinavian Peninsula specially rich in felspar, the mineral being found in ing quantities all over the peninsula. It further rs on the Ural Mountains, which separate Russia from . It also occurs in small quantities in Silesia and rhere in Germany. In the British Isles it is rather occurring principally in Ireland. On the American nent the mineral occurs in large quantities both in ast and in the west. On the whole we might say that nineral is distributed all over the world. It has also quarried for centuries by the Chinese—in whose try this mineral occurs in large quantities—for the ose of porcelain making. The extent to which it is in Europe can be gauged by the output of the ish mines, which practically supply the demand for ir in Europe.

e report of the Swedish College of Commerce of 1898 s an output for that year of 20,737 tons of all ies, of a value of 239,154 kronors, or an average of 11 kronors, or 12*s*., per ton mined and in pieces. rices vary very much, and the limits are 9 kronors kronors. In this country the price rises to 30*s*. per In September 1899 I went over to Sweden to ain the state of this class of mining, and I found that itput had to be diminished every year on account of iminished demand for quantity and the increased demand for quality from the side of the Potteries. Thousands of tons of seconds and thirds are lying at the mines for no purpose, except a possible adulteration of the ground stuff which is sold on the market.

My process for the utilisation of felspar is as follows:—I grind the spar to a fine powder in a rotatory ball mill. I then mix 53 parts of slaked lime and 40 parts of common salt with 100 parts of the powdered spar in mixing drums. If this powder be submitted to a temperature of 900° C. for an hour, a distinct chemical change takes place, although the powder comes out of the furnace looking much as it went in. It is very difficult to explain why 80 to 90 per cent. of the potassium contained in the felspar should be converted into potassium chloride in this manner. This is, however, the case, as will be shown later on by the figures belonging to the experimental research on the subject. It will suggest itself to most chemists that there should be an analogy with the analytical method proposed by Lawrence Smith, and which, as we all know, consists in the heating of felspar with an excess of lime and ammonium chloride. In this latter case the explanation is simple enough, as the ammonium chloride is practically totally dissociated at the white heat employed, and we thus have to deal with strong chlorine itself acting upon the spar, when it is decomposed by the lime alone. At a very white heat it is known that lime itself will form a soluble glass with the felspar, and this, being acted upon by the chlorine, no doubt forms the potassium chloride which is afterwards accounted for in the analysis. In my process, however, the temperature is so low that lime by itself does only in the slightest degree act upon the felspar, and the sodium chloride is hardly evaporated at all. To explain the reaction one had to suppose that the salt acts to begin with as a kind of semi-volatile flux, which acts as an intermediary between the lime and the felspar. The result of this initial step is a zeolitic compound of lime and the constituents of the felspar. That this is so is evident from the fact that the product of the heating for a very short time decomposes easily with acids, whereas water will extract very little potassium from the mass. The continued heating will, however, cause an interaction between this zeolite and the salt, potassium taking up chlorine, and soda entering in its place in the zeolite. Afterwards the soda gets into such a form as to be volatilised readily at this temperature. The mass that we take out of the furnace in this case is composed in the following manner:—20 to 25 per cent. thereof formed of water-soluble salts, 30 per cent. of which are chloride of potassium, and 70 per cent. of which are chloride of sodium. The remaining 75 per cent. of the mass contain 60 per cent. of silica, 10 per cent. of alumina, and 30 per cent. of lime. A large quantity of the lime still remains in the form of calcium oxide. As to quantitative results of the reaction, I shall now proceed to give figures relating to experiments carried out. To begin with, before contemplating the use of the soluble salts by themselves, I proposed a large excess of lime in the mass, so as to make it useful for agricultural purposes, both as potash manure and for liming the soil. I instructed the municipal chemist of the town of Gothenburg, Dr. J. E. Alén, to make an experiment with 10 parts felspar, and 10 parts lime, plus two parts salt. He found that three hours' heating to bright yellow heat caused the potash contained in the spar to be soluble in the following proportions:—

	Per Cent.
In water	40·8
In HCl, 4 per cent.	77·3
In HCl, 38 per cent.	83·7

Later experiments showed that a larger amount of salt and a smaller amount of lime gave a more favourable result as to water-soluble potassium salts. I procured some powdered felspar from Sweden of the following composition:—

	Per Cent.	
SiO_2	65·67	
Al_2O_3	19·33	
CaO	0·59	
K_2O	10·56	
Na_2O	3·37	
Ignition loss	0·36	99·88
Undetermined, and analysis loss	0·12	
	100·00	

A mixture of 100 parts of this felspar, 40 parts of pure CaO, and 40 parts of pure NaCl, was heated for three and six hours respectively. The result was as follows :—

—	Three Hours.	Six Hours.
	Per Cent.	Per Cent.
Water-soluble salts	21·5	21·5
Water-soluble salts calculated on felspar.	38·7	38·7
Containing K_2O	17·44	18·64
Containing K_2O calculated on felspar	6·75	7·21
The return of K_2O in the felspar rendered soluble.	63·1	68·2

The insoluble residue had following composition :—

SiO_2, undecomposed spar	57·47	58·44
Al_2O_3	10·04	8·76
CaO	..	25·36
Alkalis, &c. (CO_2)	..	7·44

The fineness of the felspar can be represented by a sieve containing 90 meshes to the linear inch.

It may thus be seen that the potash of the felspar can be easily extracted by this process to the extent of 70 per cent. of what occurs in it by simple extraction with water. With a finer powder the yield might be increased still more. The temperature of the furnace was measured with a thermo-electric pyrometer, and found to be 860° to 900° C.

Later experiments made with only one hour's heating of the mass give comparatively a still more favourable result than any of the above-mentioned trials, the figures being as follows :—

One Hour Heating, Same Mixture.

	Per Cent.
Water-soluble salts	23·0
Water-soluble salts calculated on felspar	41·4
Containing K_2O	19·74
Containing K_2O calculated on felspar	8·17
The return of K_2O in the felspar rendered soluble.	77·3

The insoluble residue had the following composition :—

	Per Cent.	
SiO_2 + undecomposed felspar	60·37	
Al_2O_3	6·84	Soluble HCl.
CaO	23·77	
MgO	Trace	
CO_2	6·52	
Alkalis, &c.	2·50	
	100·00	

The above part of this memoir was written about twelve months ago. Since writing the same I have, however, found that the insoluble mass which results after extracting the potash salts with water can be used with advantage for the manufacture of glass. We have, in fact, made experiments on a large scale, producing on the one hand a 20 per cent. potash salt, and on the other a glass-making material which only requires the addition of some extra silica and alkali to be converted into a good glass. Many experiments have been carried out in order to reduce the quantity of lime used in the manufacture, so as to obviate the addition of extra silica when making the glass. The deviations from the portions of 1 : 0·4 : 0·4 have caused the yield of potash salts to diminish considerably; in fact, the whole nature of the process consists in the suitable mixture of lime and salt; and to show the importance of the mixture, three parallel experiments, in exactly similar conditions, were carried out and finished on the 12th March 1901, with a view towards showing that mixed lime and salt acted upon felspar differently from these reagents by themselves. The temperature of the furnace was about 850° C., and the pyrometer readings are only comparative.

Experiment No. 1.—100 grms. of felspar, 40 grms. of lime, finely-powdered and mixed, were heated for two hours in a muffle furnace. The mean pyrometer reading was 205 divisions (arbitrary). The furnaced mass contained 0·39 per cent. of water soluble K_2O. Calculated on the felspar alone this means 0·55 per cent.

Experiment No. 2.—100 grms. of felspar, 40 grms. common salt in a finely-powdered condition, and intimat mixed, were heated for two hours in the same mu furnace as above. The mean pyrometer reading 210 divisions. The furnaced mass contained 2·66 per c of water soluble K_2O, or, calculated on the felsp 3·72 per cent.

Experiment No. 3.—100 grms. of felspar, 40 grms. salt, and 40 grms. of lime in a finely-powdered conditi and intimately mixed, were heated in the above-mentio muffle furnace for two hours. Mean pyrometer read 210 divisions. The mass contained 4·04 per cent. of w soluble K_2O, or, calculated on the felspar, 7·27 per c The spar used contained 9 per cent. total K_2O.

It will be seen from the above that the new proces using lime and salt mixed causes a far more thoro decomposition than the previously known processes treating with salt or lime separately (Patent No. 11, of 1847, R. A. Tilghman; 2983 of 1856, W. E. Newt 3185 of 1857, F. O. Ward). This is naturally under specified conditions of temperature as all previous wri on the subject have recommended *fusion*, whereas in writer's process there is a total absence of fusion. addition to the experiments referred to above we caused trials to be made in Stockholm in Sweden, in nection with the taking up of the process for comme purposes, and my assistant, Mr. Ryberg, who has car out most of the English experiments, has been over for nearly three months supervising these trials. results have confirmed our previous experience thorou and some new observations have been made with refer to the nature of the reaction taking place. The insol mass, amongst other things, contains to some exte double silicate of lime and alumina insoluble in hy chloric acid, which no doubt is formed during the pro We have also established the fact that great care h be taken in controlling the furnace operation, as too a time will lead to a bad yield, and too long a heating lead to a loss of potash. It is to be hoped that exceedingly simple process will lead to industrial u takings in countries with an abundant supply of fel and to some certain degree obviate the evils of the pr state of monopoly.

So far, promising results have been obtained towa establishment of a factory in Sweden, and in a few mo time active operations are likely to start there i neighbourhood of Stockholm. The supply of felsp that district is immense. A favourable factor, makin industry desirable, is the possibility of using thir felspar for the process. In all the trials over th third-rate spar from Rorstrand has been used. Its position is as follows :—

	Per Cent.
SiO_2	66·37
Al_2O_3	17·28
Fe_2O_3	0·50
CaO	0·84
K_2O	10·30
Na_2O	3·21
Ignition loss	1·73
	100·23

The smaller percentage of alumina, which is disa tageous to the potteries, is a gain when the residue i for glass. I have also caused inquiries to be made United States, and I have no doubt, from the g tenure of those interested in the matter over there the process will be taken up in America when we demonstrated the technical utility of the same i country.

A NEW TEST FOR SULPHUR IN BENZOL USE IN GAS WORKS.

BY WILFRID IRWIN.

It is now about five years since benzol was first em as an enricher for coal gas, and at the present ti various reasons, its adoption has become very exten

An objection has been raised to it owing to the fa if not properly prepared it may contain sulphur, a a great convenience to apply the enricher to the gas after rification, it is clearly advisable that the product should as free as possible from such an impurity. All comrcial benzol contains sulphur in some proportion, but per cent. should be considered a maximum to be allowed, l this ought to be reduced if possible. One gallon of nzol per 10,000 cubic feet of gas is a common amount to ich with, and if this contained 1 per cent. of sulphur, addition of 6·1 grains of sulphur per 100 cb. ft. uld be the result. With 0·4 per cent., my suggested ximum, the result would be an addition of 2·4 grms. per) cb. ft.

;ulphur exists in commercial benzol in several different nbinations—

I. Carbon bisulphide.

II. Mercaptans.

II. Thiophene, thiotoluene, &c.

n the case of a very bad sample, the sulphur is usually sent as CS_2 principally, but where the amount of total hur in below 1 per cent., the thiophene often exceeds mount that of the CS_2.

'he usual methods employed for the determination of hur in benzol are or have been—

Heating the benzol in a sealed glass tube with NH_3 Fe_2Cl_6, thereby changing the sulphur into FeS and CNS oxidising and weighing as $BaSO_4$ as described Holland and Philips. See this Journal, 1884, 296.

. Potassium xanthate method as described by Nickels The Chemical News, Vol. XLIII., page 148.

I. Phenyl hydrazine method. See this Journal, 1891, 578.

here the sulphur is present as CS_2 all of these ods give good results. The first method was till lately sual one employed but recently the last of the three een popular.

essrs. Holland and Philips assert that by their method sulphur compounds than CS_2 are changed into $BaSO_4$, at by it the amount of total sulphur can be determined, this view seems to be taken by Allen, though Lunge s Victor Meyer in opposition to the assertion.

. II. and III. methods are on the face of them quite acticable for the determination of the total sulphur and e used for CS_2 alone.

sample was recently received by me and, tested by method, was found to contain 0·23 per cent. sulphur. termining the specific gravity I found it to be nearly 3 which was too high for so pure a sample. As the mpurities which raise the specific gravity of benzol are od thiophene, I concluded to try some other method e estimation of total sulphur, and to devise a plan such in ordinary gas chemist or engineer can employ it pparatus he already possesses, and one which shall be gous to the standard method of testing for the grains 0 cb. ft. of coal gas in use in every gas works.

following then is the method I employ. It is an adaptation of Allen's test for sulphur in fats.

e the ordinary apparatus for estimating sulphur in hich every gas works in the country of any size ses. I take away the burner and replace it by a amp capable of holding 100 c.c. of spirit.

the benzol to be tested I carefully measure out into the spirit lamp, and then to it add 90 c.c. pure or methylated spirit, shake the two up together and e lamp. Round the lamp I place several pieces of arbonate of ammonia, and in other respects proceed as in the test for sulphur in gas. See figure in next .

special precautions to be observed are as follows:—

I. re must be taken that the flame is not too large, se it will smoke. As the test proceeds it usually es in size and should, therefore, at first be lower is intended to be. If any trouble should arise smoke a larger proportion of spirit may be ed.

I. f methylated spirit be employed instead of pure then a blind test should first be made with the of spirit alone, and a deduction (which will be o be very small) for the sulphur it contains, must :.

III. Not more wick than is absolutely necessary should be employed in the lamp.

The calculation is simple: thus, supposing the amount taken were 10 c.c., and the weight of $BaSO_4$ less the correction for the methylated spirit, 0·521 grm.

The answer in grms. of CS_2 per litre would be—

$$\frac{0{\cdot}521 \times 32 \times 1000}{233 \times 10} = 7{\cdot}155.$$

The answer in grains per gallon would be—

$$7{\cdot}155 \times 70 = 500{\cdot}8.$$

The answer in percentage would be—

$$\frac{7{\cdot}155}{0{\cdot}880 \times 10} = 0{\cdot}81,$$

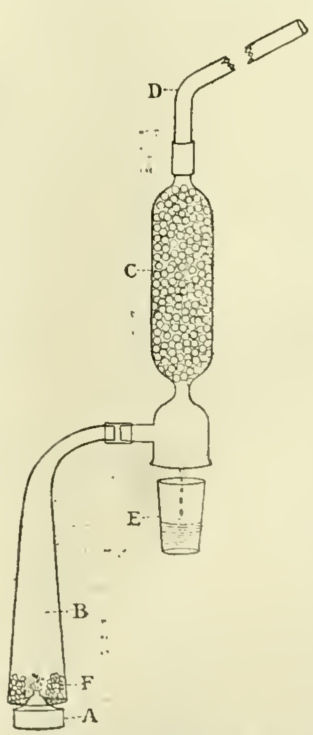
where 0·880 = the specific gravity of the benzol.

If instead of 10 c.c., 96 fluid grains were taken, then the number of grains of $BaSO_4$ found would indicate without calculation the grains of sulphur per $\frac{1}{100}$ gallon of benzol, and this result would also indicate the number of grains of sulphur per 100 cubic feet of gas which the said benzol would cause to be added to that originally present in the gas, supposing 1 gallon per 10,000 cubic feet of gas were employed.

The following are a few examples of results:—

——	Holland and Philips' Method.	Combustion Method.
	Per Cent.	Per Cent.
No. 1 Staffordshire benzol—the sample above referred to	0·23	0·44 0·45 } Duplicate tests.
No. 2. Staffordshire benzol..	0·25	0·57
No. 3. " " ..	..	0·88
No. 4. Lancashire benzol....	..	0·07
No. 5. " " ..	..	0·04
Methylated spirit...........	..	0·01

The above table shows first that Holland and Philips' results are too low probably because only the S in the CS_2 is acted upon, and also that a benzol practically free from sulphur can be readily obtained.



A, spirit lamp. B. trumpet tube. C, Condenser, with glass marbles. D, draught pipe. E, Beaker into which the condensed liquor falls. F, fresh carbonate of ammonia.

This method does not pretend to be scientifically accurate any more than is the case with the standard test for sulphur in gas; both probably give results lower than the reality, but as the principle is the same in each, the error will be proportional.

As there are many gas chemists and engineers unfamiliar with the conditions requisite for ensuring that the article which they purchase is in other respects than sulphur, the most suitable for the objects they have in view. I propose now to state them in full:—

I. Colour. The benzol should be water white.

II. Specific gravity. This should be 0·880 to 0·882.

III. Distillation. When 100 c.c. are distilled in an ordinary retort with condenser, about 90 c.c. should distil over at 100° C., and by the time the thermometer reaches 115 C., the bulb of the retort should be dry.

(*a*.) Size of retort. The retort when full to overflowing should contain about 200 c.c.

(*b*.) Rate of distillation. This should be as rapid as possible so long as the distillate falls into the receiver in separate drops.

(*c*.) The bulb of the thermometer should be in the liquid, and ⅜ inch from the bottom of the retort.

In conclusion, I might say there ought never to be any difficulty in supplying benzol to meet the requirements mentioned.

CS_2 can be readily extracted by practical distillation, whilst the mercaptans and thiophene can be easily removed by continued washing of the benzol with strong sulphuric acid.

At the end of the operation the vessels B, C, and D are all washed with distilled water into E, a little bromine water added, and the sulphuric acid estimated in the ordinary manner.

New York Section.

Meeting held on Friday, December 21st, 1901.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

THE PRODUCTION OF SODA BY THE AMMONIA PROCESS.

BY J. A. BRADBURN.

As is well known, the greater part of the world's production of soda ash and bicarbonate of soda is manufactured by the ammonia process, and the alkali industry is now almost entirely located in those places where strong brine can be obtained. The ammonia process was inveated H. G. Dyar and J. Hemming in 1838, and has been u with varying success by many persons since that time. Society's Journal in 1883, 1885, 1889, 1890, 1891, 18 and 1896, contains papers dealing with the ammonia proce the latter year's Journal contains parts of a pa contributed by the writer. The present paper is concer chiefly with a newly invented tower of about the s outside dimensions as the one ordinarily employed, but different internal arrangements for promoting intin mixture of the gas and liquid, and also an improved sys of cooling. The system of cooling is not yet in its form; but the following figures, worked out by me in S 1900, from an examination of the quantities of mate used in producing 50 tons of Na_2CO_3 in 24 hours, illus what the actions going on in such a tower are.

The tower is filled by pumping into it cooled carbonated ammonia brine at a point about six feet the top; this is pumped in continuously, being also d out continuously, so as to keep the level of the liquor a same point, namely, six feet from the top. The tow 20 metres high and 2 metres in diameter. As the l travels down, the NH_4Cl and $NaHCO_3$ increase in qua while the NaCl and ammonium carbonates decrease; i same time a proportionate quantity of water is taken the liquor by the precipitated sodium bicarbonate—

$$2NaHCO_3 = Na_2CO_3 + H_2O + CO_2$$

Only the liquor in the upper part of the tower absorb retains CO_2 from the kiln gas pumped into the tower in the bottom ring a small quantity of sodium and amm bicarbonates are decomposed, giving thus a little C the incoming kiln gas. In the bottom ring there is a quantity of NH_4Cl and of $NaHCO_3$, and a slight temperature here causes these to react a little. 48 volumes of gas, containing 6 per cent. CO_2, lea tower at the top for every 100 volumes of kiln gas, cont 55 per cent. CO_2, entering at the bottom.

Ring.	Temperature.	CO_2.	Total NH_3.	Alkaline NH_3.	Fixed NH_3.	NH_4Cl.	Na
	° C.	Grms. per Litre.	Grms. per Litre.	Grms. per Litre.	Grms. per Litre.	Grms. per Litre.	Grm Li
Entering liquor	32·0	65·5	73·95	70·38	3·57	11·23	24
18	39·6	77·0	73·95	68·68	5·27	16·58	24
17	42·3	75·8	73·78	65·45	8·33	26·21	23
16	43·7	72·5	73·35	60·86	12·49	39·30	22
15	45·0	68·8	73·95	57·20	16·75	52·71	20
14	48·0	65·5	73·78	53·04	20·74	65·26	[illegible]
13	47·5	61·5	73·44	48·45	24·99	78·64	18
12	47·5	58·0	73·78	45·22	28·56	89·88	17
11	47·3	54·5	73·78	41·48	32·30	101·64	16
10	47·0	52·5	74·20	38·84	35·36	111·27	15
9	47·0	50·3	74·29	35·53	38·76	121·97	14
8	46·2	48·4	74·46	32·38	42·08	132·42	1
7	44·2	46·4	74·37	29·49	44·86	141·17	1
6	43·0	44·5	74·80	26·94	47·86	150·60	1
5	41·5	42·9	75·65	25·07	50·58	159·17	1
4	38·0	41·5	75·90	22·78	53·12	167·16	[illegible]
3	34·0	40·3	76·16	20·76	55·40	174·34	[illegible]
2	32·0	39·8	76·75	19·12	57·63	181·36	[illegible]
1	32·5	39·0	76·50	19·21	57·29	180·29	[illegible]

Ring.	Weight of $NaHCO_3$ formed in each Ring.	Weight of CO_2 precipitated as $NaHCO_3$ in each Ring.	Weight of CO_2 absorbed in each Ring from Kiln Gas passing through.	Weight of CO_2 absorbed by the Liquor and retained in Solution.	Weight given off f Liquor Bicarb
	Grms. per Litre.	Grms. per Litre.	Grms. per Litre.	Grms. per Litre.	Grms. p
18	8·40	4·4 from the gas	15·90	11·5	0·
17	15·11	6·71 „ gas 1·2 „ liquor	6·71	0·0	0·
16	20·56	7·47 „ gas 3·30 „ liquor	7·47	0·0	0·
15	21·05	7·32 „ gas 3·70 „ liquor	7·32	0·0	0·
14	19·71	7·02 „ gas 3·30 „ liquor	7·02	0·0	0·
13	21·00	6·99 „ gas 4·00 „ liquor	6·99	0·0	0·
12	17·64	5·75 „ gas 3·50 „ liquor	5·75	0·0	0·
11	18·48	6·18 „ gas 3·50 „ liquor	6·18	0·0	0·

Ring.	Weight of $NaHCO_3$ formed in each Ring.	Weight of CO_2 precipitated as $NaHCO_3$ in each Ring.	Weight of CO_2 absorbed in each Ring from Kiln Gas passing through.	Weight of CO_2 absorbed by the Liquor and retained in Solution.	Weight of CO_2 given off from the Liquor and Bicarbonates.
	Grms. per Litre.	Grms. per Litre.	Grms. per Litre.	Grms. per Litre.	Grms. per Litre.
10	15·12	5·91 „ gas 2·00 „ liquor	5·91	0·0	0·0
9	16·80	6·60 „ gas 2·20 „ liquor	6·60	0·0	0·0
8	16·40	6·69 „ gas 1·90 „ liquor	6·69	0·0	0·0
7	13·73	6·99 „ gas 2·00 „ liquor	6·99	6·0	0·0
6	14·83	5·86 „ gas 1·90 „ liquor	5·86	0·0	0·0
5	13·44	5·44 „ gas 1·60 „ liquor	5·44	0·0	0·0
4	12·55	5·17 „ gas 1·40 „ liquor	5·17	0·0	0·0
3	11·27	5·45 „ gas 1·20 „ liquor	5·45	0·0	0·0
2	11·01	5·26 „ gas 0·50 „ liquor	5·26	0·0	0·0
1	−1·80	0·0 „ gas 0·0 „ liquor	0·0	0·0	0·94 from $NaHCO_3$ 0·80 „ liquor.

ng.	Volume of CO_2 absorbed in each Ring per 100 vols. of Kiln Gas entering at Bottom of Tower.	Volume of Kiln Gas leaving each Ring per 100 vols. entering at Bottom of Tower.	Per Cent. by Volume CO_2 in the Gas leaving each Ring.
18	1·62	48·38	6·98
7	2·95	50·00	10·00
16	4·02	52·95	15·00
15	4·12	56·98	21·02
14	3·96	61·10	26·33
13	4·10	65·06	30·83
2	3·44	69·16	34·93
1	3·61	72·61	38·02
0	2·95	76·22	40·97
9	3·28	79·18	43·16
8	3·20	82·46	45·41
7	2·66	85·66	47·47
6	2·89	88·33	49·05
5	2·61	91·22	50·67
4	2·44	93·84	52·04
3	2·19	96·28	53·26
2	2·14	98·48	54·30
1	0·0	100·62	55·28

e first thing that strikes us in the above figures is notwithstanding the great pressure at the bottom of a nn of liquid 60 feet high, less CO_2 is absorbed there at the top of the tower, where the pressure is much This is explained by the difference in composition e liquor at the bottom as compared with that at the We have at the bottom of the tower the greatest tity of NH_4Cl and $NaHCO_3$; therefore we have here the est tendency to a reverse reaction (see Journal, 1896, 2), with formation of NaCl and NH_4HCO_3; the latter ily decomposed by a slight rise in temperature.

r a production of 50 tons of Na_2CO_3 from this tower hours, about 329 cubic metres of liquor go into the and about 304 are drawn out, this diminution in e being mainly brought about by water abstracted the liquor to form, with the soda and CO_2, crystals of O_3, one molecule of water being removed by the itation of one molecule of sodium bicarbonate ximately. As a matter of fact, one of the H atoms water goes to form NH_4Cl, which remains in solution; act change in volume is therefore unknown.

Meeting held on Friday, April 19*th*, 1901.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

RAPHITE PRODUCED BY THE ACHESON PROCESS.

BY FRANCIS A. J. FITZGERALD.

ent years graphite, as met with in nature and as actured by various processes, has received much on, both from scientific investigators and from manufacturers of various kinds. Even those who are familiar with the commercial article only, know the great variety of graphites, and to one who undertakes a study of the chemical and physical properties of graphite it is soon evident that there exist "many varieties of graphite analogous to the divers varieties of amorphous carbon" (Moissan, Le Four Electrique, p. 111). When, therefore, graphite is considered, it is important to define just what we mean by the word. M. Berthelot has defined graphite as follows: "All varieties of carbon that are capable of forming graphitic oxide by oxidation." This definition is quoted by Moissan in Le Four Electrique, and he goes on to say: "This property determines definitely the classification of carbons; and the three groups—diamond, graphite, and amorphous carbon—include, therefore, all states of the elementary body that are met with in nature, or which can be produced by man."

While this definition may be satisfactory from the chemical point of view, it is not satisfactory when graphite is considered commercially. From the latter standpoint the definition is too broad, for it will include carbon which does not possess certain properties that are considered of importance in a good commercial graphite. It must be noted that in the development of the Acheson process for manufacturing graphite the production of a commercial article was kept prominently in view.

Since there is an impression in the minds of many people that the Acheson process is related to some others, it may be well to consider this matter briefly.

Moissan described three methods for converting amorphous carbon into graphite:—

1. Amorphous carbon is heated to a very high temperature in the electric furnace, the conversion to graphite being effected by "simple elevation of temperature."

2. An excess of carbon is dissolved in a metal at a high temperature. The metal is then allowed to cool down, and the excess of carbon separates out as graphite.

3. Carbon is dissolved in or combined with another element, and then thrown out as graphite by the introduction of some other body.

Girard and Street, in a lecture before the Société Internationale des Electriciens, describes a furnace which may be used for the conversion of carbon into graphite. The method consists substantially in causing an arc or arcs to play over the surface of the carbon that is to be converted into graphite.

Mr. E. G. Acheson, when experimenting on the crystallisation of carbon, in 1891, discovered carbide of silicon, or, as it is usually called, carborundum. Recognising the value of this material as an abrasive, he at once began to manufacture it on a commercial scale. The electric furnaces which he used for this purpose were of the incandescent type; heat being supplied to a mixture of carbon and silica by passing a current through a central core composed of granular carbon. In these furnaces he almost invariably found a layer of graphite next the core, and an examination of this material showed that it was formed by the decomposition of the silicon carbide, the silicon having been vaporised and the carbon left behind in the form of graphite, which preserved the structure of the silicon carbide crystals. From this observation, and various others which Mr. Acheson has described in a paper read before the Franklin Institute, at the meeting of March 15th, 1899, he concluded that amorphous carbon may be transformed into graphite by heating to a high temperature in the presence of metallic or other oxides capable of forming carbides, the carbon combining with the metal or metalloid to form a carbide, which is then decomposed, the carbon being set free in the form of graphite. It might be supposed that to convert a given weight of carbon into graphite it would be necessary to mix with it the theoretical proportion of the metal necessary to combine with the whole of the carbon. Acheson's experiments, however, showed that a much smaller amount of the metal than that theoretically required would convert the carbon into graphite, and he therefore concluded that the carbide-forming material played the part of a catalytic agent.

Dr. William Borchers claims priority in the discovery of this method of producing graphite. In the Zeitschrift für Elektrochemie, September 1899, a periodical then edited by Borchers, there is an article reviewing Acheson's lecture before the Franklin Institute. In this article the following statement occurs:—

"Although Acheson asserts than in 1896 he had formed the theory that graphite is produced from amorphous carbon by the formation and decomposition of a carbide, nevertheless the fact still remains that he did not make this known until the end of 1898, for he then announced for the first time publicly the idea of the formation of graphite by means of carbide in a patent upon the manufacture of graphite, applied for November 3rd, 1898, and published January 17th, 1899, that is almost two years later than Borchers, who said, in the Zeitschrift für Elektrochemie, March 7th, 1897:—

"'I shall only point out briefly that all substances which are capable of entering into a chemical combination with carbon, more or less easily dissociable, are also in a condition to further the crystallisation of carbon. I name especially boron, silicon, titanium, zircon, vanadium, aluminium, cerite metals, chromium, molybdenum, tungsten, uranium, manganese, iron, nickel, &c.; it appears to me, however, that it is not thoroughly determined that combination of carbon, in the form of gases and vapours, with hydrogen, oxygen, sulphur, &c., can also bring about crystallisation.'"

In the same publication, chiefly devoted to the conditions favourable to the formation of the diamond, Borchers points out in unmistakable language that, without the aid of pressure, in the formation and decomposition at high temperatures of carbides of the substances just mentioned, diamond can never be formed, but instead, graphite.

An article on Progress in Electro-Chemistry in 1899, by Borchers, in Vol. 8 of the Mineral Industry, contains a statement almost identical with that quoted above.

Borchers evidently overlooked U.S. Patent 568,323, entitled Manufacture of Graphite, and issued to Acheson, September 29th, 1895:—

"I have also discovered that, in order to produce pure graphite from carbonaceous materials, there is an indirect conversion, and that the act of formation of the graphite is more in the nature of an act of dissociation of the carbon from its combination with other materials than a conversion of the ordinary carbon into graphite, and that, as a preliminary step, the carbon has to be combined chemically with some other material. Thus, I have found that if the carbonaceous material or carbon used in the process contains a considerable proportion of mineral matter, or if it is mixed with a certain proportion of oxide or oxides, such as silica, clay, alumina, manganese, lime, or oxide of iron, and subjected to the treatment as hereinafter set forth, the yield of graphite is enormously increased and the product is most satisfactory."

The method of treatment was, of course, heating the materials in an electric furnace. It is interesting to note that in the same year that Borchers published his opinio on the formation of graphite, over 162,000 pounds graphite were manufactured at Niagara Falls by t Acheson process, and marketed.

At first the only commercial use made of the Aches method for the conversion of amorphous carbon i graphite was in the manufacture of electrodes for use electrolytic processes, where the employment of amorph carbon was objectionable owing to the rapid disintegrati of the electrodes made of that material. Electrodes intend for graphitisation are manufactured in the same way ordinary carbons, except that in making up the mixt for these carbons metallic oxides are introduced to br about graphitisation in the electric furnace. The carbo having been made up in this way, are then packed specially constructed furnaces, and are there heated t sufficiently high temperature to bring about graphitisatio

From the earliest experiments made on the graphitisat of carbon it was found that a great many varieties graphite could be produced by the Acheson process, while developing the commercial manufacture of graphiti electrodes, Acheson carried out an exhaustive series experiments with the intention of producing graphites t would be as good if not better than those obtained from graphite mines. Keeping constantly in view those quali which are most desirable in a commercial graphite, Ache after an exhaustive series of experiments, found that carbonaceous material which gives the most satisfac graphite for general purposes is found in the anthra coal measures.

The furnace used for the graphitisation of carbon by Acheson process is a long narrow trough built of fireb with a suitable refractory lining. At either end of trough is a terminal composed of 25 carbon rods, 4 in square and 34 inches long. The terminals are connecte the 'bus bars conveying the current by means of h copper cables. The furnace is filled with anthracite through the centre of which runs a core, compose carbon rods, which connects the terminals of the fur electrically. When cold, anthracite coal being a very conductor of electricity, this core is essential.

The only determinations of density made on gra manufactured by the Acheson process were obtained graphitised carbons. The results from two separate car were:—

——	(1.)	(2.)
Before graphitising	1·89	1·91
After graphitising	2·11	2·1

The graphite as manufactured for ordinary comm purposes contains over 90 per cent. carbon. The coal which it is produced contains a considerably h percentage of ash when the latter is calculated reference to the amount of fixed carbon present in the but a great part of this ash is volatilised durin process of graphitisation. As the ash of most consists principally of silica, a considerable quant silicon is volatilised during the operation of the furnac sometimes this escapes in the form of a vapour to the wall of the furnace, where it burns in the air, form thick deposit of silica on the furnace bricks. If f reason a very pure graphite is desired, it is merely nec to heat the material for a sufficiently long time to a above the vaporisation temperature of the imp contained in it. A specimen of anthracite coal contained 5·783 per cent. of ash was treated i manner, and the resulting product was found to c only 0·033 per cent. of ash. In the graphitisat carbon electrodes similar treatment may be employe it is desired to obtain an electrode that is very pure example:—A carbon electrode which, before graphiti contained about 2 per cent. of ash was found to c only 0·045 per cent. of ash after graphitisation.

The electrical resistance of carbon after graphit is diminished considerably. No resistance tests hav made at the graphite works, but we have been inform hers who have made some tests on graphitised carbon ds that their resistance, as compared to ordinary carbon, as 1 to 3 +. In an electric arc furnace it has been and that a current density of 100 ampères to the square :b may be used without objectionable heating of a aphitised electrode. The heat conductivity of a graphi- ed carbon is much greater than that of an ungraphitised rbon.

Experiments made to determine the resistance of manu- tured graphite to the oxidising action of nitric acid and tassium chlorate give very interesting results. Moissan s shown that to obtain the most rapid results from this newhat tedious process it is important to use materials t are as free from water as possible, and our own experi- nts confirm this observation. The acid used is prepared mixing equal parts of nitric acid (density 1·42 per t.) and concentrated sulphuric acid, and distilling the ric acid at as low a temperature as possible. The assium chlorate is in the form of a fine powder, and horoughly dried for some hours at a temperature of 150° 170°.

About 0·3 grm. of graphite is introduced into a test tube taining 15 cubic centimetres of anhydrous nitric acid. this is added about 4 grms. of potassium chlorate in ntities of about 1 grm. at a time. The test tube is placed in a water-bath, and the temperature gradually ed to 60°, and kept there till all action is over, which is d to be the case at the end of a few hours. The test is then removed from the water-bath and the liquid nted. The partially converted graphite is washed with te acid, followed by concentrated nitric acid, after which again treated with the oxidising mixture of nitric acid potassium chlorate. Great variations are found in the dity with which different graphites are oxidised by this ess, but in time all graphites are converted into hitic oxide. All forms of graphite examined were ally converted after the first treatment with the ising mixture, and usually showed a greenish colour, depth of the colour depending, other things being equal, the nature of the graphite.

order to study the gradual transformation of graphite graphitic oxide, equal quantities of graphite powder treated simultaneously in seven test tubes. After the treatment, the partially converted graphite contained e of the test tubes was washed with dilute nitric acid, ol, and ether, and then dried on the water-bath. The ting powder had a very dark green colour. The con- of the remaining test tubes were treated a second time the oxidising mixture. After the second treatment ontents of a second test tube were washed and dried, so on. Unfortunately seven treatments with the sing mixture were not sufficient to completely convert raphite, the graphitic oxide in the seventh tube still rving a green colour in acid, although on washing with hol, and subsequently drying, it was yellow. When, ver, this yellow powder was mixed with nitric acid, it diately reverted to a pale green colour. This would ccur if the conversion into graphitic oxide were ete. The graphite powder used for this experiment ad a second treatment at the high temperature of the c furnace in order to obtain a pure specimen, and o doubt, accounts for the great difficulty experienced nging about its complete oxidation. So far as the ment went, the washed and dried powders obtained d distinct differences after each application of the ing mixture. After the second treatment the r was slate-coloured; after the third treatment it ched more nearly a yellow; and each succeeding ent brought the powder nearer to the yellow of the etely converted graphite.

ecimen of the same graphite as that taken for the nent described above was completely converted into tic oxide by a method due to Staudenmaier (Journal ety of Chemical Industry, 1898, p. 880). After the treatment with nitric acid and potassium chlorate, en oxide obtained was heated on the water-bath solution of potassium permanganate, followed by en peroxide, and a fine yellow graphitic oxide was d.

In order to compare the Acheson graphite as manufactured for crucibles with the Ceylon graphite, which is generally employed for that purpose, equal weights of each graphite were treated with nitric acid and potassium chlorate. Both specimens consisted of somewhat coarse grains of graphite. After the fifth treatment the Ceylon graphite was completely converted into a fine yellow oxide by Staudenmaier's method. After seven treatments with the oxidising mixture, the Acheson graphite still showed several unconverted particles of graphite. This result warrants the conclusion that in so far as resistance to oxidation is a measure of value for crucibles, Acheson graphite is superior to the Ceylon article.

Some samples of graphitised anthracite coal, when removed in the form of lumps from the furnace, have a strong resemblance to Ceylon graphite. Both seemed to be composed of layers, the chief difference appearing to be that, supposing the natural graphite to have been formed from amorphous carbon, its production occurred under very great pressure. If in some way great pressure could be applied to the lump of graphitised anthracite coal, it would apparently resemble the Ceylon graphite very closely indeed. This would lead us to suppose that the natural graphite might have been originally formed from carbon having the nature of anthracite coal, but the following experiment seems to indicate that this is not the case. A piece of anthracite coal, similar to that referred to above, was placed in a test tube and treated with the oxidising mixture of nitric acid and potassium chlorate. A piece of Ceylon of the same size was treated in the same way. When all action had ceased, it was found that the graphitised anthracite coal retained its original form, but had been superficially converted into graphitic oxide. The Ceylon graphite, on the other hand, had completely disintegrated, having broken up into a fine powder which had a very dark green colour. This experiment would seem to indicate that the Ceylon graphite cannot have been formed from anything similar to anthracite coal. So far as we have experimented we have not found any form of amorphous carbon that can be converted into a graphite which, on treatment with the oxidising mixture, breaks up into fine powder in the manner that seems characteristic of Ceylon graphite.

THE SUGAR BEET IN ALKALI SOIL.

BY H. C. MYERS, PH.D.

In doing some expert work for the Ogden Sugar Co. during a recent vacation I noted the uniformity and excellence in purity and sugar per cent. of beet of the "Kleinwanzlebener" variety raised on the alkali soil of Hooper, Utah, which is as near Great Salt Lake as an attempt at cultivation is possible, being slightly above the mud flats of the lake itself. Sugar-beet culture has succeeded well in all cases where irrigation is possible; but in many cases, both at Hooper and other town about the lake, and far removed from the mountains, fresh water has not been available.

Considering that there are thousands of acres of unreclaimed alkali land, similar to Hooper in location and probably in soil content, the possibility of irrigation by means of artesian well waters is manifestly important.

In preparing for the work I collected soil samples at various depths and localities, as well as artesian waters near the soil locations and at various depths. I also collected such shrubs as grew naturally and profusely in the locality, hoping to find some relation between them and certain of the soil constituents. In not a single case had the artesian waters, collected by me, been used for irrigation, and just as well, perhaps, considering that their composition was unknown, and that Glauber salt and sal soda might be present in injurious amounts without being suspected by simple tasting.

This locality, like the others about Salt Lake, is conspicuous for its sodium sulphate, or "white alkali," with occasional dark spots of the carbonate, or "black alkali"; the soil being directly alkaline to litmus, and often with sparkling crystals upon the surface.

Tests of Beet Juice made 28th August 1900.
Samples collected at Hooper.

Sample No.	Sugar per Cent.	Purity.	Sample No.	Sugar per Cent.	Purity.
1	16·86	85·7	18	19·66	86·8
2	17·57	85·0	19	16·76	85·5
3	16·90	83·2	20	13·85	82·9
4	15·58	82·9	21	14·61	85·4
5	16·48	81·0	22	15·55	85·4
6	17·76	85·3	23	15·90	87·1
7	19·02	88·4	24	17·86	86·3
8	17·39	84·7	25	16·22	79·0
9	17·84	85·8	26	18·54	87·5
10	18·01	84·1	27	17·88	81·3
11	18·54	84·8	28	17·60	85·8
12	19·52	85·7	29	14·49	75·1
13	19·81	87·0	30	17·02	82·2
14	14·07	88·8	31	19·02	87·0
15	14·65	80·3	32	17·54	90·0
16	15·22	84·0	33	16·96	86·6
17	14·16	77·8	34	15·58	84·6

Samples 16 to 34 inclusive were tested according to Pellet's method, and showed an average 16·0 per cent. of sugar in the beet.

In each of the 34 tests beets were selected from vario parts of the field, and in such a way that a fair average the crop was represented. Three artesian wells of tl same locality were examined, as follows :—

Analyses of Artesian Well Water of Hooper.
(Hilgard's Method.)

—	No. 1. Depth 200 ft.	No. 2. Depth 250 ft.	N. 3 Depth 36
Dish and residue at 110° C.	42·0588	48·5082	48·51
„ less org. matter and chem. water.	42·0562	48·5064	48·51
„ less soluble part	42·0434	48·4968	48·50
„ less insoluble part, incl. silica.	42·0330	48·4868	48·4
„	42·0306	48·4820	48·4
Residue	0·0282	0·0262	0·03
Org. matter and chem. water.	0·0026	0·0018	0·00
Soluble part	0·0128	0·0096	0·01
Insoluble part, less silica .	0·0104	0·0100	0·01
Silica	0·0024	0·0048	0·01

—	Sample No. 1. 200 ft. deep.		Sample No. 2. 250 ft. deep.		Sample No. 3. 363 ft. deep.	
	Grains per Gallon.	Parts per 10,000.	Grains per Gallon.	Parts per 10,000.	Grains per Gallon.	Parts per 10,0
Potassium sulphate .... } Sodium sulphate (Glauber's salt), &c. .... }	0·13	0·02	1·03	0·18	0·12	0·0
Sodium chloride (common salt)	3·38	0·58	1·35	0·23	1·35	0·2
Sodium carbonate (sal soda)	3·96	0·68	3·22	0·55	4·95	0·8
Calcium and magnesium carbonates, &c. .... } Calcium sulphate (gypsum) .... }	6·07	1·04	5·84	1·00	6·54	1·1
Silica	1·40	0·24	2·80	0·48	6·77	1·1
Organic matter and chem. combined water	1·51	0·26	1·05	0·18	0·00	0·0
Total	16·45	2·82	15·29	2·62	19·73	3·3

A glance at analyses Nos. 2 and 3, in which the grains per gallon of common salt are 1·35, suggests that possibly beyond a depth of 250 feet these artesian waters are not contaminated by the saline constituents of Salt Lake. Well No. 3, at a depth of 363 feet, has an unusually heavy and constant flow. In order to study this influence more fully, I collected waters from a well at Wilson, which is about eight miles from the lake, and also at West Weber, which lies between Wilson and Hooper.

All three samples collected at Hooper indicate that they are well adapted to irrigation, and are potable, and further, that a decided advantage is gained by boring to 250 feet or beyond.

According to Hilgard, the extreme limit of mineral content is usually about 40 grains per gallon for such waters, or less in case of a large per cent. of common salt or carbonate of soda.

—	Location.	
	Wilson. 265 ft. deep.	West Weber. 135 ft. deep.
Dish and residue at 110° C.	48·5512	48·5166
„ less org. matter and chem. water	48·5498	48·5164
„ „ soluble part	48·5038	48·4996
„ „ insoluble part, incl. silica ...	48·4861	48·4874
„	48·4832	48·4834
Residue	0·0680	0·0332
Org. matter and chem. water	0·0014	0·0002
Soluble part	0·0460	0·0168
Insoluble part, less silica	0·0174	0·0122
Silica	0·0032	0·0010

The presence of nitrates in three of these waters was not taken into consideration, and would slightly modify results as above given in the usual way. The fact, then, that an artesian well is quite near Salt Lake does not signify that it is less fit for irrigation and drinking; in fact, in the

—	Location.			
	Wilson. 265 ft. deep.		West Webe 135 ft. dee	
	Grains perGallon.	Parts per 10,000.	Grains perGallon.	I per
Potassium sulphate. } Sodium sulphate (Glauber's salt),&c. }	3·74	0·61	0·47	
Sodium chloride (common salt).	18·29	3·13	2·03	
Sodium carbonate (sal soda).	4·83	0·83	7·30	
Calcium and magnesium carbonates, &c.	10·16	1·74	7·12	
Calcium sulphate (gypsum).	0·00	0·00		
Silica...............	1·87	0·32	2·34	
Organic matter and chem. combined water.	0·81	0·14	0·11	
Total	39·70	6·80	19·37	

Relation of Nitrates to Total Solids. (Phenol M o
by Sprengel.)

Location........	Hooper	Hooper	Hooper	Wilson	W
Depth	200 ft.	250 ft.	363 ft.	265 ft.	
Total solids	0·0282	0·0262	0·0338	0·0680	
N per 100 c.c. ...	0·0001	0·00005	Absent	Absent	
$NaNO_3$	2·16 %	1·16 %	„	„	

analyses already made such waters seem rather b an advantage over the two samples collected near mountains.

Soil Examination.

For an analysis of the water-soluble part the air- was sifted through a No. 40 sieve, after having bee and loosened with a rubber pestle.

ty grams were then placed with 200 c.c. water in a shaken frequently, and allowed to stand over night. half was used for general analysis and the other for te determination. In a general analysis of surface les, ignition was necessary to drive off organic matter the solutions.

Percentages of $NaCl$ and Na_2CO_3 in the Soil.

lon.... ı......	Hooper 1 ft.	Hooper 3½ ft.	Hooper 4 ft.	Hooper Surface	W. Weber Surface
solids.	0·0270 gr.	0·0124 gr.	0·0244 gr.	0·0172 gr.	0·0114 gr.
....	0·028 %	0·005 %	0·005 %	0·012 %	0·009 %
)₃.....	0·071 %	0·036 %	0·024 %	0·050 %	0·030 %

a depth of 4 feet, water soaked in and filled the ation. As the sand at that depth was completely ıted with it, and both were heated, evaporated to ss, and then air-dried together for the analysis, I that such water is fresh, and not contaminated by the ake waters.

sake of comparison a soil sample from West Weber so examined.

al P_2O_5 per Cent. in Soil. (Hilgard's Method.)

ın........	Hooper 1 ft.	Hooper 3½ ft.	Hooper 4 ft.	Hooper Surface	W. Weber Surface
soil taken	3·2570	3·4999	3·67787	3·1427	3·1265
ı ignition*	0·0922	0·2113	0·2420	0·1209	0·2160
$Mg_2P_2O_7$.	0·0140	0·0102	0·0094	0·140	0·0167
t. of P_2O_5	0·275	0·186	0·163	0·285	0·341

* Water, volatile and combined matter in air-dry soil.

mus and Humus Nitrogen. (Grandeau Method.)

n...............	Hooper 1 ft.	Hooper Surface	W. Weber Surface
per cent........	0·43	0·38	1·53
n per cent. in s.	9·07	..	13·07
nt. of humus gen in soil.	0·04	..	0·2

interesting to compare these results from two arid , one on Salt Lake, and the other removed from it, ıe average humus nitrogen per cent. of arid and regions of the United States, resulting from tests of number of eastern and western soils.

verage per Cent. for Humid and Arid Regions.

——	Humid Region.	Arid Region.
ı of soils tested...............	466	313
er cent.	2·700	0·750
per cent. in humus...........	5·450	15·870
of humus nitrogen in soil...	0·122	0·101

ıtes in the Soil. (Phenol Method by Sprengel.)

....	Hooper 1 ft.	Hooper 3½ ft.	Hooper 4 ft.	Hooper Surface	W. Weber Surface
c.c. ...	0·00076	0·00100	0·00060	0·00084	0·00022
ɪr cent.	0·009	0·012	0·007	0·010	0·002

ılysis No. 1 are indicated 2,840 lb. per acre of carbonate, which is excessive, and would corrode crown of most crops, and yet sugar beets thrived eld where this soil sample was collected. Beets lso in the soil represented by analysis No. 4, with per acre, but were slow in starting.

eld was fairly choked by the Russian thistle, a the field being cleared for beet culture. The for excessive carbonate is gypsum; this point en up later in the paper.

Summary of Water-soluble Soil Content in per Cent. and Pounds per Acre-foot.

——	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Location........	Hooper	Hooper	Hooper	Hooper	W. Weber
Depth	1 ft.	3½ ft.	4 ft.	Surface	Surface
Sulphates:					
Per cent.	0·009	0·009	0·068	0·006	0·006
Lb. per acre ..	360	360	2,720	240	240
Carbonates:					
Per cent.	0·071	0·036	0·024	0·050	0·030
Lb. per acre ..	2,840	1,440	960	2,000	1,200
Chlorides:					
Per cent.	0·028	0·005	0·005	0·012	0·009
Lb. per acre ..	1,120	200	200	480	360
Nitrates:					
Per cent.	0·009	0·012	0·007	0·010	0·002
Lb. per acre ..	360	480	280	400	80
Total per acre...	4,689	2,480	4,160	3,120	1,880
Total per cent...	0·117	0·062	0·104	0·078	0·047

Potash.

A microscopic examination of the washed sand grains proved them to be almost entirely of quartz, either clear or coloured, and practically devoid of potassium—containing minerals; hence no analyses to determine the K_2O per cent. were made.

Relation of Plants to Alkali.

Certain alkali plants which characterise soils of this nature were noticeable at Hooper, and such as grow profusely were collected. J. B. Davy, Instructor in Botany of the University of California Agricultural Station, classified them as follows:—

1. *Bigelovia Graveolens, Gray,* which is common in alkali soils from Dakota to British Columbia, and south to Southern California and New Mexico.
2. *Bigelovia Douglasii Serrulata, Gray.*—Common throughout the whole dry interior region.
3. *Salsola Kali Tragus,* or Russian thistle, an introduced weed, and found in all kinds of soils.
4. A species of *Atriplex;* apparently annual.

A great deal of patient botanical and chemical work would, of course, be necessary to discover the relation of plants to alkali soil content. Such a relation can hardly be worked out by one individual, but if collectors of alkali soil samples would also classify and record such plants as grow profusely upon given alkali lands, results of very great importance would follow, for, as Hilgard has already pointed out (Bull. No. 128), the natural plant growth seems to indicate the quality as well as the quantity of saline constituents. In this same bulletin Davy has shown the "maximum, optimum, and minimum" of salts tolerated by certain alkali plants.

Conclusion.

In studying this subject in a general way it is well to bear in mind that excessive irrigation is usually unsatisfactory and expensive, as much valuable plant food is carried away with the alkali—food that must eventually be returned to the soil by use of fertilisers; and, again, under-drainage becomes necessary in order to prevent the entire alkali in solution rising to the surface during the dry season, and making the soil worse than it was before the treatment. Moderate irrigation tends to carry the salts down to below the plant roots, and by deep tillage, maintained throughout the season, evaporation and rising of the alkali may be largely prevented. Alkali soils have a great advantage over other soils in case of drought, in that the hygroscopic salts present take up and retain moisture, which is available to plants. This latter treatment applies particularly to Hooper, where the excess of alkali is found within the first foot, and where sub-soil water is within four feet of the surface. Before taking up alkali lands a four foot column of the soil should be examined in order to know the alkali contents and method of reclaiming; such examinations are carried on by our various experiment stations. The much dreaded "black alkali," which is largely a solution of humus in carbonate of soda, is changed into the sulphate, or "white alkali," by means of gypsum, and very readily too if water be freely used; thereby setting free the humus for plant food. Hilgard recommends about double the weight of commercial gypsum as of carbonate of soda within the soil-foot.

As indicated by the purity and sugar per cent. given above, the sugar beet is particularly adapted to alkali soils. The tendency of the beet is, in fact, to purify the soil by taking up alkali constituents ruinous to common crops. This is further suggested by the average composition of sugar-beet ash as compiled by Monier :—

Average Composition of Ash.

K_2CO_3 and Na_2CO_3	82·20
$CaCO_3$	6·70
K_2SO_4; Na_2SO_4 and NaCl	11·10
	100·00

Again, careless or excessive irrigation is particularly ruinous to beet crops, which should receive no water when approaching maturity, this period being determined by the sugar companies' chemist. Irrigation after that period means a loss in sugar per cent. and purity.

He who studies the relation of plant growth to plant food as formed in the soil by disintegration and by the action of microscopic organisms will not "cry for more worlds to conquer." Too many of us are battling with complex theoretical problems which bear no important relation to the betterment of mankind, while these great unsolved problems are crying up to us from under our very feet.

I have freely consulted Hilgard's publications in attempting these investigations, and am much indebted to the Experiment Station of the University of California for kindly assistance, as well as to the Ogden Sugar Co. for the freedom of their laboratory.

SUPPLEMENT.

I have repeatedly been asked by beet growers if there not some physical characteristic which would give an id of the sugar per cent. and purity of beets; *e.g.*, should t grower strive to produce large beets or small beets? sho they be long and reach deep into the soil, or be short a obtain nourishment from the surface soil, or would it be advantage to have them many-rooted? An investigat of this question would possibly decide which method cultivation and irrigation is best adapted to sugar-b culture, and might save the grower many years of exp menting with tillage and the water supply In attempt a solution of this problem I collected 72 sacks of beets, rai in all kinds of soil and under various conditions of till and irrigation, and made careful note of the resul physical characteristics. In each sack were from six dozen beets, depending upon the size and condition of tested; *e.g.*, there would be more small beets than large, more withered ones than unripe; and, again, the small b might be very long and withered. However, the large b and the small, the long and the many-rooted, were colle in bags by themselves; and in making up the follo table at each occurrence of a given property, the purity sugar per cent. were noted in making up the average; 24 of the 72 bags were of withered beets; the added s per cents. and purity per cents. of the 24 bags, regardle being large or small, &c., divided by 24, would giv average. In each case the juice was extracted from beet pulp, examined by means of the saccharimeter, an purity and sugar per cent. calculated in the usual way. average of the entire 72 bags was as follows :—

Average per Cent. of 72 *Tests: Sugar*, 14·45; *Purity*, 76·76.

Property.	Occurrence of Property.	Maximum and Minimum Sugar.	Maximum and Minimum Purity.	Average Sugar.	Average Purity.	S.	
		Per Cent.	Per Cent.	Per Cent.	Per Cent.		
Small	15 times	23·0–11·8	91·2–64·1	17·35	80·97	+	+
Withered	24 „	23·0–10 7	91·2–68·9	17·03	82·43	+	[illegible]
Long	8 „	19·5–11·8	91·0–72·8	16·31	83·30	+	[illegible]
Medium	19 „	20·3– 9·8	89·7–68·9	15·50	81·81	+	+
Rooty	6 „	17·6–11·1	89·1–68·9	15·18	81·15	+	+
Short	9 „	18·3– 9·4	86·3–70·9	14·92	78·17	+	+
Symmetrical	27 „	20·3– 8·4	89·1–69·5	14·85	80·01	+	+
Green in colour	15 „	18·3– 8·4	86·6–71·5	14·42	79·58	–	+
Unripe	8 „	18·0–10·0	87·3–70·4	14·15	78·42	–	[illegible]
Large	25 „	17·4– 8·4	85·2–69·5	13·24	76·37	–	-

The beets were all of the "Kleinwanzlebener" variety.

In the above table, arranged in the order of the sugar per cent., the small beet takes the lead, while in purity the long beet excels. The large beet is most undesirable in both sugar and purity, being at the minus end of the scale. The number of tests here specified do not admit of making a definite statement, and yet, if any conclusion is to be drawn, large and unripe beets, resulting from excessive irrigation, and ignorance as regards time of planting, are to be avoided. The most desirable sugar beet, then, is the small, slender one, rarely grown, and resulting from deep tillage and a limited water supply. In the West, where we have the deep soils of arid regions, deep tillage is desirable for all crops; whereas, in the humid regions of the East or Middle West, the depth of actual soil may prevent deep tillage.

ERRATUM.—This Journal, April 1901, page 339, col. 2, l. 14 from top: For "Nos. 2 and 4" read "Nos. 4 and 5."

Nottingham Section.

Meeting held at Leicester, on Wednesday, April 24th, 1901.

PROF. F. S. KIPPING, F.R.S., IN THE CHAIR.

THE DETERMINATION OF MINUTE QUANTITIES OF ARSENIC IN COKE.

BY L. ARCHBUTT, F.I.C., AND P. G. JACKSON, F.I.C.

THE discovery of arsenic in beer brewed from malt and hops, and the detection of arsenic in malt, has led to the source of the arsenic being traced to the fuel, either c anthracite coal, which is used in drying the malt. such fuel is burnt, minute quantities of arsenic, ori derived from the iron pyrites or "brasses" present coal, are volatilised, and are deposited upon the su the malt, which, in the process of being dried in the exposed to direct contact with the hot fuel gases.

The fact that lignite and coal may contain arse long been known. The late Dr. Percy, in his vol "Fuel," &c. (1876), states that Daubrée found fr per cent. (5·6 grains per lb.) to 0·20 per cent. (14 per lb.) of arsenic in ordinary specimens of lignite f tertiary strata, at Lobsann, Lower Rhine; 0·003 p (0·21 grain per lb.) in the carboniferous coal of Saa 0·0415 per cent. (2·9 grains per lb.) in coal occ Villé, Bas-Rhin, in France; and traces of arsenic from Newcastle-on-Tyne. Dr. Angus Smith di arsenic in the iron pyrites of fifteen specimens o shire coal, and of a few others. Dugald Campbe arsenic in the iron pyrites of coal, and in Dr. Perc laboratory decided traces of arsenic were detected from Nottinghamshire.

The idea that gas coke might contain arseni ridiculed (*Gas World*, Feb. 9, 1901), on the gr that element, its oxides, and such of its compoun solid at the ordinary temperature, volatilise below It has been argued that the first effect of heatin would be to drive off the arsenic, and that to test for arsenic is simply waste of time. The fallac *a priori* reasoning is illustrated by some very i observations recorded by Dr. W. H. Willcox in

mmunicated to the *Lancet* of March 16, 1901.* Dr.
illcox found that if, in Marsh's test for arsenic, finely
ided substances are introduced into the heated portions of
tube, they have a very great influence in preventing the
mation of the arsenical mirror. In preparing a series of
ndard mirrors with solutions of arsenic of varying
engths, it was found that the mirrors were very much
aller if a mixture of carbon and dry sodium carbonate
re placed in the heated part of the tube immediately
r the flame, as has been recommended in order to retain
phur. Dr. Willcox asserts that the use of this mixture
vents as much as nine-tenths of the arsenic from deposit-
in the mirror form, when minute quantities of arsenic
being tested for. It at once occurred to him that one of
bodies, either the carbon or the sodium carbonate, must
responsible for this, but to his astonishment he found
each is able to prevent the formation of the arsenical
ror. Thus, if the heated portion of the tube, within the
chimney, be filled with either dried sodium carbonate or
on, and in either case 0·5 mgrm. of arsenic trioxide be
oduced into the flask, almost the whole of the arsenic is
ined by the strongly heated substance, and scarcely any
nical mirror results, whilst with nothing in the heated
ion of tube, a very large mirror was formed by the same
ntity of arsenic. It next occurred to Dr. Willcox to try
effect of some inert finely divided material, such as fine
which had been previously ignited. This sand, placed
e heated portion of the tube (within the clay chimney),
ed the retention of almost all the arsenic, and only a
minute mirror was obtained. In this experiment, half
grm. of arsenic trioxide was introduced into the flask.
sand became perceptibly darkened in colour, but no
unt of heating would cause it to give up its absorbed
nic. It seems, therefore, in view of these observations,
surprising that in the manufacture of coke some, at
, of the arsenic contained in the coal should be retained
e coke, and we know from analyses which have been
by several chemists that such is the case.

e fact should not be lost sight of that in burning coke
y considerable proportion of the arsenic remains in
ash. Two different cokes, containing respectively
grain and 0·16 grain of As_4O_6 per lb., were ashed in
m dishes in a Fletcher's gas muffle furnace. In one
we found 0·07 grain per lb., and in the other case
grain per lb., or 50 per cent. and 37 per cent. respec-
y of the arsenic originally contained in the coke still
ining in the ash. We have not had time to pursue
ubject further, but the results obtained seem sufficiently
sting from the gas manager's and maltster's point of
to be worth following up.

e accurate determination of minute quantities of
c in a substance such as coke is a problem which
ts very considerable difficulties. Taking, for example,
e containing 0·1 grain of arsenic trioxide per lb.,
ms. of such coke would contain only 1 mgrm. of
, and in dissolving out this minute quantity with
nts, comparatively enormous quantities have to be
because of the large bulk of coke operated upon,
ese reagents must therefore be extremely pure. If
ethod of estimation by means of standard mirrors in
's test be adopted, a much smaller quantity of coke
e employed, and had we been fortunate enough to
sufficiently pure reagents for the Marsh test, we
have tried burning 1 or 2 grms. of the very finely
l coke with pure dry Na_2CO_3, as in Nakamura's
d for the estimation of sulphur, dissolving the
ts of the crucible in water and acid, and introducing
lution into Marsh's apparatus. Coke is easily and
etely burned in this way, and there is no doubt that
ole of the arsenic would be retained by the Na_2CO_3.
lternative method which suggested itself was to burn
ms. of coke in a combustion tube in a current of
, passing the gaseous products through an acid or
e reagent capable of retaining any volatilised
, and subsequently separating the arsenic by distil-
and titrating with N/100 iodine. But the complete combustion of such a large quantity of coke as 50 grms. in a tube is tedious, and the whole of the arsenic would not be found in the liquid through which the products of combustion were passed, but partly also in the ash, and perhaps partly in the sublimates which are formed in the tube whilst the combustion is proceeding.

We therefore decided to act upon the coke by means of a solvent, and the first method tried was distillation with hydrochloric acid and ferric chloride (largely reduced to ferrous chloride by the coke). This, however, although it brought over the arsenic, also brought over sulphur, which could not be prevented, although a large excess of ferric chloride was used. Troublesome bumping was also experienced, owing to the large quantity of coke present, and it became necessary to separate the dissolved arsenic from the coke previous to distillation. Ferric chloride was abandoned, and nitric acid of 1·42 sp. gr. was finally decided upon as the most suitable reagent for the purpose. It can be obtained quite free from arsenic, the vapour is easily condensed and returned to the boiling liquid in a plain retort, set with the neck inclined upwards, thereby avoiding the necessity of a condenser and rubber connections, and it was thought that the arsenic in the form in which it is likely to be contained in the coke could scarcely fail to be brought into solution by prolonged digestion with the boiling acid. The details of the method are as follow:—

A fair average sample of the coke, obtained from a large bulk by crushing and quartering in the usual manner, is reduced to coarse powder in an American grinding mill, and rather more than 50 grms. of this coarse powder are further ground in a mortar and passed through a sieve, having 90 meshes in 1 linear inch, then dried at 100° C.

50 grms. of the dry coke are placed in a 16-oz. plain retort, and heated for at least two hours with 100 c.c. of pure HNO_3 (1·42), the neck of the retort being inclined upwards so as to condense and return the acid which evaporates. A small flame is used, large enough to maintain gentle ebullition. Copious red fumes are evolved.

The contents of the retort are transferred to a beaker, diluted with hot distilled water to about 400 c.c., and, after settling, filtered, and the coke washed by suction on a toughened filter, which is easily done. The clear filtrate is evaporated in a porcelain basin to complete dryness on a water-bath; the residue is mixed with 25 c.c. of pure concentrated H_2SO_4 and further heated, with frequent stirring, until the ferric nitrate is decomposed and a smooth cream containing ferric sulphate and free sulphuric acid is obtained. Heating is then continued over a sand-bath until H_2SO_4 fumes come off. The residue, when cold, is diluted with enough water to dissolve it on warming, and again evaporated until H_2SO_4 fumes appear. This is repeated until on diluting with water no smell of HNO_3 is observed, the second evaporation being usually sufficient. To make quite sure of expelling every trace of HNO_3, solution and evaporation are repeated once more.

The residue is next dissolved in 50 c.c. of water and transferred to a 16-oz. distillation flask connected to a Thorpe's revenue condenser, having an adapter attached to the end, which dips below the surface of about 20 c.c. of water contained in the receiving flask. The distillation flask is closed by a rubber bung, through which is passed a thermometer having its bulb within ¼ inch of the bottom of the flask. 23 grms. of purified NaCl and 2 grms. of ferrous sulphate are added to the liquid in the flask, which should be quite cold, and not more than 100 c.c. in volume. Distillation commences at about 110° C., and is continued until the temperature reaches 125° C., when the whole of the arsenic will be found in the distillate. (See Fresenius' "Quantitative Analysis," Vol. I., p. 485; also Gibb, this Journal, 1901, p. 184.)

We have not succeeded it titrating these minute traces of arsenic in the distillate direct, after neutralisation with ammonia, the end of the reaction being too indistinct. We therefore precipitate the arsenic as sulphide, by adding to the acid distillate some pure ZnS and agitating for a few minutes until the precipitate has coagulated. The delicacy of this reaction is remarkable, as little as 0·1 mgrm. of As_4O_6 in 100 c.c. being recognisable in daylight by the yellow

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e Toxicological Detection of Arsenic, and the Influence of
n on its Tests."

colour produced on adding the ZnS, and after agitating for a few minutes even so small a precipitate coagulates and can be filtered off. After filtering, and washing with H_2S water, the precipitate is rinsed off the paper with a fine jet of water into a flask of about 500 c.c. capacity, and boiled with about 300 c.c. of water until dissolved; the stained part of the filter paper is then added, and boiling continued for half an hour longer. The liquid is then filtered, concentrated to about 40 c.c., and made quite cold. About 0·5 grm. of $NaHCO_3$ having been added, and some starch solution, N/100 iodine solution is added until a blue colour is obtained. The titration should be done quickly. The end of the reaction, when titrating these very small quantities of arsenic with iodine, is never so sharp, or the blue colour so permanent, when the arsenic has been precipitated as sulphide and boiled with water, as when pure sodium arsenite is titrated direct; the experience necessary for judging the end-point sharply must, therefore, be obtained by boiling and titrating As_2S_3 precipitated from known quantities of a standard solution of sodium arsenite containing 0·0005 grm. of As_4O_6 in 1 c.c. This solution is used to standardise the N/100 iodine solution.

A blank experiment must, of course, be made with the same quantities of reagents, and in the same vessels as were used in the analysis, and any arsenic found must be deducted. In the reagents we used, the correction amounted to only 0·2 mgrm. of As_4O_6. An impurity which caused some trouble at first was traces of iodic acid in the nitric acid. This was not detected until commencing to distil the blank quantity, when it was observed that the first portions of the distillate were coloured slightly yellow, and that this colour disappeared as the distillation proceeded, the traces of iodine, to which the yellow colour was due, being reduced by the arsenious chloride which subsequently came over. The result was that the arsenic became oxidised, and was not precipitated on adding ZnS in the cold. Nothing of the kind was observed in distilling the extracts from the cokes, doubtless because the iodic acid had been reduced by the nitrous acid formed on heating the coke with the nitric acid, and had been volatilised. The iodic acid was got rid of from the blank quantity by adding to the residue, left on evaporating 100 c.c. of nitric acid to dryness, a little sulphuric acid and then a few drops of very dilute sulphurous acid solution, and heating strongly.

Test experiments were made by taking measured quantities of standard arsenic solution, distilling with sulphuric acid, salt, and ferrous sulphate, precipitating the arsenic by adding ZnS to the filtrate, boiling the precipitate with water, and titrating exactly as described above. The results obtained were as follow:—

——	Grm.	Grm.
As_4O_6 taken	0·00503	0·00754
As_4O_6 found	0·00496	0·00739
Error	− 0·00007	− 0·00015

A few determinations were made by weighing the precipitated As_2S_3, as described by Jones (Chem. News, Vol. 83, p. 25), instead of titrating. The results, when working the two methods on the same sample of coke, agreed very well, as the following numbers show:—

Coke.	Arsenic Trioxide found. Grains per lb. of Coke.		
	Titrated.		Weighed.
No. 1	0·27	..	0·25
No. 2	0·28	..	0·26
No. 3	0·07	..	0·07
No. 4	0·13	0·14	..

DISCUSSION.

Mr. S. **Trotman** remarked on the difficulty of obtaining a representative sample of coke for analysis. Some pieces of coke contained arsenic whilst others were entirely free, so that it was necessary to take a portion from a rathe large amount of the powdered sample.

Mr. R. M. **Caven** asked why sulphide of zinc was use instead of H_2S.

Mr. S. F. **Burford** thought that 50 grms. of the sampl was insufficient where the coke contained only very smal amounts of arsenic, and suggested that 200 to 250 grms would be more suitable. He also referred to the incon venience arising from the evaporation of 100 c.c. or mor of HNO_3, and suggested the employment of brominate HCl, which could be neutralised with NH_4HO befor evaporation and gentle ignition.

Prof. F. **Stanley Kipping** commented on the skill re quired to accurately estimate such minute traces in so muc extraneous matter, and asked if the arsenic found was measure of that originally present in the coke. It woul be interesting to know what proportion of arsenic remaine behind in the ash of the coke after burning in the ma kiln. Would lime sprinkled on the coke prevent th volatilisation of the arsenic compounds?

Mr. L. **Archbutt**, in reply, admitted the difficulty sampling, but said that he had taken particular care obtain a fair sample. Sulphide of zinc was used to obta rapid precipitation. There was no practical difficulty evaporating the HNO_3. Brominated HCl would have to l boiled under a reflux condenser with rubber connectio which would be objectionable. It had occurred to him obtain the arsenic by passing chlorine over the coke at red heat, but he had not tried the method.

Scottish Section.

Meeting held at Glasgow, on Tuesday, April 30th, 190

SIR ROBERT PULLAR IN THE CHAIR.

THE COMPOSITION AND DISPOSAL OF BUR ALE AND OTHER WASTE LIQUIDS OF WHISKY DISTILLERIES.

BY JAMES HENDRICK, B.SC., F.I.C.

Part I.—Composition.

Comparatively little has been done to investigate chemistry of whisky and whisky manufacture, and ther little exact information to be obtained on the sub Brewing is more or less an exact scientific indu Spirits of other kinds, including the patent still, or raw spirit, which is so largely used in making up ordinary whiskies, as well as spirits known by other na have had a certain amount of investigation bestowed them. But the pot-still whisky, the valuable spirit, gives the whisky character to the blended spirits now form by far the greater part of the article know commerce as whisky, has been little investigated. Highland whisky is a pot-still whisky made from This is manufactured entirely by rule-of-thumb me and scientific knowledge of the materials, processes products does not enter much into the business. investigations deal with the products of malt p distilleries only.

In former days the stills used were small, an distilleries were small and scattered. Little attentic paid to the waste liquids or to what was done with They appear to have been disposed of in various Part was fed to cattle, part was used as manur probably the greatest part was allowed simply to waste, and to find its way, if it could, to the nearest course. In recent times the industry has increased g Stills have grown very much in size and capacity, have distilleries. The industry has been largely c trated in certain districts, such as the valley of th and its neighbourhood, the so-called Glenlivet This, with the greater attention now paid to th servation of salmon fisheries and of the public caused trouble to arise as to the disposal of the bye- ucts. Objection has, very naturally, been taken by the rietors of fisheries and by the health authorities to the ution of streams by such products. As little was known rately of the properties and nature of these products early attempts to dispose of them only increased the ile and led to further difficulties. It was this which my attention to the subject and was the cause of the ving investigations :—

e early stages of the manufacture of whisky resemble of brewing. There are, of course, minor differences. for instance, is used in the malt kilns in order to give land whisky the correct flavour. From each bushel of about 22 gallons of wort, or wash, are prepared. The ntation of this is carried further than in a brewery, as oject is to get spirit. The ordinary rule is to ferment n to water," or a little "below water," if possible. is till the specific gravity of the ale or fermented wash same as that or a little below that of water. During ermentation a considerable amount of acidity is also ped, but so long as the fermentation comes down to the brewer is not troubled about acidity, which in any e never measures with any instrument more accurate is tongue. The fermented wash is distilled till about ird of its bulk has passed over. The remaining two- or about 15 gallons per bushel of malt mashed, the burnt ale, also called pot ale, and spent wash, is the principal waste liquid, and the one which has rise to most trouble. The first distillate, called the wines," is subjected to a second distillation. The te from this second distillation is divided into three and yields the main product, the whisky. With it I ot deal further in this paper. The residue left in the or low wines still is called the "spent lees." This amounts to 4 to 5 gallons per bushel mashed, and he second of the waste liquids.

re being germinated and made into malt the barley ed in the usual way. The water left from this , called the steep water, forms another of the waste The amount of this steep water varies considerably, g to the system of steeping followed. So far as observation goes, it varies from 8 to 20 gallons hel of malt. I have never met any distillery brewer, , who had any accurate knowledge of the amount of ater he used, and the estimates supplied to me by l men vary from 4·5 to 25 gallons per bushel.

ourth, and last, waste liquid is the wash-up water ts, barrels, and other vessels. The chief part of produced in the washing of the "backs," or fer- vats, and contains lime, which is used in liming s. In the case of this liquid also the quantity pro- pears to vary very much, and it is difficult to get worthy estimate of its amount. Various estimates at from $1\frac{1}{2}$ to 15 gallons per bushel mashed. the average will lie somewhere near the mean of res.

ures given above for the quantities of burnt ale t lees are probably nearly correct. They can be y reference to figures kept for revenue purposes. e of steep and wash-up waters the case is different. ate statistics are available, and the practice in distilleries varies a good deal. In the case of erefore, any estimates of quantities are mere ations.

we turn to the composition of these liquids rnt ale is the one really deserving of attention. settle the burnt ale question the other liquids will serious difficulty.

es is the liquid which occurs in smallest bulk. set of my investigations, however, I was informed han one distillery manager that it was a very quid, which, bulk for bulk, was more poisonous on and fish than any of the other waste liquids. opinion is not confirmed by experiment. In given analyses of two samples of lees examined

The ash contained copper and traces of iron, osphoric acid, and sulphuric acid.

TABLE I.

Spent Lees.

—	No. 1.	No. 2.
Appearance	Opalescent.	Opalescent.
Specific gravity at 15° C.	0·9990	1·0013
	Grms. per 100 c.c.	
Acidity (as acetic acid)	0·037	0·043
Total solids	0·029	0·0189
*Ash	0·014	0·0086
*Containing copper	..	0·0032

No. 2 contained traces of various organic bodies, including alcohol and acetic acid.

In Table I., and in all other tables in this paper, the specific gravities are given at 15° C. compared with water at 15 C. as unity.

The sample No. 1 was watered freely upon growing seedlings of various kinds, and also upon mature plants, and did them no apparent injury. Some oats and grass seeds were sown in pots and watered with another sample of spent lees for several weeks. During this time no other water was given. They germinated and developed to all appearance quite normally.

Steep Water.—Before spreading the barley on the floors to germinate in order to prepare malt, it is steeped two or more times in water. The waste waters from this process vary very much in the degree to which they are polluted. The water from the first steep is naturally the most seriously polluted. I examined a few specimens of water from the second and third steeps and found some of them so slightly polluted that, but for particles of barley they contained, they might have passed for ordinary surface waters. In no case did I find any water from a steep after the first seriously polluted.

Samples of first steep water may vary very much in quality. This variation is probably largely due to the kind of barley used, and to whether the barley is clean and undamaged when put into the steep. Table II. gives analyses of three samples of water from first steeps from three different distilleries.

TABLE II.

Steep Water : First Steep.

—	No. 1. American Barley.	No. 2. Foreign Barley.	No. 3. Home Barley.
Time in steep	24 hours	24 hours	24 hours
Specific gravity at 15° C.	1·0030	..	1·0003
Reaction	Distinctly acid.	Distinctly alkaline.	Faintly acid.
		Grms. per 100 c.c.	
Total solids	0·493	0·066	0·0092
Ash	0·240	0·037	0·0016
Nitrogen	0·0174	0·0026	..
Albumenoids (N × 6·25)	0·109	0·016	..

No. 1 was a turbid yellow liquid. It was two days old when received, and was already beginning to putrify. (The weather was warm.) It rapidly became stinking. The ash contained the usual ash constituents of plants, and was rich in phosphates.

No. 2 was a turbid yellow liquid. It contained solids in suspension, 0·040 grm. per litre. It had no smell and did not putrify in keeping.

No. 3 was an opalescent liquid without smell and which did not putrify in keeping.

None of the samples gave any reaction with iodine.

These samples illustrate the great variation in the composition of this liquid. No. 1 is probably exceptionally badly polluted. No. 3, on the other hand, is exceptionally slightly polluted for a first steep water.

Wash-up Water.—It is as difficult to arrive at the composition of this liquid as at its quantity. It may be anything from a very badly polluted liquid to a slightly dirtied water. It usually contains much matter in suspension. Certain samples of it, produced during the lime-washing of the fermenting backs contain a good deal of lime. So far as my experience goes, if the matter in suspension be removed, the liquid itself is not very badly polluted. The wash-up water is mainly derived from the cleaning and lime-washing of the fermenting vats or "wash-backs," though cleanings of stills, coppers, barrels, &c., enter into its composition. After the fermented wash is removed from the "backs" a certain amount of yeasty sediment remains deposited on the bottom and sides. It is this sediment which appears to form the main polluting material of the wash-up water.

A sample of this washing from the "backs," as nearly representative of the bulk as I could obtain, was a turbid grey liquid which frothed a little on shaking. It putrified on keeping. It had a sour yeasty smell, and a slightly acid reaction. It contained in grms. per 100 c.c. :—

Solids in suspension	0·0528
" solution	0·0372
Total ash	0·0090
" nitrogen	0·0072
Albumenoids (N × 6¼)	0·0450

In the case of another sample, the solids in suspension were allowed to settle. They were then removed and dried. They gave the following analyses :—

	Per Cent.
Moisture	3·01
*Organic matter	85·19
Phosphoric acid (P_2O_5)	3·42
Lime	5·06
Potash	0·61
*Containing nitrogen	6·71

The liquid was slightly alkaline, from the lime added in lime-washing the backs. As the analyses shows, this sediment is a substance of considerable manurial value.

Burnt Ale.—Burnt ale is a dark brown, turbid liquid. It is sour and has a characteristic sour smell. On standing it deposits its suspended matter as a bulky, dark grey sediment. This suspended matter consists largely of the dead, and thoroughly boiled, yeast. In making whisky the fermented wash is pumped into the stills, yeast and all. Therefore, after the low wines are distilled off, the burnt ale left behind in the still contains in suspension the yeast and other finely-divided solids of the fermented wash. It contains in solution all the nitrogenous matters, carbohydrates, ash constituents, non-volatile acids, and other non-volatile matters of the fermented wash. When separated from its suspended matter it somewhat resembles in appearance a dark coloured beer, like Munich beer. It froths very strongly and persistently, even when diluted with a very large volume of water. I found that one part of burnt ale in 100 of distilled water still caused very marked frothing. In Table III. analyses of samples of burnt ale from three different distilleries are given.

TABLE III.

Burnt Ale : Matter in Solution.

—	Sample No. 1.	Sample No. 2.	Sample No. 3.
Specific gravity	1·018	1·013	1·016
		Grms. per 100 c.c.	
Total non-volatile matters	3·089	3·143	3·732
Ash	0·489	0·421	0·458
Total nitrogen	0·134	0·142	0·160
Albumenoid nitrogen	..	0·040	0·042
Phosphoric acid	0·188	0·167	0·131
Lime	..	..	0·015
Potash	0·144	0·132	0·174
Soda	..	0·009	0·066
Acidity as lactic acid	1·053	1·200	0·990

No. 1 contained, in addition to the solids in solution, 1·48 grms. per 100 cc. of solids in suspension, or 4·569 grms. of total solids in solution and suspension.

The solids in solution, or, more correctly, the no volatile matters in solution were determined by drying thin layer in a steam oven. It is difficult to determi them accurately, as they lose the last of their water w difficulty, and if prolonged drying be resorted to, they alt in other respects.

The albumenoid nitrogen was determined by Stutzer method with copper hydrate.

The total acidity is expressed in terms of lactic aci as, though other acids are present, lactic acid appears t the one present in largest proportion.

The solids in suspension were not determined in t samples Nos. 2 and 3 above, but in Table IV. are giv figures showing the relation between matters in suspensi and in solution in other four samples. The specific gravi acidity, and ash of these samples are also given.

TABLE IV.

Burnt Ale.

—	Sample No. 4.	Sample No. 5.	Sample No. 6.	Sam No.
Specific gravity	1·018	1·019	1·017	1·0
		Grms. per 100 c.c.		
Solids in suspension	0·20	1·15	0·72	0·9
Non-volatile matters in solution.	4·04	3·67	3·62	3·
Total non-volatile matters	4·24	4·82	4·34	4·
Total ash	0·43	0·40	0·39	0·
Acidity as lactic acid	0·89	1·64	1·01	1·

The figures in Tables III. and IV. will suffice to s the general characters of burnt ale. I have examinations of burnt ale, more or less complete, from s different distilleries, and in no case found the total non-vol matters fall below 4 per cent. Neither have they in case risen above 5 per cent. In certain other ana which have been published the "solids," under which the non-volatile acid appear to be included, are made less than this. For example, Professor V. B. Lew report to the North of Scotland Malt Distillers' Associa states that in one sample examined by him, he f total solids 2·79 per cent., of which 0·25 per cent. we suspension.

In the case of the solids in suspension, the vari found in different samples can be easily accounted for. quickly settle to the bottom of the vessel containin burnt ale, and in drawing a sample from a still or tan contents require to be thoroughly mixed before the is drawn. In the case of No. 1 and the samples in Tabl special precautions were taken to secure an average s in every respect. With all precautions, however, the in suspension still vary very much. This appears to to the method of filling the stills. The still is filled f charger in such a way that some still charges receive less yeasty matter than others. No. 4 represents charge which has received less than the average am yeasty matter, and No. 1 a charge which has receive than its due share. Probably on the average, the so suspension are a little under 1 per cent. The non matters in solution are more constant, and amo between 3 and 4 per cent. It will be seen then, tha ale is very different from the other waste liquids. are comparatively harmless liquids. The amo matter they contain in solution and suspension, comparable with that of ordinary sewage, is only fraction of what is contained in burnt ale, which more than 30 times as large a proportion of p material as average sewage. This was pointed ou years ago by Sir Edward Frankland in his report Royal Commission of 1868 on the pollution o (Frankland's Experimental Researches, p. 827.)

The acidity of different samples of burnt ale ap differ greatly. When drawn hot from the stills, th of course sterile, but on exposure to the air it soo to undergo further fermentation. As most of the in Tables III. and IV. were already two days ol they reached the laboratory, and microscopic exa wed them to contain many rod-shaped bacilli, part of acid found was probably produced by fermentation ch took place after distillation. Arrangements were, refore, made to examine some samples taken hot from still, before further fermentation could take place. culating the acidity as lactic acid, the mean of five iples was 1·02 grms. of acid per 100 c c. It varied from 5 grms. to 1·39 grms. per 100 c.c. In the case of two iples taken from the same distillery, with an interval of ortnight between, the figures were 0·55 grms. and 8 grms. of lactic acid per 100 c.c. These figures indicate fresh burnt ale varies considerably in acidity, but tains on the average acid equal to about one per cent. of ic acid.

he suspended matters of burnt ale consists mainly of solids of the dead yeast. They form a sticky substance difficult to filter from the liquid. They readily settle bulky sludge, and where this is allowed to accumulate, the settling tanks and filter beds of distilleries, it soon uires the consistency of soft cheese. This substance ifies readily, and soon becomes very offensive. It is ly nitrogenous, and consists largely of proteid matters, hown in Table V., which gives analyses of the suspended ters from samples 1 and 2, Table III. These were filtered and dried below 105° C.

TABLE V.

Suspended Matter of Burnt Ale, Dry.

l nitrogen	8·12	9·03
menoid nitrogen	..	8·12
r extract	..	0·83
	5·20	7·02
phoric acid	0·52	2·26
sh	0·15	0·60

ie accumulation of this sludge, in a more or less sive condition, has caused much trouble about disies. A distillery mashing 2,000 bushels a week would, imate, produce a little over a ton of dry sludge per , equal to about 5 tons wet. In some cases this has disposed of in the wet state to farmers, but it is difficult ndle in this state, on account of its stickiness, and ers are suspicious of it as a strange substance of un- n value, and because in some cases where it was used l harm rather than good. These unfavourable results probably due to over-application of so nitrogenous nure and to imperfect distribution on account of its nature. In other cases considerable expense and le were incurred in burying it, or in deodorising it by s of antiseptics to keep down the nuisance. If it had roughly dried, I have no doubt it would have com- ed a market as manure. Organic nitrogenous bodies contain a good percentage of nitrogen, and npose readily, command a high price in the manure et. The rich odour of the partially decomposed sub- would not have been a serious disadvantage for this ise.

btained some samples of this strong-smelling de- osing material which was being allowed to go to . The analyses of three samples are given in VI.

TABLE VI.

Distillery Sludge, Dry.

—	1.	2.	3.
matter	65·05	80·72	75·02
ing nitrogen	5·71	8·56	7·00
	34·95	19·28	24·98
ng—			
osphoric acid	3·54	2·02	2·25
tash	..	0·28	..
icious matter	23·42	12·09	17·71
to tricalcium phosphate	7·72	4·41	4·91

1 was taken from a large sample prepared by ng out the sludge, and drying it in the sun. Roughly dried in this way until fit to bear carriage it contained 23·26 per cent. of moisture.

The ash of each sample is made up largely of sandy matter. This is derived from the shallow sandy ponds in which the sludge was allowed to settle. With a little care this sand could be easily excluded. This would increase the value of the sludge as manure.

The substances in solution in burnt ale are very complicated in their nature. In the fermented wash the matters in solution are similar in kind to those in unhopped malt beer. But in distillery wash the fermentation has been carried further than in beer with the production of more alcohol, acid, and other products of fermentation. A further complication is introduced by the prolonged boiling of the acid solution during distillation. This may be expected to cause hydrolysis and disintegration of complicated bodies, both nitrogenous and non-nitrogenous. The constitution of beer and substances produced during its fermentation have received much study. In the investigation of the constitution of burnt ale, what is known of the constitution of beer is a useful guide.

The constitution of the two samples, numbered 2 and 3 in Table III., has been studied in some detail.

In both cases the solids in suspension were separated before the examination. No. 2 was then concentrated to a syrup. The concentration being almost exactly 14 parts evaporated down to 1 (4052 grms. were evaporated down to 290 grms.). In this state it has kept perfectly for a long time. It is still sweet and shows no sign of mould or decay. No. 3 was proceeded with without concentration.

The Acid.—The total acidity of No. 3 was found to be equal to 0·99 grm. lactic acid per 100 c.c. When distilled down as far as it could be taken it was found that only a small portion of this acid came over in the distillate. The acidity of the distillate was equal to 0·077 grm. lactic acid, or 0·075 grm. butyric acid, per 100 c.c. of the original. It contained traces of acetic acid, but the acid present appeared to consist chiefly of higher homologues of acetic acid, such as butyric acid.

Two attempts were made to isolate succinic acid from this specimen of burnt ale, but both were unsuccessful. The difficulties of manipulation were great. When evaporated down to a syrup and extracted with ether and alcohol, the residue became an intractable glue, very difficult to extract thoroughly. Still, as the results were negative in both cases, nothing more than traces of succinic acid could have been present. From these extracts by ether-alcohol, in which I failed to find succinic acid, glycerin and lactic acid were isolated. In both cases the yield was not so great as might have been expected. This also I attribute, partly at any rate, to the difficulty of obtaining thorough extraction. The lactic acid was separated and purified as zinc lactate. The yield was about 1 grm. of purified lactic acid per litre. The glycerin from the same extracts after purification and drying *in vacuo* amounted to nearly 2 grms. per litre.

In No. 2 the acidity of the original was 1·200 grm. lactic acid per 100 c.c. The acidity of the syrup was 14·04 per cent. lactic acid. The syrup was prepared by evaporation over steam in an open basin. It will be seen then, that in concentrating in this way 14 parts of burnt ale down to one, about one-sixth of the acid has been volatilised.

Carbohydrates.—After removal of the proteids by suitable precipitants, burnt ale gives a precipitate with strong alcohol. This precipitate is gummy, dissolves readily in water, and is strongly dextro-rotary. It appears to consist mainly of dextrin.

Burnt ale itself, after removal of the proteids, is dextrorotary, and reduces Fehling's solution. On hydrolysis with a mineral acid the rotation becomes smaller, and at the same time the cupric reducing power increases.

Sample No. 3, after removal of proteids with basic lead acetate, gave—Cupric reducing power, $K = 0{\cdot}297$ and $[\alpha]_D = +0^\circ\ 26'$.

After the addition of 5 per cent. of hydrochloric acid and heating for five minutes, $K = 0{\cdot}399$ and $[\alpha]_D = +0^\circ\ 18'$.

After heating with 5 per cent. of hydrochloric acid in steam for $1\frac{1}{2}$ hours, $K = 0{\cdot}426$ and $[\alpha]_D = 0^\circ\ 14'$.

It is probable, then, that burnt ale contains in solution dextrin, maltose, and dextrose, and that the total carbohydrates amount to about one-half of 1 per cent. The very gluey nature of the product obtained on evaporation is due, in part at any rate, to the dextrin.

Nitrogenous Matters.—The nitrogenous matters of burnt ale are very complicated. The soluble nitrogenous matters extracted from malt have been extensively studied by others, and are known to be sufficiently complicated. These are then altered in the mash tub and in the fermenting vats by action of proteolic ferments from the malt and by living ferments. The resulting liquid, which, as we have seen, contains a considerable amount of acid, is then subjected to a prolonged process of hydrolysis in the stills. The resulting burnt ale contains, as we might expect, nitrogenous matters of all degrees of complication, from proteids down to ammonium compounds. The solids of burnt ale are, as shown already, very rich in nitrogenous matters. These are the most important matters contained in the burnt ale, whether we look at it as a putrefying and polluting material, or as a material to be utilised as food or manure. In the matters in suspension the amount of nitrogen is so great that, as shown in Table V., about half of the suspended matter must consist of nitrogenous substances. These nitrogenous bodies are almost entirely proteids precipitated by copper hydrate.

In solution burnt ale contains about 0·15 per cent. of nitrogen. Multiplying this by the factor ordinarily used in food analysis, 6¼, we find 0·94 per cent., or nearly 1 per cent., of nitrogenous matters. Proteid reagents, however, precipitate only a fraction of this nitrogen. The larger portion is contained in decomposition products of the proteids.

I have tried the effect of a number of the most important reagents used in separating and classifying the nitrogenous matters of food stuffs upon burnt ale. The results are interesting, and throw some light on the limitations of these reagents as means of separating the nitrogenous bodies in a complicated mixture into different classes, as well as on the constitution of burnt ale.

Sample No. 3 contained, in solution, total nitrogen 0·160 grm. per 100 c.c.

The nitrogen in ammonium compounds, determined by distillation with magnesia, 0·009 grm. per 100 c.c. Amido bodies, such as asparagine, yield half their nitrogen as ammonia on boiling with dilute mineral acid. The nitrogen of bodies of this kind, which I will call *amido* nitrogen, was estimated by boiling for one hour with 5 per cent. sulphuric acid under a reflux condenser, distilling with magnesia, and doubling the nitrogen so found after subtracting that originally present in ammonium compounds. It amounted to 0·015 grm. per 100 c.c. in this sample.

Proteid Nitrogen.—Church's method with phenol and metaphosphoric acid gave no precipitate.

Stutzer's method with copper hydrate precipitated proteids containing 0·042 grm. nitrogen per 100 c.c.

Saturation with zinc sulphate precipitated nitrogen equal to 0·033 grm. per 100 c.c. This method is held to precipitate all proteid bodies except peptones.

To the filtrate after zinc sulphate, phospho tungstic acid and sulphuric acid were added. This gave a precipitate containing 0·053 grm. nitrogen per 100 c.c. This reagent is held to precipitate peptones.

The filtrate after the phospho tungstic reagent was found still to contain 0·077 grm. nitrogen per 100 c.c. of burnt ale. If we subtract from this the ammoniacal and amido nitrogen, we have still 0·053 grm. nitrogen per 100 c.c. burnt ale to account for.

Other peptone reagents are bromine and tannin. Bromine is said to precipitate all peptones in bodies such as meat extracts. *Allen's method* (Commercial Organic Analysis, Vol IV., p. 315).—This method gave no precipitate at all with the filtrate after saturation with zinc sulphate. Phospho tungstic acid or tannin added to the same solution, after removing the bromine, gave immediate precipitates. Bromine, therefore, does not appear to precipitate such vegetable peptones as are present in this case.

Another portion of the filtrate after zinc sulphate w
acidified with acetic acid, and gave with tannin
precipitate containing 0·020 grm. nitrogen per 100 c
burnt ale.

The above determinations may be summarised
follows:—

TABLE VII.

Burnt Ale, No. 3.

	Grms. pe 100 c.c.
Total nitrogen	0·160
Of which there was contained in—	
Proteids, salted out by zinc sulphate	0·033
Peptones, precipitated by phospho tungstic acid	0·053
Amido compounds	0·015
Ammonium compounds	0·009
Compounds, undetermined: by difference	0·050
" " by actual determination	0·053

This table would seem to show that peptones are
most important class of nitrogenous bodies present in t
sample of burnt ale. This, however, is probably mer
due to the method of determination. Thus we find t
bromine gives no precipitate, and tannin one contain
less than half the amount of nitrogen given by phos
tungstic acid. Further, it is known that phospho tung
acid precipitates many nitrogenous bodies not pepton
proteid. It precipitates, in the cold especially, many t
the more complicated bodies formed in the decomposi
of proteids.

A more elaborate series of determinations of
nitrogenous matters was made in the concentrated sy
of sample No. 2. In general the results are simila
those in the table above, but the details vary considerab

TABLE VIII.

Syrup from Burnt Ale, No. 2.—Nitrogen in Nitrogen Matters.

	Per Cent
Total nitrogen	1·99
Of which there was contained in—	
Proteids, salted out by zinc sulphate	0·65
Peptones, precipitated by phosphotungstic acid	0·19
Amido compounds	0·14
Ammonium compounds	0·15
Undetermined compounds, by difference	0·86

The "amido compounds" were determined as be
It was found, however, that by increasing the leng
time during which the acid acted, or by increasing
strength of the acid, the amount of nitrogen found b
method could be much increased. Thus, by boiling
5 per cent. sulphuric acid for two hours instead of on
nitrogen was increased to 0·19 per cent. In another
tion which was evaporated down for 5 hours with sulp
acid, so that at the end of the concentration over 2
cent. of acid was present, the amido nitrogen, deter
as before, was found to be increased to 0·32 per cent
before, bromine gave no precipitate in the filtrate
salting out proteids with zinc sulphate; and Ch
method gave no precipitate at all.

A curious fact was noticed in the case of St
method. Duplicate determinations were made, usin
ordinary amount of the copper hydrate reagent for th
matter present. These gave 0·53 and 0·56 per
nitrogen. The filtrates had an intense blue colour,
may have been due to some body like glutamine,
forms a blue compound with copper. On this acc
and because of the great amount of organic acid p
I made other duplicate determinations, using doub
amount of copper hydrate first used. These gave
and 0·81 per cent. nitrogen.

Phospho tungstic acid gave a precipitate containin
per cent. nitrogen, and tannin one containing 0·66 pe
nitrogen. Copper hydrate is not a reagent which is c
as a precipitant for peptones. Yet in this case, when
excess, it gives a greater precipitate than either
peptone precipitants, phospho tungstic acid or tann
used in excess. But more curious still, in the filtrat

sing excess of copper hydrate, both phospho tungstic acid nd tannin give precipitates. Also, after precipitating as nuch as possible with phospho tungstic acid, tannin still gives a bulky precipitate, and *vice versâ*, after precipitating is much as possible with tannin, phospho tungstic acid still gives a bulky precipitate. These results are tabulated in ercentages of nitrogen precipitated as follows:—

	Per Cent.
No. 1.	
Copper hydrate in excess	0·84
In the filtrate from this, phospho tungstic acid	0·12
No. 2.	
Copper hydrate in excess	0·84
In the filtrate from this, tannin	0·14
No. 3.	
Phospho tungstic acid in excess	0·74
In the filtrate from this, tannin	0·11
No. 4.	
Tannin in excess	0·66
In the filtrate, phospho tungstic acid	0·15
No. 5.	
Milk of lime, till quite alkaline	0·27
In the filtrate, phospho tungstic acid	0·56

In every case where tannin was used it was difficult to y when precipitation was complete. After adding excess tannin and removing the precipitate, the filtrate always posited more precipitate. In one case, other work called e away, and some tannin precipitations stood covered for ur months. They were then filtered, and after filtration e clear filtrates were allowed to stand a few days. rther precipitation then gradually took place.

These nitrogen determinations are treated at some length, they throw an interesting light on the too absolute state-ents which are sometimes made as to the value and use of rtain reagents in precipitating and separating nitrogenous atters of different kinds. Such statements appear to be sed on researches made, often from a purely medical int of view, on a limited range of animal products. The ove determinations show that such reagent precipitates dies not precipitated by the others, and that the precipi-ion is also much effected by the conditions under which takes place.

To return to the problem under consideration, these terminations show that, as might be expected, the nitro-nous matters of burnt ale are very complex. They also ow that the greater part of the nitrogenous matters in ution are not proteid, but consist of complicated nitro-ous organic matters derived from proteids by their drolysis and decomposition. These matters are probably rtly peptones, but are in great part bodies further noved from the proteids, and less complex than peptones.

Farmers who have experimented with burnt ale as a food cattle have more than once informed me that its most rked effects are in improving the appetite and tone of animals. I can well believe that among the complicated rogenous bodies present some may have stimulating and etising properties; just as bodies such as theine, theomine, &c., naturally found in plants, and of a somewhat logous degree of complexity, have definite stimulating perties.

ther Extract.—Samples of filtered burnt ale evaporated yrup were extracted with ether. The extract was found onsist mainly of acids. Only very small quantities of real saponifiable fats were found.

sh.—The main constituents of the ash of burnt ale have ady been given in Table III. It will be seen to consist y largely of substances of high manurial value, namely, sphoric acid and potash.

Part II.—Disposal of the Waste Liquids.

n former times when distilleries were smaller, much of burnt ale, at any rate, was disposed of as food for cattle s manure. When serious trouble first arose on account of the pollution caused by distilleries, a system of disposal by so-called settling ponds and filter beds was adopted. This system is still to be seen, and smelt, about many distilleries. It soon involved them in even more serious trouble than that which they sought to avoid. It did not lessen the pollution of rivers, while it added a new and very evil-smelling nuisance. I cannot but think, that had any competent chemist investigated the nature of burnt ale for them before they embarked on this process, the distillers would have been saved much trouble. Under this system, the waste liquids were run into a series of shallow ponds, dug, preferably, in a light porous soil. In the first, and to some extent in the second, pond the suspended solids were deposited. They soon accumulated as a layer of organic mud, sometimes several feet deep. The liquid freed from the suspended matter gradually percolated through the bottoms and sides of the ponds and disappeared. The ponds varied in number from two to five at different distilleries. The highly nitrogenous suspended matters collected in the first pond soon began to putrefy and formed a sticky stinking mass, very difficult to deal with. The analysis of this material, already given in Table VI., shows it to have a high manure value. The liquid which soaked away into the soil only disappeared for the time. It generally made its presence known, sooner or later, sometimes in places hundreds of yards distant from the filter beds. Even so dilute a liquid as ordinary sewage could not be successfully purified by such a system as this. In the case of a liquid so rich in putrescible matters as burnt ale, the results, as might have been anticipated, were disastrous.

The practicable methods of approaching the disposal of these waste liquids seem to divide themselves into—

(1) Methods for their mere disposal, without the production of any bye-product.

(2) Methods involving the preparation of feeding stuffs.

(3) Methods involving the preparation of manure.

It might possibly be suggested also as a fourth method, that the whisky distillers could utilise the burnt ale and spent lees, as the rum distillers of the West Indies utilise the corresponding liquids produced in rum distillation, namely, as mashing liquid for the next brew. This suggestion would probably be received with grave suspicion by whisky distillers. If at all practicable otherwise it would certainly alter the character of the product considerably.

Methods falling under class (1) are already being tried on a large scale. Of these, the most interesting is the method of disposal in aerobic bacteria beds. The substances in solution in distillery liquids are of the kind which should be susceptible to bacterial treatment, but they will require a system to be worked out for treating solutions of more than usual concentration. Such a system is on trial at more than one distillery.

As I considered that my investigations into the composition of burnt ale had made out a *primâ facie* case for its utilisation, I have not, myself, experimented on mere disposal methods.

Burnt ale has been fed to cattle for generations. It is claimed for it, that it has not only feeding but also stimulating and appetising properties. At the present day in the neighbourhood of distilleries it is still given in large quantities to cattle. Its use in this way, however, can only be very limited, because it is not valuable enough to stand carriage and because it will putrefy if not used at once. It cannot be stored and used according to the requirements of the farmer.

Burnt ale cannot be obtained as a dry solid by evaporation. When evaporated down it becomes a thick, dark, sticky mass, which would be very difficult to deal with in any evaporating plant. Even prolonged drying in a steam oven only reduces it to a plastic material, which is very tenacious. This plastic gluey nature is due to the dextrin, glycerin, and lactic acid which it contains. It cannot be conveniently evaporated much further than 10 parts concentrated to 1, unless the suspended matter be removed, when it may be evaporated to about 15 to 1. Concentrated in this way thick syrupy liquids are obtained. These are strongly acid, and do not undergo further fermentation or putrefaction on keeping. Probably the high percentage of acid acts as a preservative. The composition of such a syrup can readily be derived from the figures already given Tables, III. and IV. The following analysis is that of a sample roughly evaporated down, sediment and all, in an open kettle. The intention was to concentrate it 10 to 1, but the work was roughly done at a distillery without accurate measurement, and the concentration is probably not so great as was intended.

TABLE IX.

Burnt Ale concentrated to Syrup.

	Per Cent.
Moisture	68·75
Solids in suspension	10·60
Non-volatile matter in solution	20·65
*Nitrogenous matters (N × 6¼)	10·60
Acidity as lactic acid	4·36
Ether extract, without acid	0·15
Ash	4·31
Dextrin, maltose, glycerin, &c., by difference	11·74
*Total nitrogen	1·71
Proteid nitrogen (Stutzer's method)	1·14

The sample of burnt ale from which this was prepared contained less than the average amount of acid, and more than the average of suspended matter. The chief feeding materials of this syrup are the proteids and carbohydrates. There is practically no fat present. The non-proteid nitrogenous matters have probably a value of their own in giving the material its stimulating and appetising qualities. The greatest objection to this syrup as a food lies in its great acidity.

Early in my experiments I made an attempt to prepare the burnt ale in a better marketable condition by drying it along with distillers' draff. Draff, both in the wet state and when dried to distillers' grains, commands a ready market. When dried along with burnt ale a substance is produced somewhat resembling dried grains, but more acid, darker in colour, and a little more sticky. Recently a company has been formed to carry out a similar scheme. They press the dried mixture into cakes. Meals and cakes prepared in this way keep well, and are readily eaten by cattle. Distillers are, however, naturally somewhat averse to withdrawing their draff from a good market to put it into one whose value has yet to be ascertained.

If the acid in the concentrated burnt ale could be removed by any easy process, no doubt a market could be found for the syrup itself, at prices which would pay for concentration, with modern evaporating plant. Some of the evaporating experiments which have been made at distilleries were carried out with the most crude and inefficient plant. Even with its acid, the syrup would probably command a market if it could be shown by practical experiments with stock that the acid is innocuous. As burnt ale itself, even when taken in large quantity, is said by practical farmers to cause no injury, it is probable that the acid syrup if fed in moderate quantity, mixed with other foods, would also prove a harmless and an appetising food.

Disposal by this method has the further disadvantage, however, that it leaves the other waste liquids untouched. They will certainly not pay for evaporation. But, as has been shown in Part I., without the burnt ale they are comparatively weak and innocuous. If a system of evaporation of burnt ale were to prove profitable, the other liquids could easily be disposed of by irrigation, where that was practicable, and otherwise by a bacterial system.

The solids of burnt ale have a high manurial value. As shown in Tables III., IV., and V., they are rich in nitrogen, phosphates, and potash. If an average sample of burnt ale were dried to about 10 per cent. of moisture, it would contain about 5 per cent. of nitrogen, about 9 per cent. of phosphates as tricalcium phosphate, and about 3 per cent. of potash. As the nitrogen is contained in readily putrescible organic matters, and the phosphates and potash in soluble form, chiefly as potassium phosphates, they are all in most valuable forms, from an agricultural point of view. The dried material should, therefore, be worth about 4*l.* per ton in a central market, and more in the country. Unfortunately, however, even if we coul concentrate burnt ale to this extent, the concentrate material would be unsaleable, on account of its intractabl condition. It could not be dried and ground into a sowabl condition. Even if mixed with a large bulk of other materia it would render them sticky. I attempted to get over th difficulty by rendering the burnt ale slightly alkaline wi lime before evaporation. This improves it a little. It ca be dried, though with difficulty, and can be powdered whil still warm. But the powder if left exposed to the air soo falls back, even in dry weather, into a pasty condition, i which it could not be marketed as a manure.

The suspended matters of burnt ale, alone, have a hig manurial value on account of their richness in nitrog (Table V.). They are a little difficult to filter-press owi to their slimy nature. Still, if no further use is to be ma of the burnt ale, it would at least be worth while to remo these solids for use as manure. When dried they form dark, tough, horny substance, which can be ground to marketable powder.

It has already been mentioned that lime precipitate certain amount of the dissolved nitrogenous matter of bur ale. It also precipitates almost the whole of the phosphat as well as some other matters. Burnt ale, No. 1, Table II after removal of the suspended matters, was made sligh alkaline with milk of lime. The precipitate form amounted when dried to a little over 10 grms. per lit It was a light coloured brittle substance which was read dried and powdered.

It contained when dry :—

	Per Cent.
*Organic matter	45·25
Phosphates, as tricalcium phosphate	35·75
Potash	0·29
*Containing nitrogen	2·17

The whole burnt ale, including its suspended matt when rendered slightly alkaline by lime, gives a hea grey flocculent deposit containing both the suspen matter and the precipitate. This can be filtered, or filt pressed much more readily than the suspended ma alone. It dries easily to a crisp grey solid which is ea powdered. On the average it requires about ½ per cent lime of good quality, or 50 pounds of lime per 1,000 gall to effect this precipation.

The following table gives analyses of some samp obtained in this way, dried to marketable condition.

TABLE X.

Precipitate by Lime from Burnt Ale.

—	1.	2.	3.	4.	5.	M
Grms. obtained per 100 c.c.	1·2	2·5	3·6	1·7	..	
Moisture	5·35	12·40	6·18	11·27	9·46	
*Organic matter	66·20	56·15	74·25	52·39	58·43	6
Phosphates, as tricalcium phosphate.	23·32	16·20	11·07	20·11	17·60	1
Potash	0·79	0·95	..	..	..	
Lime	..	..	..	16·28	17·68	1
*Containing nitrogen.	4·98	4·13	5·80	4·03	4·78	4

Nos. 1, 2, and 3 were samples prepared on a small in the laboratory. Nos. 4 and 5 were prepared on a l scale at distilleries. They are therefore, probably most representative samples. No. 4 was filtered thro sack. No. 5 was filter-pressed.

The filtrate after this treatment is still a very impure li and is quite unfit to be turned into any watercourse. above treatment is not suggested, therefore, as a mea getting rid of the pollution, but merely as a means of g something of value out of the burnt ale, and at the time taking a first step in the purification, by removi the suspended and a part of the dissolved solids. filtrate is dark in colour, and froths very badly on sh Even when diluted with 100 times its volume of wa

froths. If allowed to stand it soon begins to putrefy,
after a time stinks badly. It contains on the average
y as much non-volatile matter in solution as untreated
. ale. For, though we have removed a certain
nt of solid matter, this is compensated for by the lime
has been added, and by the volatile acid which
een fixed as salt. It contains on the average about
s much nitrogen as untreated burnt ale with the
nded matter included, that is, about 0·12 grm. per
.c. It contains very little phosphate, but nearly all
otash of the original liquid. It is, therefore, still a
of high manurial value, and has still a very much
r polluting power than ordinary sewage.

n when diluted with the spent lees and the other
liquids of the distillery, the mixture is still a very
s effluent. Mixtures of this kind, prepared from the
of burnt ale after the lime treatment mixed with
lees, steep water, and wash-up water, all freed from
uspended matter, and mixed together in the pro-
ns stated in the first part of this paper, as the
ated average proportions in which they are produced
distilleries, were prepared for experiments on further
ation by bacterial treatment. The following table
nalyses of two such mixtures.

TABLE XI.

Mixture for Bacterial Treatment.

——	1.	2.
	Parts per 100,000.	
lids..........................	1,069·0	1,350·0
ignition	910·0	1,140·0
trogen. Kjeldahl method.....	42·0	45·9
saline ammonia...............	3·2	5·9
consumed in four hours......	110·4	Very great, over 100.
....	..	15·9

e liquids contain more than ten times as much solid
in solution, and six or seven times as much com-
itrogen in solution as an ordinary sample of town
They also show enormously greater oxygen
ion from permanganate than sewage.

mixture putrefies readily. It contains nothing to
r diminish the activity of the micro-organisms which
ecay, but, on the contrary, contains just the sort of
in which they flourish freely. In this it resembles
and is dissimilar to many trade effluents, which
rious to bacteria. This is, therefore, a liquid which
be suitable for treatment by irrigation, or by
l beds or filters.

I commenced my investigations, over three years
re was in many quarters a strong objection to the
on of burnt ale to land. It was said to "burn it
to "make it rot." I have no doubt there was
or these opinions. If burnt ale was applied like
or like the liquid manure of the farm, it no doubt
. Regard should have been had to the fact that it
50 times as concentrated as sewage, and, therefore,
ch might take a million gallons of sewage would be
eavily dressed with 20,000 gallons of burnt ale.
anges which take place during the purification of
uids by irrigation, or by the similar but more con-
and better regulated methods of purification by
ks and bacteria beds, are changes of decomposition
ation of complicated organic matters to simple and
s inorganic materials. Therefore, when all the
essary conditions for bacterial purification are sup-
greater the amount of organic matter which has
lised, the greater must the supply of oxygen be.
eria cannot break up and destroy the organic
owever perfect all the other conditions may be,
y get the necessary oxygen. In the case, there-
concentrated liquid like burnt ale, a far greater
pply is needed than by an equal bulk of sewage.
e of broad irrigation this must be met by em-
greater area of land and applying less per acre.
ch is applied the conditions will become more or
less anaerobic, putrefaction will set in, and, in ordinary phrase, it will "burn" or "rot" the land.

I made a considerable number of experiments on the disposal of mixtures, such as those analyses of which are given above, Table XI., by bacterial agency. Some of these were made on tubs filled with soil. As these were situated at distilleries many miles from the laboratory, and somewhat difficult to get to, they were not sufficiently under observation and control to be quite satisfactory. In one of my first experiments the danger of "rotting" the land by the application of these liquids was unintentionally demonstrated. Two tubs, one covered with grass, the other bare, and both filled with light sandy soil, became foul at the very start. The whole dressing for a month had been applied at once during a visit to the distillery. This proved too much, and in consequence the first drainage which appeared was bad. The tubs then got a rest of some months, when the drainage became sweet again. After that the dressings were resumed, but were applied a little at a time. The tubs then soon became able to stand considerable dressings without becoming foul, and yielded a drainage rich in nitrates, which did not undergo any secondary fermentation. Rich crops of grass and vegetables were grown on the surface of these tubs. It was found in this and other experiments that a dressing which, if applied at once, will cause putrefaction, can be applied later on, when the soil has become accustomed to the peculiar treatment, without causing trouble. From this it may be concluded that not only is a sufficient supply of oxygen necessary, but that to deal with this unusual dressing, ordinary soil has to develop a special culture of micro-organisms fitted to flourish upon the unusual food. These experiments also showed that where a sufficient area of light land is available, these effluents can be sufficiently purified by broad irrigation, and at the same time suitable crops can be grown on the land.

A more complete series of experiments was made in small metal tanks in the laboratory. These were filled with gravel and sand, and with coke and sand. They constituted, practically, small bacteria beds, and were worked on a single contact system. They received at first very small dressings, which were gradually increased. It was found that when a dressing was poured or rapidly sprinkled over the surface of the tank, it formed a kind of piston which percolated down rapidly and drove out in front of it, by the drainage pipes at the bottom of the tank, a considerable amount of air. At the same time fresh air was drawn in at the surface to fill the pores again as the liquid sank. In this way good aeration was maintained. In order to make this aeration as thorough as possible, as the dressing per day was increased it was divided into several parts, applied with intervals of a few hours between. A large part of the air in the tank was thus renewed several times each day. It would be interesting to try if the purification capacity could be increased still further by forcing air through the tanks artificially. I have not yet been able to do that.

In illustration of what the tanks were capable of under the system described above the following details are given. These are taken from the most complete experiment made.

The tank used was an enamelled metal cylinder nearly 18 inches deep and eight inches in diameter. The bottom was covered with three inches of gravel, over which sand, mixed with a little garden soil, to start the culture, was placed. The cylinder was washed through with water, and small dressings of a mixture similar to those in Table XI. were then given on alternate days. On the other days a dressing of water only was given. After this had been continued for a fortnight, a dressing of the mixture, equal to about a gallon and a quarter per square yard, was given five days a week. This was continued for about a month. All this time the drainage remained sweet and clean and was rich in nitrates. The dressing was then increased to about two gallons per square yard per day, given six days a week. This was continued for about two months. The mixture used at this time was No. 1, Table XI.

In contrast with it an analysis of the purified effluent obtained during this period is given below, No. 2, Table XII. The dressing was then increased to three gallons per square yard per day, added in three dressings daily. The mixture used for this period was No. 2, Table XI. The analysis of the purified effluent is No. 3, Table XII. After this had been continued a few weeks the dressing was increased to the rate of four gallons per square yard per day, and then to the rate of five gallons per square yard per day. During both these periods the application was made in four dressings daily. The analysis of the effluents for these periods are Nos. 4 and 5, Table XII. In the last of these we have reached the limit of the capacity of the bed. After the application at the rate of five gallons had been continued for four days nitrates ceased to appear in the effluent. A few days later the effluent began to smell a little. The dressing was then discontinued. It had lasted altogether eight months.

Table XII.

Effluents from Bacterial Treatment.

——	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
	Parts per 100,000.				
Total solids	147·20	108·00	149·00	180·00	244·00
Loss on ignition	69·00	40·00	23·00	24·00	54·00
Free or saline ammonia	0·011	0·027	0·029	0·048	0·057
Albumenoid ammonia .	0·067	0·092	0·144	0·209	0·440
Oxygen consumed in four hours.	0·060	0·88	1·13	1·89	3·22
Nitrogen in nitrates....	13·71	4·50	4·64	1·93	Absent

Sample No. 1 in this table is an effluent from the period when the mixture was being applied at the rate of 1¼ gallons per square yard. During this period the nitrates reached their maximum. In some cases they were found to be as great as 20 parts of nitric nitrogen per 100,000. As the dressing increased they fell away. Apparently when the amount of organic matter increases beyond a certain point much denitrification takes place in the bed. In no case was more than a fraction of the combined nitrogen applied to the bed recovered in the combined nitrogen of the effluent.

All the effluents Nos. 1 to 4 are satisfactory. They were quite like ordinary drainage water in appearance, without taste or smell, or tendency to froth when shaken. When kept either in closed or open bottles they remained perfectly sweet. When kept in the light the only apparent change which took place in them was that lower green plants soon began to grow luxuriantly. No. 5, though an unsatisfactory effluent, is pure compared with the liquid dressed on the surface of the filter. It is only necessary to contrast Tables XI. and XII. to realise the extraordinary purification effected by this layer of sand a few inches deep. It was very interesting to notice also the rapidity with which the change took place. A few minutes after the dark, foamy, impure liquid was dressed on the surface the colourless, sweet drainage water began to appear; and within half-an-hour quite three-fourths of it had collected. The change appeared almost magical. As a rule the liquid when applied was in a state of putrefaction and very foul. Sufficient of the mixture to last for a few weeks was usually prepared at one time. It soon became foul, and as time went on its condition was always becoming worse. I am now inclined to believe that it was an advantage to allow it to undergo this anaerobic fermentation before applying it to the aerobic bed. That is a point, however, on which no exact experiment was made.

The above experiments are sufficient to show that distillery effluents of the kind dealt with can be efficiently purified by bacterial treatment on a single bed system. Others have experimented with multiple-contact systems (Journal of State Medicine, March 1901; A. M. Cowie; The Purification of Burnt Ale by the Biological Method). Systems of this kind are at present on trial on a large scale, and the trials are exciting great interest. What has now been done is sufficient at any rate to demonstrate that by bacterial treatment effluents can be produced from distillery waste liquids, with or without the previous separation of a bye-product, sufficiently pure to be safely turned into clean rivers and streams. A distillery mashing 1,000 bushels weekly would have about 50,000 gallons of waste liquid per week to deal with. This, if put through manure process described above, should yield about 1½ of dry manure. The effluent would still be so impure be equal to at least 500,000 gallons of ordinary sew Whatever system of bacterial treatment is adopted, th fore, the beds must be large in proportion to the volun liquid to be dealt with, otherwise the mistake of the filter-bed system will be repeated.

The above paper deals with experiments carried o odd times during more than three years. It is, there somewhat disconnected, and in many parts incomplet hope, however, it has thrown some light on the que of the disposal of distillery waste, and shown that it i as stated by more than one distinguished authority insoluble problem.

Discussion.

Dr. John Clark said that pot ale could easily be dis of, but that it was difficult to deal with profitably. experience was that under certain favourable conditio waste products of a distillery could be purified by filt through gravel beds, when of sufficient dimensions an effluent obtained in which no impurity except a nitrate could be detected; but for most distillerie bacterial method would probably be the simplest and available. Distillers, however, were anxious if po to utilise their pot ale either for feeding purposes a manure, and of these two methods he though conversion into a feeding stuff was likely to be the profitable. Experiments had been made in mixi evaporated pot ale with draff and other materials to a feeding cake, which was of value on account stimulating action, although it might have a deleterious on account of the free acid which it contained when used in too large a quantity. The only objection method of utilising pot ale was the cost of evaporatio various means of reducing this to a minimum had proposed and deserved a careful trial. When grave were available he thought the disposal of the pot ale be most economically effected by treatment with lim subsequent filtration of the liquid portion. The prec produced by the lime would contain the phosphoric ac a considerable portion of the nitrogen, and when and dried would be a valuable manure. When grav were not available the filtrate could be treated bacterial method.

Dr. David Wilson said that extensive experimen been made in various localities with the object of deter the value of pot ale as a feeding stuff. These expe had shown that the material might be used with ad in the case of pigs, but that it was not, except in re small quastities, a suitable food for dairy cattle, as it to produce kidney and other troubles. He was opinion that utilisation of pot ale as a manure, rath as a feeding-stuff, should be aimed at, and suggeste might, after concentration, be spread over dung t by combination with the acid present in the liq ammonia which escaped from the dung under conditions.

Mr. A. Macdonald said that the value of the m a manure was not sufficient to repay the cost of eva and transport; on account of its physical conditio unsuitable for manurial purposes.

Dr. Wm. Frew said he was greatly intereste results of Mr. Hendrick's experiments on the prec of the nitrogenous constituents of pot ale by the reagents mentioned in the paper, and confirmed own experience the unsatisfactory nature of the clas based thereon. He questioned the advisability of the pot ale for mashing a subsequent brew as t of lactic acid, phosphates, and albumenoids would fermentation unfavourably.

Mr. Hendrick, in reply, said that the speaker appear to disagree with him seriously, and he c thank them for the kind way in which they had the paper. Dr. Clark appeared very favourab gravel-bed method of disposal. He was no dou that this had been one of the cheap and easy m disposal already tried many times. Similar metho had also been tried, were pumping on to waste into old quarry holes. The result of such methods was, ner or later, disaster. Sometimes they appeared to be essful for a time, but, perhaps after many months, putrid ients found their way out somewhere, often at conerable distances from the point of application. No doubt vel beds, if sufficiently extensive, and if properly worked respect to distribution of liquid and to aeration, could nade successful. But that simply brought them back to terial beds.

r. Wilson's experience of burnt ale as a feeding stuff of great interest. This was just one of the points on ch exact information was at present required, and on ch he was trying to arrange for experiments. Many ers in the distillery districts said that burnt ale had n fed in considerable quantity to fatten stock, without producing any noticeable evil effects. By using it food the manure value was obtained in the dung of the als. This was, therefore, the most economical method sposal, if it could be made otherwise practicable.

reply to Mr. Macdonald, the manure product described e paper was, as the samples on the table showed, in ect physical condition for transport and distribution. its analysis it was worth about 70*s*. per ton, which d easily pay for its production.

stillers could not look on burnt ale as a gold mine. At same time they had to consider how to dispose of it out loss, if possible. That could only be done by ring from it a saleable bye-product.

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LANT, APPARATUS, AND MACHINERY.

ia Ice Machine; Connection between the Temure in the Compressor, and the Quantity of Ammonia ted into the Evaporator. R. Habermann. Woch. rau. 1901, **18**, [14], 188—189.

king an ammonia ice machine, it is customary to the quantity of liquid ammonia injected into the tor by means of the valve, so that the temperature pressure tubes of the compressor may remain at 5°—40° C. The regulation of the valve varies the of liquid particles which enters the compressor along with the gas from the evaporator, and the evaporation of these liquid particles governs the temperature in the pipes. If the gas enters the compressor dry, the temperature rises, and the pipes become hot; whilst if it enters moist, the pressure pipes are cooled. Under an absolute pressure of 9 atmospheres, the temperature at which no liquid ammonia evaporates and no gaseous ammonia is condensed is 22° C. If the injection valve be entirely closed, the gas entering the compressor becomes dry, and the temperature rapidly rises under the work performed in compression. If the temperature be kept at 22° C., it may happen that only so much liquid passes into the compressor as is necessary to maintain this temperature. But, on the other hand, it may also happen that too much liquid gets through, and a loss of power will then occur, the liquid increasing perhaps to such an extent that there is a danger of blowing off the cylinder cover. This is the reason why it is safest to work at a temperature of 35° C., so as to ensure the evaporation of all the liquid which enters the compressor. It is generally reckoned that a 1,000 kilo. ice machine requires 500 kilos. of liquid ammonia per hour. If the condenser be not very efficient, the production of liquid may not be sufficient. In this case, in order to obtain moist gas and moderate temperatures, it will be necessary to restrict the heating surface of the evaporator.
—J. F. B.

Inflammable Liquids; Safety Vessels for Storing ——. K. Ernst. Färber-Zeit. 1901, **12**, [5], 71—72.

A NEW form of vessel intended for the storage of large or small quantities of volatile inflammable liquids and suitable for use by chemical manufacturers, fat extractors, cleaners, &c., has been devised and patented by Messrs. F. Henze and Co. (Ger. Pat. 1898, Cl. 34, No. 101,508; 1899, Cl. 34, Nos. 108,477 and 111,834). The effectiveness of the Henze vessel depends on the principle of the Davy safety-lamp, the contents of the vessel being protected from any external flame by means of wire gauze of very fine mesh which is inserted in the inlet and outlet pipes of the vessel. According to the first patent the vessel consists of a drum capable of being revolved on its axis, and fitted with two bent tubes, one of which, on the rotation of the drum, acts as the outlet, while the other admits air to the vessel. The fine gauze in the outlet in addition to its use for preventing explosion also serves as a filter for the out-flowing liquid. The second patent describes a more complete fitting intended for larger vessels. The safety tube is a narrow cylinder of fine wire gauze extending from the opening across the interior of the vessel to the opposite side, where it is closed with a cap similarly perforated, and attached to the side of the vessel, in order to prevent the tube from alteration in position during transport. The end of the tube which opens on the external air is provided with a valve which opens when the internal pressure exceeds a certain amount, and also with a ring bearing a thread on which a cap can be screwed. During transport this cap is tightly screwed down, but when the cask is stored in one place, it is removed in order to allow the valve to act, and thus obviate danger of the cask bursting owing to rise of temperature. If a flame is brought near the mouth of the tube, only that portion of liquid can burn which is within the safety tube.

The latest patent refers to small cans for the same purpose in which all the openings consist of minute holes or slits or are covered with fine wire gauze.—R. B. B.

PATENTS.

[*Optical Pyrometer*] *Temperature of Highly Heated Bodies; Determining and Controlling the ——.* R. W. James, London. From The Bethlehem Steel Co., Pennsylvania, U.S.A. Eng. Pat. 19,400, Oct. 30, 1900.

THE method consists in comparing the colour and intensity of the light emitted by the heated body with the colour and intensity of the light emitted by a medium which is simultaneously within the range of vision and has an ascertained relation to temperature. The pyrometer is shown in sectional elevation in Fig. 1, in sectional plan in Fig. 3, and in cross-sectional elevation in Fig. 2. It consists of a

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of these specifications may be obtained by post by : 8*d*.—the price now fixed for all specifications postage —to C. N. Dalton, Esq., Comptroller of the Patent Office. pton Buildings, Chancery Lane, London, W.C.

combination of a tube J having a closed end I′, as described in the preceding abstract, with standardised light-emitting media. For the latter, incandescent carbon filaments may be used, but it is preferable to employ only reflected and diffused light which is transmitted through suitably coloured transparent screens.

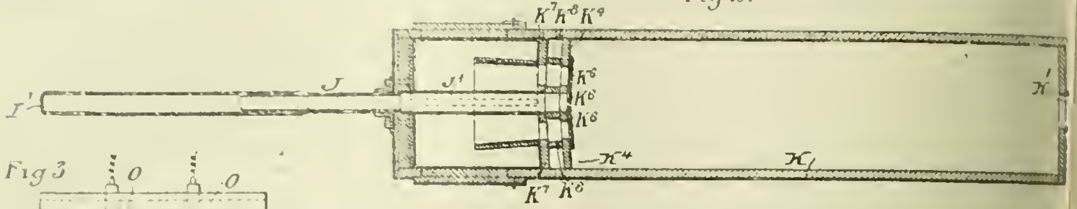


Fig 2.

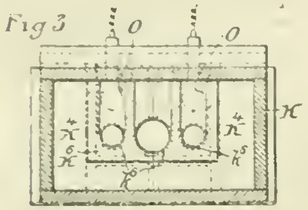


Fig 3

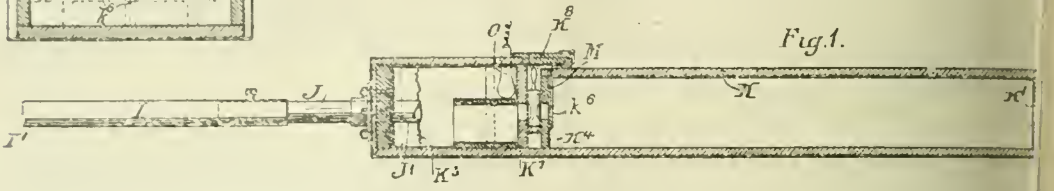


Fig.1.

The open end of the pyrometer tube J′, enters the box-like extension K, provided with the observation-opening K′. Across the box extends a double-walled partition K^4, K^7, provided with the apertures K^6, the pyrometer tube terminating in the central aperture, so that the observer looking through K′ can see the highly heated closed end of the tube I′. The apertures to right and left correspond to the standardised light-emitting media, each of which consists of a chamber, lined with a suitable material and illuminated by an incandescent electric lamp O, the lamp being screened off so that only diffused light issues from the aperture. The colour and intensity of the standard lights are modified as required by placing within the recesses K^8, formed by the double wall of the partition, glass cells M containing an aqueous solution of Methyl-Orange and Nigrosine. The two light standards should, for convenience, differ slightly from each other, but should approximate closely in intensity and colour the light which should be emitted by the closed end of the pyrometer tube when at the required temperature. The means for regulating the temperature of the object under observation should be situated close to the pyrometer. —H. B.

[Optical Pyrometer] Temperature of Highly Heated Receptacles or Objects; Ascertaining the ——. R. W. James, London. From The Bethlehem Steel Co., Pennsylvania, U.S.A. Eng. Pat. 19,401, Oct. 30, 1900.

The patentee claims the use of a tube, one end of which is closed and is placed within the furnace, or in contact with the material, under inspection, so as to attain the same temperature as the latter; the other end of the tube, which is open, being outside the heated receptacle. Through the open end of the tube, the colour and intensity of the light emitted by the heated end may be observed.

The tube is preferably used in connection with and as a part of the pyrometer described in patentee's Eng. Pat. 19,400 of 1900 (see preceding abstract).—H. B.

Distilling and Evaporating Liquids; Apparatus for ——. E. Edwards, London. From Krauschwitzer Thonwaarenfabrik für Chemische Industrie, Germany. Eng. Pat. 4393, March 1, 1901.

The bottom of the apparatus is deeply bossed or chased at several points, to obtain an enlarged heating surface, the lower parts of the bottom being provided with outlets for the residue or the rinsing water. The bossing or chasing may be in the form of inverted cups, or spiral or circular bulges or channels.—R. A.

Evaporating or Concentrating Apparatus [for Sacchari Solutions, &c.]. J. McNeil and C. McNeil, Colonial Ir Works, Govan, N.B. Eng. Pat. 8763, May 12, 1900.

A chamber or box is formed on or fixed to one side the evaporating vessel, near the bottom thereof, and so to extend across the vessel in a horizontal or downwa inclined direction, a space being left between the cha and the sides of the vessel. A set of tubes formin heating surface are fixed in and extend through chamber from top to bottom, in a direction inclined t vertical. The chamber may be furnished with a baffle or plates, and is provided with an inlet for the he steam and an outlet for the water of condensation. I the action of the heating steam, the liquid treated through the tubes, and descends through the space be the chamber and the sides of the vessel.—R. A.

Materials Proof [Waterproof] against the Acti Moisture and of Chemicol Agents, Process for R ing ——. A. Kronstein, Karlsruhe, Germany. Pat. 2679, Feb. 7, 1901.

The material to be treated is saturated with "wood "its mixtures with other oils, solvents, or resins," "c of polymerisation," and is heated for several ho 200° C. in a suitable oven. If the heating is effec air, the material becomes dark red, but when air is ex it retains nearly its original colour. A great num applications of the invention are described, such as i nating ropes, nets, and the like; wood pulp, car paper, asbestos, cork, and objects required in el industries that require to be made proof against m Vessels made from gypsum, cement, or like porous may, it is stated, be thus rendered acid-proof, and a for chemical purposes. It is also stated that it possible "to manufacture vessels for uses in c factories from cellulose or from wood pulp, which wi the action of acids, such as hydrofluoric acid, sulphuric acid of 40 per cent. strength, of dilute alk of solvents, such as alcohol, benzene, oil of turpenti at an elevated temperature."—E. S.

Flours, Cements, [Lime, Phosphates, Colours, Sug other Pulverulent Materials; Machines for P and Separating ——. A. Renault and G. Cuss of Chateauroux, France. Eng. Pat. 7848, April

The machines are of the class described in Eng. P of 1900, in which the material is delivered on to of smooth-surfaced cylinders, the finer portion adl the cylinders, from which it is removed by scra allowed to fall into a receiving chamber at the bas apparatus, while the coarser portion is thrown o other side of the cylinders to fall into a separate

Several arrangements of apparatus are described, icable for bolting flour, separating grains, &c. In arrangement, two superposed sets of cylinders are loyed, the coarser material, rejected by the upper set, g subjected to a second treatment in the lower set. In newhat similar arrangement, a rotating brush is inserted een the sets, and one or more cylinders of metallic e are inserted in the series of the second set. In her arrangement, applicable as a bran brush, rotating hes are inserted between the separating cylinders. A der of wire gauze, against which a brush rubs, or a revolving against a fixed wire mesh, may be employed stribute the material on to the uppermost separating der, or at intermediate stages of the operation.—R. A.

II.—FUEL, GAS, AND LIGHT.

leum for Metallurgical Purposes. A. v. Forselles. chnisk Tidskrift; Petr. Ind. Techn. Rev. **4**, [105], 1—222.

e Krusell petroleum furnace, which is being largely yed for metallurgical purposes in Russia, the dimen- of the combustion chamber are based on 12—15 cb. ft. ace per pood (1 pood = 36 lb.) of oil consumed per ; and the minimum height is 3 ft., since, with a smaller he oil is not completely gasified before it reaches the n. The size of the air conduits *b* and *e* (Fig. 1) and the also depends on the oil consumption, 1 pood (36 lb.) our requiring 8,000 cb. m., or 2·22 cb. m. per second; , with an air current moving at 20 ft. per second, *b* and *e* have a sectional area of 16 sq. in. In the case of *a*, ectional area—assuming a temperature of 1,200° C. in ombustion chamber—will have to be 86·4 sq. ins.; aximum height should be 3½ ins., as otherwise the will rapidly destroy the chamber arch and fire bridge. hamber (Fig. 1) should have a capacity of 12—15 , and, since the height is 3 ft., the length may be . and the breadth 3 ft., thus giving a cubical capacity 5 cb. ft. The area of *b* is about one-third or one-fourth f *b* and *e* together, and its height above the chamber at least one-third the total height of the chamber. iquid fuel (mazut) is fed through ½-in. gas-pipe s with cast-iron funnels at a rate of ½ pood per each. If firebrick feed-conduits be employed, they e vertical, to prevent obstruction by coke incrusta- The conduits *b* and *e* (Fig. 1) should correspond in r to the siphons, and *e* should be situated below ter. A 3-in. pipe leading from the oil tank is set in mbustion chamber arch, and supplies the siphons h ¼-in. taps, and the tank is placed close to the fur- ensure the warming up of the oil. The air supply lated by flap doors and is warmed before entering the stion chamber, *e.g.*, in a series of gas pipes below ubustion chamber, or by the waste furnace gases.

uffle furnace working at a constant temperature of 1,000° C. is shown in Fig. 2. The air enters through uit under the flue into *k*, where it is heated and through *c* and *b* into k_1, where further heating and thence *viâ* three sets of conduits *d* into the stion chamber. The gas generated in the latter is in *h*, and develops a temperature of 2,200°—2,400° C.; and in escaping through the other chambers *h* to the flue plays round the muffles and heats them to 960°, 910°, and 980° C. respectively.

Fig. 1.

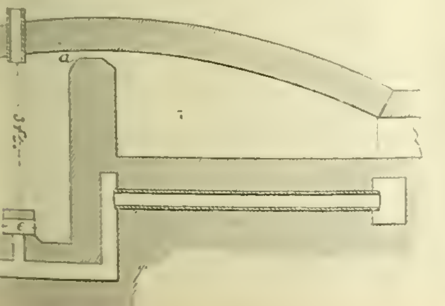


Fig. 2.

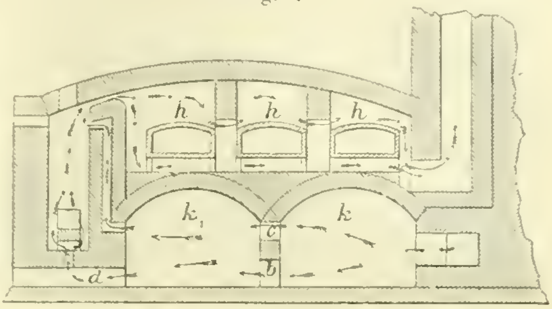


Fig. 3.

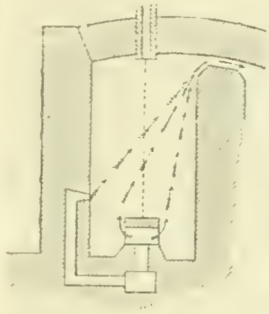
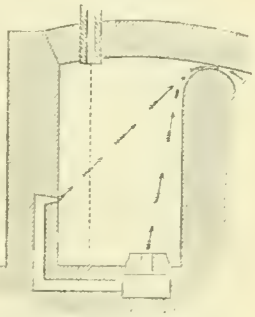


Fig. 4.



To prevent coking, the air supply must be directed towards the point of contact between the descending oil fuel and the sole of the furnace. This is secured by providing a brick bridge (Fig. 3) on to which the oil drops, and which divides the incoming air into two currents. On the other hand, the arrangement shown in Fig. 4 is a failure, the air currents not fulfilling the aforesaid essential condition. The longer conduit at the fire bridge in Fig. 3 is preferable to that in Fig. 4. For furnaces with a large working aperture on the longer side, a bridge has been devised with a 3-in. orifice on the front side and one 2 in. high on the rear side, the bulk of the gas thus passing over the well-cooled front side.—C. S.

Benzol; Test for Sulphur in ——, for Use in Gasworks. W. Irwin.

See page 440.

Coal and Coke; Arsenic in ——. R. F. Wood Smith and R. L. Jenks.

See page 437.

PATENTS.

Fuel, Solid Portable; Incorporating Alcohols, Ketones, Volatile Liquid Hydrocarbons and other similar Liquids with Solid Substances for the Production of a ——. G. C. Fowler, M. A. Fowler, and E. J. Fowler, all of London, trading as Welcome and Co. Eng. Pat. 4847, March 14, 1900.

The object of this invention is to obviate the risk of explosion, fire, and other dangers inseparable from the storage and use of spirit as a fuel, and also to make it more easily portable. The process is preferably carried out as follows:—8 parts by weight of carnaüba wax are melted with 24 parts of stearin, after which 3 parts of caustic soda are thoroughly stirred and ground into the mixture. The latter, when cold, is then added to a mixture of 800 parts of methylated spirit (say, 64° over proof) with

1 part of caustic soda in a digester, and the temperature is raised until a pressure of from one to three atmospheres is reached. The pressure is maintained for from 30 to 90 minutes, and then the contents are allowed to cool, but not to the congealing point, and are drawn off into moulds. The melting point of the resulting compound is 127° to 130° F.—D. B.

Coke; Manufacture of ——. R. Cochrane, Lanchester, Durham. Eng. Pat. 9157, May 17, 1900.

Breeze or coke cinder is washed, dried, and pulverised, then mixed with pulverised small coal, and finally subjected to coking.—R. S.

Fire Block or Artificial Fuel. W. H. Bailey, London. Eng. Pat. 16,934, Sept. 22, 1900.

The fuel is composed of shavings, sawdust, &c., and liquid clay, formed into balls, &c., and dried. Mineral oil may be added.—R. S.

Peat; Processes for Treating and Drying ——. W. J. R. Sims, Kirkfield, Ontario, and A. L. Davis, Peterborough. Ontario, Canada. Eng. Pat. 23,237, Dec. 19, 1900.

The roots and foreign matter are first removed from the peat by mechanical means. The material is then spread in a loose layer or layers upon a slab or table, the latter being mechanically conveyed to a press by which the material is compressed into flat cakes. These cakes are next transferred to a disintegrator provided with a regulating device, by which they are broken up or disintegrated. The disintegrated mass is now exposed to the action of heat in a further disintegrator, by which the mass is still further and more uniformly reduced, when it is conveyed to a suitable drier heated to a high temperature, and through which the mass is mechanically impelled, being subsequently conveyed to a disintegrator by which the material is still further and more uniformly reduced. The powdered peat material is now mechanically carried to a sufficient height, and then precipitated downwards, so that in passing through the air the temperature and moisture are further reduced prior to being submitted to a final compression—R. S.

Graphite; Process for Manufacturing ——. O. Imray, London. From International Acheson Graphite Company, Niagara Falls, U.S.A. Eng. Pat. 2116, Jan. 30, 1901.

Amorphous carbon, such as petroleum coke, in powder and in lumps up to 3 or 4 ins. in diameter, is packed about a carbon conductor connected with electrodes, and through it is scattered about 5 per cent. of iron or other metal in the form of oxide or other compound. On passing an electric current through the conductor, the metal is first liberated and then volatilised, and thus brought into intimate contact with the carbon, which is said thereby to be converted to graphite. It is desirable to cover the charge with an air-excluding layer of a mixture of sand and powdered carbon in the proportions to form silicon carbide.—J. A. B.

Carburetting Air; Apparatus for ——. S. H. Hauslich, Kischinew, Russia. Eng. Pat. 6184, April 3, 1900.

Air is forced by means of a hot-air motor over heated urine and through an annular carburetting chamber, containing asbestos wool saturated with gasoline or benzol, to a gasholder which traverses the central cavity of the carburetting chamber.—J. A. B.

Carburetting Air or Gas in Varying Proportions; Apparatus for ——. W. T. Purves and The Notkin Syndicate, Ltd., both of Edinburgh. Eng. Pat. 6857, April 11, 1900.

Air is admitted at the top of a receptacle containing shelves, on which is placed absorbent material saturated with hydrocarbon, the vapour of which is taken up by the air in its downward passage through the receptacle. Traversing the receptacle from top to bottom is a hollow cylinder with a helical slit, and within this cylinder fits a second cylinder with a vertical slit. One of these cylinders can be rotated so that the position of the opening formed by the coinciden of the two slits can be brought to any level in the saturat This opening forms the outlet for the air-gas, the degree carburation of which is determined by the length of passage through the carburettor, and hence by the level the outlet.—J. A. B.

Air Carburetting Apparatuses. A. Rudolph, Stuttga Germany. Eng. Pat. 2,509, Feb. 5. 1901.

Air is forced by a pressure drum, which is rotated by mea of a weight or otherwise, to a gasholder from which traverses passages in superimposed vaporising cells throu which oil passes. The cells are heated by hot water wh circulates from an external boiler heated by a burner. T air takes up the gas from the oil, and then traverses dry chambers containing wicks. The amount of oil gas in t mixture is regulated by means of a tap.—J. A. B.

Furnace; Regenerative Retort Heating ——. C. Neureuther, Peru, Illinois. Eng. Pat. 1001, Jan. 15, 19

The retorts are heated by means of a combustion cham and regenerators of special construction.—J. H. C.

Furnace; Improved ——. A. Brunn, Hamburg. Eng. Pat. 3869, Feb. 22, 1901.

A smoke-consuming apparatus for furnaces, wherein fire gases and air are thoroughly mixed and the amoun air regulated, is constructed as follows:—The upper e of the fire-bridge is oblique, and behind it is an arch lo on one side than on the other. Within the fire-bridge passage through which the secondary air passes. T passage contains a vertical grate, and also a large num of dependent tongues or bars for heating the air pas through the passage. An air-regulating valve is supplie the passage.—R. S.

Coke Ovens; Regenerative ——. F. W. C. Schniew New York, U.S.A. Eng. Pat. 993, Jan. 15, 1901.

There are arranged a series of horizontal externally-he ovens, having heating flues situated between their w and partitions dividing these flues into a series of c bustion chambers connected at the top by flue passa The combustion chambers are supplied with gas by a s of gas burners. There are a pair of regenerators, w are connected to the combustion chambers by a serie chambers and flues. The passage of the air and ga regulated so that heated air is supplied by one regener to one group of combustion chambers and the product combustion are drawn through the other group of cham into and through the other regenerator. The ovens built of masonry supported above the ground on columns, the regenerators being situated beneath the ce of the ovens and supported directly on the ground. columns are connected together on one side by ang braces set in the direction of the thrust of the coke-disc ing pusher.—R. S.

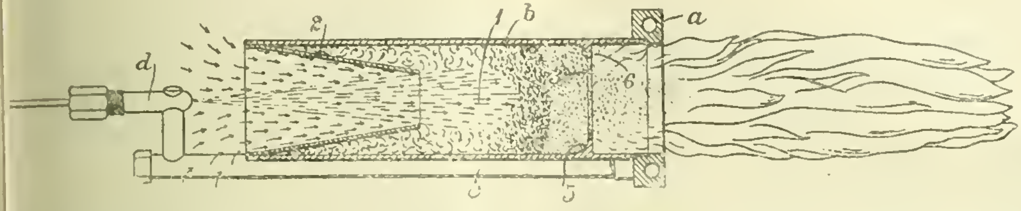
Gas Producers. A. Laughlin, Sewickley, U.S.A. E Pat. 1918, Jan. 28, 1901.

The patentee describes a cylindrical water-sealed gas ducer built in a water-tight tank or casing. The brickwo which the producer is built is surrounded by a metal ca and a metallic bottom extends entirely beneath the prod being rivetted to the metal casing and forming therew water-tight shell. The lower part of the interior w the producer slopes inwards towards the centre, a provided with a conical metallic lining, to ensure the de of the ashes. In the wall of the producer, at its l part, are arranged openings for the removal of ashes, being sealed by means of water placed within the m outer casing; and corresponding openings, above the level, are provided in the outer casing, for the same pu The blast-distributor in the midst of the fuel is built a number of conical sections, bolted together with vening air-escape passages. The distributor is arr upon a horizontal air-conduit, which crosses the lower of the generator at such a height from the metallic b as to leave space for a shovel to pass clear below it.—

ces, and Means for the Recovery of By-products 1 the Fuel used therein. P. Naef, New York. Eng. 6563, April 7, 1900. Under Internat. Conv., Sept. 11,).

atentee's object is to recover by-products, such as 3 and ammonia, from furnaces in which bituminous used. The fuel is conducted down a vertical shaft, ed at the top with a suitable charging arrangement, ear the top with a gas outlet leading to a suitable g plant for the recovery of tar and ammonia. At :om of the shaft is an inclined grate or other support fuel, below which an air supply is introduced. The rns upon the grate, most of the hot gas being led furnace or boiler to be heated. A certain proportion the hot gas is drawn, by means of a fan, up the rough the fresh fuel, causing dry distillation of the he tarry and ammoniacal gases being drawn through hing plant and then returned to the furnace or To increase the yield of ammonia and oils, steam may be injected into the fresh fuel in the shaft.

—H. B.



Carbides and Derivatives therefrom; The Pro- n of ——. C. M. J. (*dit* Claudius) Limb, Lyons, e. Eng. Pat. 7282, Nov. 27, 1899.

sulphide mixed with carbon, and a metal, such or an oxide, is subjected to a high temperature that furnished by the electric furnace. Barium mixed with the sulphide of the metal employed nd on treatment with water yields acetylene and hile the sulphide remains unaffected. The breakof the barium sulphide into its elements may be d by the electrolytic effect of a continuous current oying such a current for the electric furnace. The is applicable to the sulphides of strontium and as well as to barium sulphide.—J. A. B.

Carbide; Method of Protecting from Atmospheric re and Retarding the Decomposition of ——. E. ncaster, London. Eng. Pat. 9334, May 21, 1900.

bide is more or less saturated with creosote, to ide petroleum, kerosene, or other diluent which will npose the carbide may be added.—J. A. B.

e Gas; Apparatus for Purifying ——. E. W. caster, London. Eng. Pat. 194, Jan. 3, 1900.

closed by a gas-tight lid has, near its bottom, a l shelf, on which rests a bag or case of felt or aterial, containing layers of powdered purifying material. The layers are kept apart by wads of gas enters below the shelf, passes through the nd leaves by a pipe near the top of the vessel.

—J. A. B.

e Gas Generators. T. Kautny and R. W. Lotz, 1 of Chicago. Eng. Pat. 478, Jan. 8, 1901.

is discharged from a container in measured by means of a dumping device operated by the s of the storage gasholder, into a sieve which is in water in a generating chamber having a ttom, at the lowermost part of which is a valve scharge of refuse. This valve is opened autowhenever carbide falls into the generator, through n of a float on water, the level of which is raised essure of the gas which is evolved. Means are or replenishing the water as required, and for purifying the gas. Several modifications are described. There are 39 claims.—J. A. B.

Vapour Burners. W. P. Thompson, Liverpool. From F. W. Braun, Los Angelos, U.S.A. Eng. Pat. 7201, April 18, 1900.

This relates to a burner specially adapted for burning gasoline. It consists of a vaporising chamber *a*, formed of a ring of metal with a tubular perforation, which is fed with gasoline; an adjustable jet *d*; a vapour-pipe *c* communicating between the vaporiser and the jet; a Bunsen tube *b*; a conical funnel 2; and an inwardly-projecting collar 3, which has the corner rounded off at 5, but not at 6. A supply pipe for gasoline communicates with the vaporiser *a*. An auxiliary jet is arranged beneath and communicates with *c*, and a trough extends along beneath *c*; these are for use in the preliminary heating of the burner and vaporiser. By moving the collar 3 nearer to, or further away from, the funnel 2, the amount of air drawn in is lessened or increased respectively, the illustration showing the position of the collar when the flame is to be burned in the open air and not in a closed chamber.—H. B.

Incandescence Bodies or Media for Gas Lighting. O. Knöfler, Charlottenburg. Eng. Pat. 5366, March 21, 1900.

The patentee states that by mixing thoria and ceria in the proportion of 93 per cent. of the former to 7 per cent. of the latter, a greater light effect is obtained than from the ordinary thoria-ceria mixture; but to attain this favourable result, the mantle should only weigh about 0·1 grm. A mantle of this weight being impracticable, the patentee impregnates threads with the 93 : 7 mixture, and twists these together with threads impregnated with thoria alone, afterwards knitting mantles from the combined threads as usual. On burning off, a composite mantle is obtained, consisting of strands of thoria (which act as the support), and finely distributed strands of thoria-ceria of the above composition. Such mantles are said to be more durable, and to emit more light than mantles made in the usual manner. The claims are for (1) incandescence media composed of thoria-ceria in the proportion 93 : 7, and (2) composite threads of pure thoria and thoria-ceria as described above.—H. B.

Incandescent Gas Lighting; Apparatus for So-called ——. A. G. Brookes, London. From The Incandescent Gas Light Company, Boston, U.S.A. Eng. Pat. 23,850, Dec. 31, 1900.

In the burners described, ordinary coal-gas, at the usual supply pressure, and air preferably at a somewhat greater pressure, are used. The mixture of gas and air is led into a mixing chamber, across which are arranged several convex and concave diaphragms of wire-gauze. The spaces between the convex surfaces of adjacent diaphragms may be filled with refractory granular material to more thoroughly mix the gas and air. The mouth of the burner may be made of wire gauze, held in position by a central rod extending up through the diaphragms, and provided at the top with a polygonal nut (in which case the nut acts as a flame spreader), or it may be made of a short cylindrical piece of refractory material, provided with outlet passages for the combustible mixture. By screwing down the nut, or by pressing the cylindrical piece into the burner head, the permeability of the arched diaphragms may be adjusted.

—H. B.

Hydrocarbon Oil or Spirit; Lamps for Burning ——. W. Notley, Dulwich, and C. E. Frost, Lewisham. Eng. Pat. 6313, April 4, 1900.

In the oil lamp described, the wick is surrounded closely throughout its length by a flattened tube of wire gauze, this being surrounded by an imperforate dependent tube, closed at its lower end by wire gauze. The reservoir and the space between the wire gauze tube, and the imperforate tube are filled with absorbent material, such as bran; there is thus no liquid oil in the lamp, liable to escape when the lamp is upset.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

PATENTS.

Anthracene; Purification of ——, *with Recovery of the Purifying Agent.* E. Wirth, Dortmund, Germany. Eng. Pat. 11,462, Aug. 13, 1900.

The removal of the carbazol found in considerable quantities in crude anthracene is effected by converting the former into its easily soluble nitroso-compound, whilst the anthracene is not attacked by the reagents used. The process is said to have the advantage that the nitrous acid employed for forming the nitroso-compound can be recovered from the solution obtained with the simultaneous isolation of technically valuable carbazol derivatives. Appropriate solvents are, light coal-tar oil, petroleum spirit, carbon bisulphide, carbon tetrachloride, or the like. The reaction takes place both in hot and cold solutions. The nitrous acid can be used either as nitrous anhydride in a gas mixture or in solution, or as a nitrite and an inorganic or organic acid.

In one of the examples the process is carried out as follows:—100 kilos. of ground crude anthracene (containing, say, 32 per cent. of anthracene and "30 per cent. of carbazol") are mixed in a vessel provided with a stirrer and a funnel pipe with 300 kilos. of light coal-tar oil and 14 kilos. of sodium nitrite. Dilute sulphuric acid of 16 per cent. strength is then added in quantity equivalent to the sodium nitrite, in small portions at a time, so gradually that no violent reaction occurs. When the reaction is completed, the sodium sulphate formed is dissolved by the addition of water and separated, and the purified anthracene is filtered from the coal-tar oil, washed with benzene and dried. It has a purity of 75 to 95 per cent. according to the quality of the crude anthracene. The solution containing the nitroso-carbazol is heated with sulphuric acid (sp. gr. 1·5) in quantity amounting to three times the weight of nitroso-compound, whereby the green oxidation product described by Zeidler (Annalen, **191**, 285; this Journal, 1882, 98—100) is obtained. The nitric oxide evolved is conducted into a gas-holder and used as nitrous acid gas for further purification of crude anthracene by mixing it with a sufficient quantity of air.—D. B.

Mineral Oil Distillates; Solidification of ——. J. R. Hatmaker, London. From J. A. Just, New York, U.S.A. Eng. Pat. 8141, May 2, 1900.

The process is preferably carried out as follows:—To about 70 parts by weight of water are added about 9 parts of glycerin and about 4 parts of pure desiccated milk casein in the form of a caseinate soluble in water. This mixture is heated on a water-bath until the caseinate is completely dissolved, when from 1 to 3 parts of soap are added and dissolved. This solution, preferably whilst hot, is then poured into a suitable vessel containing, say, about one-half its quantity of mineral oil distillate (such as petroleum ether or spirit), at ordinary temperature, and the mass is violently shaken. It soon emulsifies, becoming uniform in appearance, and showing a tendency to adhere to the sides of the vessel. Then more distillate is added—say as much as was first used—and the shaking continued until the fresh quantity is absorbed by the partially solidified mass. Small quantities at a time are again added and with constant shaking until the solidifying capacity of the solution is exhausted. The mass finally acquires a stiff, jelly-like consistency. This solution is capable of solidif
18 to 20 times its quantity of petroleum spirit.—D. B.

*Oils, Mineral or Vegetable, or the Distillates or Resi
thereof; Treatment of* ——. J. S. Stewart-Wall
Redhill, Knock, Down, and W. B. Cowell, Full
London. Eng. Pat. 9796, May 28, 1900.

This invention avoids the treatment of the oil with sulpl
acid and the subsequent washing thereof with caustic s
and is said to obviate thereby the loss and deteriorati
oil which result from such treatment. It is propose
employ manganate or permanganate of potash or
manganese oxide, or other suitable "oxymanganic" a
preferably with the use of caustic soda or potash, i
proportion of ½ to 1 per cent. The permanganate empl
is, prior to or during the process of distillation of the
be treated, added to the latter in the still or preferabl
vessel from which the treated oil is led into the still.
or oxygen (heated or otherwise) may also be intro
into the said vessel or still, and it is also advantage
supply steam to the mixture during its treatment
alone or together with the air or oxygen and superh
or otherwise. The addition is made after the oil has
heated to a temperature of 180° F.—D. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

Toluene; Electrolytic Oxidation of ——. K. Puls.
Zeit. 1901, **25**, [25], 263.

The author confirms the results of A. Merzbache
E. Smith (Chem. Zeit. Rep. **25**, 8; J. Amer. Chem
22, 723). Starting from the assumption that th
group was converted first into the aldehyde group,
and eventually into the carboxyl group, he electroly
toluene in alcoholic solution in the presence of sul
acid. One of the experiments was made under the fol
conditions:—Toluene, 40 c.c.; alcohol, 130 c.c.; c
trated sulphuric acid, 30 c.c.; water, 30 c.c.; N
first, 6 A.; subsequently, 3·3 A.; duration 14 hours a
and 14 hours at 4 V. The electrodes consisted of pl
After a short time there was an odour of benzal
and of the ethyl ester of benzoic acid. In addi
these, *p*-sulpho-benzoic acid was liberated about the
the yield being considerably greater than that
benzoic acid, of which only traces could be detected.

Under similar conditions Renard obtained p
$C_6H_6(OH)_6$, in addition to benzaldehyde. The
however, has not found that compound in any
experiments.—C. A. M.

Aniline: New Synthesis of ——. G. F. Jaub
Comptes Rend. **132**, [13], 841—842.

On heating together toluene, hydroxylamine hydroc
and aluminium chloride, vigorous reaction occu
abundant evolution of hydrochloric acid. The
besides unaltered toluene, contains paratoluidine.
reaction yields aniline from benzene. The yield i
small, and other condensing agents, such as zinc
and sulphuric anhydride, have given no results;
author thinks it possible that this may develo
working method of preparing aromatic amines.—J.

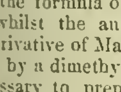
Diphenylmethane Derivatives; New ——. P.
Zeits. angew. Chem. **14**, [13], 1901, 311—3

According to Ger. Pat. 87,934, anhydroform
aniline acts on aniline hydrochloride in the cold
p-aminobenzylaniline, which reacts at a higher te
with a second molecular proportion of aniline hydr
yielding diamino-diphenylmethane derivatives.
of this reaction it is possible to obtain new unsym
substituted diphenyl bases from *p*- and *o*-ami
anilines, and the author has studied the course
reactions. When anhydroformaldehydeaniline is
with aniline and aniline hydrochloride, diamino
methane is obtained. If, however, the aniline be
by its homologues with free para positions, corr
diamino derivatives of ditolyl- and of phenyltol

formed, whilst if in place of anhydroformaldehyde- ne, the corresponding *p*-toluidine or *as-m*-xylidine ouads be employed, the same derivatives are obtained en the aniline compound is employed, the base combined the formaldehyde being regenerated and only serving as rier. The formation of *p*-aminobenzylaniline as an mediate product (in the preparation of diaminodiphenyl- ane) and its separation, is an important fact in explain- he course of the reaction. When *p*-aminobenzylaniline ited with hydrochloric acid or aniline hydrochloride, ormation of diaminodiphenylmethane is not a molecular formation, since by employing the hydrochlorides of ent bases with free para positions, different end pro- are obtained. For example, *p*-aminobenzylaniline olylene diamine hydrochloride yield triaminophenyl- ethane. Homologues of *p*-aminobenzylaniline, in the *p*-position is occupied, are obtained by reacting the anhydroformaldehydeaniline compound of a base a substituted *p*-position on a mixture of an amine n amine hydrochloride with free *p*-positions. It is thus le to obtain alkylated aminobenzylanilines. By ying anhydroformaldehyde-aniline compounds with tuted *p*-positions for combination with similarly sub- d amines, homologues of *o*-aminobenzylaniline are d, which on further condensation with the hydro- les of primary aromatic bases yield derivatives of aminodiphenylmethane. For the preparation of obenzylaniline, a mixture of 200 grms. of aniline and ns. of formaldehyde (40 per cent.) is allowed to stand out 24 hours, when the oil, after separation from the is gradually mixed with 100 grms. of finely ground hydrochloride at a temperature not exceeding 15° C. ellow viscous mass gradually becomes crystalline. en treated with dilute soda lye, and the aniline blown th steam, when *p*-aminobenzylaniline remains as a ystallisable mass. In order to obtain *p*-diethylamino- -*p*-toluidine, 60 grms. of anhydroformaldehyde-*p*- ne (from *p*-toluidine and formaldehyde in cold lic solution) are stirred into a mixture of 300 grms. hylaniline and 143 grms. of *p*-toluidine hydrochloride C. The condensation product separates from alcohol ms melting at 60° C.—T. A. L.

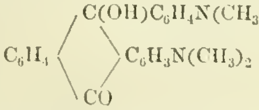
ethyldiaminophenyl-anthranol and -oxanthranol; nation and Properties of ——. A. Haller and A. ot. Bull. Soc. Chim. **25**, [6], 1901, 315—322.

revious communication (Bull. Soc. Chim. **25**, 166), ited that the most characteristic feature of dialkylated enzoylbenzoic acids is the property of condensing e molecular proportion of a tertiary aromatic amine tetra-alkylated derivatives of diphenylphthalide or ilinephthaleïns. The condensation takes place in acetic anhydride solution, and by its means the have been able to prepare dimethylanilinephthaleïn, hey have converted into its isomeride dimethylaniline- lein or tetramethyldiaminophenyloxanthranol by the ries of reactions as employed by Baeyer in convert- enylphthalide into phenyloxanthranol and phenol- in into phenolphthalideïn. This research was a ry outcome of the work on Phthalic Green (Bull. im. **15**, 939), which Fischer (Annalen, **206**, 112) s has the formula of a tetramethyldiaminophenyl- anol, whilst the authors are of opinion that the is a derivative of Malachite Green substituted in the sition by a dimethylaminobenzoyl radicle. It was e necessary to prepare tetramethyldiaminophenyl- anol directly, in order to show that it differs from s Phthalic Green. For the preparation of dimethyl- hthaleïn, a mixture of equimolecular proportions thylaniline and dimethylaminobenzoylbenzoic acid l on the water-bath with three times the weight of hydride for about a quarter of an hour. The melt poured into dilute hydrochloric acid, boiled, and ted with ammonia in excess. The product separates urless oil, solidifying to a white crystalline mass, the formula—



$$C_6H_4\left<\begin{matrix}C:[C_6H_4N(CH_3)_2]_2\\ >O\\ CO\end{matrix}\right.$$

Its properties have been described by Fischer. In order to convert it into the corresponding phthalin, $HO_2C.C_6H_4.CH:[C_6H_4N(CH_3)_2]_2$, it is treated in hydrochloric acid solution with granulated zinc and precipitated as zinc chloride double salt, which is afterwards decomposed with sodium acetate. Although the product represents the leuco base of *o*-carboxylated Malachite Green, it does not on oxidation give a dyestuff but loses water, forming a lactone, which is dimethylanilinephthaleïn itself. If the carboxyl group be alkylated, this inner condensation cannot take place and a true leuco base is formed, which, on oxidation, gives a greenish-blue dyestuff. The product (Ger. Pat. 38,863) has, however, no technical importance, since its solutions decolorise slowly in the cold more quickly on heating, probably in consequence of hydrolysis. By the action of phosphorus oxychloride on the acid in a solution of dimethylaniline, a product is obtained having the formula of a bitetramethyldiaminophenylanthranol. This, on oxidation in dilute mineral acids with ferric chloride, gives a pur blue solution, which, however, soon decolorises, depositing yellowish-white needles of tetramethyldiaminophenyloxanthranol—



$$C_6H_4\left<\begin{matrix}C(OH)C_6H_4N(CH_3)_2\\ \\ CO\end{matrix}\right>C_6H_3N(CH_3)_2$$

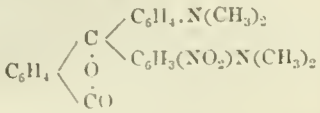
This substance is very soluble in chloroform and nitrobenzene, sparingly soluble in alcohol, ether, benzene, and toluene. It melts at 213° C. and dissolves in cold concentrated sulphuric acid with the magenta coloration characteristic of all phenyloxanthranols. The sulphuric acid solution poured into a large quantity of water gives a blue solution, which decolorises, yielding crystals of the original product. The product, which differs in all particulars from Fischer's so-called tetramethyldiaminophenyloxanthranol, may be regarded as tetramethyldiaminotriphenyloxanthranol, or Malachite Green base, in which two benzene nuclei are united by the carbonyl radicle, thereby weakening the basicity of the molecule. It is also noteworthy that Malachite Green base also dissolves to a colorless solution in dilute hydrochloric acid, which only becomes coloured on warming. The zinc chloride double salt of the dyestuff described above, which forms small needles with a bronzy reflex, is comparatively stable, but its aqueous solution soon becomes decolorised, depositing a crystalline powder of tetramethyldiaminophenyloxanthranol.
—T. A. L.

Dimethylaminobenzoylbenzoic Acid; New Derivatives of ——. A. Haller and A. Guyot. Comptes Rend. **132**, [12], 1901, 746—750.

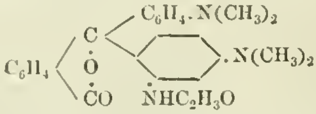
According to a previous communication (Bull. Soc. Chim. **15**, 551) the authors have already prepared nitrodimethylaminobenzoylbenzoic acid and in the present paper they give further details of its preparation, some of its reactions and its constitution. It can be produced by nitration in sulphuric or acetic acid solution, a good yield being obtained by dissolving one molecular proportion of the acid in ten times its weight of concentrated sulphuric acid and adding to the solution cooled to 0° C., one molecular proportion of potassium nitrate mixed with five times its weight of concentrated sulphuric acid. The melt is then allowed to rise to the ordinary temperature and poured on to ice. After filtering off and washing, the nitro compound is dissolved in sodium carbonate and precipitated from this solution by supersaturating with hydrochloric acid. Crystallised from alcohol it forms small yellow prisms containing one molecular proportion of water, which it loses at 100° C. It then melts at 170° C., and is readily soluble in boiling water, to which it imparts a taste, at first bitter, and subsequently excessively sweet. It gives salts with both acids and bases. Reducing agents yield non-crystalline products. On heating to 250° C. with 20 parts of concentrated sulphuric acid and a little mercuric sulphate, it gives phthalic acid, showing that the nitro group is not present in the phthalic acid radicle. The methyl ester—

$$CH_3O_2C.C_6H_4.CO.C_6H_3.NO_2.N(CH_3)_2$$

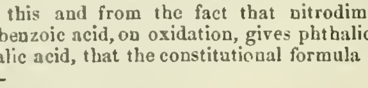
is obtained by saturating a solution of the anhydrous acid in absolute methyl alcohol with gaseous hydrochloric acid. It forms yellow prisms, melting at 140° C., insoluble in water, slightly soluble in cold alcohol, benzene, toluene, and chloroform, more readily in hot. The product described by Limpricht (Annalen **307**, 307), melting at 163° C., is probably *p*-nitro-dimethylaniline. When equimolecular proportions of dimethylaniline and of the nitro acid are heated for a short time on the water-bath in acetic anhydride solution, condensation takes place, with formation of nitrodimethylanilinephthaleïn, having the formula—



The product melts at 175° C., and separates in orange prisms from a mixture of alcohol and chloroform. On reduction with stannous chloride, it yields aminodimethylanilinephthaleïn, which crystallises in white needles melting at 179° C., and becoming coloured on exposure to air. When heated for a short time with 2—3 times its weight of acetic anhydride, the product forms acetylaminodimethylanilinephthaleïn, which is stable in the air, and crystallises from a mixture of alcohol and chloroform in colorless prisms melting at 157° C. An isomeride of this compound has been obtained by condensing dimethylaminobenzoylbenzoic acid with acetyl-*m*-aminodimethylaniline in presence of acetic anhydride. This compound, from the method of its formation, has the following constitution—



It melts at 209° C., crystallises in colorless prisms, and is much more soluble in alcohol than its isomeride. It follows from this and from the fact that nitrodimethylaminobenzoylbenzoic acid, on oxidation, gives phthalic, and not nitrophthalic acid, that the constitutional formula of the nitro-acid is—



—T. A. L.

Pyrogen (Sulphur) Dyestuffs. W. Zimmermann, Färber. Zeit. 1901, **12**, [7], 103—104.

Included in a group of colouring matters recently introduced under the name "Pyrogen (Sulphur) Dyestuffs," is one, *viz.*, Pyrogen Yellow M, which bears a great similarity to the well-known dyestuff Primuline. It yields similar shades when diazotised and developed on the fibre with β-naphthol, &c., and from the reactions of the dyed colour and its properties as regards fastness, it appears to be Primuline under a new name. The author strongly deprecates the inclusion of this colouring matter in a group designated as "Sulphur dyestuffs," since neither by its chemical constitution nor by fastness is this inclusion justified. The term "Sulphur dyestuffs" should be reserved for those prepared by melting various organic substances with alkaline sulphides and sulphur, and the dyer expects from such colouring matters a high degree of fastness to washing, acids, and light. Pyrogen Yellow M or Primuline is extremely fugitive to light when dyed direct, and even when diazotised and developed, the fastness is not such as would be expected from a sulphur colour. Pyrogen Brown M and Pyrogen Olive N are also fugitive to light, and are apparently mixtures containing Primuline as their chief constituent. Pyrogen Green B, probably a true sulphur dyestuff, is deficient in fastness to light, being considerably changed after eight days' exposure. It thus appears that among the vast number of possible Sulphur dyestuffs, some will be found which are fugitive to light, and the author considers that it is a mistaken policy at tl present day to introduce such colouring matters into tl market.—R. B. B.

Indigo; Manufacture of Natural ——. W. Gullenkam Chem. Zeit. 1901, **25**, [19], 197—199.

The author narrates his experience in an Indigo facto near Madras in the year 1894, and at the same time critici the process of Indigo manufacture in vogue, indicating t lines upon which he considers improvements should made.

The first operation in the process of manufacture Indigo from the plants consists in steeping these in wa for 12—14 hours. Here they undergo fermentation, dur which gases are evolved. The latter were several ti collected and their quantity determined. They were fo to be most copiously generated during the first four or hours. After this time the evolution slackens, and at end of six or seven hours it has almost ceased; thus an experiment in which the steeping vat was filled 4 p.m., there had been disengaged at 6.30 p.m., 17·1 cent. of carbon dioxide; at 7.30 p.m., 28·4 per cent. 9.30 p.m., 44·7 per cent.; at 11 p.m., 51·8 per cent. 12.30 a.m., 60·6 per cent.; and at 6 a.m., when the vat emptied, 67·5 per cent. of the same gas. Along with gas, and perhaps also carbon monoxide, hydrogen is pre in considerable quantity in the gases evolved. This appears to have escaped general notice. Schre mentions it, but he states that the quantity of the diminishes as the fermentation nears its end. This i so, however, since at the close of the operation, it is present to such an extent in the bubbles which rise i vat that these may be lighted as they come to the surf

It was formerly supposed that the principal effect o fermentation action was the decomposition of the gluc indican, contained in the plant, into Indiglucin and In tin, a secondary effect being the conversion of the compound into indigo white, which, it was considered, into solution in the vat as it does in an ordinary indig According to this view, the steeping vat is a kind of which it would be possible to dye textile stuffs. A colour can, it is true, be dyed in this way, but the is not to be compared with that which is obtained f properly set indigo vat of similar concentration. In sition to this view, moreover, Schunck has shown tl plant juices are acid. A small quantity of acid may be added to the steeping vat without affecting the res

The fermentation may be entirely suppressed, w disadvantage as regards the quantity of dyestuff ob This is accomplished either by adding to the steepi the necessary quantity of mercuric chloride or of or by the use of water at a temperature of 75° C., or by assisting the extraction of the glucoside by beati squeezing the plant while it is submerged under After treating the plant in the last-mentioned man five minutes, a dark-coloured liquid is obtained exactly resembles that obtained after 12—14 hours usual steeping method. This process has been p in France (French Pat. 300,826). The operation menting is antiquated and should be abandoned. nothing to recommend it, and there is much that is it, for instance, the danger of over-fermentation lea the destruction of dyestuff, and the imperfect extra the glucoside which takes place up to the time w action has on this account to be interrupted. T rational method of extraction is systematically to t leaves, which alone contain the glucoside, with war in a properly constructed extraction apparatus.

An important matter in the manufacture of Indi precipitation of the dyestuff. The beating of th withdrawn from the steeping vat, which constit second operation in the process of Indigo manufac for its object the aggregation of the finely divided of Indigotin, rather than the exposure of the li the air.

In the ordinary process of manufacture, the In formed by the decomposition of the glucosid enzyme contained in the plant. It is advanta effect this decomposition by chemical agencies. N ipounds have already been tried to this end, for instance, nonia and lime. Of a considerable number experimented) by the author, the most suitable was found to be ic acid. With this a pale blue precipitate is produced, ch, when boiled with a little hydrochloric acid, changes olour to a dark blue. The product obtained on the large e by its use is a soft light Indigo containing 65 per :. of colouring matter, as against that previously obtained he same factory, which contained only 40 – 50 per cent. yield is also 50 per cent. greater than it was.

 order to place the manufacture of Indigo upon a atific basis, the planters, besides adopting better methods xtraction, must ascertain the period in the growth of plant when the formation of glucuside is greatest, and t pay attention to the selection of the most suitable At present no method for the exact and rapid rmination of the glucoside in the plant is known. A iod which the author has tried gives concordant results, n the absence of a method to control it, it is impossible ty whether these are correct. This consists in exing the macerated leaves with water at 75° C., filtering, pitating with tannic acid, pouring repeatedly from beaker to another in order to render the precipitate ılar, allowing to settle, decanting the clear liquor, ıg the residue with a small quantity of hydrochloric filtering, drying, and weighing. The results by this od give the amount of Indigotin in the leaves as -2·5 per cent.

e author considers that although the manufacture of al indigo can be greatly improved, there is little hope planters being able to compete with the manufacturers dyestuff by synthetical methods.—E. B.

'phide Colours; Analysis of ——. A. Mayenberg.

See under XXIII., *page* 508.

PATENTS.

Colouring Matter Directly Dyeing Cotton; Manuure of a ——. C. D. Abel, London. From The iengesellschaft für Anilin Fabrikation, Berlin. . Pat. 7332, April 20, 1900.

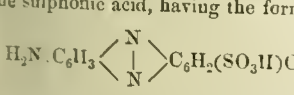
method depends upon the observation that when ic acid, or the equivalent quantity of picric acid, is with an aqueous solution of sulphur in an alkaline le, a sulphurised dyestuff is obtained, which gives violet-black shades of remarkable fastness on unnted cotton. The following example illustrates the d :—A solution of 14 kilos. of sodium picramate, os. of crystallised sodium sulphide, 25 kilos. of r, and 50 litres of water is boiled for 30 hours under condenser. The solution is then diluted and the f precipitated, either by adding a mineral acid or cing a current of air. It is then filter-pressed and ither directly or after adding sodium sulphide. In ner case, sodium sulphide must be added in order n an aqueous solution of the dyestuff.—T. A. L.

Colouring Matter Directly Dyeing Cotton; Manure of a ——. C. D. Abel, London. From The ngesellschaft für Anilin Fabrikation, Berlin. Pat. 7333, April 20, 1900.

linitro-hydroxydiphenylamine sulphonic acid—

$$.4.(NO_2)_2.C_6H_3.NH.C_6H_3(SO_3H)OH.4.2.1$$

ed to the corresponding diamino compound, and am salt of this product is oxidised, it yields aminoazine sulphonic acid, having the formula—



$$H_2N.C_6H_3\left\langle\begin{matrix}N\\|\\N\end{matrix}\right\rangle C_6H_2(SO_3H)OH.$$

bstance forms lustrous green crystals, readily u water to a yellowish-red solution, which turns n addition of caustic soda-lye, and bluish-red with or acetic acid. The aqueous solution is readily ed by reducing agents, but the colour returns on to air. When heated together with sulphur and sodium sulphide under the conditions given in the following example, a deep black dyestuff for unmordanted cotton is obtained. A mixture of 25 kilos. of the sodium phenazine sulphonate above described, 85 kilos. of sodium sulphide, 35 kilos. of sulphur, and a small quantity of water is heated for several hours to 140° C. The temperature is then slowly raised, and maintained at 165° C. until the mass has become perfectly dry. The product so obtained may be used directly for dyeing or after dissolving the melt in water, the dyestuff may be precipitated by salt, a mineral acid, or a current of air. It is then filter-pressed and dried after adding sodium sulphide.—T. A. L.

Black Colouring Matter directly Dyeing Cotton; Manufacture of a ——. C. D. Abel, London. From The Actiengesellschaft für Anilin Fabrikation, Berlin. Eng. Pat. 7477, April 23, 1900.

By boiling dinitro-hydroxydiphenylamine—

$$1.3.4.(NO_2)_2C_6H_3.NH.C_6H_4.OH.1.4$$

with sulphur and sodium sulphide in aqueous solution, it yields a dyestuff giving intense black-greenish-blue shades on unmordanted cotton. A mixture of 20 kilos. of dinitrohydroxydiphenylamine, 75 kilos. of crystallised sodium sulphide, 30 kilos. of sulphur, and 75 litres of water is boiled for 30 hours under a reflux condenser, the dyestuff being then separated according to the method given in the preceding specifications (*v. supra*).—T. A. L.

Azo-Colouring Matters [Brown]; Manufacture of Mordant Dyeing ——. C. D. Abel, London. From The Actiengesellschaft für Anilin Fabrikation, Berlin. Eng. Pat. 10,294, June 5, 1900.

Diazotised picramic acid is combined with 1.2.4- or with 1.3.5-chlorophenylenediamine. For instance, 22·4 kilos. of sodium picramate and 20 kilos. of concentrated hydrochloric acid (sp. gr. 1·16) are dissolved in water, and the solution is diazotised with 6·9 kilos. of sodium nitrite. The diazo solution is then slowly run into a solution of 14·5 kilos. of chlorophenylenediamine ($Cl:(NH_2)_2 = 1:2:4$), and after stirring for several hours, 5·3 kilos. of sodium carbonate are slowly added, the solution is heated and the dyestuff is salted out. The product dissolves easily in water, and dyes chrome mordanted wool deep brown shades very fast to milling and light. The 1.3.5 isomeride produces somewhat redder shades.—T. A. L.

Dyes or Colouring Matters [Brown]; Impts. in the Manufacture or Production of Substantive ——. G. W. Johnson, London. From Kalle and Co., Biebrich-on-Rhine, Germany. Eng. Pat. 8229, May 3, 1900.

Sulphite waste lyes (resulting from the manufacture of sulphite-cellulose) when fused with sulphur and an alkaline sulphide yield dyestuffs containing sulphur and giving deep brown shades on unmordanted cotton from a bath containing sodium sulphide and Glauber's salt or common salt. The sulphite waste lye before use is preferably freed from lime and concentrated to 28° B. A mixture of 20 kilos. of sulphite waste lye so treated, and 20 kilos. of crystallised sodium sulphide is heated in an iron pan, and 7 kilos. of finely ground sulphur are added to the melt, which is then heated, with constant agitation, to 120°—130° C. until it becomes semi-solid. It is then baked at about 180° C. in a stove until quite dry and friable. The product so obtained is, when ground, a black powder, soluble in water to a deep brown solution. It dissolves in sulphuric acid with a brown colour, giving a dark brown precipitate on dilution with water. The aqueous solution is unchanged by caustic soda lye, whilst hydrochloric acid produces a dark brown precipitate.—T. A L.

Blue Sulphurised Dyestuff; Manufacture of a ——. O. Imray, London. From the Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 7261, April 19, 1900.

When *p*-amino-*p*-hydroxydiphenylamine sulphocarboxylic acid $1.2.4\cdot OH.CO_2H.C_6H_3.NH.C_6H_3.SO_3H.NH_2.1.2.4$ is heated with dilute acids under pressure, the sulphonic acid group is split off and the resulting *p*-amino-*p*-hydroxydiphenylamine carboxylic acid when fused with sulphur and alkaline sulphides gives a fast blue cotton dyestuff. About 30 kilos. of the diphenylamine carboxylic acid are gradually added at about 140° C. to a fused mixture of 100 kilos. of sodium sulphide and 40 kilos. of sulphur. The temperature is gradually raised to 160—200° C. until the melt becomes quiescent and begins to solidify. It is then dissolved in water, and the dyestuff is precipitated as a leuco compound, together with sulphur, by adding hydrochloric acid. The filtered precipitate is extracted with sodium carbonate, and this solution is oxidised by means of a current of air, when the dyestuff is precipitated as a dark powder with a metallic lustre. It is sparingly soluble in water, and dissolves in concentrated sulphuric acid to a dark blue solution.

—T. A. L.

Brown Dyestuff for Cotton from 1.8. *Dinitro-naphthalene; Manufacture of a* ——. O. Imray, London. From the Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a Main, Germany. Eng. Pat. 8873, May 14, 1900.

Under the conditions described below, 1.1′.dinitronaphthalene can be converted into a brown dyestuff for cotton, which is characterised by great fastness. A solution of 200 kilos. of sodium sulphide ($Na_2S.9H_2O$) in 50 litres of water has gradually added to it at about 50° C., 30 kilos. of finely powdered 1.1′.dinitronaphthalene. The mixture is then evaporated to dryness on the water-bath. The product thereupon is transferred to tin trays and heated at 160—180° C. for about 5—6 hours, until it becomes quite hard. The dark brown mass obtained, may, after grinding, be directly employed for dyeing. It dissolves readily in water to a deep brown solution, from which the dyestuff may be precipitated by acids as a dark brown amorphous mass, insoluble in pure water, readily soluble in caustic alkalis, sodium carbonate, and ammonia.—T. A. L.

Dyestuffs [*Yellow, Orange*] *for Cotton, Fast to Alkali, Acid, and Light; Manufacture of Substantive* ——. O. Imray, London. From the Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a Main, Germany. Eng. Pat. 10,127, June 1, 1900.

By combining diazotised Primuline with 5.pyrazolone derivatives, yellow to reddish-orange dyestuffs are obtained fast to alkalis and light. The products formed are hydrazones of the corresponding 4.ketopyrazolones. For instance, a solution of 75 kilos. of Primuline acid and 7 kilos. of sodium nitrite in 1,000 litres of water is run into 36 kilos. of hydrochloric acid (30 per cent.) and 100 litres of water. After stirring a few hours, the diazo compound so obtained is run into a solution of 27 kilos. of 1-*p*-sulphophenyl-3-methyl-5-pyrazolone, and 30 kilos. of sodium carbonate in about 400 litres of water. The combination is soon complete, and the dyestuff is then salted out. It forms an orange yellow powder, very easily soluble in water to a reddish yellow solution, which becomes redder on adding caustic alkali. An excess of mineral acid gives an orange precipitate, whilst the solution of the dyestuff in concentrated sulphuric acid is light yellow. The following pyrazolone derivatives are also suitable for the purpose of this invention:— 1-phenyl-3-methyl-5-pyrazolone, 1-phenyl-5-pyrazolone-3-carboxylic acid, and 1-*p*-sulphophenyl-5-pyrazolone-3-carboxylic acid.—T. A. L.

Dyestuff [*Brown, Grey*] *for Wool; Manufacture of a* ——. O. Imray, London. From the Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 11,348, June 22, 1900.

By diazotising *p*-chloro-*o*-aminophenol-*o*-sulphonic acid and combining it with γ-aminonaphthol sulphonic acid in alkaline solution, a dyestuff is obtained which gives reddish brown shades on wool from an acid bath, whilst subsequent treatment with bichromate produces a bluish-grey shade, very fast to milling and light. The chloro-aminophenol sulphonic acid is obtained by first sulphonating and nitrating *p*-dichlorobenzene, then treating the product with alkali, and subsequently reducing it. A solution of 21·5 kilos. of sodium *p*-chloro-*o*-aminophenol-*o* sulphonate is diazotised with 7·2 kilos. of sodium nitrite and 30 kilos. of hydrochloric acid in the usual manner. The intensely yellow diazo solution is gradually added to a solution of 25 kilo of *p*-aminonaphthol sulphonic acid and 30 kilos. of sodiu carbonate. The combination takes place slowly, and complete in about 24 hours. The solution is then heat for a short time to 100° C., and the dyestuff is precipitat with salt. It forms a greyish-black powder, soluble water to a bluish-red solution, and dissolves in sulphu acid to a red solution.—T. A. L.

Colouring Matters [*Brown*] *from* 1·5 *Naphthylene D amine; The Manufacture and Production of Mix Disazo* ——. J. Y. Johnson, London. From The Badis Anilin und Soda Fabrik, Ludwigshafen, Germany. E Pat. 9287, May 19, 1900.

Mixed disazo dyestuffs are obtained by combining molecular proportion of the tetrazo compound from 1. naphthylene diamine with one molecular proportion salicylic acid in alkaline solution, and subsequently co bining the intermediate product so formed with some ot usual dyestuff component. The dyestuffs produced can used for dyeing chrome-mordanted wool, or they will unmordanted wool from an acid bath, and, on subseq treatment with chromates, yield shades which are fas fulling. For example, the tetrazo solution from 230 ki of 1.4′-naphthylene diamine hydrochloride (*vide* Ger. 39,954) is added with constant agitation to 5,000 litre water containing 138 kilos. of salicylic acid and 800 kilo calcined soda. The intermediate compound produced, w remains in suspension, is treated with 250 kilos. of sod 2.3′-naphthol sulphonate dissolved in 3,000 litres of w After stirring for several hours, the dyestuff separates and can be collected in the usual way. It dyes woo from an acid bath, and subsequent chroming yiel brownish-red shade.—T. A. L.

Colouring Matters [*Black*] *therefrom; Manufactu Condensation Products from Para-amidophenol Homologues, and of* ——. C. Rudolph, Offenbach a Germany. Eng. Pat. 10,293, June 5, 1900.

Certain condensation products of *p*-aminophenol, heated with sulphur and alkaline sulphides, yield new dyestuffs for unmordanted cotton. The conden products are obtained by the action of *p*-aminophe *p*-aminophenol hydrochloride, and by the action of aro nitro compounds on *p*-aminophenol in presence of co ing agents under certain conditions. When a mixt 11 kilos. of aminophenol and 15 kilos. of amino hydrochloride are heated together for 5—6 hours to 210° C., or for 10 hours at 170° C., the *p*-dihydroxydip amine formed at the commencement of the op disappears, and is transformed into a new product is insoluble in dilute hydrochloric acid and dissol soda lye to an intense blue solution. By using a proportion of base, another condensation product is ob For instance, 33 kilos. of *p*-aminophenol and 15 k *p*-aminophenol hydrochloride are heated for 10 h 160°—180° C. The mass, after cooling, is extract dilute hydrochloric acid and filtered, the residue be above-mentioned condensation product. The filt treated with dilute sodium acetate solution, which tates the new condensation product. The mix filtered boiling, when the *p*-dihydroxydiphenylamine simultaneously separates from the filtrate on cooling new condensation product is a bright grey powder turns blue in the air. It dissolves to a reddish-blue in soda lye. As an example of a condensation obtained with a nitro-compound, 10 kilos. of *p*-amin 5 kilos. of *p*-aminophenol hydrochloride, and 6 *o*-nitrophenol are heated together until reactio mences at 145° C. The melt is then heated for hours to 160°—170° C. The product obtained sol a hard metallic-like mass on cooling, dissolves in soda lye with a violet-blue colour, and gives a blue with concentrated sulphuric acid. For the prepa a dyestuff from it, 10 kilos. are heated with 7 sulphur and 50 kilos. of sodium sulphide for 5—6 110°—180° C. The new dyestuff dissolves to a b tion in water, from which hydrochloric acid thro a greenish-black precipitate. The dyestuff gives ıck shades on cotton according to the strength of the cing. For the production of a dyestuff from the first-entioned condensation product (see above), 12 kilos. of e product are mixed with 30 kilos. of crystallised sodium lphide and 4 kilos. of sulphur, and heated for several urs at 180°—220° C. The melt dissolves in water to a ıckish-blue solution, from which hydrochloric acid throws t a black precipitate. The alkaline solution of the dye-tff is decolorised by zinc dust, the original colour being stored on exposure to air. The product dyes unmordanted ton black from an alkaline bath containing salt.

—T. A. L.

—TEXTILES: COTTON, WOOL, SILK, Etc.

drocellulose; Preparation of ——, from Cellulose, by Means of Glacial Acetic Acid and Chlorine. R. Sthamer, Hamburg. French Pat. 304,723, Oct. 20, 1900; hrough Chem. Zeit. 1901, **25**, [25], 270.

ıim is made for the preparation of a hydrocellulose ich possesses the remarkable property of yielding acetyl ivatives readily soluble in water and alcohol, and thus ering from analogous compounds previously obtained. e cellulose is treated with glacial acetic acid containing e chlorine at 65°—70° C. The reagent is prepared by sing the chlorine into the acid until the latter acquires a low coloration, complete saturation being unnecessary. the end of the treatment the cellulose shrinks, and is a filtered off, washed with water, dried at 70° C., and verised. This hydrocellulose is a white powder, feeling sand to the touch. It offers great resistance to the on of acids and alkalis, but is dissolved by concentrated ic acid, forming a reddish-brown solution, from which er precipitates a nitro-derivative resembling ivory.

Vith acetic acid alone, a brownish hydrocellulose is ined, as described by Girard (Ann. Chim. Phys. 1891, 352), but the colour of this renders it unsuitable, *e.g.*, photographic purposes.—C. A. M.

ol; Action of Nitrous Acid on ——. A. Lidow· russ. phys.-chem. Ges. **32**, 766—774. Chem. Centr. 01, **1**, [12], 703.

: action of nitrous acid on wool is similar to that of c acid, except that in the latter case the yellow reaction luct is stable to light, whilst in the former it is not. action usually causes the wool to lose weight; only in case—by the action of nitric acid in the cold for 18 rs—was a small increase in weight observed. The luct obtained by the action of nitrous acid has a coarse ag to the touch, and it is readily acted upon by reducing ts, the yellow colour changing to brown. It has an reaction, decomposes carbonates at 50°—60° C., ates iodine from a solution of potassium iodide, and mes blackened at 110°—120° C. Dyestuffs are fixed readily by the nitrated product than by the original . The nitrated wool is non-hygroscopic, and has an number 169 and iodine number 4·7, as compared with umbers 38 and 18·4 respectively for wool. It con- less nitrogen than the original wool, although during rocess there is an absorption of nitrogen in the form of and nitroso-groups. Attempts to determine the ity of gases liberated during the nitration did not give rdant results.—A. S.

Artificial: Identification and Determination in Mixed Fabrics. M. Dayk.

See under XXIII., *page* 509.

PATENTS.

hing and Mercerising Cotton Yarn. O. Kopp and Usuelli. Andernach, Germany. Eng. Pat. 8654, r 10, 1900.

ANISM is employed of such a kind that when the yarn the mercerising tank at its natural length, it is ıed while being mercerised, relaxed while the mer-g fluid is being squeezed out, and stretched again it is being washed and dried. A better result is d when adopting these conditions than with those ordinarily employed. (See also this Journal, 1898, 149, 240, 345, 452, 573, 756, 840, and 1141; 1899, 36, 136, 267, 490, 680, 911, and 1122; 1900, 43, 114, 240, and 821.)

—C. M.

Mercerising or Imparting a Silky Lustre to Yarns and Fabrics of American or Short-staple Cotton. F. W. Golby, London. From F. A. Reichmann and C. A. Lagerqvist, Varberg, Sweden. Eng. Pat. 14,283, Aug. 9, 1900.

THE ordinary process of mercerising cotton yarn is only applicable to long-staple or Egyptian cotton. This process is suited to American or short-staple cotton. The well-gassed yarn is boiled in caustic soda of 7° B. for two hours. It is then partially dried in a centrifugal pump, and afterwards steeped for about 10 minutes in soda lye of 45° B. at 80° C., with the addition of as strong a cuprammonia as possible, the quantity of the latter depending on the thickness, twist, and closeness of the yarn. The material, still hot, is rinsed with boiling water, or with cold dilute nitric acid, 1°—5° B. It is now thoroughly washed and steeped for about eight minutes in nitric acid of 35° B. at 5° C. Finally it is thoroughly washed in cold water. Finer yarns need more cuprammonia.—C. M.

Textile Fabrics; Drying Moist ——, while Stretched. P. Hahn, Niederlahnstein, Germany. Eng. Pat. 1374, Jan. 21, 1901.

To avoid taking the fabrics off the rollers after mercerising, and further to adapt rollers to suitable widths of material, the rollers are either made of discs clamped together by means of screws in the axle, or the rollers are placed on long axles so that they may slide longitudinally one over the other, thus squeezing a maximum width (the width of the roller) or any smaller width. When the disc device is used they are made to abut very accurately one against the other, and the number of discs suitable to the width of the fabric is employed.—C. M.

Textile Materials with Circulating Fluids; Treating ——. R. Weiss, Kingersheim, Mulhouse. Under Internat. Conv. Eng. Pat. 2283, Appl. for U. Kingdom, Feb. 1, 1901.

THIS process is an improvement on that of Eng. Pat. 486, Jan. 8, 1900, (this Journal, 1900, 345). The improvement consists in having a reserve tank interposed in the circulating liquid, away from the tank containing the material which is being treated. This extra tank is further in connection with a tank containing concentrated liquor. As the water in the working tank is evaporated and the liquor in consequence gets stronger, a quantity is from time to time run into the interposed tank, thus keeping up the dilution without materially altering the conditions.—C. M.

Artificial Silk, suitable for the Production of Threads and Films. J. Duquesnoy, Paris. Eng. Pat. 8799, May 12, 1900.

CELLULOSE is nitrated in a mixture of nitric and sulphuric acids in the ordinary way of making pyroxylin. 200 grms. of the nitrocellose (dry) are dissolved in a litre of equal quantities of acetone, acetic acid, and amyl alcohol.

The solution is filtered and then expressed from fine jets. It solidifies instantly on coming through the jet, owing to the evaporation of the acetone, and can be wound and formed into hanks.

These hanks are denitrated by digesting them for some hours preferably in a solution of ammonium sulphydrate.

They are then washed well with water and dried.—C. M.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, AND BLEACHING.

Brown Colour suitable for being "Over-Dyed" in the Piece. C. Thurm. Färber-Zeit. 1901, **12**, [5], 72—73.

PIECE-GOODS containing coloured threads are sometimes dyed in another shade, and the colour of the dyed yarn is, of course, more or less modified during this process. A brown dyed with Anthracene Chrome Black F, Anthracene Yellow C, and Diamine Fast Red F, is well suited for dyeing yarn intended to form the coloured threads, since it does not bleed into the paler shade dyed in the piece; and other shades, such as olive, drab, &c., produced with the same three dyestuffs, possess the same advantage. The effect of the piece-dyeing on the coloured yarn is least noticeable when the second shade is of the same tone as the first, only differing from it in depth. If a navy blue is dyed on pieces with brown stripes, the stripes will become black, and scarlet stripes are changed to a deep cherry-red.

Pleasing effects may be obtained by dyeing in the piece, goods which have been woven from mixture yarns, *i.e.*, yarns produced from a mixture of white wool and wool which has been dyed in fast colours.—R. B. B.

Paranitraniline Red; Note on the Printing of ——. R. J. Flintoff. J. Soc. Dyers and Colourists, 1901, **17**, [3], 59—61.

In printing a seven-colour chintz pattern two rollers of Paranitraniline Red were employed. The remaining colours were produced by means of Auramine, Rhodamine 6 G, Brilliant Green and Auramine, Logwood, and Victoria Blue. The cloth was prepared in an aqueous solution of β naphtholate of soda, printed in the above colours with one roller of Paranitraniline Red in the peg colours and the other in the blotch, and then aged, fixed, and soaped. Since the peg roller usually withdraws very little colour from the colour-box it does not require additions of new colour, and tends to decompose owing to agitation in the heated atmosphere behind the printing machine; the printer therefore empties the red peg colour-box after every two or three lumps of cloth. As a rule this is not necessary with the blotch red since it requires much more colour and the box is frequently refreshed, but in this particular design both rollers placed approximately equal amounts of colour on the cloth. The red blotch in the third lump of cloth was not as good as in the previous ones, and from the fourth to the sixth, when the machine was stopped, it changed by gradations from a yellow shade of red to an orange. The discrepancies in the shade were more particularly marked after the soaping and subsequent processes.

After considering all possible causes for the defect it was finally concluded that it must be due to the use of fermented starch thickening. After the initial decomposition of the thickened diazo compound has taken place, owing to the influence of the fermented starch paste, the rate of decomposition is represented by an ever-increasing factor up to the point when no red precipitate can be obtained by mixing the solution with an alkaline solution of β-naphthol. Experiments showed that the influence of the decomposing diazo compound on the colour of the oxy-azo compound is somewhat remarkable. Up to a certain point the regularity of decomposition is indicated by the gradual increase in the yellowness of the shade of red, but when this stage has been reached the colours vary very rapidly from red to orange and light brown. The following proposition must be accepted as true:—The rate of decomposition of a thickened solution of the diazo compound of paranitraniline is a progressively increasing quantity up to a certain point, which having been reached, the rapidity is infinitely increased.

In the case under consideration, the products of decomposition were entirely removed from the peg colour-box at frequent intervals, whereas in the blotch colour-box they were allowed to accumulate; hence the rate of decomposition was much greater in the latter case than the former, and it is easy to understand why the peg colour-box gave a good red and the blotch colour-box an inferior one.—R. B. B.

Lactic Acid; Percentages by Weight and by Volume in the Sale of ——. O. Eberhard. Chem. Zeit. 1901, **25**, [27], 294.

Lactic acid, which contains 50 kilos. of acid in 100 litres, is sold by certain firms as 50 volume per cent.; it really contains 43 per cent. by weight. The author points out that misconceptions are sure to be caused by this method of description, though there is no doubt of the convenience in using a dilute acid of such strength, which can be measured. The correct description of such 50 per cent. acid would be "lactic acid of 50 parts by weight in 100 volumes," whic might be abbreviated to $\frac{\text{"50 weight}}{\text{100 volume}}$ = 43 per cent. weight."—A. C. W.

Lactolin in Dyeing Hats. Deutsche Hutmacher Zeit. **31**, [45].

In using "lactolin" (this Journal, 1899, 491) for reducin potassium bichromate in dyeing hats, the bodies should washed in clean water, or, in case of light shades, boil with a 0·3 per cent. solution of ammonia. The mordantin bath for. 66 lb. (or 20 dozen) hat bodies is composed 450 grms. of potassium or sodium bichromate and 900 grm of lactolin, the bodies being entered at 70° C., worked abou and the bath raised to boiling; after $\frac{3}{4}$ hour 300 grms. sulphuric acid are added in a diluted state, and boiling continued for $\frac{1}{2}$ hour longer. For light shades, a weak bath is used; and in the case of carbonised hat bodies initial temperature is reduced to 30° C., the hats being boil for $\frac{1}{4}$—$\frac{1}{2}$ hour after working about for $\frac{1}{2}$ hour. For da blues, browns, &c., 3 litres of ammonium acetate are add to the bath.

The mordanted bodies must not be allowed to dry bef dyeing, and should therefore be wetted with hot water, boiled. The dye bath contains 1,000 litres of water a 3 litres of ammonium acetate; the bodies are entered 30° C., worked about for $\frac{1}{2}$ hour, and boiled for an eq period, then turned and boiled till finished, 1 to $1\frac{1}{2}$ litres acetic acid being added to the bath. To make up the col exactly to pattern, chrome-proof aniline dyestuffs are u when the difference is slight, but when the divergenc greater the bath is cooled to 70° C., and Alizarin dyest are added. The subsequent treatment is the same as wh tartrate has been employed.

Dyeing Recipes.—Mordant for I. and II. (for 20 do hat bodies): Potassium (or sodium) bichromate, 300 gra lactolin, 600; sulphuric acid, 150 grms.

I. *Beige.*—Alizarin Brown (powder), 15 grms.; Diam Flavin G (pow.), 3 grms.; Alizarin Red S (pow 3 grms.

II. *Grey.*—Alizarin Blue-black B (pow.), 5 grm Alizarin Orange N (pow.), 5 grms.; Anthracene W G G (pow.), 3 grms.

III. *Brown.*—Diamond Flavin G (pow.), 50 grm Alizarin Blue-black B (pow.), 30; Alizarin Brown (po 200 grms.

IV. *Olive.*—Alizarin Blue-black B (pow.), 10 grm Alizarin Brown (pow.), 45; Cerulein S W (paste), grms.

V. *Havana.*—Alizarin Blue-black B (pow.), 15 grm Diamond Flavin G (pow.), $7\frac{1}{2}$; Alizarin Orange N (po 10; Alizarin Brown (pow.), 10 grms.

VI. *Tobacco Brown.*—Alizarin Brown (pow.), 80 gr Anthracene Blue W G G (pow.), 5; Alizarin Orang 10; Diamond Flavin G (pow.).—C. S.

Turkey Red Oil; Detection of Iron in ——. Leip Färber- u. Zeugdr. Zeit. 1901, [50], 153.

See under XXIII., *page* 508.

Woollen Industry; Soaps and Turkey Red Oils in the A. Steinberg. Leipziger Färber- u. Zeugdr. Zeit. [50], **4**, 14, 149—151.

The author proposes, as a substitute for the ordinary and Turkey red oils, a preparation analogous to the l obtained in the following manner:—To a quanti commercial oleic acid (*oleïne*) contained in a high concentrated sulphuric acid (66° B.) is added, in portions at a time, during 10—12 hours, the mixture well agitated, and the temperature kept below 40° C. the dark brown viscous liquid, when shaken up with water in a test tube, gives a clear solution, whic standing, may develop a slight turbidity, but mus separate any layer of oil. The contents of the ca then run off into another vessel with an inclined containing a concentrated solution of Glauber's salt mixed, and then allowed to stand for 24 hours.

The salt solution is run from below the oily laye after again standing and separating from the small a il, it may be employed in dyeing, as a Glauber's salts huric acid solution.

ie oil—"sulpho-oleic acid"—is now ready for use. haracteristic properties are its solubility in water and cid reaction.

ie strongly acid reaction may be corrected by partial ralisation with alkalis, while, for milling goods dyed the woods, Indigo or Alizarin, the sulphonated olein is tly neutralised in *dilute* solution with soda or ammonia. r milling goods dyed with a colour not sensitive to is, for washing acid-milled goods, for the removal of c acid, &c. the sulphated oleine is mixed with an excess kali until the turbidity first produced disappears and nber-coloured liquid is obtained. The neutralised oil nix with other soaps, but the acid, of course, liberates fatty acids.

though the preparation of this sulphonated oleine is what more complicated than that of ordinary soap, uthor thinks that the advantages which it presents ordinary soap in its solubility in both acid and alkaline on and in water, and the other properties described, than compensates for the additional trouble. He also that less of it is required.—H. I.

lphide Colours; Analysis of ——. A. Meyenberg. J. Soc. Dyers and Col. 17, [3], 60.

See under XXIII., *page* 508.

ous Sulphide; Action of Caustic Potash and Soda on ——. F. Mollwo Perkin.

See page 425.

PATENTS.

g and Bleaching Fabrics. H. R. Armitage, Bradford. Eng. Pat. 6523, April 7, 1900.

proved method and apparatus for automatically ng the rollers in a dyeing machine, in which all or the rollers, when in use, are under the surface of the

tissue to be dyed is attached to lappings placed upon ollers. Projecting fingers are secured to one or both of the lappings in such a position that they strike . and actuate mechanism by means of which the l of the rollers is effected.—E. B.

, Washing, and Bleaching Textile Materials; aratus for ——. P. Schirp, Barmen, Germany. Pat. 23,668, Dec. 27, 1900.

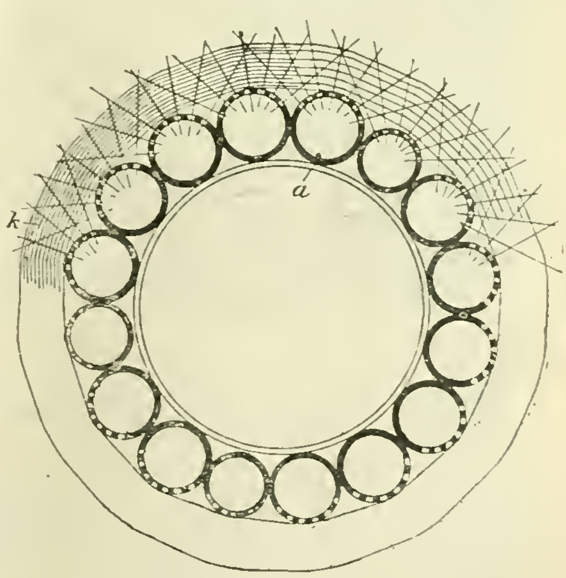
apparatus described in Eng. Pat. 22,948 of 1899 ournal, 1900, 243) the two tanks containing the l are placed above the vessel containing the dye- and the liquor is pumped to the top of the apparatus ws down through the goods into the reservoir. t sometimes happens that the upper parts of the l are dyed more intensely than the lower parts, it is ntage to be able to direct the flow of liquid upwards the goods, and this is effected by arranging a pipe from the centre of the bottom of each of the upper hich can be connected above, when desired, with the ranch of the force pipe, through which the liquor the tank. Outlets are provided near the top of : for the liquor to return to the reservoir.—R. B. B.

ting Wool. C. D. Abel, London. From The a Gesellschaft für Anilin-Fabrikation, Berlin, Ger- Eng. Pat. 8874, May 14, 1900.

s materials are simultaneously mordanted and means of potassium or sodium bichromate and ammonium salts, along with suitable dyestuffs. h, containing, for instance, potassium bichromate nonium sulphate, is neutral at first, but gradually acid when boiled, a part of the ammonium salt sing, and ammonia being given off. The latter or reduces the small quantity of chromic acid, s at the same time been set free, forming water, , and chromic oxide, the last of which becomes fixed upon the fibre. As an example of the process:—1 lb. of potassium bichromate, 1 lb. of ammonium sulphate, and 1 lb. of Anthracene Red are dissolved in 200 gallons of boiling water, 100 lb. of woollen slubbing are introduced, and the bath is connected with a pump and circulated for two hours, until it is exhausted; the slubbing is then rinsed and dried. The method permits of the addition of a number of dyestuffs to the bath without the formation of a precipitate occurring. The dyestuffs are first absorbed by the wool, and they then become fixed by the chromic oxide as this is formed, the reaction continuing in this manner until practically the whole of the dyestuff and chromium are withdrawn from the bath and combined upon the wool. The advantages of the process are:—(1.) Mordanting and dyeing are accomplished in a single operation. (2.) The bath is exhausted, so that several dyeing operations may be carried out consecutively in the same bath. (3.) The colours formerly obtained by after-mordanting with chrome are directly obtained. (4.) The dyeings are unusually even, and thick and closely woven fabrics are well penetrated. (5.) Many dyestuffs yield, by this process, colours which are richer and much faster than those hitherto produced. (6.) The setting of the dyebath may be facilitated by the preparation of standard mixtures containing the dyestuff and mordanting compounds in the necessary proportions.
—E. B.

Mordanting, Dyeing, &c.; Apparatus for ——. R. Bernheim, Augsburg, Germany. Eng. Pat. 7680, April 25, 1900.

THE materials, namely, yarns or tissues, *k* (see figure), to be dyed, are wound upon a number of pipes *a*, arranged together in a circle, and perforated on their outer sides. The pipes are closed at one end and connected at the other end with a pump or a vacuum, compressed air, or liquor chamber. Dye liquors are forced or drawn through the materials, while these are rotated upon the roller formed by the system of pipes, the excess of liquor being removed, after sufficient action, by placing the pipes in communication with a vacuum chamber. Compressed air is passed through yarns or the like to open or blow the fibres, in order to give certain desired effects.—E. B.



DYEING APPARATUS.

Dyeing with Amido-oxyanthraquinone Sulphonic Acids. H. E. Newton, London. From The Farbenfabriken vorm. Friedrich Bayer & Co., Elberfeld, Germany. Eng. Pat. 7686, April 25, 1900.

SEVERAL amidohydroxy-derivatives of anthraquinone, namely, diamidoanthrachrysone disulphonic acid, and the mono- and disulphonic acids of *p*-diamidoanthrarufin and *p*-diamidochrysazin, possess the property of dyeing unmordanted wool from an acid bath. It has been found, on using these dyestuffs on a large scale, that they do not invariably produce the same colour; for instance, diamidoanthrachrysone disulphonic acid sometimes gives a blue, sometimes a reddish blue or red colour. The other dyestuffs mentioned show a similar behaviour, although the variation in colour is less. The production of such reddish colours is avoided, by adding small quantities of suitable reducing agents, such as sulphurous acid or sodium bisulphite, to the dyebath, bright violet and blue colours being then obtained: thus, diamidoanthrachrysone disulphonic acid under these conditions, yields a pure blue colour, which cannot, except accidentally, be otherwise produced. —E. B.

Indigo-Vat Dyeing. O. Imray, London. From The Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 7829, April 27, 1900.

It has hitherto been found impossible to produce satisfactory deep shades with indigo by a single immersion in a vat, and even when fairly full colours are thus obtained by the use of a very concentrated vat the indigo is only superficially fixed and easily rubs or washes off.

In order to render unnecessary repeated immersions in the vat, advantage is taken of the fact that free indigo-white has a much greater affinity for both animal and vegetable fibre than the sodium or lime salt hitherto employed in the vats has. The separation of indigo-white in a neutral or even acid bath is avoided by the addition of certain substances, such as gum, glue, gelatin, dextrin, starch, albumin, &c., and vats are thus prepared which yield deep colours by a single immersion. The vat may either be neutralised before dyeing is commenced or may be alkaline at first, a neutral or even acid reaction being produced during dyeing by a gradual addition of acid or acid salts. A dilute solution of sodium bisulphite or sulphurous acid is best suited for acidifying the vat. The best practical results are obtained with the hydrosulphite vat, whilst those vats having a sediment, such as the copperas and zinc powder vats, are less suited for this process, as the sediment appears to combine mechanically with the greater portion of the substance added for dissolving the indigo-white; but if the clear vat-liquor is drawn off from the sediment, these vats also yield good results.

It is claimed that the dyeing is thorough, and the fastness to milling and rubbing far superior to that of equally deep shades obtained in the ordinary manner.—R. B. B.

Blue to Black-blue Dyes, Fast to Light, from Mono-azo-Dyestuffs and Copper Salts; Process for Obtaining on Wool Fibre ——. O. Imray, London. From The Farbwerke vorm. Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 8237, May 3, 1900.

The mono-azo-dyestuffs obtained by the action of diazotised *o*-amidophenols and their sulphonic, nitro, and halogen derivatives upon 1.1′-amidonaphthol mono- and disulphonic acids, are altered in colour and rendered faster to washing, alkalis, acids, and especially to light, when they are treated on the wool fibre, during or after dyeing, with copper salts. The colours are thus changed from red, violet, and black into blue, green-blue, and black-blue or blue-green, respectively. For example, 60 kilos. of wool are dyed, by the aid of 2·4 kilos. of sulphuric acid and 12 kilos. of Glauber's salt, with 1·8 kilos. of the dyestuff derived from diazotised *o*-amidonitrophenol sulphonic acid and 1.1′-amidonaphthol-4-sulphonic acid. The wool is then treated in the bath in which it has been dyed, with 1·8 kilos. of copper sulphate. A green blue is thus produced, remarkable for its fastness to alkalis, light, and steaming.

The action of copper salts upon the above dyestuffs is exceptional, since most mono-azo-dyestuffs are affected but little in shade and not at all in fastness by treatment with such salts. Some, indeed, such as the *o*-hydroxy-azo dyestuffs from chromotropic acid, are unfavourably influenced, the dyeings produced, being of no practical value.—E. B.

Colouring Fibres Composed of Vegetable or Animal Tex Fibres. G. Comber, Knutsford, and J. C. Chor Bewsey, Warrington. Eng. Pat. 7388, April 21, 190

This process consists in impregnating fabrics with visc mixed with coal-, gas-, or wood-tar, and a little dye or o material, such as ferric hydrate. A suitable mixture dyeing "khaki" is the following: 100 lb. of viscose, taining 10 lb. of dissolved cellulose, is mixed thorou with 4 lb. of gas-tar. To this, ferric hydrate (fre precipitated) is added, and also about 10 oz. of primu The whole is mixed well and made up to about 200 lb. water, and a little caustic soda if necessary. The fabr impregnated by passing it through squeeze rollers, d and then, if cotton, "steamed" for about two hours, finally boiled in brine for 15 minutes, washed, bleach necessary, washed, and finished.

If wool is to be dyed, the impregnation is followe saturation in ammonium chloride, boiling in concent brine, washing, drying, and finishing. —C. M.

Dyeing, Washing, Mercerising or otherwise Tre Hanks of Yarn; Machines for ——. J. T. Mc and W. Menzies, Wilkes-Barré, Pennsylvania, U Eng. Pat. 20,136, Nov. 8, 1900.

The machine is provided with a series of horizontal r shafts at right angles to the main driving shaft, connected with it. Supported by the end portions of shafts are extension frames bearing an upper and a series of rollers for supporting the hanks of yarn. lower part of the frame slides upon the upper part, th parts being provided with suitable guides for retaining in their relative positions, and permitting the frame extended. The hanks of yarn are slipped over the e the rollers before extending the frame.

The liquid with which the yarn is treated is spray the hanks by a spray pipe, and pressed into the ya means of pressure rollers, which are arranged at on of the upper yarn-carrying rollers. All the roller are kept constantly in motion, and the rollers are t into and out of connection with their shafts as req Some rollers are revolved while the yarn is being plac or removed from others, so that the machine as a wl kept in constant operation.—R. B. B.

Bleaching, Dyeing, and otherwise Treating Yarns, i Cheese, Bobbin, or other Compact Form; Appara ——. J. Brandwood, Elton, Bury, Lancs., Eng 9722, May 26, 1900.

The yarn in cops or similar form is placed on perforated skewers, which are attached to perforated and through which the liquor is circulated by mean pump as described in a former specification (Eng. Pa of 1899, this Journal, 1900, 532—533). The apparat sists of a vat with one or more circulating pipes at int preferably projecting upwards from the bottom, and ea is connected to a circulating pump beneath or near t At both sides of each suction pipe are placed gu supports for the cop plates, and two plates are therein back to back, thus enclosing the suction Above the pipe are placed transverse horizontal pla to close or seal the top of the suction chamber thus and two to form an exhaust chamber (the sides o are also closed by the cop plates as they pass) purpose of withdrawing moisture from the cops as t raised from the vat. The exhaust chamber is co with an air pump, and the latter is also connected with the suction chamber in order that air may be ex from the cops before the circulating pumps are action.—R. B. B.

Indigo Paste; Processes for the Preparation of a —— [*Reduced Indigo*]. W. P. Thompson, &c. From Gebrüder Flick, Opladen, Germany Pat. 2009, Jan. 29, 1901.

The process depends on the reduction of Indig metals in a state of fine division in the presence centrated ammonia. A soluble indigo paste strength and containing no fixed alkali is prep ng very gradually to an intimate mixture of natural or cial indigo and a metal in a finely divided state (zinc, or iron), a definite quantity of concentrated ammonia or, agitating the mass during the addition and for some afterwards, and finally pressing the paste to free it the adhering moisture.—R. B. B

VII.—ACIDS, ALKALIS, AND SALTS.

rine; Preparation of ——, from Sodium Chlorate; d Preparation of Phosphorus Trichloride. C. Graebe. r. **34**, [5], 645—652.

chlorine gas evolved by the action of hydrochloric of sp. gr. 1·10—1·12 on a strong solution of sodium ate at temperatures of 100° C. and above, contains nore than 4 or 5 per cent. of chlorine peroxide. For purposes this impurity is in no way disadvantageous; n be destroyed (with production of an equivalent nt of oxygen) by passing the gas through a red hot; or it can be entirely removed by washing, if small nts of the gas only are needed (a wash bottle with . of water will secure the freedom from peroxide of rst 3 grms. of chlorine passing through).

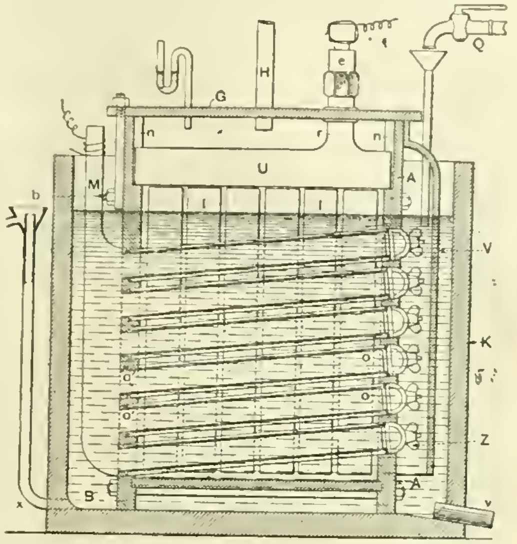
e author operates with a globular flask fitted with an ube for the gas, a bent tube dipping into water to act essure-gauge and safety-tube, and a Bulk's dropping l (in which the dropping is regulated not by a stop-but by raising a rod ground into the funnel-tube), the f which is drawn out and recurved so as to deliver the chlorate solution with an upward direction. The chloric acid is placed in the flask, heated to boiling 100° C.), and kept at that temperature by a small while the sodium chlorate solution (200 c.c. contain grms.—sp. gr. 1·315) is allowed to flow in at a nt rate determined by circumstances. A litre of chloric acid of sp. gr. 1·12 and 200 c.c. of the chlorate n furnish about 175 grms. of chlorine. The whole ion is perfectly regular and manageable.

prepare phosphorus trichloride (as an instance of efulness of the chlorine process), the desired quantity osphorus is covered with phosphorus trichloride (50 phosphorus and 50 c.c. of trichloride) in a 250 c.c. flask, ed with a wide entrance tube for the gas; this tube dips to the phosphorus trichloride, and is arranged so that be cleared by pushing up or down a glass rod, should ome choked with pentachloride. The flask is also ted with an efficient reflux condenser. Chlorine from lculated quantities of hydrochloric acid and sodium te (see above) is now led in as rapidly as the cong arrangement will allow. When the reaction is over, osphorus trichloride, in almost theoretical amount, directly distilled out of the preparation flask. This l allows the use of either red or yellow phosphorus; e former an excess may be put into the flask, and ed at the end; the product is then entirely free hosphorus, and from phosphorus pentachloride.

—J. T. D.

Process; Outhenin-Chalandre, Electrolytic ——. . C. Kershaw. Electrician, 1901, **46**, [23], 853—

rocess, protected by Eng. Pats. 15,903 of 1893 and of 1896 (this Journal, 1897, 446), is now being used res, in Switzerland (by the Soc. Anon. Suisse de l'Ind. Chim. Volta), and at Moutiers, in France. The cell of an inner closed anode cell A (see annexed figure) ng round carbon anodes I connected by means of support U with the terminal *e*, a pipe H serving to vay the electrolytic chlorine evolved. The sheet-iron s forming part of the plate M (the top of which s the other terminal) are contained in the sloping ubes *o*, which are hermetically sealed through the the anode chamber, but which allow free circula- the cathode liquid through them. The tubes are in place by the arrangement shown at Z. The re suspended in rows of seven between adjacent sets de tubes. The anode solution is sodium chloride, hode liquid sodium hydroxide. The evolved chlorine is carried off, and is mainly used in the manufacture of bleaching powder; the hydrogen produced at the cathode passes up the sloping tubes and is collected in a sheet-iron hood (shown in section) and thence conducted away to be burnt in chlorine, to yield HCl, which is then passed into the anode cell. The caustic soda produced is run off from the outer cell at V from time to time, as necessary, and as the hydrogen passes off without disturbing the liquid very greatly. Fairly concentrated solutions of soda may be obtained. Soda made by this process was shown at the Paris Exhibition in 1900; it contained 97·6 per cent. of NaOH. The object of introducing hydrochloric acid into the anode cell is to break up ClO compounds into H_2O and Cl, any excess of HCl being electrolysed, and yielding Cl at the anode and H at the cathode; but chlorine thus obtained is only gained by a double expenditure of electrical energy, for the chlorine thus yielded must first have been separated from NaCl electrolytically. No figures as to working cost are yet available. The advantages claimed for the Outhenin-Chalandre type of cell are: complete separation of anion and cation, with consequent prevention of hypochlorite and chlorate production; and collection and utilisation of the cathode-hydrogen. The disadvantages are: a high EMF, due to the diaphragms, and a very complicated structure, with consequent high maintenance charges.—W. G. M.



Aluminium Chloride; Ammoniated ——. E. Baud. Comptes Rend. **132**, [11], 690—692.

A study of the thermal properties of $Al_2Cl_6 . 18NH_3$. The substance is formed by saturating aluminium chloride (or any of the compounds containing less ammonia) with ammonia at −23° C. The heat of formation of the solid from solid aluminium chloride and gaseous ammonia is 317·85 cal., or 8·27 cal. for each molecule of ammonia added to the substance $Al_2Cl_6 \cdot 12NH_3$. Observations of its dissociation-pressure gave the figures 1790 mm., 970 mm., 481 mm., 189 mm., at 0°, − 10°·7, − 22°·3, − 37° C. respectively.—J. T. D.

Ammonia Solution; Vapour Pressure of Aqueous ——. E. P. Perman. Proc. Chem. Soc. 1901, **17**, [234], 46.

The vapour pressure of aqueous ammonia solutions of concentrations varying from nothing to 35 per cent. has been found by a statical method; the temperatures ranged from 0° to 60° C. The curves showing the variation of pressure with concentration at various temperatures are found to be approximately represented by the equation $p(100 - c) = ac + bc^2$; a and b are constants, c is the concentration of the ammonia in the solution.

The equation may be put in the form $p(100 - c) = c.k.$ when $k = a + bc$ and is the reciprocal of the solubility coefficient. The variation of pressure with temperature (the concentration remaining constant) is expressed with fair accuracy by the equation $\log p = \alpha + \beta t + \gamma t^2$, α, β, and γ being constants, of which γ is always γ negative.

The constant β is found to have the same value as the corresponding constant found in the expression $\log. b = \alpha' + \beta' t$ for the rate of escape of ammonia from aqueous solution (Trans. Chem. Soc., 1898, **73**, 511).

Ammonia Solution; Influence of Sodium Sulphate on the Vapour Pressure of Aqueous ——. E. P. Perman. Proc. Chem. Soc. 1901, **17**, [234], 47.

The author has determined the vapour pressures of ammonia solutions containing sodium sulphate in solution at temperatures varying from 26° to 47° C. and has compared them with corresponding solutions of ammonia without sodium sulphate. The curves show no break at 33°, nor do they diverge more than those for ammonia solution. Hence it seems probable that the sodium sulphate does not exist as a hydrate in solution.

Barium Monoxide and Dioxide; Manufacture of ——. R. Heinz. Chem. Zeit. 1901, **25**, [19], 199.

The yearly consumption of barium peroxide is computed to amount to 10,000 tons. Besides being employed in producing this, barium oxide is largely used in sugar manufacturing, and is likely in future to be used to an increasing extent in that industry, as the deposits of the chief strontium minerals appear to be becoming exhausted.

The following methods of preparing barium oxide are too costly to succeed at the present time:—The precipitation of barium hydrate from soluble barium salts. Decomposing barium carbonate by means of superheated steam, which is unsatisfactory, from an industrial point of view, on account of the inferior yield. The decomposition of barium nitrate by heat; although by this method a very pure product is obtained, and part (30 per cent.) of the nitric acid disengaged from the salt can be recovered. The process of H. Schulze (Ger. Pat. 108,599) is likely to be too costly. He proposes to convert the barium residues from sugar refineries into barium carbide, by heating in an electric furnace with carbonaceous matters, afterwards converting the barium carbide into barium hydrate, by treatment with boiling water, and the process of S. Bradley and B. Jacobs (Ger. Pat. 111,667), in which an electric current serves to convert a mixture of barium sulphate and coal into one of barium sulphide and barium oxide. To the same class may be added a process patented by Limb (French Pat. 294,727), which consists in fusing together barium sulphide, coal and certain metals or metallic oxides, barium carbide being thus formed.

Of greater promise is a proposal to decompose barium chloride with zinc oxide. The zinc chloride which is formed at the high temperature employed, sublimes and is decomposed into zinc oxide, which is recoverable for use again.

Leroy and Segay's discovery (Ger. Pat. 100,969), that barium carbonate is acted upon at 360° C. by dry hydrogen sulphide and converted into barium sulphide, which is decomposed by steam at a temperature below a red heat, into barium oxide, is of technical importance, although it is doubtful whether the process can be worked on an industrial scale.

A method has been worked out during the last year, and is in successful operation in Germany for the manufacture of the oxide from the carbonate. It consists in heating the native carbonate (witherite) in suitably constructed furnaces, with producer-gas. The native mineral is more readily decomposed than the artificially precipitated carbonate, and is, on this account, preferred. The furnaces employed are built of a basic sandstone; the ordinary magnesite stone is unsuitable for the purpose. 100 parts of witherite and 125 parts of coal give 70 parts of oxide. An operation lasts about 12 hours. The product contains a high percentage, namely 95, of barium oxide, and it is well adapted for conversion into barium peroxide, which, as thus prepared, is of above 90 per cent. strength and is free from cyanide and nitrite. The oxidation takes place so readily that it would seem to be possible to accomplish the manufacture of peroxide from the carbonate in a single operation, but th are technical difficulties in the way. The manufactur the peroxide is, however, now carried on side by side that of the monoxide.

The process of Bonnet, Ramel and others (Ger. 104,171) which consists in heating a mixture of bar carbonate and coal in crucibles lined with paper or o carbonaceous materials at 1100°—1200° C., gives a gree grey product which cannot be directly transformed barium peroxide. An oxide suitable for this purpos obtained, according to the same inventors (Ger. 108,255) by strongly heating a mixture of barium hyd and coal.—E. B.

Potash Salts; Soluble Production of ——, *from Potas Felspar.* J. G. A. Rhodin.

See page 432.

Soda; Production of ——, *by the Ammonia Proce* J. A. Bradburn.

See page 442.

PATENTS.

Acetic Acid; Manufacturing Chemically Pure ——. J. G. Behrens, Bremen, Germany. Eng. Pat. 3392, b. 16, 1901.

Crude acetic acid is heated in a still, the vapour ing into a coil set in a heated oil bath, in which the vapour is mixed with air, and then passes into a or metal vessel containing platinised asbestos, heated l oil bath to from 120° C. to 300° C., according to the centration of the acid to be purified. The acid vap then condensed. Manganic oxide, finely-divided c and other substances may be substituted for the plati asbestos.—E. S.

Hydrochloric Acid, Chemically Pure; Manufactu ——. J. Wetter, London. From the Firm of Haen, List, Germany. Eng. Pat. 10,196, June 2, 1

Crude hydrochloric acid, previously freed from arse run continuously into a lead still containing sulphuri so diluted that its boiling point is about 10° C. highe that of the inflowing hydrochloric acid. The aci heated by a leaden steam coil, and the hydrochlor which distils off is condensed in earthenware pi receptacles, and is of about the same strength as the acid flowing into the still.—E. S.

Alkaline Earth Dioxides; the Manufacture of ——. G. F. Jaubert, Paris. Eng. Pat. 2504, Feb. 5, 19

Hydrates of the alkaline earth dioxides are obtai causing a solution of an alkaline earth sulphide to r double decomposition upon a solution of a hydrat alkaline dioxide. For instance, 110 kilos. of com barium sulphide is lixiviated with boiling water to about 1,000 litres of solution, to which, after coo 25°—30° C., is added a solution of 42 to 45 k sodium dioxide in 1,000 litres of cold water. A pre of hydrated barium dioxide forms immediately in which when filtered off, washed and pressed, gives of 160 to 180 kilos. of the hydrated dioxide.—E. S.

Sulphur Compounds from Waste Gases; Recov ——. A. Carey, O. Heslop, and The United Company, Ltd., all of Liverpool. Eng. Pat. June 5, 1900.

The waste gases obtained in the Chance-Claus pro the recovery of sulphur from alkali waste, are pass air through a furnace to burn the hydrogen sulph sulphur dioxide, and the issuing dilute gases are d sulphuric acid in a tower, and are then passed through, a catalytic agent, such as platinised asbesto oxide, maintained at a suitable temperature, to sulphuric anhydride.—E. S.

um and Potassium Chromates and Bichromates; anufacture of ——. F. M. Spence, D. D. Spence, and Shearer, all of Manchester. Eng. Pat. 5057, March 16,)0.

)ME ore is mixed with sodium carbonate and lime in proportions that the frit obtained by roasting may in half its chromium combined with sodium as mono- aate, and that the lime may be in excess of the pro-)n necessary to form with the other half of the chro- ı, calcium mono-chromate. The furnaced product, ered and mixed with water, is subjected to a current boaic acid gas and ammonia, until the chromic acid)mbined with the soda and ammonia, and the lime is itated as carbonate. The cleared solution of sodium ammonium chromates is heated in a closed vessel)el ammonia (which is recovered for re-use by suitable ;) and the sodium bichromate solution remaining, is atrated to obtain the crystallised salt, or to form on g a hard cake, which may be broken up. Potassium)mate may be similarly obtained.—E. S.

'III.—GLASS, POTTERY, ENAMELS.

y; Use of Lead in the Manufacture of ——. Report ıe Home Secretary by T. E. Thorpe, Principal of the ernment Laboratory, 1901.

)amphlet contains various letters and reports pre- by Prof. Thorpe to the Home Office on matters which have arisen since the publication of the last report in 1899 (this Journal, 1899, 494).

Composition and Solubility of Lead Silicate Frits.—In the annexed table (No. 1), arranged in order of increasing solubility, are given the analyses of a series of silicate frits. On inspection it will be seen that the proportion of lead (calculated as lead oxide) bears no simple ratio to any one of the constituents of the material. Neither is there any connection, except a very rough one, between the proportion of any class of ingredients (*e.g.*, monoxides, sesquioxides, dioxides, total bases, or total acids) and the solubility of the lead. But if all the bases are calculated as PbO, and the acids as SiO_2, there is a distinct relationship between the solubility and the ratio of bases to acids. The rule holds good in every case except sample L_1; and here the ratio is probably lower than it should be, as the boric acid was determined by difference. Thus it appears that, provided the ratio of bases to acids be not greater than 1·45:1 the frit will be practically insoluble in 0·25 per cent. hydrochloric acid, irrespective of the precise chemical composition of the material; and it might even be possible to replace the whole of the lime, alkalis, and alumina by lead oxide, so as to produce a silicate having the formula $7PbO\ 18SiO_2$ (PbO, 59·1 per cent.; SiO_2, 40·9 per cent.) without prejudice to the insolubility. Such a product, however, would perhaps not be very fusible.

At the close of 1899 the Secretary of State intimated his intention to propose that after a certain period of time only such fritted lead should be employed in glazes as would

TABLE I.

Composition and Solubility of Lead Silicate Frits.

its Arranged in Order of Increasing Solubility.		Percentage Composition.							Sum of Equivalents of		Ratio. Bases as PbO.	PbO dissolved by 0·25 per cent. HCl.
ıce	Description.	PbO.	CaO.	MgO.	$(NaK)_2O$.	Al_2O_3.	B_2O_3.	SiO_2.	Bases.	Acids.	Acids as SiO_2.	
												Per Cent.
	Preparation from L_1 ..	18·04	8·43	0·06	4·39	7·74	6·14	55·23	81·3	60·4	1·35	None
	„ „ K_1 ..	21·83	8·54	0·12	3·80	7·43	3·84	54·44	83·6	57·6	1·45	Traces
	Boch's frit............	22·44	8·82	0·12	3·99	7·62	4·07	52·94	86·2	56·3	1·53	2·6
	Almström's frit	44·03	0·89	0·13	3·37	5·47	..	44·74	70·0	44·7	1·57	4·8
	Maastricht frit........	18·97	8·96	0·14	4·86	8·06	5·88	53·16	87·0	58·0	1·50	5·6
	Owen's glaze-frit......	16·23	8·54	0·19	9·20	10·34	5·83	49·67	100·1	54·7	1·83	6·6
	Owen's frit	45·77	1·16	0·14	7·09	10·04	..	35·66	93·4	35·7	2·62	23·8
	Doulton's frit.........	37·92	10·83	0·08	3·72	8·24	..	37·62	110·0	37·6	2·93	60·4
	Owen's lead silicate, No. 2 sample.	70·40	0·92	0·13	1·94	0·88	..	25·11	82·2	25·1	3·27	99·6

ıer cent. or less of the metal (calculated as oxide) sample was treated with 100 times its weight of r cent. HCl under prescribed conditions; and it gested that manufacturers should submit their ıs of suitable frits for examination at the Govern- oratory. Among these a set of six were handed contained between 24 and 53 per cent. of total lead. ıbility, in percentages of PbO calculated on the ılso the ratio above mentioned, are represented in

TABLE II.

No.	Soluble PbO.	Ratio.
	Per Cent.	
1	5·06	2·79
2	4·96	1·97
3	1·47	1·92
01	0·60	1·70
02	0·80	1·87
03	0·67	1·80

he exception of No. 1 these conformed to the limit of solubility; but although the ratios were an such as were obtained on practically insoluble cates (*cf.* Table I), the said ratios increased as h rises in the proportion of soluble lead.

Influence of Grinding upon Solubility.—It having been suggested that the degree of fineness to which a particular fritt was ground might materially affect the relative solubility of the lead in dilute HCl, experiments to elucidate this matter were instituted. A mill was employed which was represented by the potters to be capable of reducing the frit particles to a much finer state of subdivision than "any laboratory appliance used by chemists." In this apparatus a bulked sample of frit was ground for 24 hours, and the lead-solubility was determined as 2·8 per cent. The material was then certainly fine enough for industrial purposes. It was next ground again for 12 hours, when the solubility had risen to 3·6 per cent. Although this increase in solubility after prolonged grinding is greater than might be expected, it is much smaller than the amount suggested by the manufacturers; and seeing that these frits are only the lead portions of finished glazes, it is obvious that the finished glazes themselves, into the composition of which these frits may enter, must fall well within the limits of solubility laid down by the Home Office —Rule II. (2 per cent.). Prof. Thorpe has also examined a considerable number of finished glazes in the condition as regards fineness in which they were intended to be used. He has found the solubilities to range from 0·7 to 2·8 (mean 1·775) per cent.; so that there is abundant evidence that manufacturers can work, and are successfully working, with glazes conforming to Rule II.

In the 1899 Report, Drs. Thorpe and Oliver recommended that the amount of fritted lead in the dipping tub, calculated as PbO, should not exceed 12 per cent. of the dried materials. Further experience has shown this limit to be unnecessarily high. Leadless glazed ware, both china and earthen, are now on the markets, also coloured and printed tiles free from lead. Certain firms are prepared to supply such ware, even tiles which formerly were among the most heavily lead-coated articles made. Such leadless tiles are reported on satisfactorily by artists and pottery experts. The 2 per cent. limit of solubility is therefore not too stringent. To raise it to 5 per cent. would mean that one-third of the lead in an ordinary earthenware or china glaze might be extracted by very dilute acid at atmospheric temperature in one hour, whereas the stomach works hour after hour at blood heat. If, to meet the exceptional demand of a fraction of the trade, any modification of Rule II. be permitted, it should be confined to coloured glazes, and the maximum of solubility must be fixed at a certain point to be decided upon, which point should not exceed 5 per cent.

The Glazing of Red and Brown Ware.—Coarse red and brown ware is usually dipped or "swilled" internally with a white "glaze," and externally in a glaze consisting either of red lead or of "blue lead," *i.e.*, finely divided galena or natural lead sulphide. Plumbism is not unknown in this trade; but so far as can be discovered it has been invariably traced to the use of red lead. After examining various factories and consulting with different manufacturers, Dr. Thorpe comes to the following conclusions:—There may be difficulties in enforcing the use of fritted lead, and the circumstances of the case do not actually require it. There would be no practical hardship in requesting manufacturers who decline to adopt fritted leads to employ galena or blue lead in place of red or white lead. Galena is almost insoluble, and does not appear to produce plumbism. It is the cheapest compound of lead available, but it has to be ground, which is an inconvenience and a source of expense to the small potter. It evolves sulphur when fired, but the proportion of sulphur fumes is small in proportion to those emitted by the coal used in the oven. It gives a faint yellow or brownish-yellow tinge to the glaze, but this is not objectionable in the industry.—F. H. L.

Lead Silicates in relation to Pottery Manufacture. T. E. Thorpe and C. Simmonds. Proc. Chem. Soc. **12**, [237], 113—114.

As is well known, the use of oxides and basic carbonates of lead in glazes employed by potters is attended with danger to the health of the workpeople on account of the ready solubility of these compounds in the acids of the animal organism. Attention was drawn to the fact that lead silicates or boro-silicates, or complex silicates of lead and other metals, can be used instead of the oxides or carbonates as a means of introducing lead into the glaze. On the Continent this use of lead silicates is far more common than in England, and it is generally recognised that their employment has greatly tended to minimise the risk of lead-poisoning. This is due to the fact that the lead silicates used in the continental factories are of a high degree of insolubility so far as the lead is concerned.

On examining a number of lead silicates used or proposed for use in England, it was found that many were attacked by dilute acids practically to the same extent as the oxides or carbonates. That is, they yielded the whole, or nearly the whole, of their lead to the action of acids comparable with the acids found in the human system—such as, for example, the hydrochloric acid of the gastric juice. Other specimens were more resistant, but still yielded a large proportion of their lead. On the other hand, the specimens obtained from the Continent, as well as many which have recently been produced by English manufacturers, gave up only small quantities of lead when tested under the special conditions described.

A large number of specimens was therefore analysed in order to ascertain, if possible, to what variations in chemical composition these differences of behaviour were due.

The condition on which the insolubility of the lead depends was found to be, primarily, the existence of a certain ratio between the whole of the base-oxides on one hand, and the whole of the acid-oxides on the ot This becomes eventually referable to the hypothe silicic acids from which the silicates may be considere be derived. For working purposes, the relation ma more simply expressed as.

$$\frac{\text{sum of percentages of base oxides, expressed as PbO}}{\text{sum of percentages of acid-oxides, expressed as SiO}_2},$$

or, alternatively, as

$$\frac{\text{number of acid molecules}}{\text{number of base molecules}}$$

the latter ratio being obtained by dividing the perce of each oxide by its molecular weight, and then div the sum of the quotients for the acid-oxides by the s the quotients for the base-oxides.

Provided the ratio falls within certain definite limit amount of lead extracted under the prescribed conditi always small. It does not depend upon the quanti lead in the silicate, which may have any value up to 55 per cent. The other bases usually present (alumina, and alkalis) may also vary considerably, repl one another and also the lead oxide, within very limits without prejudice to the insolubility of the lead.

Analyses and formulæ of a number of silicates given, together with tables showing the dependence solubility of the lead in the silicates upon the ratios tioned above.

In applying the acid tests, it was stated by one authors in discussion, that an excess of acid was nece for otherwise misleading results were obtained; thi due to the curious fact that certain kinds of lead s reacted with a neutral solution of lead chloride and re the lead from solution, probably as an insoluble oxych The volume of acid selected must be sufficiently gr ensure that there should be no very considerable wea of its strength by the action of the various acid-neutr constituents, of which, it should be borne in mind might be several besides the lead.

As regards fineness of subdivision, some of the mens were sent ready ground, and were stated manufacturers to be in the condition in which they be used for glazing pottery ware; these were te received. The other specimens were ground to an i able powder in an agate mortar. Various solven been experimented with—for example, lactic and acids—but the results threw no greater light on the than those obtained with hydrochloric acid; conse the experiments were not persisted in. Salt soluti not been tried, but in Germany there was a provisi such ware should not give up lead when boiled for hour with 4 per cent. acetic acid.

With reference to the state in which the lead when dissolved from a silicate, whether as a lead si as lead chloride, complete analyses of several of t tions had been made, and some small quantity of si always present. The lead, or a part of it, may th perhaps, have dissolved as a basic silicate.

PATENTS.

Electrical Glass Furnace. A. Voelker, Cologn Pat. 23,903, Dec. 31, 1900.

The charge is introduced into several radial sloping towards the centre, and is melted by generated by electric arcs mounted in these passag molten material descends into a refining pot, wh exposed to the influence of an electric current, and thence into a working-out basin. The combusti evolved in the passages are conveyed to a burner u the basin, where they are mixed with air and c thus heating the contents of same.—C. S.

Ceramic Ware, Glass Ware, and like Ware; M Apparatus for Dipping ——, into Glaze o S. H. Ellis, Hanley, and T. Holt, Hartshill, Trent. Eng. Pat. 5673, March 27, 1900.

The claims include: a process for dipping the revolving it into the glaze, then rotating it whilst ein, and finally revolving it back out of the glaze; a ing machine, consisting of a tub, a horizontal bracket nted thereon and capable of turning about half-way nd, headed shafts mounted on the bracket at right es to and geared to the horizontal shaft, and cages ng on and retained by the heads, the cages consisting of cal bars with projections, end rings for securing the , and a door of hinged vertical bars.—C. S.

s; Furnace for use in the Manufacture of Press ——. Zeiller, Munich, Germany. Eng. Pat. 6482, April 6, 00.

heating flame is produced in a smoke-consuming fur- , of known construction, and is introduced through a ber of small orifices in the back wall of the heating ber, whilst the gases of combustion are drawn off in a manner that the flame is compelled to surround the les placed in the heating chamber.—C. S.

s, Yellow, Red, Brown, and Black; Colouring ——. Meurer Cologne. Eng. Pat. 22,596, Dec. 11, 1900.

inventor employs lignite, preferably Rhenish lignite, in ely-powdered and sifted condition, moistened and d with the charge of glass metal previous to firing. It imed that, for colouring white glass a medium brown, 3½ per cent. of this lignite will produce the same as 10 per cent. of manganese peroxide. In presence n, 2½ per cent. of lignite will give a medium to dark n, and 5 to 10 per cent. will stain the glass so power- as to appear black and non-transparent.—C. S.

Glass Facing Tiles or Plates. A. J. Davis, Stourbridge, Staffs. Eng. Pat. 458, Jan. 8, 1901.

gh, spongy, acid-resisting surface is produced on the of the opal glass by coating it with a saturated solution dium thiosulphate, and exposing it to artificial heat. es are then cut into the rough surface, by means of a , or wheel, and emery or sand, in order to make a t grip for the cement.—C. S.

Mirrors with Translucent Colour Decorations. Wagner and G. Lorenz, Vienna. Eng. Pat. 1459, . 22, 1901.

process is one for effecting the rapid removal of the r foil from glass mirrors, intended for the application nslucent colour decorations, and consists in covering arts to be removed with a slow-drying composition oftens when heated, *viz.*, a mixture of printer's ink, in, oil, and some binding material; the whole back mirror is then covered with a layer of quick-drying n, which hardens on heating, whilst the former sition softens and can be rubbed off with a cloth, the foil exposed ready for removal by any known l.—C. S.

s of Metals and Metalloids, or Compounds of the ; Treatment of ——*; and Products obtained there-* . C. G. Sudre and C. V. Thierry, Paris. Eng. Pat. , Jan. 22, 1901.

s of metals and metalloids (SiO_2, MgO, Fe_2O_3, &c.) elted in a vacuum or neutral atmosphere by the heat of the electric arc, and cooled quickly to prevent lisation; such oxides form products capable of re- glass, porcelain, metals, &c., in the arts.—J. W. H.

ain, Glass, Enamel, or the like; Pigments, Colouring ers, or "Lustres" for or on ——. L. Ziegenbruch, stadt, Germany. Eng. Pat. 9353, May 21, 1900.

ons of boric esters are incorporated with the pig- or glazes, and, in the firing process, form borates, eact on the metallic oxides or metals present. Thus, ustre, by this means, gives a blue on enamel, whilst tres furnish rose-pink to purple shades according to ount of metal present.—C. S.

Pottery and Similar Kilns; Improved Method and Means for Indicating the Temperatures in ——. H. Watkin, Burslem. Eng. Pat. 6288, April 4, 1900.

The means for indicating the temperatures, consists of small refractory trays in the saggars of the kiln or in the kiln itself, each provided with recesses containing test blocks of convenient form. These test blocks are made so as to fuse at certain pre-arranged temperatures so that their fusion, partial fusion, or non-fusion, respectively, indicates the temperature attained, &c.

Potters' Ovens or Kilns. W. Bettaney and W. F. Bettaney, Stoke-on-Trent. Eng. Pat. 10,017, May 31, 1900.

An upright wall of firebrick is built in each firing hole, ash-pit, and charging hole of potters' kilns, to secure a more even distribution of heat.—J. W. H.

Bricks, Tiles, Pipes, and other Articles from Plastic Substances; Manufacture of ——. H. Coiffier and E. Viéville, of Neuilly-Plaisance, and A. Majesté, Neuilly-sur Seine, France. Eng. Pat. 10,218, June 2, 1900.

A machine for kneading and moulding plastic substances is claimed, in which the stones are automatically eliminated, and in which the parts are so arranged that obstruction cannot take place.—J. W. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Insulating Material; Reconstructed Granite as an ——. J. Franklin Inst. 1901, **151**, [4], 309–312.

The Franklin Institute Committee on Science and the Arts has investigated the merits of a new insulating material termed reconstructed granite by its inventors, T. W. Blakey and W. Courtenay (see this Journal, 1898, 1150). The claims made for the material are as follows:—(1) It is absolutely fireproof. (2) It resists the action of all solvents and acids except hydrofluoric acid, which attacks it superficially. (3) It is frost-proof. (4) It is non-porous, and consequently does not absorb moisture. (5) It has a high crushing and tensile strength. (6) It has high insulating qualities.

The committee reports that it believes the new material to be an invention of decided commercial importance. Claims (1), (2), and (6) are stated to be substantially correct. As to Claim (4): A piece of the material, on being kept in water from Nov. 1899 to Oct. 1900, absorbed 0·76 per cent. of its weight of moisture. The crushing strength in three tests was 5,312, 12,290, and 11,612 lb. per sq. in. respectively, and the tensile strength in four tests, 1,005, 820, 973, and 867 lb. per sq. in. respectively.—A. S.

Lime; Valuation of ——*[for Mortar]*. Bender. Chem. Zeit. Rep. **25**, [22], 82. Thonind. Zeit. 1901, **25**, 42.

Magnesia limes (used in mortar making) will carry a larger proportion of sand than pure limes. Slaked dry, 1 volume of well-burnt magnesia lime yields 2 volumes of slaked powder, and may be mixed with 6 volumes of sand. Such mortar, after 28 days' setting, has a tensile strength of 4—7 kilos. per sq. cm., and a compressive strength of 10—15 kilos. per sq. cm.; mortars made from pure limes under similar conditions have a tensile strength of 1—3·5 kilos. per sq. cm., and a compressive strength of 3—15 kilos. per sq. cm. The composition of such magnesia lime is: CaO, 52—75 per cent.; MgO, 14—37 per cent.; $Al_2O_3.Fe_2O_3$, 2—10 per cent.; SiO_2, 1—4 per cent.
—J. W. H.

Cement; Water-Glass as an Addition to ——. H. Bornträger. Oesterr. Chem.-Zeit. **4**, 81—83. Chem. Centr. 1901, **1**, [12], 708.

The author has observed that an addition of water-glass to cement (20 parts of water-glass, sp. gr. 1·4; 100 parts of cement; 35—100 parts of water) improves the agglutination of the latter, and, so long as the amount of water remains below 100 per cent., the mixture can be satisfactorily moulded, but the cements are softer, more voluminous, and bear a greater resemblance to gypsum. If more than 100 per cent. of water be used, the cement separates into a gelatinous mass, probably containing hydrate of alumina, and a layer of cement retaining about 170 per cent. of water, which hardens on exposure, but later becomes fissured.—A. S.

PATENTS.

Artificial Stone; Manufacture of ——. H. H. Lake, London. From D. Wachtel and Co., Berlin. Eng. Pat. 5995, March 30, 1900.

The invention relates to the manufacture of artificial stone from quartz, sand, or silicious material, and hydrate of lime, under high pressure; the hardening is carried out in one continuous operation, steam being developed in the pressure vessel in proportion to the increasing temperature of the blocks; after hardening, the blocks are treated with a solution of carbonate of ammonia.—J. W. H.

Cements used for Constructive and other Purposes, including Portland, Roman, and other Cements, and Concrete or Mixtures in which Cements for Constructive and other Purposes are used; Improved Setting for ——. W. Wright, London. Eng. Pat. 5659, March 26, 1900.

Carbonate of potash or other alkalis are added to cement to improve its setting qualities; the use of "sulphur combined with a strong alkali" is also claimed for the same purpose.—J. W. H.

Cement; Manufacture of ——. W. P. Thompson, London. From the firm of Terranova Industrie (C. A. Kapferer and W. Schleuning), Munich, Germany. Eng. Pat. 6238, April 3, 1900.

The invention relates to a modification of a process of making white cement (Eng. Pat. 17,853, 1899; see this Journal, 1900, 748), in which felspar, added to supply silicic acid and to serve as a flux, is replaced by acid silicate frittings or glass free from iron.—J. W. H.

X.—METALLURGY.

Magnetic Separation; The Wetherill Process of ——. W. R. Ingalls. Eng. and Mining J. 1901, **71**, [13], 399. (See also this Journal, 1900, 1115.)

The author communicates an abstract of a paper read by M. Smits before the Congrès International des Mines et de la Metallurgie de l'Exposition, Paris, 1900, on the Wetherill process of magnetic separation.

Minerals may be classed as strongly magnetic, feebly magnetic and non-magnetic. Pluecker has given the following data as to the magnetic permeability of various minerals compared with that of metallic iron, which is valued at 100,000; Magnetite, 40,227; siderite, 761; hematite, 714; limonite, 296; hausmannite (Mn_3O_4), 167; but these figures are only of general value, as the magnetic permeability varies in the same mineral according to its chemical composition. Langguth has stated ("Fascicule de l'Electrochemie," No. 23 of Dec. 7, 1899), that the permeability of blende varies according to its content of FeS or MnS. Two plants, one with a capacity of 30,000—35,000 metric tons per annum, the other with a capacity of 20,000 tons, have been installed in Australia, for the treatment by the Wetherill process, of the tailings of the dressing works of Broken Hill, containing a mixture of galena, blende, and garnet. These tailings assay from 25 to 30 per cent. of zinc, 8—10 per cent. of lead, and 300—400 grms. of silver per metric ton. They are dried, separated into three or four sizes, and the small proportion which is of more than 2·8 mm. size is crushed. The dry sized mineral is delivered to the Wetherill separators, arranged in series. The first machine of each series separates the garnet and rhodonite, amounting to 15—20 per cent. of the weight of the crude mineral. The losses in blende and argentiferous galena in effecting the first separation are very small. The tailings from the machines pass to others, which have a more powerful n
netic field, and separate, as the magnetic product, ble
assaying from 41—45 per cent. of zinc, and represen
50—75 per cent. of the weight of the crude mineral;
blende still contains about 8—10 per cent. of lead, and
—400 grms. of silver per ton. As diamagnetic prod
there is obtained a mixture of quartz with 10—20 per
of lead, 10—20 per cent. of zinc and 300—500 grms
silver per ton, this product constituting about 20 per
of the weight of the original material; it is subjected
further process of gravity separation in the usual man
yielding a concentrated product of argentiferous gal
The total recovery of zinc varies from 80 to 90 per cen
that contained in the crude tailings. The cost of the
cess is a little less than the cost of wet concentration in
ordinary manner as practised at Broken Hill.—A. S.

Carbon; Reducing Action of ——, *on Metallic Compo*
O. Boudonard. Bull. Soc. Chim. **25**, [6], 282—28

The action of carbon on different metallic compounds d
with the nature of the metal and the temperature at w
the reaction takes place. In the experiments perfor
an intimate mixture (obtained by incorporating the ma
in a small roller mill) of the metallic compound and
coal in excess, was employed. The latter was wood cha
which had been heated to redness in a stream of chlorin
then washed, and dried. The mixture was introduced
a porcelain tube, which it filled completely. The tem
ture was taken by means of a thermo-electric coupl
the liberated gases were collected.

Metallic Compound.	Temperature.	CO_2.	C
	° C.	Per Cent.	Per
$CaCO_3$	650	34·2	6
„	800	22·0	7
$BaCO_3$	800	5·0	9
$BaSO_4$	800	17·1	8
ZnO	1125—1150	1·0	9
NiO	800	98·9	
„	550	98·3	
CuO	445	99·0	

The results in general confirm Berthelot's work
reduction of alkaline sulphates by hydrogen and c
The reducing action is not due to the carbon itself,
must be considered as a polymeric substance, but to
pound containing normally a single atom of carbon,
example, carbonic oxide.—T. A. L.

Iron; Films of Oxide on Sheet ——. H. Kamps.
Zeit. Rep. **25**, [22], 83. Stahl u. Eisen, 1901, **21**,

The scales formed during the rolling of sheet iron
of a mixture, in varying proportions, of ferrous and
oxides; annealing in closed boxes produces a sca
remains firmly adherent to the metal. The thick
the scale is an important factor when making m
tests of the material, and the author has devised a
of determining it, which depends on the differe
permeability between the metal and scale. A test i
with the ordinary sheet, and repeated after the sc
been removed by pickling.—J. W. H.

Vanadium Iron. J. Baxeres. Chem. Zeit. Rep. **25**
83. Oesterr. Zeit. Berg- u. Hütt. 1901, **49**, 9

The addition of 0·5 per cent. of vanadium is
increase the tensile strength of soft iron from 39
61 kilos. per sq. cm., with an elongation of 10 pe
0·5 kilo. of vanadium added to one ton of iron r
tensile strength from 1,200 kilos. to 2,000 kilos. per
Very minute additions to steel are said to consider
crease the malleability and hardness after ten
Waggon wheels made of such steel are, it is state
durable than ordinary ones. Vanadium iron made
author's method contains 29·1 per cent. of vanadium
—J.

on Silicides. Ad. Jouve. Bull. Soc. Chim. **25**, [6], 290—293.

author concludes, from analyses of various compounds on and silicon, that commercial ferrosilicons contain silicon in mixtures of two definite compounds, Fe_2Si FeSi, together with varying proportions of iron or on. The crystallised ferrosilicons approximating to contain carbon. For example, one of such samples d, Fe = 69·33, Si = 28·61, C = 2·02 per cent. acing the carbon (C = 12) by its equivalent in silicon = 28) and subtracting this value from the theoretical 33 per cent.), a number is arrived at (28·63) which is close to that found for silicon. Hence the carbon ars to form an integral part of the crystal and to ally substitate silicon, but it remains to be determined nat form it actually exists.—T. A. L.

osilicons; Constituents of Industrial ——. P. Lebeau. Comptes Rend. **132**, [11], 681—683.

EN masses of crystals occur frequently in cavities in trial ferrosilicons; these all fall short in silicon con- of SiFe, and microscopic analysis shows them to be nted with a matrix of a different material, from which s proved impracticable to separate them so as to tain the composition of the crystals alone. They are ubt SiFe. The authors have obtained from a 35 per ferrosilicon, by alternate treatments with acid and , a crystalline (tetrahedral) non-magnetic residue, the ty and analysis of which prove it to be FeSi.

rbon in these alloys is almost always present in the itic condition. Where amorphous carbon has been , manganese has also been present. As carbon might conceivably be there as carbon silicide, the author ders the statement that carbon may in the isomorphous replace the silicon in the iron silicides, to be quite ved.

heating iron in the electric furnace with a large s of silicon, the author has obtained, in crystals, the nce Si_2Fe. He therefore considers it established that r all of the compounds $SiFe_2$, SiFe, Si_2Fe may exist pecimen of industrial ferrosilicon.—J. T. D.

Industry in Japan. E. Bahlsen. Berg- und Hütten- n. Zeit. 1901, **60**, 101, 113; through Chem. Zeit. Rep. 1, **25**, [26], 99.

97 the production of gold in Japan amounted to kilos., the principal group of mines being situated in land of Sado. The ore consists of auriferous and iferous quartzes, with small proportions of lead and . The rich ores are treated by the Washoe process, orer ones by stamp-mill amalgamation, and the richest y smelting. In the first case, the ores are stamped d treated in MacCormac pans with mercury, copper te, and salt for six hours. The lower grade ores are on amalgamated copper plates in Duncan con- ors. The residues from these and from the Washoe s are treated by the Kiss process—chlorination, ion with thiosulphate, and precipitation by sulphide. smelting the richest ores, the precipitates from the ocess and cupreous pyrites are mixed with dolomite ke. If copper ore be not available, lead is employed. lso occurs in the island of Kyushu, where there are rable deposits, which are not worked regularly for of capital. In the goldfields of Yamagano, the s worked are virgin gold, silver glance, and pyrites. ld in the first grade ores amounts to about 175 grms. , and in the second grade to about 40 grms. per A large proportion of the total gold production rom the silver mines of Junai and Ikuno.—J. F. B.

malgams; Nature of ——. H. Fay and E. North. Amer. Chem. J. 1901, **25**, [3], 216—231.

thors have observed the "cooling and warming" of lead-mercury mixtures, and are led to believe that no eutectic amalgam with a freezing point below that ury. Commencing at the mercury end, the additions produce practically no alteration in the lower freezing point of about − 38° C. until the mixture contains 65 per cent. of lead, when that lower freezing point disappears, and a new freezing point is suddenly assumed, *viz.* + 177° C., where the influence is not that of lead upon mercury, but of mercury upon lead. The freezing point after this rises with increased percentages of lead until that of lead itself is reached. The experiments show that in these mixtures a compound Pb_2Hg is produced. This is soluble in and isomorphous with lead, and consequently lowers its freezing point as the quantity formed increases, until the mixture contains about 35 per cent. of mercury; but it is practically insoluble in mercury, and hence separates out from the mixtures containing excess of mercury, and does not lower their freezing points. None of the latter amalgams, where the mercury became the solvent, were entirely liquid. They consisted of a liquid portion and a pasty granular portion, which, although apparently dissolved by shaking, could be readily removed and partially purified. The resulting compound Pb_2Hg could not be obtained absolutely pure, owing to the mechanical retention of mercury, the analysis varying from 66 to 68 per cent. of lead. The microscopical examination supported its isomorphism with lead. The solid amalgams were etched and examined for crystalline structure, but in no case was there a separation into two constituents, which would be expected if lead had separated as pure solvent, or if there had been a eutectic mixture.—A. W.

Copper Ores; Leaching ——, *with Sulphurous Acid.* E. P. Jennings. Eng. and Mining J. 1901, **71**, [13], 400.

J. W. Neill has patented in the United States a process of leaching copper ores with sulphurous acid. The process is based on the fact that the native oxides and carbonates of copper are readily soluble in water containing sulphurous acid, with the formation of cuprous sulphite, whilst if this solution be heated to expel the excess of sulphurous acid, the copper is precipitated as cupro-cuprous sulphite, $CuSO_3.Cu_2SO_3.2H_2O$. This compound forms a heavy crystalline precipitate of a dark red colour, which settles readily from the solution, and can be washed by decantation, dried and reduced to metallic copper by fusing on the hearth of a reverberatory furnace. The process is suitable both for sulphide and oxidised ores, but the former must first be roasted to convert the copper compounds into oxide; the presence of lime and magnesia is objectionable, as they dissolve in sulphurous acid solution, and although they do not materially interfere with the reactions, they increase the cost of the process by consuming a certain amount of sulphur. The sulphurous acid is produced either by burning pyrites or sulphur, but when the original ore is a sulphide, it will furnish, by roasting, sufficient sulphurous acid for its own treatment. In practice, about 1 lb. of sulphur is required to treat 3 lb. of copper contained in the ore.

The ore is crushed to pass a 20-mesh screen, then placed in covered tanks filled with water containing sulphurous acid, and kept in a state of agitation by forcing a current of sulphur dioxide through the solution. After from one to four hours, according to the physical condition of the ore, the charge is drawn into a settling tank, and the solution is decanted into a filter press, where the slimes are separated, and thence it is forced to the precipitating tank. The sands in the settling tank and the slimes in the filter press are washed once with sulphurous acid solution, which is afterwards used in the treatment of the next charge. The dissolving tanks are arranged in series, one above the other, the sulphur dioxide entering the lowest one and passing through each one in turn, any excess being finally absorbed in a condensing tower.

The solution in the precipitation tank is heated by means of a steam coil, through which the exhaust steam from the crushing plant is passed. The precipitated cupro-cuprous sulphite settles rapidly to the bottom of the tank, and the solution is run while still hot into another tank, where the small amount of copper present in solution as sulphate, is separated by the addition of a little lime. The precipitates are dried and smelted to fine copper. The plant can be so arranged that nearly all the sulphurous acid except that combined with the copper can be recovered and used again.

The advantages claimed for the process over the sulphuric acid or hydrochloric acid method are: (1.) The cost of the reagent is low; only a relatively small amount is used, and it can be generated on the spot by the use of a very simple plant. (2.) The copper is separated from the solution by heat alone. (3.) The copper produced is practically free from impurities.

In experiments made by the author on ores of the Triassic sandstone of Northern Arizona, 95 per cent. of the copper was extracted by leaching the ore for four hours. The ore was a mixture of blue and green carbonates, with some oxide disseminated in sandstone, the grains of which were firmly cemented by a secondary deposition of silica, making the rock harder to crush and much more difficult to leach than an open-grained sandstone would have been.—A. S.

Copper; Occlusion of Gases in ——, and Influence of Tin, Phosphorus, and Antimony upon ——. W. Stahl. Chem. Zeit. Rep. **25**, [22], 83. Berg- u. Hüttenmänn. Zeit. [1901], **60**, 77.

Copper absorbs sulphur dioxide, carbon mon-oxide, and hydrogen; oxygen is most probably only absorbed at high temperatures. The power of occlusion increases with the purity of the metal and the temperature; this explains the varying specific gravities of the same copper cast at different temperatures.

During "poling" the absorption of hydrogen and carbon monoxide takes place, with the result that metal of a high density cannot be obtained. To get rid of these dissolved gases, lead, carbon dioxide, phosphorus, tin, antimony, and arsenic are used. A very small quantity of either tin or antimony increases the density of the metal, whilst 0·065 per cent. of phosphorus produces copper of the highest possible density.—J. W. H.

Uranium; Preparation of ——. J. Aloy. Bull. Soc. Chim. **25**, [7], 344—346.

Moissan has already prepared uranium in the electric furnace, using currents of 500 to 800 ampères at 45 to 55 volts. The author, trying lesser currents, has found that satisfactory results are obtained (on the scale of 30 or 40 grms. of substance) with 100 ampères, but that currents of 15 to 25 ampères give no yield of product. Uranium is also reduced from its oxide U_3O_8 by heating with magnesium or (preferably, as the action is more manageable) aluminium; but the separation of the metal from the other products of the action is a matter of great difficulty.

A mixture of UO_2 (prepared at as low a temperature as possible by reduction of UO_3) and sugar charcoal, heated in a clay crucible to low redness, and then inflamed by a mixture of magnesium and barium peroxide, enters completely into reaction, and a button of fused metal is left at the bottom of the crucible. This always contains some aluminium, but contains not less than 96 to 97 per cent. of uranium.—J. T. D.

Petroleum for Metallurgical Purposes. A. v. Forselles. *See under* II., *page* 461.

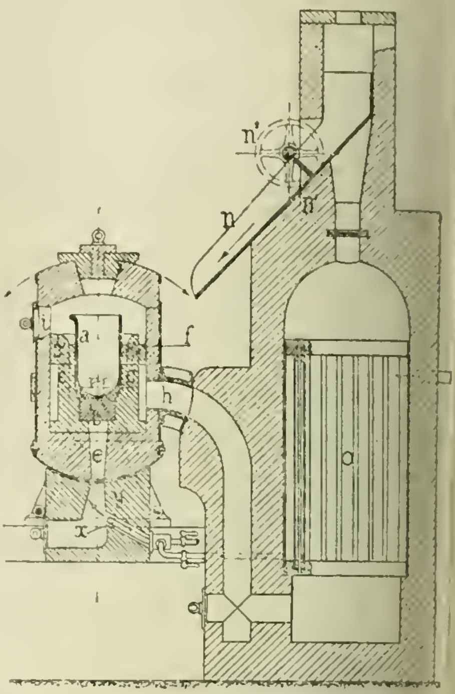
Steel: Determination of Aluminium in ——. E. Spatz. *See under* XXIII., *page* 507.

Platinum-Gold-Silver Assay. Oehmichen. Chem. Zeit. Rep. 1901, **25**, [28], 104. *See under* XXIII., *page* 507.

PATENTS.

Furnace; Improved Melting ——. J. Essner and E. Laurans, both of Paris. Eng. Pat. 6554, April 7, 1900.

A furnace for use with gas under pressure for melting metals, more particularly bronze, brass, copper, cast iron, and steel, and allowing all chemical operations to be performed in a crucible at high temperatures is claimed. It is constructed as shown by the accompanying drawing. T crucible *a* rests upon a stand *b*, and is supported by refr tory side walls *c*, which prevent its movement when in position, either in working or discharging. An outer wa is provided with a closable aperture *i* for discharging. side wall *c* is made up of an annular piece containin supports c^1, c^3, &c., which serve as keys, so that the pass upwards between the annular piece and the cr and then through the radial spaces between thes supports. The hot waste gases pass down outsi annular piece and between it and the outer wall exit *h*, which leads to a regenerator o, provided with which can be arranged for supplying both the air a gas separately. The heated gas and air meet at the *x*, and the flames pass up into the central conical The crucible furnace is supported on trunnions, by the whole of it can be oscillated for pouring throu tilting back towards the shoot *n* for charging throu opening above the crucible. The shoot is built i extension at the top of the regenerator o, so that the can also receive a preliminary warming from the wast while it is held in the upper part by a plate n^1 open a hand wheel n^2. The advantages claimed are:—th ing of the crucible by both contact and radiation, the life and larger size of the crucible, the use of various compositions to produce an oxidising, redu neutral medium, the triple utilisation of the waste beating the air, the gas, and the materials, and the of the materials from the shoot on the side of the instead of on to the bottom, whereby breakage avoided.—A. W.



Steel; Direct Continuous Process for the Manufa Open-Hearth ——. J. L. Stevenson, Middle Eng. Pat. 22,826, Dec. 14, 1900.

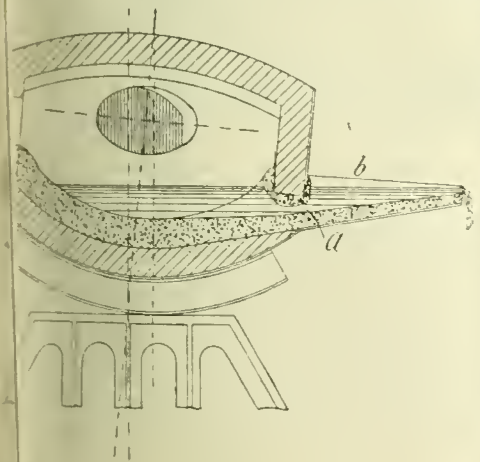
The process consists of running into a steel furna tinuous stream of unrefined or partly refined m conversion into steel and mixing it with metal already under treatment, and continuously or inter casting part of the bath, preferably the bottom required by a specially constructed furnace. Th can be in combination with a blast furnace or cu 'er, mixer, or other apparatus, so that the metal is ied from the cupola to the steel furnace in a molten either continuously or intermittently. The metal the mixer may also be desiliconised in another furnace ous to running it into the steel furnace, if necessary. furnaces for this process are claimed under two ite patents. (See succeeding two abstracts.)—A. W.

Furnaces, and Casting the Metal therefrom. J. L. venson, Middlesbrough. Eng. Pat. 22,827, Dec. 14, 0.

blast furnace or cupola for use in the continuous s (see preceding abstract) has no crucible, whilst the or bottom is only a few inches below the tuyères, opes towards the outlet. The outlet is connected with l or other receiver, or with the steel furnace, by a d blast-tight runner. Claims are made for the adap- this means of continuously running out the metal as nade into a receiver, and thence to a ladle, casting ne, or pig bed, both to blast furnaces and cupolas of linary type.—A. W.

Hearth Tilting Furnaces. J. L. Stevenson, Middlesbrough. Eng. Pat. 22,828, Dec. 14, 1900.

utlet or tapping hole is constructed level with the of the furnace bath, or with the lowest portion of l in an open-hearth tilting furnace, so that the lowest of the metal only may be taken out, the remainder eft in for further refinement and the slag removed in al way. In connection with the outlet *a* is a casting ng spout *b* fixed to the furnace casing, which rises as the furnace is tilted. The end of the spout is, ormal position, above the top level of the bath, so removing the tamping, the metal does not overflow e whole is tilted. After tapping, the remaining s tilted back into the furnace, the outlet tamped up h material run in for treatment in accordance with tinuous process described in the preceding two .—A. W.



Smelting Furnace. O. Forsbach and E. Clere, eim-on-the-Rhine, Germany. Eng. Pat. 22,777, 3, 1900.

re two crucibles arranged one above the other, the e serving to feed the lower one, and covered when a close-fitting lid. The heating gases and flames und the lower crucible, and then either completely the upper crucible to a side outlet near the top of it, ound the upper one and then downwards through yer in the upper crucible to the outlet. To obtain et flames, the air supply tube enters the base of ace immediately below a perforated plate, a short above which is the usual grate.—R. S.

Sulphide Ores and Metallic Sulphides; Metallurgical Treatment of ——. L. M. Bullier and The Soc. des Carb. Métalliques, Paris. Eng. Pat. 9046, 1900 (Nov. 13, 1899, claimed).

The sulphides with or without previous roasting are fused at a clear red heat with granulated calcium carbide and suitable flux for about one hour, by which means copper and certain other metals may be separated in an entirely novel manner.

In treating volatile metals a closed apparatus is used.
—J. H. C.

Lead, Silver, Gold, and other Metals; Process for the Elimination of Zinc, from Sulphide Ores, and the Extraction and Recovery of ——, *therefrom, and from other Sulphide Ores.* J. C. Clancy and L. W. Marsland, Sydney. Eng. Pat. 4039, 1901 (Nov. 26, 1900, claimed).

The pulverised ore is roasted (1) with the addition of lead sulphate at a temperature of 950° to 1,500° C., or (2) with a further addition of lime. The roasted ore is transferred while still hot to a vat containing sulphuric acid 10 parts, and water 90 parts, and agitated therein until the zinc is dissolved. The ore and solution are then discharged and made to flow over concentrating tables to separate oxide of lead, which is afterwards converted into lead sulphate and used for treatment of a further portion of ore. The ore and solution which pass over the table, are then led into a settling vat from which the solution containing the zinc as sulphate is drawn off for subsequent treatment. The deposit in the settling vat is washed with another hot solution, consisting of 2 parts of sulphuric acid and 98 parts of water to remove the remainder of the zinc, and it is finally washed with water; dried and smelted for lead and silver.

The zinc may be recovered from the zinc solution by soda or other alkali, or by electrolysis. A slight modification of the process is recommended when the original ore contains no zinc, or less than 10 per cent.—J. H. C.

Aluminium Parts; Composition of Matter for Uniting or Soldering ——. E. M. Totten, Buffalo, U.S.A. Eng. Pat. 3009, Feb. 12, 1901.

The soldering compound is prepared, as an article of manufacture, of the following substances in about the proportions named:—aluminium, 20 per cent.; tin, 38 per cent.; zinc, 40 per cent.; and a "hydrocarbon," such as fat, wax, paraffin, &c., 2 per cent. The first two metals are melted together and the zinc added thereto, after which, and whilst still hot, the "hydrocarbon" is mixed in to form a homogeneous mass which can be used direct for soldering aluminium parts without the necessity of scraping and preparing the surfaces.—A. W.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Fluorine; Poulenc and Meslan's Apparatus for the [*Electrolytic*] *Manufacture of* ——. Brochet. Électricien, 1900, [20], 273—275.

Poulenc and Meslan have patented an apparatus, constructed mainly of copper, Moissan having discovered that copper may be used in place of platinum for the construction of the electrolytic vessels and tubes for the production of fluorine. The anode, which consists of a long narrow copper box covered on two sides with platinum plates, rests in a rectangular copper vessel provided above with a tube for the removal of fluorine, and perforated in its lower part with V-shaped holes, so that it plays the part of a porous diaphragm. This anode chamber rests in the outer cathode vessel, which is of copper, and is furnished with a cover and tube to remove the hydrogen liberated. The anode chamber is insulated from the outer vessel by a layer of caoutchouc, but this material does not come in contact with the fluorine.

The whole apparatus is immersed in a freezing mixture, and a cooling liquid is constantly circulated through the hollow anodes, whilst the gases evolved are passed through tubes surrounded by a freezing mixture, in order to condense any hydrofluoric acid present. The electrolyte used is a solution of potassium fluoride in anhydrous hydrofluoric acid.
—A. S.

Mica; Influence of Oil on the Insulating Properties of ——. F. Drouin. Chem. Zeit. Rep 25, [22]. 83, 84. L'Electricien, 1901, 21, 116.

According to Moloney the contact of mica with oil reduces the insulating properties of the former considerably. Two plates, one of which stood 16,000 volts and the other 8,000 volts (alternating current), after being soaked in paraffin oil, broke down under 9.000 and 4,000 volts respectively; other oils gave similar results, but contact with water did not impair the insulation.—J. W. H.

Toluene; Electrolytic Oxidation of ——. K. Puls.
See under IV., *page* 464.

Conductivities of Solutions of Potassium Chloride, Hydrogen Chloride, and Potassium Hydroxide; Influence of Cane Sugar on the ——, *with Evidence of Salt Formation in the Last Case.* C. J. Martin and O. Masson. Proc. Chem. Soc. 1901, 17, [236], 91.

Sugar solution is generally considered to be a non-electrolyte, but in view of the fact that saccharates exist, it may more probably be viewed as a very slightly ionised acid. To test this point, the conductivities of solutions of hydrogen chloride and of potassium chloride containing varying amounts of sugar were determined, and it was found that the conductivity did not appreciably differ from that of aqueous solutions of these compounds, except in so far as the viscosity of the sugar solution had to be allowed for. On the other hand, when sodium hydroxide was added to sugar solutions of different strengths, it was obvious that the sugar took part in the conduction, and this is attributable to the formation of sodium saccharate, which, like other salts, is largely ionised, in dilute solution. The conductivity, even in this last case, was of course influenced by the viscosity of the sugar solution, but even after allowing for this, the proof of ionisation was unmistakable.

Beverages and Liquids by means of Manganates under Influence of the Electric Current; Purifying —— W. P. Thompson. Eng. Pat. 3313, 1901.
See under XVIII. A., *page* 494.

Essential Oils; Improving Odour of ——. J. H. Lavollay and G. E. Bourgoin.
See under XX., *page* 503.

Alkali Process; Outhenin-Chalandre, Electrolytic ——. J. B. C. Kershaw.
See under VII., *page* 473.

Graphite Produced by the Acheson Process. F. A. J. Fitzgerald.
See page 443.

PATENTS.

Accumulator Electrode; Negative ——. E. W. Jungner, Stockholm, Sweden. Eng. Pat. 7768, April 26, 1900.

A negative electrode, more especially adapted for the accumulator described in Eng. Pat. 7892, 1899 (this Journal, 1900, 450), is formed by mixing or stirring cadmium oxide with water to which a small quantity of ammonium chloride may have been added, and spreading it on a network or perforated plate not affected by alkali. It is then dried and immersed in a solution of some salt which is capable of forming with cadmium oxide a solid mass consisting of basic cadmium salts. The net, covered with the hardened, cement-like substance, is then placed as cathode in an alkali bath and subjected to electrolytic reduction; or the network, covered with the cadmium oxide, may be placed in a solution of some kind of salt wh
combines with cadmium oxide in a twofold manner,
the acid of which is capable of entering into basic c
bination with it.—G. H. R.

Accumulator Plates; Composition of Paste for Filling Cells of Reticulated ——. H. J. H. Pickard and
Evans, London. Eng. Pat. 4509, March 2, 1901.

Sulphuric acid and glycerin are mixed with red
(Pb_3O_4) and litharge (PbO) for this composition, an
proportions specified, *viz.*, for filling for positive pl
5 of red lead to 2 of litharge; and for negatives, 2 of
lead to 5 of litharge.—J. C. R.

Electric Storage Batteries. W. P. Thompson, Lon
From E. A. Sperry, Cleveland, Ohio, U.S.A. Eng.
5569, March 24, 1900.

This specification relates to battery jars, electrodes, e
lopes for retaining the active material, separators to pre
short-circuits, a cooling bath, and a system and appa
for recovering and re-use of exhausted battery materia
—J. C.

*Secondary Batteries, or Electrical Accumulators; M
facture of Negative, or Spongy Lead, Plates or Ele
for* ——. The Electrical Power Storage Company,
H. W. Butler, and J. H. May, all of London. Eng.
10,511, June 8, 1900.

Plates are manufactured by subjecting a paste of
oxide and powdered carbon, or the equivalent applie
grid or support, to the action of an electric current i
forming solution or solutions. This current is a
whilst the element or plate to be formed is attached
positive pole of the source of electricity, so as to o
the carbon or any desired portion thereof, and the c
being afterwards passed through in the reverse directi
as to reduce to spongy lead the porous lead thus prod
—J. C

Electrolysis, and Apparatus therefor. P. A. N
London. From The National Electrolytic Co
Niagara Falls, U.S.A. Eng. Pat. 393, Jan. 7, 1901

This specification relates to the manufacture of ch
by electrolysis of chlorides of the alkalis. The
embrace the following: subjecting the chloride in so
while flowing continuously through a cell, to the
of an electric current between two electrodes in
proximity, and insulated from each other, but ot
separated only by the liquid, the density of the
used being such as to maintain the solution in the c
temperature suitable for decomposing hypochlorite
trolling the temperature of the solution in the cell b
lating the flow of the solution, and the density
current; making the negative electrodes of vertical
wires or rods, of a diameter less than $\frac{1}{4}$ in., and a cel
interiorly with a metal suitable for anode.—J. C. R.

*Galvanic Batteries; Depolarising by Liquid Cir
in* ——. C. D. Abel, London. From La Soci
Piles Electriques, Paris, France. Eng. Pat. 9647,
1900.

Depolarisation is effected by maintaining, betw
electrodes of a battery, a very strong circulation of
lyte liquid, preferably hot, the quantity thus ci
being greatly in excess of that necessary for mere
to the battery. The process is carried out by arran
such as are described in specifications 16,172 of
9512 of 1899 (this Journal, 1900, 355), with the
tution, in whole or in part, of the active and rapid ci
of liquid for the injection of air described in these
—G.

Thermo-Electric Couples; Manufacture of ——
Sulphide]. E. Hermite and C. F. Cooper, Paris
Eng. Pat. 2835, Feb. 9, 1901. First foreign a
(in France) Aug. 1, 1900.

Rods or bars of copper are heated in a crucible
equal weight of sulphur, which combines with the c
creasing its volume, although the form of the bar is
After cooling the bar out of contact with air, the s
of copper which has escaped sulphurisation is w
leaving a tube of homogeneous copper sulphi

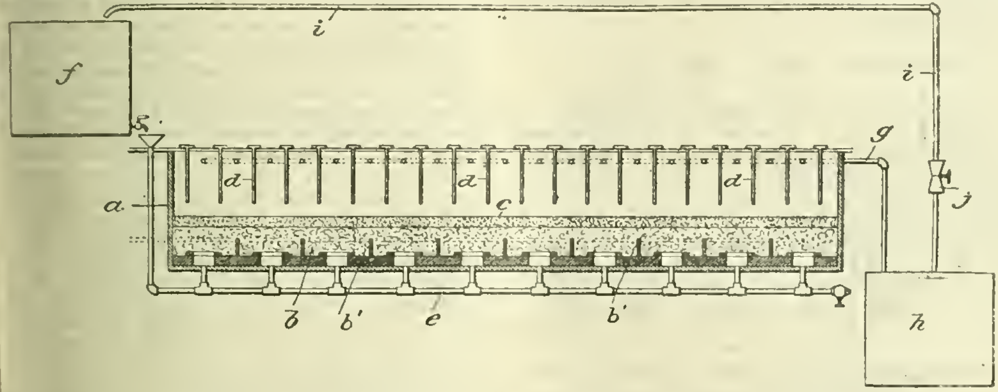
acts are made by sulphurising copper, on which is laid etal or alloy which is not, or only slightly, sulphurisable, as platinum, iron, bronze, or, preferably, brass; and methods of constructing them are illustrated. The mo-electric couples made by the method described must rotected against the direct action of heat, in order to l the destruction of the copper sulphide, and various are shown of mounting the couples, which also serve rengthen them for industrial work.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

el, Copper, &c.; The Frasch Electrolytic Process for fining ——. Eng. and Mining J. 1901, **71**, [14], 428.

escription is given of an electrolytic process for ng nickel, copper, &c., devised by H. A. Frasch and cted by the U.S. Pats. 669,439, 669,440, 669,441, and 42 of March 5, and 669,899 of March 12, 1901.

e patents 669,439 and 669,440 refer to the direct ction and reduction of those metals, the hydroxides ich are soluble in ammonia or alkalis, by the direct of an electric current upon a salt of ammonium in nce of an anode containing the metal to be extracted, monium salt being recovered and used over again.



xample, if ammonium sulphate solution be used as etrolyte, with an anode containing copper or nickel, - or nickel-ammonium sulphate is formed, but is again posed at the cathode, with deposition of the metal and ation of ammonium sulphate. Instead of ammonium te, the chloride or any other ammonium salt or any any alkali may be used, which is capable of forming e salt with the metal to be extracted. The Fig. shows cal section a form of apparatus in which the method carried on. The tank or vessel, *a*, carries on its the anode, *b*, composed of a layer of disintegrated r ore containing the metal or metals to be extracted, rent being conducted to this layer by means of rods, *b'*. Above the anode is the diaphragm, *c*, ed of a layer of sand, ground quartz, or other or electrically neutral or inert material. The s, *d*, which are preferably made of the metal which e extracted, but may be of iron, carbon, or other material, are suspended within the tank. The tic solution contained in the vessel, *f*, passes by the pipe, e, through the permeable anode, and o the cathodes, where the metal extracted from the s deposited. The overflowing electrolyte passes the pipe, *g*, to the receiver, *h*, and thence is through the pipe, *i*, to the holder, *f*, or the te may be made to circulate directly through the sing apparatus.

atent 669,441 is for the production of alkali by the ou of this method. For instance, a solution of an lt, such as sodium chloride, is subjected to an current in presence of an anode consisting of a aring substance, such as copper- or nickel matte, ode being composed of any suitable conductor. rides of copper, nickel, iron, &c., are formed at e, whilst caustic soda is produced at the cathode. The chlorides of the metals may be subjected to electrolysis, and the metals separated and refined.

The fourth patent, 669,442, refers more specifically to the application of the process to the treatment of copper-nickel ore and matte. A solution of the salts of the metals is prepared either by a chemical process or by the method described in patent 669,441, and this solution is then submitted to electrolysis in a series of baths, similar to the one described in patents 669,439 and 669,440. The solution flows past the cathodes, and through an overflow pipe on to the anode of the bath next in series, and so on through any desired number of baths. The least electro-positive metal represented in the electrolyte—in this instance, copper—is deposited at the cathodes, care being taken that the tension of the electric current does not greatly exceed the electro-chemical requirements for copper, and the electrolyte dissolves a corresponding quantity of fresh metals from the anode of each bath. By the repeated re-saturation with the metals of the anode, and deposition of copper only, the electrolyte becomes more and more saturated with the other metals and impoverished in copper, until finally a point is reached convenient for the recovery of the metals other than copper. In order to remove the last traces of copper yet contained in the electrolyte, the latter, in its passage through the bath last in series, is made to circulate through the anode only, and below a diaphragm, which permits only enough of the electrolyte to pass through as will ensure complete exhaustion of the copper still contained in the electrolyte at the cathodes. The solution from the cathode section of the bath last in series, contains only nickel, iron, and cobalt; the iron is removed by chemical treatment, and the nickel separated from the cobalt by electrolysis or by chemical means.

The final patent, 669,899, refers to the preparation of a new nickel-ammonium compound, $Ni(NH_3)_2Cl_2 + 4NH_3$, which can be obtained of great purity, and may be employed directly for nickel-plating and other purposes. The salt is prepared by absorbing ammonia in a solution of a nickel salt; it is of a purple (violet) colour, crystalline, very hygroscopic, readily soluble in water to a blue solution, and loses part of its ammonia if exposed to dry air.—A. S.

PATENTS.

Copperas; Method of Recovering and Producing ——, from Waste Tin Cuttings or other Substances containing Tin, and Apparatus therefor. C. L. and F. Gelsthorpe, Manchester. Eng. Pat. 2282, Feb. 1, 1901.

The tin cuttings are introduced into a vat containing an electrolyte consisting of a slightly acidulated and dilute solution of tin by means of a travelling belt, or on a grid, or in crates. The support is connected with the positive pole of a current generator and cathodes of tinned iron are connected with the negative pole. The detinned cuttings may be utilised to generate the current by the action of dilute sulphuric acid upon them, thus producing copperas, which is crystallised out.—J. H. C.

F 2

Zinc: Cleaning, Preparing, and Coating Iron or Steel with ——. S. O. Cowper-Coles, Westminster. Eng. Pat. 5647, March 26, 1900.

THE material to be coated is first cleaned by means of a pickling-bath or otherwise, and is then introduced into a bath containing a solution of zinc, in which iron is soluble. A current is passed through the bath in such a direction that the articles to be coated are anodes. The current is then reversed or the articles are placed in another zinc bath and are then made cathodes.—J. H. C.

Zinc and other Salts with Soluble Anodes; An Electrolysing Process for ——. C. D. Abel, London. From La Société des Piles Electriques, Paris, France. Eng. Pat. 9563, May 24, 1900.

THE process is carried out with batteries of the kinds described in specifications 9803 of 1897, 16,172 of 1898, and 2748 and 9512 of 1899 (this Journal, 1900, 54 and 355). The anode is any soluble metal other than the salt to be electrolysed, in which a metal cathode is immersed, and the deposit of zinc or other electrolysed metal in metallic form is ensured by interposing between the anode and the cathode at least two porous vessels, between which there is a circulation of washing liquid, which prevents mutual diffusion of the saline solutions surrounding the anode and the cathode.—G. H. R.

XII.—FATS, OILS, AND SOAP.

Linseed Oil; Boiled ——. *Analytical Constants.* M. Kitt. Chem. Rev. Fett- u. Harz Ind. 1901, **8**, [3], 40—42.

THE alterations which linseed oil undergoes on boiling are shown in the subjoined table, in which the numbers (0—6) represent the different stages from the thin oil to the consistency of india-rubber :—

No.	Acid Value.	Saponification Value.	Iodine Value.	Iodine Value of Fatty Acids.	Acetyl Acid Value.	Acetyl Saponification Value.
0	4·8	188·9 188·6	159·3 158·6	158·0	153·5	178·0
1	5·2	189·9 188·3	101·4 100·4	107·3	191·3	201·7
2	7·8	189·1	95·6	100·4	192·4	208·0
3	9·5	186·6	83·6	88·1	188·2	206·2
4	9·1	187·2	79·1	85·6	..	..
5	11·7	187·2	76·2	81·9	193·4 192·6	213·1 210·9
6	18·8	192·3	71·1	..	..	..

—C. A. M.

Neat's-foot Oil; Cholesterol in ——. Holde and Stange. Mitt. aus den königl. techn. Versuchsanst. zu Berlin, 1900, **18**, [5], 255—261.

As the iodine and saponification values frequently fail to give an indication of the addition of vegetable oils to neat's-foot oil, the authors have made use of the cholesterol test applied in the following manner :—50 grms. of the fat are heated with 40 c.c. of 96 per cent. alcohol and saponified with 40 grms. of potassium hydroxide dissolved in 20 c.c. of water. The soap is dissolved in water and the cold solution shaken in a separating funnel with three successive portions of 600—700 c.c. of ether, emulsions being prevented by the addition of a little absolute alcohol. The united extracts are distilled, the residue dissolved in 10 c.c. of absolute alcohol, and distilled water added to the solution (which is heated on the water bath) until the first signs of turbidity. The liquid is then left to cool, and the insoluble matter collected on a filter, again dissolved in a little alcohol, and again precipitated by the addition of water, this treatment being repeated until the crystals show a constant melting point after being dried on porous porcelain. In the case of train oils two or three crystallisations are necessary; with pure bone fats, about six; and with mixtures of bone fat and vegetable oils often as many as 12. Finally the crystals are examined under the microscope.

Of 11 pure oils examined by the authors, 10 yielded a cholesterol melting between 145° and 147° C., and the other between 147° and 148° C. In the case of adulterated the melting points varied from 143°—144° C. to 130°—131 The cholesterol and mixtures of cholesterol and phytost showed the crystalline forms described by Bömer (*cf.* Journal, 1898, 954).

Iodine Value.—The 10 pure oils gave values of 66 to and the other of 77·6. The values obtained with adulterated oils varied from 78·3 to 85·2.

Saponification Value.—This was 196—199 with nin the pure oils, and 194—195 with the two others. adulterated oils gave values of 183 to 197, the maj being below 192. From this the authors concluded rape oil was the adulterant. In one case they obtair slight reaction by Halphen's test, pointing to the pos use of heated cotton-seed oil.—C. A. M.

Cholesterol and Phytosterol in Mixtures of Fatty Mineral Oils; Separation of ——. J. Marcu Mitt. aus den königl. techn. Versuchsanst. zu B 1900, **18**, [5], 261—263.

THE author has applied the following methods with su in the examination of lamp oils :—

I. Distillation of Volatile Mineral Oils with S heated Steam.—A lamp oil consisting of 60 per cent. thin mineral oil and 40 per cent. of a fatty oil submitted for a report as to the animal or vegetable of the fat. A preliminary experiment with 0·2 gr cholesterol in 100 c.c. of petroleum showed that a siderable proportion of the former could be reco from the distillation residue. 200 grms. of the oil then saponified, the insoluble constituents extracted ether from the aqueous soap solution, and distilled superheated steam until only about 3 c.c. remained. temperature of the oil was never allowed to exceed 2 The residue from the distillation was repeatedly ext by boiling with 70 per cent. alcohol, and the on cooling yielded crystals, which, after repeated rec lisation, melted at 139·5° C. and showed the fo phytosterol. This is the melting point of the phyt isolated by Bömer from rape oil, and the presence oil in the mixture under examination, was confirmed saponification value (180·5), and iodine value (105 the fatty acids obtained from it.

II. Mixtures of Heavy Mineral Oils and Fatty As the preceding method would not be applicable higher temperature was required to volatilise the constituent, the author used the following met examining a mixture of 100 grms. of cylinder 100 grms. of bone oil containing a little vegetable oil oil was dissolved in ether, and the greater part mineral oil precipitated by the addition of alcoho supernatant liquid was decanted, concentrated to 50 c.c., and, after cooling, again separated from the On again evaporating the liquid, a residue was left in addition to the fatty oil and higher alcohols, co only extremely small quantities of mineral oil. T saponified, the soap solution extracted with ether, residue from the extract recrystallised from 70 p alcohol. The melting point (144° C.) and the cry form corresponded to a mixture of cholester phytosterol.—C. A. M.

Soap Leys; Dialysis of (Crude Glycerin) — R. Auzenat. Monit. Scient. 1901, **15**, [711], 167

THE addition of barium or iron chloride to soap l cipitates the residual alkali soaps, leaving sodium ch solution. The author has made attempts to elimir of this by means of dialysis; so as to obtain a conce of the glycerin before the distillation.

The following experiment may be given as typ solution containing 480 grms. of glycerin and 68 sodium chloride per litre was dialysed into co through a battery of five dialysers. After 10 l ratio of salt to residual glycerin had increased fr to 10·98, whilst the greater part of the glycerin (cent.) had passed into the exterior liquid. Th points out that such results have no practical val the exterior glycerin would require further conce whilst that within the diaphragm would be very di ild equally require concentrating. Attempts were made ubstitute sodium sulphate for sodium chloride, but it found that the latter salt had the same velocity of smosis as glycerin. A solution of iron sulphate was l for the exterior liquid, but, contrary to what was ected, the glycerin passed through the membrane more ly than the sodium chloride. Nor were better results ined by using alcohol as the external liquid. Hence author concludes that dialysis is not practicable under present conditions of extracting glycerin.—C. A. M.

p containing Free Rosin; Preparation of ——. Dreher, Freiburg, Germany. German Pat. 118,233, n 19, 1900. (Through Zeits. angew. Chem. 1901, [13], 4.)

percentage of free rosin in a soap is greater in proon to the readiness with which the rosin can be melted incorporated during the saponification. In this patent, is made for the addition of phenanthrene, which has ffect of lowering the melting point of the rosin. Thus in which melts at 125° C. has its melting point reduced ° C. by the addition of, *e.g.*, 20 parts of phenanthrene. stated that phenanthrene has at least an equal effect ee rosin in the sizing of paper. By means of this ion it is possible to obtain a rosin soap with a sizing equal to one containing from 55 to 60 per cent. of osin. For example, 100 parts of finely divided rosin 20 parts of powdered phenanthrene are added to a g solution of 7½ parts of caustic soda in 25 parts of . The mass is boiled for an hour with constant ıg, until a test sample dissolves to a milky-white on in water of 80° to 90° C.—C. A. M.

Oleates of the Metals; Preparation of ——.
W. A. H. Naylor.

See under XX., *page* 498.

nes, Commercial; Determination of Unsaponifiable Matter in ——. P. Neff.

See under XXIII., *page* 509.

eine; Determination of Unsaponifiable Matter in Commercial ——. A. A. Shukoff.

See under XXIII., *page* 509.

'ats and Waxes; Optical Examination of ——.
G. Marpmann.

See under XXIII., *page* 509.

Acids; Action of Zinc Dust on ——. A. Hébert.

See under XXIV., *page* 513.

PATENTS.

Animal and Vegetable ——; *Method of and Appa- for Refining.* E. Rocca, Marseilles, France. Eng. 10,899, June 15, 1900.

is made for a process of passing the oil through a f chambers, in which it is purified by steam passing pposite direction.

ecial form of apparatus claimed, consists of a set rimposed chambers, arranged as in a column still, being introduced at the top of the system, and the at bottom, the latter bubbling successively through its upward course. In a second form of apparatus, ich claim is also made, each chamber can be opened outside air, and has a steam-admission pipe, so that be made successively the first or last in the series. process is said to be particularly suitable for the tion of cocoa-nut oil.—C. A. M.

Wood Oil and Mixtures thereof; Impts. in ising ——. A. Kronstein, Karlsruhe, Germany. Pat. 1386, Jan. 21, 1901.

ject of this patent is to prevent the coagulation ccurs on treating this oil with oxidising agents. The oil is mixed with a resin, drying oil, or solvent in certain specified proportions, and the mixture heated with an oxidising agent. Or the wood oil or mixture may be solidified by heating it with another oil, or a resin or solvent, and the solid product further mixed with a resin, drying oil, or solvent, and oxidised.—C. A. M.

Oil, Grease, Glue, and the like from Waste Products and other Substances; Process and Apparatus for Extracting ——. N. B. Powter, New York, U.S.A. Eng. Pat. 3470, Feb. 18, 1901.

The process claimed consists in applying suction to the material, which is heated in a closed vessel. The lighter oils and volatile substances thus separated are collected in a liquid, whilst the uncondensed vapours are carried on and burned. The residual heavier oils and other substances are discharged into a separator, which they should practically fill. This vessel has a conical neck, with a discharge outlet near the top, and on introducing water at the bottom, the oil is expelled through this outlet. Suction may also be applied at the top of this vessel to remove any remaining volatile substances. After the introduction of sufficient water to expel the grease, the residual mass in the separator is dried in a vessel suitably heated and conveniently provided with stirring arms, whilst suction is also applied to accelerate the process. Finally the dried mass is burned. The oil or grease expelled from the separator is allowed to stand in a purifier for any solid matter to deposit, whilst, if required, steam, followed by dry air, may be blown through it. The oil may also be treated at this stage with any purifying agent.

The separation of the grease from the solid matter may also be effected within the digester, and the drying in the separator or in the digester.

In extracting oil from fish material from which isinglass or glue is also to be extracted, the finely divided substance is first mixed with salt or other substance, to prevent the glue rising with the oil in the digester. The salt is subsequently removed (conveniently, by washing the material with water) and the glue, &c. brought into solution by boiling the mass with water free from alkali.

Special apparatus for the various combinations and modifications of this process are also claimed.—C. A. M.

Blown Oil; Obtaining ——. P. H. Joselin, New Wandsworth, and J. Crichton, Hackney Wick. Eng. Pat. 1379, Jan. 21, 1901.

According to this patent the crude cotton-seed oil is heated and agitated with an aqueous solution of a borate, which removes impurities. The aqueous layer, which separates on standing, is withdrawn, and air blown through the residual oil heated to a suitable temperature.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*C.*)—INDIA-RUBBER, &c.

Rubber Goods; Manufacture of ——. Gummi Zeit. 1901, **15**, [25], 411.

Rubber plates and discs are made of the best Para, which is boiled, washed thoroughly, and then most carefully dried. The purified rubber is massed into blocks of an appropriate size, compressed by machinery, and then frozen until it is no longer elastic. In this condition it is sliced by a cutting machine and the thin plates so formed, after the original character of the rubber has been restored by warming, are stamped to the required shape by sharp dies moistened with water. To vulcanise them, the plates are immersed for 1—2 minutes in carbon bisulphide containing 2—3 per cent. of sulphuryl chloride, dried for an hour or two, again dipped in the solution for half a minute, dried once more and then heated in the vulcaniser. The goods are afterwards boiled in soda-lye and warmed in the oven until all smell of sulphur has disappeared.—R. L. J.

(Rubber): *Valve-Balls.* Gummi Zeit. 1901, **15**, [26], 427—428.

Rubber valve-balls for pumps dealing with corrosive liquids may be composed entirely of rubber or of a nucleus of wood, iron, lead, or other metal coated with rubber. The sizes range from 0·5 to 20 cm., the smallest being made from cylindrical sticks or strings of rubber from which pieces, slightly larger than the required size are cut off by an experienced workman. These are placed in heated moulds for 10—15 minutes, and the excess rubber which exudes is trimmed off. If the amount has been over-estimated, and a ring forms round the ball, this must be cut away and the ball re-moulded. When soft rubber is used, the balls are vulcanised in the mould, their extreme size being 20 mm. Hard rubber balls may be as large as 30 mm. in diameter, are vulcanised in talc, and finally trimmed in a lathe. Still larger sizes are made from strips of sheet rubber cut somewhat wider than the required diameter, and rolled up carefully into a cylinder, any air-bubbles that form meanwhile being pricked and squeezed flat; the rolls are then hot pressed and finished.

A non-porous rubber is of first importance. "Barytes" and recovered rubber may be mixed with it, but no oil-substitutes or rubber-residue that contains an appreciable amount of such substance. A good mixture, in parts per hundred, is the following:—Mozambique rubber, 14; Cameroon, 14; recovered rubber, 10; lead glaze, 13; barytes, 32; lime, 13; sulphur, 4.

The temperature of vulcanisation should be about 150° C. and the time according to the size of the balls and the mixture used.

During this process the central core may char the canvas layer and become loose, which may be detected by the sense of touch or by shaking the ball held against the ear.

Oil and grease must be carefully kept from contact with the finished product.—R. L. J.

Rubber-like Substance. C. N. R. Steenstrup, Copenhagen. Danish Pat. 3645, Jan. 30, 1900; through Chem. Zeit. 1901, **25**, [23], 252.

Old rubber goods (1 part) are mixed with 4—12 parts (the exact proportions should be carefully adjusted) of an oil such as linseed, or oil residue, and agitated mechanically and by air under pressure until solution is as complete as possible. Insoluble portions are then separated; sulphur and other mineral matter settle out on standing. The mixture is now heated with a small quantity of red lead for 2—6 hours so that when cold it forms a thick viscid mass. This material may be employed in various ways instead of pure rubber, and also in the manufacture of linoleum and asphalt.—R. L. J.

PATENT.

Caoutchouc; Apparatus for Vulcanising Articles of ——. H. Hamet, Paris. Eng. Pat. 8567, May 9, 1900. Under Internat. Conv., Feb. 16, 1900.

The essential feature of this specification consists in the employment of moulds made of thin sheet copper or steel, stamped to shape, in place of moulds of heavy iron or steel castings formerly used. The new moulds are constructed in halves, and the apparatus carries the lower halves in a fixed frame, while the upper portions can be raised or lowered into position mechanically. Steam is admitted so as to surround both parts, and the whole operation is thus claimed to be rendered more speedy.—F. H. L.

XIV.—TANNING, LEATHER, GLUE, SIZE.

Tanning Materials; Analysis of ——. Paessler. Chem. Zeit. 1901, **25**, [27], 295.

The quality of the filter-paper and the volume of the solution influence the results in the analysis of tanning materials. A less dense paper may allow fine particles to pass, which make the liquid turbid, and lead to high results for the tannin and low for the insoluble matter; difference frequently reaches 2 per cent. Unsatisfac results have been obtained with the tannined filter pa of Willenz, who has already himself abandoned their us

—A. C. \

Gallotannin; Constitution of ——. H. Pottevin. Comptes Rend. **132**, [11], 704—706.

Tannin from gall-nuts, several times submitted to Pelot process of purification, gave at last a product of con rotatory power ($\alpha = +50°$). This tannin (100 grms.) mented with tannase, gave by hydrolysis a mixtu "gallic acid (95·1 grms.) and dextrose (13·5 grm (query, 3·5 grms.). Its solution, heated in a sealed with very weak hydrochloric acid, diminished in rot power; and when the operation was stopped at a ce point, no gallic acid, but a true digallic acid was fou solution. The author concludes that different tannin glucosides of digallic acid, containing different propo of that acid and of glucose. Tannase seems to be ca of hydrolysing, on the one hand, digallic acid and v esters of aromatic acids; on the other hand, glucosid contains possibly two constituents, related respectiv the lipases and the emulsins.—J. T. D.

Leather Book Bindings; Preservative Composition ——. "H. G." Papier-Zeit. 1901, **26**, 978.

It is now becoming recognised that the leather in books are bound, like the paper on which they are pr is frequently apt to deteriorate in course of time, whet be exposed to sulphurous vapours or not. This destr is due to a variety of causes; to reagents employ dyeing the leather, to modern methods of tanning, carelessness on the part of the binder in the select his varnishes and pastes. Leather bindings are varnished with shellac dissolved in borax solution; b material is far from being moisture-proof or imperv gases. Even when the shellac is used as an al varnish, it is but an imperfect protection.

A distinctly better preservative is to be found in ca which 5·5 grms. should be dissolved in 7·5 grms. of a ammonia and 100 c.c. of water at a temperature of The varnish dries on leather fairly fast, becomes so ha water and other liquids and vapours have absolu effect on the film, and is quite capable of protectin inherently defective leather bindings. The casein m be dissolved in strong borax solution; but whene borax is liable to injure the leather or the dye ther ammoniacal formula is preferable. A casein varn often a rough feeling. This may be overcome by the leather with a mixture of 5 parts of yolk of 1 part of glycerin, permitting the coating to dry, a polishing with a woollen rubber.

Sometimes a spirit varnish is necessary. The f formula gives a material which is better able to w ammonia, moisture, and the heat of the hand than else. Spirit, 3 litres; sandarac, 60 grms.; mastic, 3 "olive-tree resin," and shellac, of each, 24 gr addition of 3·75 grms. of camphor, dissolved in 2·8 spirit, will render the varnish flexible; but the ca liable to yield an opalescent bloom in cold damp a cannot be removed.

A matt spirit varnish is best prepared from 180 dammar dissolved in 1·6 kilos. of acetone mix little collodion. "Four parts of the dammar an are combined with 2 parts of semi-liquid collodion 6 parts are added to the whole." Before the appl any spirit varnish, the leather must be sized with tr 60 grms. are soaked in 4·5 litres of cold water fo weeks till a viscid mass results. Insoluble m white particles must be removed before use, f necessary, finally introducing about 60 grms. of g prevent brittleness. The solution of the tragacan on no account be assisted with oxalic acid.—F. H.

Glue; Apparatus for Testing ——. R. Kis

See under XXIII., *page* 509.

nning Materials, their Speed of Tanning and Weight-iving, &c.; Relative Leather-forming Value of the Different ——. J. Youl and R. W. Griffith.

See page 426.

Tannery Refuse; Anthrax Traceable to ——. H. L. Russell.

See under XVIII. B., *page* 494.

PATENTS.

es and Skins, Method of Treating ——; *and Apparatus mnected therewith.* W. T. Forbes, Atlanta, Georgia, .S.A. Eng. Pat. 7850, April 27, 1900.

: hides are tanned in an ordinary liquor to every 100 galls. hich, 5 lb. of common salt, ½ lb. of borax, and 1 lb. of nesium sulphate have been added; 1 lb. each of boric and sodium sulphate being also employed for special oses. During the operation a current of electricity, rably a weak alternating one, is passed through the the electrodes being arranged at all four sides of the els so that the path of the current may be changed. process is claimed to produce good bright coloured er in half the time usually occupied; and the salts are oyed partly to raise the conductivity of the liquor. aratus is also described which consists of a rectangular e split in halves and clamped together. In this are ned two skins, face to face, so as to form a kind of flat and between them is forced the tanning liquor by means draulic pressure.—F. H. L.

eather; Lacquer or Enamel for ——. G. L. Mohr, Darmstadt. Eng. Pat. 8993, May 15, 1900.

parts ($1\frac{1}{2}$ of each) of "chloride of iron," ferrous ate, ferrocyanide, and ferricyanide of potassium are l together, "somewhat moistened" with nitric acid gr. 1·375, and the whole quickly dried. 100 parts of d oil are boiled for two hours, and the above is added; fth part of the following mixture is next put in, and oiling is continued till the oil can be drawn into ls. The mixture consists of tallow exposed to the d moisture till it has begun to "putrefy," 1 part of earth made from pulverised slate," 1 part of puz-, and 1 part of infusorial earth. This "settles or ses the bubbles arising" during the boiling of the oil. ly, 10 parts of a special siccative, about 3 parts of h, and 3 parts of oxidised linseed oil are added to lk. The drier is made by boiling 1 part of logwood part of nut galls in 5 of water till the liquid is d to half its volume, then adding a hot solution of s long as a precipitate is formed. The precipitate is l and dried. Its addition to the lacquer "prevents udation of the oil of the leather." When the product ttled, it is ready for use.—F. H. L.

r and the Like; Drying Apparatus for Use in the duction of Enamelled ——. C. Hoch, Weinheim, eu, Germany. Eng. Pat. 1701, Jan. 24, 1901.

ATUS is described in which air is treated in such a "that it becomes specially suitable for drying the led coating of 'patent' leather, and whereby the ine left as refuse on the coating may be neutralised nisation, its conversion from the sticky condition by al drying process not being attainable." The appa- onsists of superposed chambers, in which air is first with a spray of an alkaline liquor, then heated to 30° C., next washed by passage through flasks of m hydroxide and sulphuric acid; it is finally led another vessel, where it travels over the leather which have to be dried.—F. H. L.

ease, Glue, and the Like from Waste Products and Substances; Process and Apparatus for Extracting N. B. Porter. Eng. Pat. 3470, Feb. 18, 1901.

See under XII., *page* 485.

XV.—MANURES, Etc.

Soil Inoculation; New Problems in ——. J. Stoklasa. Deutsche landw. Presse, 1900, **27**, 189.

WHILST *Bacillus radicicola*, the nitragin microbe, assimilates free nitrogen alone, obtaining its food from the plant, *Bacillus megatherium*, the alinit microbe, requires a large excess of carbohydrates in the soil, and also, for nitrogen assimilation, the co-operation of a bacillus which occurs chiefly in humous soils. This new bacillus, discovered by the author, assimilated, in conjunction with the alinit bacterium, 31·5 mgrms. of nitrogen in 33 days.

Inoculation experiments were made in which soil (100 kilos. per morgen) was saturated with a solution of molasses (6 kilos. in 10 litres of water) and alinit (2 grms.) The whole was covered with straw to exclude light, and left for a week, water being added when necessary. The soil was then spread over the land, with the straw chaff, and harrowed in. The yield of barley was increased by inoculation from 2,013 kilos. to 3,390 kilos. per hectare; and the yield of oats from 2,100 to 3,086 kilos. The soil applied along with the alinit contained the new bacillus, which, in conjunction with alinit, assimilates free nitrogen; otherwise infection with the bacillus, isolated from humous soil, would be necessary.

Addition of alinit to bone, horn, and leather meal proved to be very beneficial in promoting the decomposition of the phosphatic and nitrogenous manures. It is important to at once supply carbohydrates by adding either a solution of glucose or a concentrated straw extract.—N. H. J. M.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar Cane; Coefficient in the Indirect Analysis of ——. L. Bonnin. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**, [7], 465—467.

To obtain the richness of the cane in sugar from that of the juice per 100 grms., the co-efficient 0·85 is used. In the factory this figure is correct enough. The author confirmed it from the results of an entire sugar season, based on the mean pressing, and the average richness of the juice and bagasse. Prinsen Geerligs (this Journal, 1900, 757) found the same figure from results of several factories in Java.

The hand-mill in the laboratory does not give the same crushing as on the industrial scale, and this co-efficient, or any smaller one, may lead to erroneous results.

It is better to analyse the juice and bagasse and calculate therefrom, taking account of the crushing obtained. Adopting the results of number 10 in the table given, we have—

Sugar per 100 grms. of juice .... 17·28
" " bagasse .... 10·08

whence,

Sugar per 60 grms. of juice obtained = 17·28 × 0·60 = 10·36
" " 40 " bagasse " = 10·08 × 0·40 = 4·03
" " 100 " cane .... 14·39

To find the co-efficient applicable here, we have—

$$17 \cdot 28 \times x = 14 \cdot 39, \text{ whence } x = 0 \cdot 832.$$

The co-efficient shows great variations, dependent not only on the degree of crushing obtained, but on the hardness of the cane, its age, and the proportion of woody fibre.—L. J. de W.

Sugar-Cane Factory; Carbonating in the ——. Harloff. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**, [9], 718—719. (From Centralbl. Zuckerind. 1900, 218.)

VARIOUS observations are made on carbonating in the cane-sugar works in Java.

Care must be taken that the juice purified by saturation is neutral when sent for evaporation. In simple carbonating it is found best to have a separate defecation by lime, with, if possible, mechanical mixing of the juice and lime.

There is no advantage in strongly heating the saturated juice; it should be saturated at 55° to 60° C. until neutral to phenolphthaleïn, and should be immediately filtered without decantation. At this temperature it filters well.

The best results, however, are obtained by double carbonating.

The increased expense, compared with defecation, was for two extreme cases, 0·0724 and 0·144 per picul of sugar. —L. J. de W.

Beetroot Juice; Krause's Method for Determining the Purity of ——. J. Weisberg. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**, [9], 655—659.

The author made a number of tests of the quotient of purity by Krause's method, on different sorts of rasped pulp, varying the duration and the temperature of digestion, and found differences of 2 to 4 units for the same pulp. He therefore prefers to use the old methods, the purity of pressed juice giving the nearest approach to that of the diffusion juice obtained on the large scale.

From the results of the mutual control of forty-seven Russian and Polish sugar works, where daily analyses were made, the following averages were obtained:—Purity of pressed juice from chopped chips, 86·2; purity of diffusion juice, 87·0. As a general rule, under normal conditions, the purity of diffusion juice is always higher than that of corresponding pressed juice.—L. J. de W.

Beetroot Juice; Methods of Krause and Perroche for Determining the Purity of ——. H. Pellet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**, [9], 659—662.

The method of Perroche, which was published in 1891–92, consists in agitating 200 grms. of beetroot pulp with 400 c.c. of water while heated for 20 minutes on a water-bath, and determining the saccharine richness from the density, and the sugar really present being also determined, the purity is found.

The method has much analogy with that of Krause, as regards the preparation of the juice, although the object to be attained is a little different.

The results are affected, however, by the fineness and physical condition of the pulp, which vary with the form of rasp used, by the mode of heating, by the duration of the maceration, and the large error introduced from the feeble density of the juice observed. Hence it is not astonishing that there should be want of agreement as to the value of Krause's method.—L. J. de W.

Acidity and Alkalinity; Determination of ——, *in Coloured Sugar Solutions.* H. Pellet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**, [9], 693—695.

The author prefers sensitive litmus paper to phenolphthaleïn for the determination of the reaction of sugar solutions. There are cases in which phenolphthaleïn gives absolutely no coloration, even in very alkaline liquids. This is when sulphites are present. Litmus paper is not affected in this way.—L. J. de W.

Sugar Solutions Saturated with Lime; Action of Carbonic Acid on ——. J. Weisberg. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**, [7], 457—462. (This Journal, 1898, 1061.)

On passing carbonic acid gas into a solution of pure sugar or beetroot juice containing lime, the alkalinity to phenolphthaleïn falls continuously, but the polarisation of the filtered juice at first falls and then rises again until the initial value is again reached. The point of minimum polarisation is coincident with that of greatest thickening of the liquid and slowest rate of filtering, and is also that at which decolorising of the juice begins.

The lowering of the polarisation may reach an amount, under favourable conditions, equivalent to 10 to 20 per cent. of the sugar contained in the original liquor, a gelatinous compound being precipitated, containing sugar, lime, and carbonic acid—the sucrocarbonate or hydrosucrocarbonate of Loiseau. The analytical figures given by Loiseau, h ever, do not seem to correspond closely with the form given of these compounds.

A solution containing 12 to 16 per cent. of sugar saturated with lime, when heated on the water-bath, becor turbid and afterwards yields a gelatinous precipitate treated with carbon dioxide until the greater part of alkalinity is neutralised and it has become thick or visc and difficult to filter, it no longer gives a precipitate w heated on the water-bath, showing that the gas has occasio a complete change in the physico-chemical state of liquor, and it is to be presumed that a liquor so tre contains a calcium sucrocarbonate.

To separate the compound, a solution was prep containing 13 per cent. of sugar and 3·52 of lime. carbonic dioxide was passed in until the alkalinity phenolphthaleïn was reduced as low as possible wit the precipitation of sugar or lime. The slightly dull l was filtered, and 300 c.c. of the solution were mixed 900 c.c. of alcohol of a strength to give 70 per cent alcohol in the mixture. The gelatinous precipitate filtered off and pressed strongly. It then contained 4 per cent. of water. The analysis of the precipitate culated to the dry state was: carbonic acid, 10·36 per ce lime, 26·96; sugar, 62·68. These figures correspon $3C_{12}H_{22}O_{11} . 4(CaO . CaCO_3)$.

The sucrocarbonate only partially re-enters into sol in water, and the solution deposits crystals of cal carbonate. The insoluble portion is also calcium carbo —L. J. de

Syrups; Table for Degrees Baumé of ——, *at diff Temperatures.* H. Nové. Bull. de l'Assoc. des (des Sucr. et de Dist. 1901, **18**, [7], 464—465.

The table may be constructed by adding 0·05° B. for degree of temperature above 15° C.

Thus, the correction for 70° C. is 2·75, to be add the degrees Baumé observed, to reduce it to degrees B at 15° C., or 0·05 (70°—15° C.) = 2·75.—L. J. de W

Syrups and Massecuites; Real and Apparent Pur ——. F. L. de Jongh. Bull. de l'Assoc. des Chi Sucr. et de Dist. 1901, **18**, [7], 504—511. (Fro Deutsche Zuckerind. 1900, 1369 and 1402.)

The author tested eight different methods for the mination of the degree Brix.

(1) Direct determination of the water by drying sand or methyl alcohol in a current of dry air.

(2) Determination by a pyknometer closed with a g plate and entirely filled with the de-aërated syrup.

(3) By the pyknometer gauged to 50 c.c., and three-quarters full of syrup and weighed; de-aërat the water-bath, the bubbles of air removed with water, and the vessel filled to the mark with distilled and weighed.

(4) By hydrometer direct.

(5) By hydrometer after convenient dilution and lation according to the formula $\frac{100 \times \text{Pol. of original so}}{\text{Quotient of the solu}}$ = degree Brix of the original substance.

(6) By hydrometer on a solution of equal wei substance and water. The degree Brix found, multiplied by two, equals the degree Brix of the solution.

(7) By hydrometer on a solution of three tin normal weight made up to 300 c.c. with distilled 50 c.c. are clarified, made up to 100 c.c., and polari purity being calculated from Oswald's table.

(8) By Curin's method.

The first method is too long, and impracticable control of the refinery, from the number of determ required daily. Methods 2 and 3, although only gi apparent dry matter, take too much time. The method requires complete de-aëration. In the re four methods the error is multiplied by dilution, r to real dry solids; but, operating always under t conditions, the error is fairly constant and may be influence. For Method 5 this is not the case, the not always being the same. Of the three last that of Curin has the advantage, for it is not a hy thod, and it is not only of relative precision, but is ckly executed. It is as follows:—Into a tared 100—) c.c. flask, the normal weight of syrup or massecuite is roduced and dissolved in distilled water, and made up to) c.c. at 17·5° C., and weighed. Weight of 100 c.c. of ution + 26·048 = factor of dilution. Weight of 100 c.c. solution ÷ 100 = specific gravity of the solution. om the tables of Scheibler and Mategzeck, the degree x is sought corresponding to the specific gravity found. s, multiplied by the dilution factor, gives the degree x of the syrup or massecuite. Acetate of lead is now led, the solution made up to 110 c.c., filtered, polarised, l the quotient of purity calculated.

'he above method gives the apparent purity. For the ermination of the real purity, the author prefers the hod of Molenda, who states that the current opinion the difference between real and apparent purity is ater with products of lower purity, is erroneous, but increases until a fixed ratio of real non-sugar to sugar reached, and afterwards falls to 0. The maximum erence is with a real purity of 48, with a saccharisation e of 1·1 for real non-sugar, that is when each 1 grm. non-sugar per 100 c.c. represents 1·1 of sugar. Thus ibstance of 70·0 of real purity contains in 100 parts ry solids 70 parts of sugar and 30 parts of real nonir. These 30 parts raise the density by an amount l to 30 × 1·1 parts of sugar, so that the apparent solids are $70 + (30 \times 1{\cdot}1) = 103$. The formula iced from the mean value 1·1 is then: Real purity = 0 × Apparent purity ÷ (1,000 + apparent purity).

—L. J. de W.

ps and Massecuites; Determination of the Real and pparent Purity of ——. H. Pellet. Bull. de l'Assoc. s Chim. de Sucr. et de Dist. 1901, **18**, [9], 689—692.

EAD of using several tables to calculate the Brix from density of a dilute solution of the syrup, as de Jongh , the author prefers to read the degree Brix of the solution by a special instrument, and from this to late the degree Brix of the full weight syrup. The ometer used is checked against instruments tested on ions of pure sugar.

practice the full weight Brix has been found sensibly ame, no matter what the dilution was.

e divergence between real and apparent purity cannot ated in advance. It will vary with the Brix in use, iethod of determining the full weight Brix, and with nature of the material examined, beetroot or cane, ry or refinery, the period of manufacture, and the on of organic matter to ash.—L. J. de W.

Sugar; Influence of ——, *on the Conductivities of utions of KCl, HCl, and KOH; with Evidence of t Formation in the last Case.* C. J. Martin and Masson.

See under XI. A., *page* 482.

ar Cane Refuse; Manufacture of Paper from ——.
F. C. Thièle.

See under XIX., *page* 495.

Sugars; Determination of the Alkalinity of ——.
A. Herzfeld.

See under XXIII., *page* 510.

Sugar Beet in Alkali Soil. H. C. Myers.

See page 445.

PATENTS.

in Crystals; Process for Obtaining ——, *from ps, and Apparatus therefor.* H. Claassen, Germany. . Pat. 5518, March 23, 1900.

pecification deals with a process for regulating the turation during the evaporation of sugar syrups, is carried out as follows:—The syrup first drawn vaporated to a certain empirically ascertained conion in the usual manner, the heating steam is then replaced by direct steam introduced into the syrup. By this means the temperature of the liquid is regulated according to the degree of the vacuum until the formation of crystals takes place, after which the remaining syrup is boiled with an additional supply of syrup, the above operations being then repeated. The liquor is kept in motion during boiling by a suitable stirring arrangement. The method may also be applied to syrup of only slight supersaturation, in which case crystals, crystal powder, or a syrup mixed with crystals must be fed into the syrup. Claims are also made for a controlling apparatus consisting of two double scales, one indicating air pressure and the corresponding boiling point of water, while the other gives for these boiling points the corresponding percentage of water in the syrup. By means of these scales the temperature may be maintained at the point corresponding with the vacuum employed in the pans.—T. H. P.

Sugar; Apparatus for Dissolving ——, *or the like.* H. de V. Robbé, Amsterdam. Eng. Pat. 5787, March 28, 1900.

This apparatus consists of an inclined casing fitted above with a hopper to receive the sugar or other material, and containing a revolving shaft with arms and an adjustable plate to promote and regulate the descent of the sugar, which is led past a series of combined water and steam jets, and thereby completely or partially dissolved. The water pipes are arranged concentrically within the steam pipes, the latter being perforated with slits directed towards the material to be dissolved, and the former perforated on the reverse side, so that the water and steam are intimately mixed, and the water heated and sprayed. The sugar solution and any undissolved sugar pass into a vessel in which the dissolving process is completed by the combined influence of steam jets and a heating coil, the solution being finally strained and discharged. The whole action is automatic and continuous.—T. H. P.

Saccharine Solutions; Purifying and Decolorising ——. J. H. Lavollay and G. E. Bourgoin, Paris. Eng. Pat. 22,767, Dec. 13, 1900.

This process, which is applicable to syrups, glucose syrups, and in general to all saccharine juices, consists in treating such liquors with manganates of the alkaline earths or other insoluble manganates under the influence of an electric current. Further decolorisation of the juice is then brought about by agitation with a freshly precipitated insoluble carbonate, such as that of barium.—T. H. P.

Molasses Fodder; Process and Apparatus for Making ——. R. Schrader, Hamburg. Eng. Pat. 20,992, Nov. 20, 1900.

The process described consists in thoroughly mixing the molasses, diluted with water, if necessary, with suitable nutritious substances at ordinary temperatures, the thin fluid paste thus obtained being allowed to stand for one or two days until it assumes a solid and crumbly form, after which the mass is disintegrated and packed in the ordinary manner. Claim is also made for an apparatus consisting of a molasses pan and a water container, both opening into a mixing chamber, with the object of diluting the molasses to a suitable density. The molasses flows continuously into a mixing drum, to which the absorbent substances are supplied in a regulated quantity from a feed hopper provided with a disc distributor or valve.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Invertase of Yeast. E. Salkowski. Zeits. physiol. Chem. 1900, **31**, 305; through Chem. Zeit. Rep. 1901, **25**, [20], 70.

The author had reason to believe that the preparations of yeast invertase, made some years ago by Barth under his directions, were contaminated with gummy matter. Examination showed that all these preparations contained varying proportions of a gummy carbohydrate—yeast-gum.

The presence of this impurity is a fault of the process of preparation, and no doubt the invertase preparations of

Osborne and Kölle were contaminated in the same manner, since the methods employed were very similar.

But the author, like Barth, is of opinion that invertase is, in no sense of the word, a proteid substance.—J. F. B.

Yeast; Auto-Fermentation of ——. F. Kutscher. Zeits. physiol. Chem. **32**, 59—78. Chem. Centr. 1901, **1**, [16], 906.

Schützenberger has shown that by the auto-fermentation of yeast, besides carbon dioxide and alcohol, which are formed from the carbohydrates of the yeast, nitrogenous products, particularly tyrosine, leucine, and xanthine bases, are produced as digestion products of the protein matters of the yeast. These views have been confirmed by Geret and Hahn (Ber. **31**, 202) as regards the auto-fermentation of Buchner's pressed extract of yeast.

The author allowed fresh bottom-fermentation brewery yeast to undergo auto-fermentation under "toluene-water" at 38° C., till liquid and residue (after 14 days) no longer gave the biuret reaction. The liquid was precipitated with baryta water, the filtrate freed from barium by sulphuric acid, then faintly acidulated with acetic acid and concentrated. The separated tyrosine was filtered off, and from the filtrate there were subsequently isolated xanthine bases (guanine and adenine), ammonia, asparagin, histidine, arginine, lysine, and a substance of the formula $C_5H_6N_4O_4$; details of the method of separation followed are given.

The author attributes the formation of the above-mentioned products to the presence of an enzyme similar to trypsin in the yeast. The products are only formed from starved yeast; they are not contained in extracts of well-nourished yeast and beer. The author suggests, as an explanation of this fact, that with well-nourished yeast, the enzyme acts on the nitrogenous nutrient materials diffused in the interior of the cells, and only alters them to the extent that they can be used in the building up of living yeast substance; whilst with starved yeast, the enzyme attacks the living substance of the yeast, and continuously decomposes it.—A. S.

Yeast; Supply of Pure ——, *for Top-Fermentation Breweries.* F. Schönfeld. Woch. für Brau. 1901, **18**, [14], 185.

In Germany it is usual to brew light top-fermentation beer during the summer months. This beer is especially subject to infection, both from the conditions under which it is fermented and from the fact that the low percentage of alcohol and light hopping deprive it of the protective influences common to other beers. The beer is brewed from wort containing but little extract with a low-attenuating yeast, and is bottled direct from the fermenting vats with a considerable proportion of yeast in suspension. Very few breweries carry out the pure cultivation of the top-fermentation yeast for these light beers, and they are generally very unstable and liable to the attacks of bacteria, which increase in proportions as the season advances.

The Berlin Research Brewery is making arrangements for fortnightly supplies of a good, pure cultivated, top-fermentation yeast. This yeast is of a low-attenuating type, giving solid sediments in the bottles; it has been selected, with special regard to the purpose for which it is required, from a stock which has yielded excellent results in practice.—J. F. B.

Saccharifying Action of Wheat Germs, and Use of these Germs in Distilleries. Lindet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**, [9], 686—688.

The new grinding processes enable the miller to remove, at the commencement of the operation, the wheat germ in a great state of purity. These germs are sold as fodder at the same price as ordinary bran.

In this operation the germ is found not to be separated from its scutellum. Now, Brown and Morris have demonstrated that diastases, and especially that which, during germination, dissolves starch, are secreted in this part of the grain. Experience has shown the author that the germ bran, rich in fragments of scutellum, contains large quantities of saccharifying diastase, and that it can replace, at a given point in the distillery process, barley malt, which is dou the price.

The author thinks that the diastase of wheat ge exists as a liquefying and saccharifying enzyme, but he not been able to prove its liquefying action, the ge containing a large proportion of soluble albuminoids wh coagulate above 50° C., and when the temperature reac 65°—70° C. the quantity of precipitated matter is so g that the liquid becomes thick, so that the diastase, proba retained in the meshes of the albuminoids, is incap of liquefying and saccharifying. But if its liquef action remains undecided, there can be no doubt about saccharifying action. By operating on a paste, previo liquefied with malt, and keeping the temperature at 5 55° C. (that is, a temperature lower than that at which albuminoids coagulate), the saccharification of dextri determined.

Barley malt and wheat germs were compared at diffe temperatures for equal lengths of time on dextrin paste, and the results are expressed in dextrin transfor per 100 of dextrin pre-existing.

—	35° C.	45° C.	55° C.	65°
Germ bran......	38·5	46·2	45·1	8·
Barley malt.....	36·6	42·9	45·8	17·

The diastase of wheat germs is capable of saccharif dextrin in the course of the alcoholic fermentation, jus that of malt does.

The expense of the method is a minimum; for m 2 per cent. of malt and 10 of wheat germs are used, half this quantity for potatoes. The introduction of germs into the malt can only increase its nutritive v Those from the mill of the Paris hospitals contained per cent. of nitrogenous matters, 8·4 of fat, and 2·4 of —L. J. de

Beer; Biological Examination of ——. E. Prior. angew. Chem. 1901, **14**, [11], 270.

In the biological examination of beer, the quantity of yeasts and other micro-organisms present is frequent great that the beer yeast is suppressed, and its isolatio identification are rendered impossible. The foreign orga most frequently met with are species of Mycoderma acidifying bacteria, which grow on the surface of the li It is true that, by the addition of certain substances culture media, the development of the foreign orga may be retarded without affecting the beer yeast the results are always uncertain, and depend on the of the yeast, the vegetative condition of the cells various organisms, and the proportions of each p The author has devised a simple method whereb difficulty may be avoided. The nutrient medium, bee or the like, in which the beer sediments are cultiva covered, after infection, with a layer, 2—3 cm. in thic of mineral oil which has previously been sterilise current of hydrogen. This process has been use great success, and always prevents the suppression culture yeast by the foreign aerobic organisms.—J. F

Diastase; Examination of Samples of Commercial — G. Barth. Zeits. angew. Chem. 1901, **14**, [15], 368–

The author gives details of a comparative examina eight samples of commercial diastase. The moistur and nitrogen were first determined; the diastatic pow then measured by Lintner's well-known method. the liquefying power was determined with starch pas by a method devised by Lintner, which, although not allow of numerical expression, gives a very go of the relative velocity of liquefaction. The liq power is not necessarily proportional to the diastatic since they depend on different enzymes.

The author also determined the optical and reducing powers of the products of complete sacch tion of a 10 per cent. starch paste, liquefied at 70° saccharified at 62° C. under comparative condition tested for the presence of dextrose amongst the ducts of the reaction, by means of the osazone test. he results are summed up in the following table :—

——	1. Taka.	2. Witte.	3. Merck.	4. Remy.	5. Defresne.	6. Jeune.	7. Billault.	8. Chaix.
sture	10·35	10·47	7·75	11·64	10·21	5·17	..	..
	33·54	5·64	17·37	2·44	7·30	1·49	..	..
ein (N × 6·25)	16·56	81·81	42·31	5·25	31·56	6·38	5·19	1·93
tatic power (Lintner)	8·63	27·4	11·5	..	Very low	Very low	..	..
ms of diastase in 100 c.c. of the lution used.	0·2550	0·0832	0·1737	..	0·2040	0·5088	..	..
ific rotation [α]D	146·7	156·1	151·7	..	..	..	..	..
ne reducing power	72·19	68·39	72·19	..	..	..	..	..
rose in the products of saccharifi-tion.	Considerable quantities.	None	None	..	..	..	..	..
ne reaction of the diastase	None	Very slight blue.	Very slight blue.	Blue	Blue	Red	Blue	Blue
efying power at 65° C.	Strong	Strong	Very strong	..	..	..	..	..
ns of diastase in 100 c.c. of the ution used.	0·200	0·260	0·1993	..	..	..	..	..

From these results it would seem that the French preparations, Nos. 4—8, are almost inactive, and adulterated with starch or dextrin. Taka diastase apparently contains ge proportion of the enzyme glucase. Merck's pre-tion seems to be a malt diastase, whilst that of Witte ars to be of animal origin, since the protein is so high. enormous variation amongst the preparations examined inly emphasises the author's contention that the manu-rers of enzymes should sell them on a standard based their specific activity.—J. F. B.

le Wines; Invertase in ——. B. Fallot and L. Michon. ll. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**,], 522—531. From Revue de Viticulture, **14**, 347.

E sugar should never be found in wines, as, owing to action of invertase, a normal product of yeast, and to acidity of the medium, the sugar is completely hydro-l. This invertase exists in wines whether sugar has added or not, and its invertive action is exerted at nary temperatures. It preserves its properties, even excessive fining and sulphiting. Diluted alcohol lyses it slightly, without destroying it even after pro-ed contact. It resists the action of light well, even resence of air. Time does not appear to diminish nvertive power. From this it may be concluded that nvertase of wine yeasts is not only not very delicate, s less so, in fact, than other enzymes of the same , remaining active even after the death of the yeast.

—L. J. de W.

illery Wash; Alcohol in Spent ——. [*Cattle Food.*] Heinzelmann. Zeits. f. Spiritusind. 1901, **24**, [11], 7—108.

everal instances complaints were raised against the of cows fed on spent wash, on account of its peculiar ur, described as potato-like or alcoholic. Moreover, avour and an objectionable odour were transmitted to butter. The trouble was eventually found to arise alcohol (0·2—2·8 per cent. by volume) in the wash, resence being due to defects in the distilling apparatus ocess; *e.g.*, too rapid distillation, production of very ntrated spirit in apparatus originally constructed to a weaker alcohol, gradual enlarging of the perforations shelves of the rectifying column, &c.—H. T. P.

Fungus [*Physarum Leucophæum Fr.*]; *Yeast-closing Amoebæ of a* ——. W. Henneberg. Woch. Brau. 1901, **18**, [12—13], 159—161 and 173—175.

presence of amoebæ on the gypsum blocks employed dying the spore-formation of yeasts is very frequently ved. They are also present in hay infusions and are always found on germinated grain. Two classes of æ are recognised, the animal amoebæ which remain s form during their whole life, and the vegetable æ which are merely a stage in the development of n slime fungi or myxomycetes. The author has ed the life history of one of the commonest of these fungi, *Physarum leucophæum Fr.* The spores, are of a violet-brown colour, and are readily transported in the air, develop into amoebæ which assume the form of motile pear-shaped cells with a flagellum. These pass through a resting stage and are changed into characteristic amoebæ forms moving by means of protoplasmic points (pseudopods). These amoebæ multiply and form large masses of slime, in which sporangia are formed as globular fruits on stems. Under unfavourable conditions the amoebæ may encyst themselves in a membrane which renders them very resistant.

The main point of interest about these amoebæ is that they readily enclose yeast cells, preferably those of small species such as Torula. The yeast cells may be observed inside the amoebæ and remain there for a considerable time. The amoebæ certainly derive some nourishment from the yeast since they thrive much better when provided with it. But it is uncertain how this is obtained; possibly the amobæ assimilate the slimy covering of the yeast or some metabolic excretions. It is uncertain whether the yeast cells are dead, when, after some time, they are thrown out from the amoebæ. Certain kinds of bacteria are enclosed in the same manner.

The animal amoebæ are very similar to the vegetable or temporary amoebæ, it is often difficult to distinguish between them except by following their life history. The animal amoebæ, moreover, also enclose and utilise yeast cells in exactly the same manner as the amoebæ of the slime fungi.—J. F. B.

Acetylmethylcarbinol; Production of ——, *by Bacillus Tartricus.* L. Grimbert. Comptes Rend. **132**, [11], 706—709.

Bacillus tartricus attacks calcium or ammonium tartrate, forming acetic and succinic acids, carbon dioxide, and hydrogen. It also ferments glucose, saccharose, lactose, maltose, dextrin, and mannitol. The products are acetic and succinic acids, lactic acid, ethyl alcohol, and also acetylmethylcarbinol, $CH_3CO.CHOH.CH_3$. When a 5 per cent. solution of the sugar is completely fermented at 37° C., filtered, and the filtrate distilled, a little ethyl alcohol comes over at first, and the later portions of the distillate reduce Fehling's solution in the cold, and contain a substance which is proved, by the properties of its osazone, to be acetylmethylcarbinol. The quantity is small, 100 c.c. of the distillate containing from 0·0211 grm. in the case of mannite to 0·0904 grm. in the case of glucose. Dextrin, glycerin, and calcium tartrate yield none, nor do the sugars when sown with cultures of other *Bacilli.*

—J. T. D.

Maltose; Method of Isolating ——, *when mixed with Glucose.* A. C. Hill. Proc. Chem. Soc. 1901, **17**, [234], 45—46.

This method is, essentially, one of removal of the glucose by fermentation with Saccharomyces Marxianus, a yeast observed by Hansen in 1888 as not fermenting maltose. It includes also certain details of procedure, which have been found to facilitate, even if they are not necessary to, an easy crystallisation of the maltose after the fermentation is over, and reduce to a minimum such adventitious impurities as the by-products of fermentation and the oxidation products of the sugars.

A pure culture of the yeast, which has been grown in a glucose broth, is washed repeatedly with sterilised tap water, making use of a centrifugal machine, and is then added to a sterilised solution of the sugars which it is desired to ferment. The solution, which may be in an ordinary flask closed by a cotton wool plug, should not contain much more than 10 per cent. of sugar and should be made up in part with sterilised tap water.

The fermentation is conducted at 25—29° C. and proceeds slowly in the absence of proteid and without any notable multiplication of the yeast cells. When the evolution of carbon dioxide has nearly ceased, the flask is heated for a minute or so at 100° in the autoclave, and then its contents are freed from cells by filtration through a porous funnel. Alcohol is added to the solution to one-third of its volume and the whole evaporated down in a current of carbon dioxide to a thick syrup under diminished pressure; if necessary, more alcohol is added during the evaporation so that the temperature does not rise above 60° C. The rest of the process resembles that usually employed in the recrystallisation of maltose from 80 to 85 per cent. ethyl alcohol and results in the separation of the maltose quite white at the first crystallisation.

Carbohydrates and Allied Compounds, Chemical Action of Bacillus Coli Communis and Similar Organisms on ——. A. Harden. Proc. Chem. Soc. 1901, **17**, [235], 57—58.

Bacillus coli communis ferments glucose with production of a quantity of lactic acid corresponding to rather less than half the sugar, and of alcohol and acetic acid in approximately equivalent amounts, each representing about one-sixth of the carbon of the sugar. Small amounts of succinic and formic acids are also produced and carbon dioxide and hydrogen evolved. The carbon dioxide amounts to 12—18 per cent. of the sugar, whilst the volume of hydrogen is slightly greater. The lactic acid formed was found to be a mixture of inactive acid (25—5 per cent.) with *l*-lactic acid (75—95 per cent.). *B. typhosus* produces the same products from glucose, except that it yields a large amount of formic acid (17 per cent.) and no gas. Some of the abnormal forms of *B. coli communis* act in a similar manner on glucose, others produce the same substances but in entirely different proportions. *d*-Fructose yields the same products of fermentation by *B. coli communis* as glucose, and *l*-arabinose and *d*-galactose also yield *l*-lactic acid. Mannitol yields a much larger proportion of alcohol, 26—29 per cent., and a much smaller amount of lactic and acetic acids. The production of alcohol by this organism therefore appears to depend on the presence of the group $CH_2(OH)\cdot CH\cdot OH$ in the compound to be fermented; glycerin, which also contains this group, yields nearly half its weight of alcohol when fermented by the same organism.

Formic acid is decomposed into carbon dioxide and hydrogen (Pakes and Jollymen), but lactic acid is not attacked and hence the active lactic acid is probably not produced by the selective decomposition of previously formed inactive acid.

When asparaginic acid is the sole nitrogenous nourishment, glucose and mannitol are fermented as usual by this organism, but a large proportion of the hydrogen is absorbed and reduces the asparaginic acid to ammonium succinate.

Burnt Ale and other Waste Liquids of Whisky Distilleries; Composition and Disposal of ——. J. Hendrik.

See page 450.

PATENTS.

Distillers' Spent Residues or Wash; Treatment of ——. C. G. Sudre and C. V. Thierry, Paris. Eng. Pat. 2026, Jan. 29, 1901.

This invention is an improvement on that specified in Eng. Pat. 3522 of 1900 (this Journal, 1901, 379). The claims provide for the distribution of the previously concentrated spent wash from a movable distributing part in a t layer upon a stationary surface, provided with means heating the layer of wash. The distribution is effected an arm carried by a rotatable pipe through which liquid is passed. The stationary platform has a hol space beneath, through which heated oil is circulated effect the evaporation. The distributing arm is prece by a scraper which removes the layer of solid resid the whole apparatus being enclosed in a bell, the wa glycerin, ammoniacal, and tarry vapours are carried off an exhaust.—J. F. B.

Amylaceous or Starchy Matter; Rendering Soluble —. Soc. Anon. Alliance Industrielle, Brussels. Eng. 8514, May 8, 1900.

The claim provides for the employment of a weak s tion of aluminium chloride as the saccharifying agent effecting the liquefaction of amylaceous matters. starch or cereal is boiled in a similar manner to followed when acid is employed, and the alumina ma separated, if desired, by the subsequent addition of sod silicate. The use of aluminium chloride prevents extraction of objectionable nitrogenous matter from grain.—J. F. B.

Beer; Preserving ——. F. Crôtte, New York. Eng. Pat. 2690, Feb. 7, 1901.

The process claimed consists in placing a suitable servative substance in a receptacle in contact with the to be treated, then passing through the system an ele current of high tension, in such a way as to indu "cataphoric transference" of the preservative throug receptacle into the beer. An electric current of low te may then be passed through the beer for a short tin complete the treatment. A further claim provides tha beer may be placed in a non-metallic porous vessel, the receptacle containing the preservative made to form positive electrode. The opposite electrode is then p at a point outside the vessel containing the beer, wi moistened sponge making contact between the elect and the vessel. The receptacle for the preservativ preferably a copper tube silvered externally.—J. F. B.

Hops and other Organic Substances; Preserving - M. Trier, London, and A. Wilkinson, Liverpool. Pat. 11,352, June 22, 1900.

The process claimed consists in placing the previously hops or other substance to be treated in a vacuum-vessel or chamber, exhausting and maintaining the ex tion by means of a vacuum pump, drawing the air sulphuric acid contained in a separate vessel in the sys the hops are thus desiccated without elevation of tem ture and preserved *in vacuo*. The necessary apparat described and claimed; it includes a cock of special struction for maintaining the vacuum, it is provided gutter and a cup, a tube connecting the gutter with a va gauge passes through the cup which contains a washe liquid lying above the washer. The sulphuric acid which contains an inner vessel of acid-proof mate placed on a trolley so that it can be rocked when req to agitate the contents.—J. F. B.

Hops; Drying, Curing, and Sterilising ——. J. Cardiff, and E. W. Lancaster, London. Eng. Pat. March 20, 1900.

The apparatus consists of a series of vertical ch fitted with inclined trays or grids, down which the ho by gravity and are dried, cured, and sterilised durin passage through the chambers, by means of a curr cold air, a current of heated air mixed with a s antiseptic and a final current of cold air. The i trays have the form of an inverted V and means are s for giving them an oscillating motion, or a co vertical, horizontal, and oscillating motion. The necessary for forcing the currents of air and impreg them with antiseptic are also claimed.—J. F. B.

VIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

and Cream Regulations; Report of the Committee of Inquiry appointed by the Board of Agriculture.

Committee held 15 sittings for the purpose of taking nce, and examined 49 witnesses, of whom 15 were sts, 17 dairy farmers, and 12 representative milk r and distributors. The following recommendations e Committee are signed by Lord Wenlock (Chairman), George Cowan, Mr. P. G. Craigie (an Assistant Secre- of the Board of Agriculture), Mr. S. W. Farmer, Shirley F. Murphy, Prof. T. E. Thorpe (Government ratory), and Mr. J. A. Voelcker:—

That regulations under Section 4 of the Sale of Food Drugs Act, 1899, be made by the Board of Agriculture respect to milk (including condensed milk) and n.

-(*a.*) That in the case of any milk (other than ned, separated or condensed milk), the total milk- in which, on being dried at 100° C., do not amount to r cent., a presumption shall be raised, until the con- is proved, that the milk is deficient in the normal tuents of genuine milk.

) That any milk (other than skimmed, separated or nsed milk) the total milk-solids in which are less than r cent., and in which the amount of milk fat is less 3·25 per cent., shall be deemed to be so deficient in fat as to raise a presumption, until the contrary is d, that it has been mixed with separated milk or water, t some portion of its normal content of milk-fat has removed. In calculating the amount of deficiency of e analyst shall have regard to the above-named limit 25 per cent. of milk-fat.

That any milk (other than skimmed, separated, or sed milk) the total milk-solids in which are less than cent, and in which the amount of non-fatty milk- is less than 8·5 per cent., shall be deemed to be so nt in normal constituents, as to raise a presumption, he contrary is proved, that it has been mixed with In calculating the percentage amount of admixed the analyst shall have regard to the above-named of 8·5 per cent. of non-fatty milk-solids, and shall r take into account the extent to which the milk-fat xceed 3·25 per cent.

That the artificial thickening of cream by any addition tin or other substance shall raise a presumption that am is not genuine.

hat any skimmed or separated milk in which the milk-solids are less than 9 per cent. shall be deemed o deficient in normal constituents as to raise a pre- on, until the contrary is proved, that it has been with water.

hat any condensed milk (other than that labelled ine-skimmed milk" or "skimmed milk" in confor- ith Section 11 of the Food and Drugs Act, 1899) in either the amount of milk-fat is less than 10 per r the amount of non-fatty milk-solids is less than 25 t., shall be deemed to be so deficient in some of the constituents of milk as to raise a presumption, until trary is proved, that it is not genuine.

Committee further submit the following expressions ion on points raised before them in evidence:—

That it is desirable to call the attention of those d in the administration of the Food and Drugs Act necessity of adopting effective measures to prevent lition of water, separated or condensed milk, or other ous matter, for the purpose of reducing the quality uine milk to any limits fixed by regulation of the f Agriculture.

That it is desirable that steps should be taken with of identifying or "ear-marking" separated milk by ition of some suitable and innocuous substance, and adoption of procedure similar to that provided by 7 of the Food and Drugs Act, 1899, in regard to ne.

(*c.*) That it is desirable that, so far as may be found practicable, the procedure adopted in collecting, forwarding, and retaining pending examination, samples of milk (including condensed milk) and cream under the Food and Drugs Acts should be uniform.

(*d.*) That it is desirable that, so far as may be found practicable, the methods of analysis used in the examination of samples of milk (including condensed milk) or cream taken under the Food and Drugs Acts should be uniform.

(*e.*) That it is desirable in the case of condensed milk (other than that labelled "machine-skimmed milk" or "skimmed milk," in conformity with Section 11 of the Food and Drugs Act, 1899), that the label should state the amount of dilution required to make the proportion of milk-fat equal to that found in uncondensed milk containing not less than 3·25 per cent of milk-fat.

(*f.*) That it is desirable in the case of condensed whole milk to limit, and in the case of condensed machine-skimmed milk, to exclude, the addition of sugar.

(*g.*) That the official standardising of the measuring vessels commercially used in the testing of milk is desirable.

Mr. S. W. Farmer, who signed the above, issues a reservation report, in which he comes to the conclusion that the governing limit of 12 per cent. total solids "is too low for six months" of the year, and also renders the 3·25 per cent. fat limit inoperative. He objects to the suggested limit of 3·25 per cent. of fat for the whole year, and is in favour of seasonal limits, *viz.*, 3 per cent. of fat and 8·5 per cent. of solids not fat for March, April, May, and June; and 3·25 per cent. of fat and 8·5 per cent. of solids not fat for the remainder of the year; or even for periods of six months for each set of limits.

Mr. George Barham, a member of the Committee, also submits a separate report, as he is unable to give his assent to that of the majority. He recommends seasonal limits of 11·75 per cent. total milk-solids and 3 per cent. fat during the months from July to February inclusive, and from March to June inclusive of 11·75 per cent. total solids and 2·75 per cent. fat. Further, that 8·75 per cent. shall be the minimum limit of total milk-solids in skimmed milk, and that any condensed milk (other than that labelled "machine-skimmed" or "skimmed" milk), in which the fatty solids are less than the proteids, shall be presumed to be adulterated. He expresses the opinion that the mixing of water or separated milk with milk for the purpose of sale should be made a penal offence; that an employé adulterating milk without the consent or knowledge of his employer, shall be liable to the penalties; that all vessels or churns used in the conveyance of separated milk sold wholesale should be painted on the outside a red colour; and that in the case of a sample of milk being presumed to be adulterated, the third, or reference, sample should, on the request of the defendant, be referred to the Government Laboratory, and the result be made known to both parties, before the hearing of the case.—W. P. S.

Butter and Margarine; Cocoanut Oil in ——. W. G. Indemans. Bull. Assoc. Belge des Chim. **14**, [10], 404—407.

The author recently examined a sample of so-called margarine, which gave the Reichert-Meissl value 5·87 and the refractometer index 43°·5, at 40° C., whereas the normal butter of Northern Brabant gives the Reichert-Meissl value 26·5, and the same refractometer index, the index calculated for the mixture of butter and margarine presumably indicated by the Reichert-Meissl value, worked out to 48°·4. Further examination showed the mixture to consist solely of oleomargarine and cocoanut oil, the lower refractometer index of which latter accounts for the discrepancy recorded above, though the characteristic odour and flavour of this oil could not be detected. In another instance an alleged pure butter gave the refractometer index 45°·5 (which is a normal value for September butter), but only 21·51 as the Reichert-Meissl value, thus indicating an adulteration with at least 20 per cent. of foreign fats. Consequently, the author considers that reliance should not be placed on the refractometer index alone, but that the Reichert-Meissl test should be used in conjunction therewith, in examining butter for the presence of other fats.—C. S.

Hexone Bases in Heteroalbumose and Peptone: Determination of ——. C. H. Haslam. Zeits. physiol. Chem. **32**, 54—58; Chem. Centr. 1901, **1**, [16], 901.

The author examined, by the method described by Kossel and Kutscher (see this Journal, 1901, 270), heteroalbumose, and deuteroalbumose prepared according to Foliu's method (Zeits. physiol. Chem. **25**, 152). He finds that heteroalbumose contains 23·9 per cent. and deuteroalbumose, 31·4 per cent. of its nitrogen in the basic form. In deuteroalbumose, the hexone bases consist principally of arginine and lysin, particularly the latter, whilst in heteroalbumose, histidine is the predominant base.—A. S.

PATENTS.

Food Product or Article of Food. A. F. Tritton, Great Leighs, Essex; and L. F. G. Beyer, Rayne, Essex. Eng. Pat. 9493, May 24, 1900.

Cereals or leguminous substances are placed in a 1 to 10 per cent. aqueous solution of either potash, lime, phosphoric acid, or soda. After absorption has taken place, the material is steamed, either in closed vessels under pressure, or in open vessels, and is then dried and ground.—L. A.

Beverages and Liquids by Means of Manganates under Influence of the Electric Current: Purifying ——. W. P. Thompson, London. From The Société Mangano Electrique pour la Purification des Eaux et des Boissons, Paris, France. Eng. Pat. 3313, Feb. 15, 1901.

Insoluble manganates, especially calcium manganate, are added to the liquid and mixed by agitation, whilst an electric current of suitable strength is passed through the liquid. —L. A.

(*B.*)—SANITATION; WATER PURIFICATION.

Crude Sewage; Bacterial Treatment of ——. Third Report to the Main Drainage Committee of the London County Council by F. Clowes and A. C. Houston. See this Journal, 1898, 862, and 1899, 1148, for abstracts of previous reports; and also this Journal, 1901, 145.

I. *General Conclusions.*—The Thames is a tidal river, and the "intakes" for waterworks purposes are situated high up the river, and are "cut off" by "locks" from the influence of the sewage discharge at the outfall works.

Although the bulk of London sewage is certainly very great, the large size of the River Thames must also be considered, as also the proximity of the "outfalls" to the sea and the huge body of water in the river at high tide.

The river water outside the influences of the discharges at the outfall works is already polluted and contains practically all the bacteria found in raw sewage.

The body of Thames water which may be supposed to be directly affected by the discharge of the effluents at Barking and Crossness is "brackish," and so could hardly be tolerated for drinking purposes, even by individuals who are indifferent to the physical characters and biological composition of the water which they drink.

The bacterial coke-beds effect a reduction of at least 50, and it may be as much as 80 per cent. in the amount of dissolved oxidisable and putrescible organic matter in the raw sewage, as compared with 17 per cent. effected by the chemical treatment.

The effluents from the coke-beds are apparently non-putrescible.

The suspended matters in the crude sewage are practically entirely removed as a result of the biological treatment, instead of only about 80 per cent. effected by the chemical treatment; and recent experiments seem to show that this result may be obtained without loss of capacity in the coke-beds if the sewage has undergone a previous process of rapid sedimentation.

In the biological treatment no chemicals are required, and no offensive sludge is produced.

Where an effluent is turned into a stream to be used drinking purposes, the bacteriological results are manifes of more importance than the chemical; but when, as in t present case, the river is not a potable one, and is alre polluted, the converse probably holds good; *i.e.*, chemical state of the effluent is of primary, and biological of secondary importance. In the first case chief object is to guard against disease, and in the sec case the main consideration is to avoid fouling the ri with putrescible matters to such an extent as to constitut grave public nuisance.

However desirable it may be to obtain an efflu chemically pure, and, at the same time, bacteriologica above suspicion of danger, a process which leads to solution of the great mass of suspended matters in the r sewage, which effects a striking reduction in the amount putrescible matters, which avoids the use of chemicals the accumulation of offensive sludge, which yields apparently non-putrescible effluent, and which is at same time practicable, is one which presents such sing advantages over chemical treatment, and which prod such satisfactory results in view of all the requirement the case, that it would be idle to deny its value or atte to minimise its usefulness simply because it falls short standard of absolute perfection.

II. *Biological Conclusions.*—Although the total num of bacteria, the number of spores of aërobic bacteria, number of liquefying microbes, the number of *B. coli* spores of *B. enteritidis sporogenes* were, on an average, in the effluents from the coke-beds than in the correspon samples of crude sewage, the reduction was not well mar and in some cases the effluents contained more mi organisms than the sewage before treatment. Thus, w the chemical results were always satisfactory, the bact logical results were usually quite the reverse, because microbes producing the chemical changes passed thro the coke-beds in practically unaltered numbers.

In view of these results, only one conclusion se possible, namely, that however satisfactory the process be from the chemical and practical point of view, effluents from the bacterial beds cannot be reason assumed to be more safe in their possible relatio disease than raw sewage slightly diluted, but other unaltered in its bacterial composition.—A. S.

Tannery Refuse; Anthrax Traceable to ——. H. Russell. Seventeenth Report of the Wisconsin A Stat. Pharm. J. 1901, **66**, [1605], 391.

An investigation into the causes of a severe outbre anthrax, which occurred in the vicinity of Medford, U.S.A., showed that the virus of the disease undoub came from tannery refuse, probably owing to the us "murrain," or infected hides imported from C Attempts to disinfect the hides with formaldehyde met no success, as in order to kill anthrax spores, the solu have to be of such strength that they cause injury to hides. It is stated that at the present time, there satisfactory method of disinfecting hides, before subj them to the tanning process.—A. S.

Moorland Waters; Researches on ——. *Part II.* (*of the Combined Chlorine.* W. Ackroyd. Proc. (Soc. 1901, **17**, [236], 87.

The object of the investigation has been to discove origin of the common salt in the water of the W reservoir in Yorkshire, about midway between the two this water being continually removed and as conti replenished from a saltless area of Millstone Gri Yoredale rocks. The chlorine in the winter rainfall than accounts for it, and the conclusions arrived at a (that the combined chlorine in the reservoir water is derived from rain water; (2) that the quantity of cl in the reservoir, whose capacity is 640½ million g closely approximates to a yearly average of 1·188 pa 100,000, and (3) that in winter the chlorine in the ra is in excess of the average for other seasons of the y *ater; Volumetric Determination of Calcium and Magnesium in* ——. L. W. Winkler.

See under XXIII., *page* 507.

table Waters; Determination of Phosphates in ——. A. G. Woodman and L. L. Cayvan.

See under XXIII., *page* 506.

PATENTS.

ge; Structures for the Bacterial Treatment of ——, *d in Apparatus connected therewith.* T. I. Goldie, rwich. Eng. Pat. 8224, May 3, 1900.

ERIAL tanks or chambers are arranged on either side ceutral inspection chamber common to all, in which ber or culvert are laid, above one another, the channels ying the sewage respectively to and from each tank. eptic tanks are arranged in pairs, communicating with other, at the end farthest from the culvert, by means arched opening in the dividing wall, so that the flows from the upper channel in the culvert into one through the opening into the second tank, and from nto the lower channel in the culvert. It is dis-ed thence into one of two filter tanks, worked ately, the discharge being automatically diverted into nk or the other by means of a movable delivery nto which the discharge channel empties its liquid, elivery end being connected by levers, links, or other lent arrangements to a shaft carrying blades or agms upon which the discharge from the filters is l to act alternately, and thus shift the delivery end ne filter to the other.—L. A.

Waters; Apparatus for Purifying ——. H. sch, Uerdingen-on-the-Rhine, Germany. Eng. Pat. 4, May 12, 1900.

nvention relates to apparatus by means of which the nces which accumulate upon the grates or screens h which dirty water flows, are continually removed he same, so that the flow of water is not impeded. paratus consists essentially of rotating elastic combs, by means of guide-rails and guide-rollers, are ted over the grate, which is formed of longitudinally ed wires stretched over a frame. The rotating raise the dirt accumulated upon the grate above the of the water, and the dirt is then removed from the by a suitable mechanism.—L. A.

(*C.*)—DISINFECTANTS.

Green" as an Arsenical Insecticide; Soluble nious Oxide in ——. S. Avery and H. T. Beans. mer. Chem. Soc. **23**, [2], 111—117.

thors find that even pure samples of "Paris Green" rge quantities of soluble arsenic on treatment with ter, and that the amount rendered soluble depends e dilution and the duration of the extraction. The division of the particles also influences the amount nic going into solution. The results obtained by ling "Paris Green" in 1,000 parts of water, and to stand for a week, are quite arbitrary.

s found, however, that the presence of sodium in the solution largely prevents the hydrolysing f water on the compound.

n dioxide, in the presence of water, readily oses "Paris Green," even to the point of complete osition, and the authors come to the conclusion much importance must not be attached to the 4 per cent. of soluble arsenious acid. Probably the irregularities observed in the action of "Paris on foliage, may be due to the weather conditions, appen to be favourable to the formation of free s acid from a pure sample of the substance.

—W. P. S.

naldehyde; Gasometric Determination of ——. E. Riegler.

See under XXIII., *page* 510.

PATENTS.

Fungicide; Manufacture of an Improved ——. C. D. Abel, London. From Bayerische Actien-Gesellschaft für Chemische und Landwirtschaftlich-Chemische Fabrikate of Heufeld, Bavaria. Eng. Pat. 11,818, June 29, 1900.

CALCINED copper sulphate and calcined sodium carbonate are intimately mixed in equivalent proportion, to form a mixture which is stable while dry, but yielding when treated with water a precipitate of cupric carbonate, stated to be effective when used as a fungicide.—E. S.

Sheep Dipping Preparations. I. S. McDougall and J. McDougall, Manchester. Eng. Pat. 12,621, July 12, 1900.

SHEEP dip, composed of the usual ingredients, is prepared in the form of solid blocks or cakes, by mixing with the ingredients a sufficient proportion of solidifying material (*e.g.*, 6 to 9 per cent. of stearine), for convenience of handling and transport.—L. A.

Fertiliser and Disease Germ, or Pest Destroyer; Application of Spent Oxide to the Soil and Plants as a ——. D. M. Nelson and G. R. Nelson, Glasgow. Eng. Pat. 19,304, Oct. 29, 1900.

SPENT oxide is added to the soil for the purpose stated in the title.—L. A.

XIX.—PAPER, PASTEBOARD, Etc.

Paper Materials from Wood, and the Waste Waters from their Manufacture. L. Gottstein. Papier-Zeit. 1901, **26**, [22], 828—829.

THE author gives an historical survey of the various processes for the manufacture of cellulose from wood, and an account of the more recent improvements in the same. He then considers the question of the disposal of the waste liquors from the bisulphite process, and deals with the applications discussed by Seidel (this Journal, 1900, 1033). He remarks that any method of utilisation of these liquors must be on a very large scale, as the output in Germany is calculated to be about 900—1,000 tons of dissolved solids per day, or approximately equal to the quantity of cellulose manufactured. If these waste liquors be put upon the land, they clog it up and the drainage waters become dark coloured; the development also of micro-organisms readily takes place.

In the author's opinion cellulose factories may reasonably be required to remove all fibres and to nearly neutralise the sulphurous acid of these liquors. Beyond this he thinks that it should be permissible to run them into a river of sufficient volume, provided that the total solids of the water were not increased to any considerable extent; he points out that the liquors are not poisonous or injurious to health. In the case of factories which have not a river of sufficient size available, there is no other means of treatment than by the evaporation of the more concentrated portions of the liquors. They cannot be dealt with in a multiple effect evaporator on account of their tendency to froth. Even if this difficulty were overcome, the evaporation would still be very expensive. The employment of the concentrated liquors as an adhesive or cement for the manufacture of briquettes is not possible on account of the hygroscopic nature of the dissolved matter. Dorenfeldt's process for the recovery of the sulphur is complicated and the plant is expensive, and its introduction is not likely to lead to any advantageous results.—J. F. B.

Paper; Manufacture of ——, *from Sugar-Cane Refuse.* F. C. Thiele. Chem. Zeit. 1901, **25**, [27], 289—290.

THE author describes the process of paper-making from sugar-cane refuse used at a large works in Texas. The woody fibre, &c., from the diffusion battery are the raw material; they contain 82 per cent. of water, 16·5 of crude cellulose, 0·75 of carbohydrates, and 0·75 of mineral matter. The ash contains silica, 82·77; ferric oxide, 6·65; alumina, 3·69; chlorine, 0·82; phosphoric acid, 1·48; and potash, 4·32 per cent. It is thus the silica which must essentially be removed. If the chips be boiled at once with soda and lime under pressure, inconvenient foaming subsequently takes place in the beater, the mass is washed with difficulty, and the moist paper sticks to the hot roll of the paper machine. These difficulties are overcome by allowing the chips to ferment in heaps, the process being assisted by frequent watering. The pectins are thus destroyed; valerianic acid is formed, probably owing to the decomposition of the albumins. The fermented chips are then taken by a conveyor to a "rotary," a spherical vessel of steel plate, turned by cogwheels at the rate of seven revolutions per minute. The charge of the "rotary" is 40,000 lb. of chips, to which are added 450 lb. of dry soda and 200 lb. of dry quicklime; the chips contain sufficient water to dissolve the materials completely during the boiling process. The mass is boiled by direct steam at a pressure of 90 lb. per sq. in. during 4 hours, the "rotary" being in continuous movement. Steam is then blown off, the contents allowed to drain on a large wire sieve, and then transferred to the beaters, where they are thoroughly washed. The pure cellulose is then brought into large tanks, from which it is fed to the paper machine, first passing through a "knot-catcher," which retains large pieces and mechanical impurities.

The material is not sized, and rosin is not added, since the paper is sufficiently strong and writing paper is not made. The original material appears to contain some unfermentable substance (pith), which gives to the paper in the later stages certain properties which make it similar to sized paper. The daily output is 24,000 lb. of brown paper, suitable for packing purposes. The paper is very strong, and possesses a fair resistance to the penetration of water. In a single season (the summer months) 8,000,000 lb. of paper are obtained from 40,000,000 lb. of chips. The paper sells at 2 cents per lb.

The material obtained from the soda process requires, for bleaching, too much chloride of lime to make the operation profitable. The author has, however, found that, if the material from the beater be treated with sulphurous acid, the brown decomposition products contained in the cellulose become soluble. After well washing, the mass may then be bleached snow-white by small quantities of bleaching powder and alum. It may then be coloured by organic dyestuffs or by insoluble pigments.—A. C. W.

Photographic Papers. Papier-Zeit. 1901, **26**, [28], 1052.

The author discloses the general results of laboratory investigations of the "photographic" papers of Blanchet frères ("Rives" paper) and Steinbach and Co. ("Papiers de Saxe").

They are made from a rag half-stuff of 85 per cent. of linen and 15 per cent. of cotton, the latter being "new pieces," the former from worn material. They are rosin sized with 3 per cent. rosin, some starch is added, apparently to give "rattle." The strength was medium, *i.e.*, a mean breaking length of 2,700 m.; a mean extensibility of 2·7 per cent. is also low; and resistance to rubbing was "small."

The ash varied from 3—4 up to 10—15 per cent. In the latter case the added "mineral" was China clay, 80, and barytes, 20.

The stuff is evidently beaten very "short" and run very "wet." Attention is directed to the necessity for scrupulous cleanness of the stuff and the absence of metallic particles.

PATENTS.

Paper Pulp and the Like; Apparatus for Use in Purifying ——. H. Schmolka. Prague, Germany. Eng. Pat 21,222, Nov. 23, 1900.

The paper pulp is made to pass through a long, shallow trough, wherein it meets a series of cross laths, affixed to an endless chain, and which pass along in contact with the bottom of the trough. In this way all the impurities—sand, limestone, knots, &c.—which accumulate at the bottom of the trough, are swept along by the laths, and received in a collecting vessel at the front end of the trough. Any foam or scum forming on the top of the liquid, is removed by another series of laths, which only dip slightly into the liquid. A series of brushes is also affixed to the endless chain, for the purpose of keeping the bottom of the troug thoroughly clean, and thus preventing the formation slime.—A. S.

Waste Water from Paper Mills; Process and Apparat for Recovering, suitable for Re-use, Water and t Pulp of the ——. A. Faust, Liverpool. Eng. P 21,737, Nov. 30, 1900.

The process consists in dividing the waste water by pr liminary settling into two parts, one rich and the other po in pulp, the former after having passed through a fro collector being led back direct to the paper machine, whil the part poor in pulp is allowed to settle in tanks, where the remainder of the pulp deposits, and from which it brought back into the machine. The water overflowi from the settling tanks is quite clean and ready to be us again in the paper mill.

The apparatus consists of a number of settling cylinde with conical bottoms connected by overflow pipes reachi more than half way down into the cylinders. All t conical bottoms communicate with a common collecti pipe provided with a stopcock and a throttle valve betwe every pair of cylinders, so arranged that they may operated simultaneously. The waste water is raised into t first cylinder from a collecting pit by means of a pump, t delivery of which is divided. One part passes through pipe and a preliminary settler to the cylinder, whilst t other part with less rise passes first by a pipe and valve a scum collector and thence by a pipe and valve back the paper machine. The scum collector consists of outer box provided with an internal cone funnel, vertica adjustable, terminating in an outlet pipe and a draw-cock.—D. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Sulphuryl Chloride; Hydrate of ——. A. Baeyer a V. Villiger. Ber. **34**, [5], 736—738.

Sulphuryl chloride, SO_2Cl_2, thrown on ice or into ice- water forms colourless crystals of a hydrate. These per for many hours under ice-cold water, though they rapi volatilise in the air after drying on a tile. In water ab the freezing point they break up, forming an oily liq no doubt sulphuryl chloride, for on cooling they ca formed again. Analysis gave the ratio $SO_2:Cl_2:H_2O$ 1 : 2·024 : 15·857. The crystals thus contain sulph chloride, not its decomposition products; and they are doubt a hydrate of the anhydrous substance, and cont no "chemically combined water" or hydroxyl groups, they are not only stable under ice-cold water, but decomposed only slowly by ice-cold solution of sod carbonate.—J. T. D.

Oxalic Acid; Preparation of Chemically Pure —. O. Schmatolla. Apoth. Zeit. 1901, **16**, 194; thr Chem. Zeit. Rep. 1901, **25**, [26], 95.

Chemically pure oxalic acid, for checking standard tions of alkali, is best prepared in the following manne 50 grms. of oxalic acid are dissolved in 120 grm absolute alcohol on the water-bath, allowed to cool an settle. The solution is filtered, 2—3 drops of d sulphuric acid (1 : 2) are added, the whole is sh vigorously and allowed to remain all night, when the traces of alkali will be deposited as sulphate. The alc it then distilled off, the residue is dissolved in 200—30 of water, and the aqueous solution is allowed to stan some hours in the cold. A small quantity of imp formed by interaction of the acid with the alcohol, is separated as a heavy oil. The solution is filtered caused to crystallise, and the crystals which are absol pure oxalic acid, are dried, first at a temperatu 35°—40° C., and then in the desiccator over anhy calcium chloride.—J. F. B.

Phenol; Some Iodo-derivatives of ——. P. Brena Comptes Rend. **132**, [13], 831—833.

When phenol (1 molecule) and potassium hydr (2 molecules), dissolved in water, are slowly added otion of iodine in potassium iodide, mixtures of di-iodo- H : I_2 : 1 : 2 : 4) and tri-iodo- (OH : I_3 : 1 : 2 : 4 : 6) phenol obtained. With 2 atoms of iodine the di-iodo-deriva- e, with 6 atoms of iodine the other, is the chief product. e iodophenols separate as greyish crystalline precipitates. er washing and drying, the two derivatives are separated ier by fractional crystallisation or by distillation in steam, ch brings over the di-iodophenol.

Both substances were identified by their physical racters; the di-iodophenol also by those of its methyl acetyl derivatives.—J. T. D.

rcuric Oxide; Action of ——, on certain Organic ubstances. A. and L. Lumière and F. Perrin. Comptes end. 132, [10], 635—637.

: solution of mercuric oxide by sodium phenoldisul- nate (this Journal, 1901, 273) is an action common ll substances containing a phenolic group; though ily oxidisable phenols, such as amidophenols, are ised rather than converted into mercury compounds. anisol and phenetol do not behave similarly, the olic hydroxyl would seem to be essential to the ion. The authors have prepared the sodium mercury- ncol-disulphonate, the properties of which are quite ar to those of sodium mercury-phenol-disulphonate.

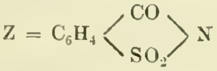
—J. T. D.

arin-Chloroform: A Fresh Instance of Chloroform of ystallisation. G. Kassner. Archiv. der Pharm. 237, —48.

s leprarin, derived from the lichen *Lepraria latebrarum rius*, is crystallised from chloroform, it retains 1 molecule of that body in intimate combination, as chloroform of crystallisation. The formula of leprarin was found to be $C_{19}H_{18}O_9$ and not $C_{38}H_{40}O_{17}$ or $C_{21}H_{20}O_{10}$, as previously given. The formula for the crystalline chloroform compound is therefore $C_{19}H_{18}O_9.CHCl_3$.—J. O. B.

Saccharinates; Metallic ——. H. Defournel. Bull. Soc. Chim. 25, [6], 1901, 322—329.

"SACCHARIN," the artificial sweetening matter, readily combines with mineral or organic bases giving well-defined salts, which generally possess a definite crystalline form. They may be obtained by double decomposition of sodium saccharinate and metallic sulphates in aqueous or alcoholic solution, since the sodium sulphate simultaneously produced is readily soluble in the one and insoluble in the other medium. An alternative method is to decompose the carbonates with saccharin either in an aqueous or alcoholic solution. Ammonium saccharinate, which has been patented in France under the name of Sucramine, is obtained by dissolving saccharin in a sufficient quantity of ammonia and allowing the solution to stand, when it deposits white crystals possessing a greater sweetening power than saccharin and leaving no after-taste. The salt is soluble in hot or cold water, methyl or ethyl alcohol, but insoluble in other organic solvents. It melts at about 150° C., and then decomposes, giving off ammonia. Hypobromite liberates the ammoniacal nitrogen in the cold. The following table gives the characteristics of various saccharin salts which have been prepared:—



$$Z = C_6H_4 \left\langle \begin{array}{c} CO \\ SO_2 \end{array} \right\rangle N$$

Base.	Formula.	Crystalline Form and Colour.	Solubility.			Taste.
			Hot Water.	Cold Water.	Alcohol.	
m	$ZLi3H_2O$	White needles	Sol.	Sol.	Sol.	Sweet.
r	Z_2Cu4H_2O	Emerald green prisms.	Sl. sol.	Almost insol.	Insol.	Very astringent.
niacal copper...	$Z_2CuH_2O3NH_3$	Violet blue	..	Sl. sol.	Sl. sol.	"
m	Z_2Ca11H_2O	White crystals	Sol.	Sol.	Sl. sol.	Sweetish.
ium	Z_2Sr2H_2O	White crystals effl.	Sol.	Sol.	Sol.	Sweet.
sium	Z_2Mg5H_2O	White needles	Very sol.	Very sol.	Sol.	Sweet, no after taste.
....	Z_2Zn6H_2O	Long white prisms	Very sol.	Sol.	Intol.	Styptic.
ry	Z_2Hg	Nacreous plates	Sol.	Sl. sol.	Sol.	Sweetish.
um	Z_2Cd2H_2O	White crystals effl.	Sl. sol.	Sl. sol.	Very sol.	"
....	Z_2Pb	White prisms	Sl. sol.	Sol.	Insol.	Sweet, with metallic after taste.
nese	Z_2Mn4H_2O	" "	Very sol.	Sl. sol.	Sol.	Less sweet than saccharin and with a bitter after-taste.
....	Z_2Co5H_2O	Violet-red crystals	Sol.	Sl. sol.	Sol.	..
....	Z_2Fe7H_2O	Yellow lamellæ	Sol.	Sl. sol.	Insol.	Sweet, then astringent with a final iron taste.
....	Z_2Ni5H_2O	Small green crystals effl.	Sol.	Sl. sol.	Insol.	Sl. sweet.
iacal nickel...	$Z_2NiH_2O4NH_3$	Sky-blue crystals	Sol.	Sl. sol.	Insol.	Sweet.

—T. A. L.

ol; Action of Nitric Acid on ——. H. Cousin. J. Pharm. Chim. 13, [6], 269—272.

nitro-tri-iodopyrrol.—Ten grms. of iodol (tetra-iodo- are dissolved in 50 c.c. of ether, and a mixture of fuming nitric acid in 15 c.c. of acetic acid is slowly the product is then poured into a dilute solution of bisulphite, and the mixture extracted with ether. hereal solution is evaporated to dryness, and the is recrystallised from alcohol diluted with an equal of water. The crystalline mass thus obtained, of two compounds, which may be separated by ut with absolute alcohol, in which one is soluble in ; this constitutes the greater part of the products eaction. This body, purified by precipitation with nd recrystallisation, proved to be mononitro-tri-iodo- $C_4I_3NO_2NH$. It crystallises in groups of prismatic ellow needles, which decompose suddenly at 185°— without melting. It unites with alkalis to form ed crystalline salts, which explode on heating. dy. is of interest, as being the first mono-nitro- c of pyrrol which has been described.—J. O. B.

Emodin as the Active Constituent of some Drugs. A. Tschirch. Giorn. di Farm. di Trieste, 1901, 6, 33. Chem. Zeit. Rep. 1901, 25, [10], 90.

THE presence of emodin in Chinese rhubarb and in the bark of *frangula* and *cascara sagrada* has been confirmed by experiments carried out by pupils of the author, and also its presence in aloes, in English and Austrian rhubarb, in the fruit of *Rhamnus cathartica* and in the fruit and leaves of *Cassia senna*, shown (see this Journal, 1900, 1139). In most cases, emodin is accompanied by chrysophanic acid and rheïn; the relation between these compounds is shown by the following formulæ:—chrysophanic acid (dihydroxymethylanthraquinone), $C_{15}H_{10}O_4$; emodin (trihydroxymethyl anthraquinone), $C_{15}H_{10}O_5$; rheïn (tetrahydroxymethyl anthraquinone), $C_{15}H_{10}O_6$. It is apparent that each of these compounds can exist in several isomeric forms, and as a matter of fact, the emodin from aloes and senna differs from that obtained from frangula, rhubarb and rhamnus, in some of its reactions, and also as regards reduction products. If emodin from aloes or senna be heated with concentrated sulphuric acid till acid vapours are evolved, then a drop of the solution mixed with a little water and neutralised with ammonia, a violet coloration is produced. Emodin obtained from the other drugs mentioned above, when submitted to similar treatment, gives a cherry red colour. The emodin is not present in the drugs in the free state, but in the form of complex compounds, frequently of a glucosidal nature, which undergo hydrolysis.—A. S.

Oleates of the Metals: Preparation of ——. W. A. H. Naylor. Pharm. J. 1901, 66, [1605], 392.

The author describes simple methods for the preparation of the oleates, using in all cases a genuine olive-oil soap of high quality, and containing 15 per cent. of water.

Aluminium Oleate.—1 oz. of pure potassium alum is dissolved in 6 fluid oz. of boiling water, and poured, with stirring, into a solution prepared by dissolving 2 oz. of soap in half a pint of boiling water. The precipitate is washed by decantation with boiling water until free from sulphates, and dried on the water-bath. The product forms a yellowish-grey, opaque, adhesive mass, and contains 3·2 per cent. of aluminium. The oleate can be obtained in an anhydrous condition by drying at 120° C.

Bismuth Oleate.—1 oz. of bismuth subnitrate is dissolved in 5½ fluid drachms of nitric acid diluted with its own volume of distilled water. The solution is further diluted with three times it volume of distilled water, and poured whilst hot, with stirring, into a solution of 3 oz. of soap in 24 oz. of hot water. The precipitate, when washed by decantation with hot water, and dried on the water-bath, contains 20 per cent. of bismuth.

Copper Oleate.—1 oz. of pure crystallised copper sulphate is dissolved in 5 fluid oz. of water, poured, with stirring, into a solution of 2¾ oz. of soap in 1 pint of water, and the mixture boiled for a short time, until the precipitate separates in the form of a plaster, which is washed, kneaded, and dried on the water-bath. The oleate forms a dark green, somewhat opaque, "toughly brittle" mass, and contains 9·3 per cent. of copper.

Ferrous Oleate.—1 oz. of pure crystallised ferrous sulphate dissolved in 5 fluid oz. of water and 2 oz. of soap dissolved in 16 oz. of water are mixed together in a stoppered vessel of as small a size as possible. The precipitate is washed with water, thrown on to calico, and subjected to strong pressure, and the pressed cake dried at a temperature not exceeding 50° C. The water used for preparing the solutions and for washing the precipitate should be freed from dissolved oxygen by prolonged boiling. Ferrous oleate is unstable, readily undergoing oxidation.

Ferric Oleate.—4 fluid oz. of solution of acetate of iron (B.P. 1898) are mixed with a solution of 2½ oz. of soap, dissolved in 16 oz. of boiling water; the precipitate is washed with hot water, and dried on the water-bath. Ferric oleate is of a deep red colour, is readily soluble in the fixed oils, and contains 5·6 per cent. of iron.

Lead Oleate.—3 oz. of lead acetate are dissolved in 160 fluid oz. of water, with the addition of a few drops of acetic acid, and poured, with constant stirring, into a solution of 5 oz. of soap in 80 oz. of water. The mixture is heated to boiling, and the precipitate is washed with hot water by decantation, then subjected to pressure, and dried on the water-bath. The oleate forms a dirty grey, strongly adhesive mass, and contains 25 per cent. of lead oxide.

Mercuric Oleate.—The author points out that the precipitation method of the B.P. is not described very clearly. For instance, powdered soap may mean soap that has been completely dried at 110° C., or soap that has only been sufficiently dried to admit of its easy reduction to powder. The extent to which the oleate should be dried is not given, although perhaps the consistence of the product may be taken as the guide. The author prefers drying the oleate in a dark room or cupboard at 49°—55° C.; he questions whether the use of oleic acid in the B.P. formula is really necessary; and he states that a larger yield, closely approximating to the theoretical, can be obtained by using a slight excess of soap. Mercuric oleate prepared according to the B.P. formula, contains al 23 per cent. of mercury.

For the determination of mercury in the oleate, following modification of Bennett's method (Pharm Nov. 24, 1900, 575) is proposed: 2 grms. of the oleat stirred with 10 c.c. of ether in a tared beaker, until pletely disintegrated, and then 25 c.c. of alcohol and of hypophosphorous acid (30 per cent.) added. mixture is heated on the water-bath until the red mercury settles, when the liquid is poured off, the re washed by decantation with alcohol and ether successi and the beaker and mercury dried at 100° C. and weigh

Zinc Oleate.—The oleate prepared according to B.P. method contains 11·59 per cent. of zinc oxide theoretical amount being 12·90 per cent.—A. S.

Alkaloids in Cinchona Trees; Formation of ——. Bull. de l'Inst. Bot. de Buitenzorg, 1900 [3]. Inst J. April, 1901, 97.

The author has made a series of investigations int mode of formation and the occurrence of alkaloids i species of cinchona, *viz.*, *succirubra* and *ledgeriana.* micro-chemical examination of each part of the tree i for the presence of the characteristic cinchona alk proved the existence of these substances in certain c every portion of the plant. In general, the alkaloids a to occur only in the tissue known as the *hypoderma,* t in the part of the plant where the building-up and bre down processes which constitute plant metabolism ar active. In the youngest parts of the plant, such as t of the stem and under the root cap, where no differen into tissues has begun, no alkaloid is found. A p feature of the distribution of the alkaloids is that they occur in the sieve-tubes, which are associated with th veyance of the albuminous products of the plant. results of the observations afford an explanation phenomenon that the first bark obtained from a cir tree is richer than that obtained from succeeding this being due to the fact that the bark first is produced by the drying up of hypodermal tis which each cell contains alkaloids, whilst the secondar produced by the continued activity of the cork ca contains, in addition to hypodermal cells, bast fibres contain no alkaloid. In dealing with the method of tion of the alkaloid, it appeared highly probable, si leaves of the plant are mainly concerned in the pro of starch and albumin, which serve for their nutriti here also the alkaloids were produced, but the e already existing strongly negatived this view. The points out, however, that a mere determination amount of alkaloid contained in the leaves, gives no answer to this question, because it is quite possible t alkaloid as soon as it is formed is transported tow stem. As the result of a large number of careful o tions, it was found that, under normal climatic co a leaf accumulated alkaloid during the day and itself during the night by allowing the alkaloid transported towards the stem. This normal remova alkaloid from the leaves does not occur under adv ditions, such as are found in extremely cold o weather; climatic influences also have consideral on the amount of alkaloid formed during the day. observed that empty cut leaves were capable of p alkaloid when placed in stimulating liquids, such solution of ammonia.

With regard to the bearing of the results upon cultivation, it should be noted that since the useful are formed in the leaves of the plant, care should in the selection of varieties for cultivation, to obta having a good foliage, both with regard to quan size of leaves formed. The author states that this been generally adopted in recent years in the Java plantations, with excellent results. Further, any of cultivation which tends to increase the hypoderm in the plant should yield bark containing an amount of alkaloid, and therefore, better yields expected from "pollarding" than from ordinary g

inine Arsenate. Guigues. Répertoire, 13, 52; Pharm. J. 1901, 66, [1602], 289.

RATED quinine suspended in water is gently warmed, and ilute solution of arsenic acid added to distinct acid tion. The solution is then exactly neutralised with very te ammonia, and allowed to cool, when fine, colourless, needles of quinine arsenate crystallise out. The salt ains 71 per cent. of quinine alkaloid.—A. S.

chonine. E. Juagfleisch and E. Léger. Comptes Rend. 132, [13], 828—830.

examination of commercial samples of cinchonine has n that they almost always contain considerable ortions (up to 20 per cent.) of hydrocinchonine. By ocess of successive crystallisations, both from water from alcohol, of the neutral sulphate, the authors ned from a cinchonine containing 20 per cent. of ocinchonine, one containing only 1 per cent. The ical constants of this purified cinchonine differ some- from those usually given :—The solubility of the ate in water is one part in 72·1 parts at 12° C., 60·2 °·5 C., and 12·9 at 101° C.; the melting-point of the is 261°·3 C.; its rotatory power in alcoholic solution = + 229°·6, and in solution in aqueous hydrochloric α_D = + 263°·4. In all these cases, mixture of the ed base or salt with hydrocinchonine would make the s approximate to the usually received constants.

—J. T. D.

ionine Transformations by Means of Sulphuric Acid. H. Skraup. Monatsh. für Chem. 1901, 22, [2], —190.

action of sulphuric acid of different strengths upon onine at various temperatures was studied. A quantity bisulphate, $C_{19}H_{22}N_2O.H_2SO_4.3H_2O$, corresponding grms. of base, was dissolved in 60 c.c. of acid, and lution kept in the thermostat. At the end of the ion, excess of strong ammonia was added, and 60 c.c. ohol. The precipitate, after washing with ice-cold and 50 per cent. alcohol, was weighed as cinchonine. ltrate and washings were extracted with ether, the t distilled off and ammonia expelled from the e, which was then converted into the hydrochloride and into hydriodide. The separated and dried iodide, $N_2O.2HI$, was weighed and calculated as α-iso- onine. The mother-liquors of the iodide contained nine and β-isocinchonine.

extracted aqueous solution of ammonium sulphate ied the sulphonic acid; an estimation of this acid lious and unsatisfactory, the difference between the nine taken and that recovered as cinchonine and its ides was therefore calculated as "remainder."

ll concentrations and temperatures, α-isocinchonine e sulphonic acid are the first products; they are simultaneously. In order to obtain a rapid reaction, ric acid of sp. gr. 1·525, 1·649, and 1·768 was the last-named converts 25 per cent. of the base our. Broadly speaking, the ratio of the base con- into α-isocinchonine to that converted into sulphonic independent of the temperature, and becomes less creasing concentration of the acid.

cinchonine is converted, but with much greater y than cinchonine, into β-isocinchonine and allo- ine; a sulphonic acid is also formed. β-isocincho- obtained in good yield from cinchonine only by of strong acid or at high temperatures; it is trans- by acid of sp. gr. 1·76 at 100° C. into allocinchonine, antity of α-isocinchonine, and a sulphonic acid is med. The sulphonic acid is converted by sulphuric o bases, which do not act upon litmus and do not o contain α- or β-isocinchonine.

onine Sulphonic Acid.—Neither the acid nor es could be obtained crystalline. In attempts to , the acid is converted into compounds free from

nalyses of the precipitated copper salt correspond arly with the formula $C_{19}H_{22}N_2O_5SCu$—the basic cinchonine hydroxysulphonic acid.—A. C. W.

Base from Cinchonine, Analogous to Nichine. F. Langer. Monatsh. für Chem. 1901, 22, [2], 157—170.

When hydrobromic acid is removed from hydrobromocinchonine, a base, δ-cinchonine, is obtained (Cordier, Monatsh. für Chem. 19, 466—472), soluble in ether with difficulty, and forming a neutral hydrochloride soluble with difficulty. The author adopted Cordier's method, using silver nitrate. The base, separated from the purified hydrochloride, and recrystallised from ether, melted at 141·5° C.; $[\alpha]_D = 139°$. Analyses of the base, its hydrochloride and hydriodide, resulted in the formula $C_{18}H_{22}N_2O$; whilst δ-cinchonine has been hitherto regarded as isomeric with cinchonine, $C_{19}H_{22}N_2O$. Hydriodo-δ-cinchonine is obtained by triturating the trihydriodo-compound with ammonia, it was not obtained crystalline; when treated with silver nitrate it regenerates δ-cinchonine. Hydrochlorocinchonine gives, by the action of alcoholic potash, in addition to α-isocinchonine and other bases, a base soluble with difficulty in ether, and forming a hydrochloride little soluble in cold water. This base is, however, isomeric with cinchonine; it reacts with nitrous acid, but the product does not give Liebermaan's reaction.—A. C. W.

Hydrocinchonine. E. Jungfleisch and E. Léger. J. Pharm. Chim. 1901, 13, [7], 313—317.

Hydrocinchonine was obtained by Caventou and Willm by the oxidation of cinchonine with potassium permanganate; they regarded it as pre-existing in the cinchonine. Amongst other bases produced by the action of dilute sulphuric acid on cinchonine, the authors had obtained cinchonifine (this Journal, 1894, 657), which, though similar to hydrocinchonine, was regarded as isomeric with cinchonine. The two bases have now been compared, and are found to be identical; they melt at 278° C., $\alpha_D = + 199°$. Under the same conditions both bases are attacked by permanganate. The sulphates of the bases were hitherto regarded as differing in water of crystallisation; cinchonifine sulphate is now found to crystallise from strong solutions with $2H_2O$, from weak solutions with $11H_2O$. Though these figures do not agree with the $3H_2O$ and $12H_2O$ of hydrocinchonine sulphate, yet the identity of the sulphates is regarded as proved; the crystals of the $11H_2O$ hydrate agree in measurements with the $12H_2O$ hydrate of hydrocinchonine.

The authors' process for obtaining hydrocinchonine (Comptes Rend. 112, 944; this Journal, 1891, 724) has enabled them to find large quantities in all cinchonines; they propose to show that cinchonine freed from hydrocinchonine has properties different to those now attributed to pure cinchonine.—A. C. W.

Allocinchonine. O. J. Hlavnicka. Monatsh. für Chem. 1901, 22, [2], 191—205.

The following process is the most satisfactory for the production of allocinchonine :—Potassium iodide is added to a solution of cinchonine bisulphate, and then alcohol. The filtrate from the potassium sulphate gives in two crystallisations 70 per cent. of the theoretical yield of cinchonine dihydriodide. The first crop may be used without further purification. The dihydriodide is heating with hydriodic acid (boiling at 127° C.) for four hours on the water-bath; the crystals obtained on cooling are washed, mixed with alcohol, and treated with a mixture of equal volumes of ammonia and water. Hydriodocinchonine is precipitated, whilst α-isocinchonine remains in solution. After washing, the moist precipitate is treated with so much strong hydrochloric acid that an 18 per cent. solution of the acid is obtained, cinchonine then dissolves; the hydriodocinchonine is washed, dissolved in boiling water, poured into ammonia, dissolved in dilute sulphuric acid, the solution treated with a slight excess of silver nitrate, excess of silver removed by common salt, and equal volumes of alcohol and ammonia added to the filtrate. After standing some time, crude allocinchonine is precipitated, it is neutralised by sulphuric acid, and the sulphate recrystallised until its solubility no longer decreases.—A. C. W.

Tautocinchonine. F. Langer. Monatsh. für Chem. 1901, 22, [2], 151—156.

By the removal of hydrobromic acid from hydrobromocinchonine, von Cordier obtained, together with other bases, an alkaloid very similar to cinchonine, which he termed tautocinchonine, the properties of which were not altered by fractionation (Monatsh. für Chem. 1898, 171). The author prepared trihydrobromocinchonine from commercial cinchonine dihydrobromide and from pure recrystallised cinchonine sulphate. On removing the bromine by means of silver nitrate, the yield of bases insoluble in ether from the commercial preparation was found to be diminished if the latter was recrystallised. The trihydrobromocinchonine prepared from the pure sulphate yielded almost pure allocinchonine by the same treatment. Tautocinchonine was found to contain considerable quantities of cinchotine. On the water-bath cinchotine is almost unattacked by sulphuric acid of 1·7 sp. gr. during one hour, whilst cinchonine and its isomerides are either sulphonated or converted into bases readily soluble in ether and in alcohol of 50 per cent. strength. By means of this method, Cordier's tautocinchonine was shown to contain almost 40 per cent. of cinchotine.—A. C. W.

Ipecacuanha; Alkaloids of ——. Paul and Cownley. Amer. J. Pharm. 73, 107.

Emetine, $C_{15}H_{22}NO_2$ or $C_{30}H_{44}N_2O_4$, is an almost colourless (yellowish after exposure to light) amorphous substance, melting at 68° C., strongly alkaline to litmus. It is readily soluble in alcohol, ether, chloroform, and benzene; sparingly soluble in water and hot petroleum spirit; insoluble in caustic alkali solution. Emetine is left in the form of a transparent varnish on evaporating its solutions. The hydrobromide crystallises in tufts of silky needles, the hydrochloride in radiating groups of silky filaments, the hydriodide in silky needles, and the nitrate in tufts.

Cephaeline, $C_{14}H_{20}NO_2$ or $C_{28}H_{40}N_2O_4$, is a colourless crystalline compound melting at 96°—98° C., or at about 102° C. if it has been precipitated by ammonia. Like emetine, it soon becomes yellowish on exposure to light. It is readily soluble in caustic soda solution, very sparingly soluble in cold, more freely in hot, petroleum spirit, and is much less soluble than emetine in ether. Cephaeline is left in the form of a faintly yellowish transparent varnish on evaporating solutions in alcohol, ether, or petroleum spirit. It can, however, be separated from ethereal solution, especially in presence of water, in bunches of delicate, silky needles. Cephaeline hydrochloride forms transparent rhombic crystals, the production of which, like those of the corresponding emetine salt, is facilitated by the presence of excess of acid. If a salt of cephaeline be agitated with ether and ammonia, the base crystallises out immediately.

Psychotrine is a crystalline base, melting at about 138° C., and apparently having a much higher molecular weight than emetine or cephaeline. It is readily soluble in alcohol and chloroform, the solutions becoming dark coloured on exposure to light, and depositing a dark brown substance. It is very sparingly soluble in ether, and separates from that solvent in well-defined pale lemon-yellow transparent prisms.—A. S.

Ipecacuanha; Chemistry of ——. Paul and Cownley. Amer. J. Pharm., Feb. and March 1901.

The authors have isolated three alkaloids—emetine, cephaeline, and psychotrine—from both Brazilian and Colombian (New Granada) ipecacuanha, but although the amount of total alkaloid is practically the same in each case (about 2 per cent.), the two varieties cannot be regarded as interchangeable, as the proportions of emetine and cephaeline differ considerably. Thus the alkaloid from Brazilian ipecacuanha root consisted of 72·14 (stem 65·6) per cent. of emetine, 25·87 (stem 32·8) per cent. of cephaeline, and 1·99 (stem 1·6) per cent. of psychotrine; whilst that from the Colombian variety consisted of 40·5 per cent. of emetine, 56·8 per cent. of cephaeline, and 2·7 per cent. of psychotrine. Ipecacuanha also appears to contain a crystalline saponin-like constituent of the nature of a glucoside. The so-called de-emetinised ipecacuanha has been found to contain as much as 0·5 per cent. of to alkaloids.—A. S.

Damascenine: A Constituent of the Seeds of Nige Damascena [Action of Alkali on ——]. H. Pomm rehne. Archiv. der Pharm. 239, 31—39.

Continuing his researches on damascenine, the author fi that true saponification does not take place when the s of that alkaloid are treated with alcoholic alkali, but that isomeric change takes place, the reaction product acquir the characters of an acid. He represents the action betw damascenine hydrochloride and caustic potash thus—

$$(C_9H_{11}NO_3HCl + H_2O) + 2KOH = KCl + C_9H_{10}KNO_3 + 3H_2O.$$

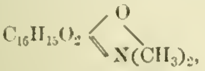
The reaction product was isolated by first removing unconverted damascenine by shaking out the alkaline s tion with ether, then acidulating with acetic acid, and ag extracting with ether. It was obtained, when pure perfectly colourless quadratic tablets, with oblique an Air-dried crystals, containing 3 mols. H_2O, melted at 7 77° C., but the anhydrous crystals, dried over H_2S 50° C., melted at 140°—141° C. Analysis gave figures cordant with the formula, $C_9H_{11}NO_3$. That the actio the alkali does not affect the methoxyl groups is sh by the fact that two Zeisel determinations before and treatment with caustic potash gave identical results, yielded iodo-compounds of the same melting points. hydrochloride of this reaction product, $C_9H_{11}NO_3H$ H_2O, melted at 199°—202° C.; the platinum $(C_9H_{11}NO_3HCl)_2PtCl_4 + 4H_2O$, melted at 202°—203°. action of alcoholic KHO on damascenine is quantita both under pressure and when the mixture is boiled i ordinary manner under a reflux condenser, it takes partially, even with the weaker alkalis, such as so carbonate and sodium hydrogen carbonate, at ordi temperatures.—J. O. B.

Morphine; Researches on ——. *Part II.* S. B. Sch er and F. H. Lees. Proc. Chem. Soc. 1901, 17, [235],

The authors have shown (Trans. Chem. Soc. 1900 7 1024 and this Journal 1900, 687,) that bromomor $C_{17}H_{18}O_2NBr$, is decomposed by water in accordance the equation $C_{17}H_{18}O_2NBr + H_2O = C_{17}H_{19}O_3N,HBr$, from the reaction product a new base, isomeric morphine and designated *isomorphine*, was isolated described. The authors have since isolated fro product of the above reaction, another new base, *morphine*, $C_{17}H_{19}O_3N$, which is formed only in rel small amount. It crystallises from alcohol in pyramids of the formula $2C_{17}H_{19}O_3N, C_2H_6O$, after drying at 120° C. melt at 182° C., and for $[\alpha]_D^{17^\circ} = -216{\cdot}2^\circ$. Chloromorphide, when decompos water, also yields β-*iso*morphine, together with a base which has not yet been further examine view of the non-narcotic action of *iso*morphine as pared with morphine, experiments were carried determine the chemical relationship between th isomerides. *iso*Morphine yields a *diacetyl iso methiodide*, $C_{17}H_{17}(O.CH_3CO)_2ONCH_3I$, as needle ing at 242° C. with decomposition. Phosphorus trib reacts with *iso*morphine, giving bromomorphide (170° C.) identical with that obtained from morph the same reaction. Phosphorus trichloride, on th hand, reacts with *iso*morphine, yielding no definite whereas chloromorphide results from the same with morphine. iso*Codeine methiodide*, $C_{17}H_{18}O_2($ NCH_3I, forms reaflets melting at 265° C. with decom and for it $[\alpha]_D^{17^\circ} = -102{\cdot}7^\circ$. It was prepared by t following methods: (*a*) by the action of silver sulp barium hydroxide on *iso*morphine methiodid subsequent interaction of the resulting methydrox methyl iodide; (*b*) by the action of excess of iodide on the sodium derivative of *iso*morphine; (codeine by the following steps: *bromocodeide*, $(OCH_3)N \cdot Br$, prepared by the action of phosph bromide on codeine, forms pearly scales melting at for which $[\alpha]_D^{20^\circ} = +56{\cdot}7^\circ$; iso*codeine*, $C_{17}H_{18}O_2(($

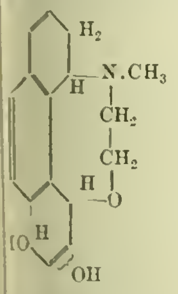
the action of water on bromocodeide, which forms lles melting at 144° C., for which $[\alpha]_D^{18°} = -169°$. The hiodide was then readily prepared from *iso*codeine.

he formation of *iso*codeine methiodide by the above ods confirms the phenolbetaine constitution—

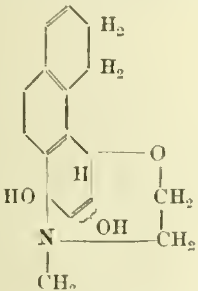


$$C_{16}H_{15}O_2 \langle {}^{O}_{N(CH_3)_2},$$

*iso*morphine methydroxide, which was provisionally gned to this substance by the authors in their previous r. Sodium hydroxide reacts with *iso*codeine methiodide, ling the base *methi-*iso*morphimethin*, $C_{16}H_{14}O_2(OCH_3)$ $CH_3)_2$, which forms tables melting at 167° C., and having $= +64 \cdot 6°$ *Methi-*iso*morphimethin methiodide*, $_{14}O_2(OCH_3) \cdot N(CH_3)_3I$, forms needles melting at 265° nd for which $[\alpha]_D^{17°} = +34 \cdot 7°$. *Methi-*iso*morphimethin ydroxide* is split up by the action of heat and yields henol methyl ether, $C_{15}H_{10}O_2$, m. p. 65° C., which is ical with the phenol obtained by Knorr (*Ber.*, 1889, 83) from codeine methiodide, the morphine derivative, alogous reactions to the above. These results indicate resence in *iso*morphine of exactly the same groups as in morphine, and the authors suggest that the onship between these two bases is, in all probability, r to that represented by the two following formulæ:



orphine (Knorr).



iso-Morphine.

different physiological behaviour of morphine and rphine was treated of from the standpoint of Ehrlich's

hebenidine. E. Vongerichten. Ber. 1901, **34**, [5], 767—770.

stillation with zinc dust, morphine yields phenanthrene base morphidine; methylmorphimethine gives the products; thebaïne yields phenanthrene and traces of r base; morphothebaïne yields similar products; erine produces a different base; thebenine gives and the base thebenidine. Thebenidine is insoluble ter, readily soluble in alcohol, ether, and benzene, a blue fluorescence. It melts at 144°—148° C. atinum salt is $(C_{15}H_9N)_2H_2PtCl_6$, a yellow precipitate. nidine is not oxidised by chromic acid in acetic acid n; it combines with methyl iodide to form the com- $C_{16}H_{12}NI$, which could not be further methylated. duced by tin and hydrochloric acid. The methyl- compound gives, by the action of caustic soda, a line hydroxide soluble in ether. Thebenidine is in properties to phenanthridine and chrysidine, and ave a similar constitution. Morphidine has not yet btained crystalline; it behaves in a similar manner enidine.—A. C. W.

obacco; New Alkaloids of ——. A. Pictet and A. Rotschy. Ber. 1901, **34**, [5], 696—708.

NE is the only organic base hitherto found in . In preparing a large quantity of nicotine, the endeavoured to discover other alkaloids. The mate- s the concentrated tobacco liquor of a cigar works, d by extracting the leaves of Kentucky tobacco kewarm water and evaporating *in vacuo* to 40° B.; os. of tobacco produced 11·4 kilos. of the extract, containing, approximately, 10 per cent. of nicotine, which was obtained by adding strong caustic soda solution and distilling in steam. The alkaline liquor was extracted with ether, the bases extracted from the solvent by dilute hydrochloric acid, and liberated by soda. The nicotine still present was removed by distilling in steam until the distillate gave no turbidity with picric acid. The residue was neutralised, the solution evaporated, and the bases separated by solid potash; 40 grms. of non-volatile bases were obtained from 13 kilos. of the original liquor. From these bases, by repeated distillation at ordinary pressure, were obtained a fraction boiling at 266°—268° C. and remaining liquid on cooling, and a smaller fraction boiling between 300°—310° C. and partly solidifying on cooling. The former fraction consists of the alkaloid nicoteïne, $C_{10}H_{12}N_2$; the solid alkaloid, nicotelline, separated from the second fraction after washing with ether and recrystallising, melted at 147°—148° C., analysis indicated the formula $C_{10}H_8N_2$. A very small quantity of the latter alkaloid was obtained; it is, however, almost insoluble in ether, so that the original liquor probably contained a larger proportion than corresponds with the results obtained.

The crude nicotine contained a secondary base; the mixed hydrochlorides were treated with sodium nitrite, the bases liberated by potash, and the nicotine removed as far as possible by distillation under 10 mm. pressure at a temperature not exceeding 113° C. The residual nitrosamine was boiled with strong hydrochloric acid, and the recovered base benzoylated by the Schotten-Baumann method. On distillation under ordinary pressure, the benzoyl compound came over above 350° C. without decomposition; it was a viscid yellow oil, which did not solidify on cooling. The alkaloid separated from the benzoyl compound was a colourless liquid, boiling at about 250° C.; it is isomeric with nicotine, and was given the name nicotimine, to recall its imide character.

10 kilos. of the tobacco liquor contained about 1,000 grms. of nicotine, 20 grms. of nicoteïne, 5 grms. of nicotimine, and 1 grm. of nicotelline. These figures do not, however, represent the proportions in which the alkaloids are contained in the tobacco leaf.

Nicoteïne, $C_{10}H_{12}N_2$, is a colourless liquid boiling at 266°—267° C. (uncorr.); its odour recalls parsley and pyrrol; the taste of a very dilute aqueous solution is burning and intensely bitter. It mixes with water and all ordinary solvents in every proportion. The aqueous solution has a strongly alkaline reaction. In the presence of excess of sulphuric acid, it at once decolorises potassium permanganate. Its specific rotation is $[\alpha]_D = -46 \cdot 41°$. The nicoteïne salts are also lævo-rotatory. The alkaloid is a divalent bitertiary base. The platinum salt, $C_{10}H_{12}N_2 . 2HCl . PtCl_4$, is an orange yellow crystalline precipitate. Gold chloride at once produces an egg-yellow precipitate, which crystallises from warm water in small tables, melting at 186° C. with complete decomposition. In the aqueous solution of the free base, mercuric chloride produces a voluminous white precipitate, which melts at about 115° C., from the solution of the hydrochloride it separates colourless drops, which solidify in 1—2 days to small white crystals, which melt at 215° C. The picrate is also first precipitated as an oil, it crystallises from warm water in yellow prisms, melting at 165° C. Free nicoteïne unites with methyl iodide to form a pale yellow oil: $C_{10}H_{12}N_2(CH_3I)_2$. Attempts to reduce nicoteïne to nicotine failed. Nicoteïne readily yields nicotinic acid by oxidation with strong nitric acid. Acid solutions of nicoteïne become red on evaporation; its platinum salt evolves white vapours on heating, which colour a moistened pine splinter deep violet-red; it is very similar to dihydronicotyrine (Ber. **31**, 2020). Thus nicoteïne is probably very similar in constitution to nicotine. The physiological action of nicoteïne is similar to that of nicotine but more intense.

Nicotelline, $C_{10}H_8N_2$, crystallises from warm dilute alcohol or boiling water in small white prismatic needles; it melts at 147°—148° C. and boils without decomposition several degrees above 300° C. It is readily soluble in alcohol and benzene, very readily in chloroform, but with difficulty in ether and petroleum spirit. Its aqueous solution has a neutral reaction; it is not volatile with steam and does not reduce permanganate in acid solution; the acid solutions do not become red on evaporation; the alcoholic solution does not colour a pine splinter; it gives no colour reactions with ferric chloride, ferrous sulphate, or potassium ferrocyanide. The platinum salt is a very pale yellow precipitate, which separates from warm very dilute hydrochloric acid in small transparent rounded crystals, which neither melt nor decompose at 290° C. The gold salt is a flocculent precipitate, it sinters at 170° C., and then decomposes. The mercuric double salt crystallises from hot water in brush-shaped aggregates of long needles, which melt at 200°—201° C. The picrate forms yellow flakes. The bichromate is a golden-yellow precipitate, it crystallises from hot water and does not melt at 250° C.; no other tobacco alkaloid forms an insoluble bichromate.

Nicotimine, $C_{10}H_{14}N_2$, is a colourless liquid, boiling at 200°—205° C., soluble in water and ordinary organic solvents, its odour is stronger and more unpleasant than that of nicotine or nicoteïne. The aqueous solution has a strongly alkaline reaction. The hydrochloric acid solution does not turn red on evaporation. The platinum salt is pale yellow, it consists of very small rounded crystals, which turn grey at 270° C. but do not melt at 290° C. The gold salt forms small pale yellow leaflets, which melt under boiling water or at 182°—185° C. with decomposition. The mercury salt forms bundles of fine white needles; it decomposes with effervescence at 190° C. The picrate is precipitated as an oil, which slowly solidifies to thick yellow prisms melting at 163° C.—A. C. W.

Phenylmethylchloropyrazol Chloromethylate [Antipyrine Chloride]; Action of Aniline and of Ammonia upon ——. A. Michaelis and E. Gunkel. Ber. 1901, **34**, [5], 723—727.

When heated with aniline hydrochloride and phosphorus oxychloride or pentoxide, antipyrine yields a compound in which the oxygen atom is replaced by $:N.C_6H_5$ (Ger. Pat. 113,384). Phosphorus oxychloride, however, converts antipyrine into phenylmethylchloropyrazol chloromethylate, thus the aniline compound (anilopyrine) would probably be obtained by the action of aniline on the chloromethylate. The reaction is effected by heating for two hours at 250° C., pouring into dilute hydrochloric acid, diluting, and adding caustic soda. A thick oil separates, which soon solidifies; after washing with ether and recrystallising from alcohol, it melts at 120° C. Anilopyrine is not decomposed by hydrochloric acid at 150° C., by heating alone at the same temperature or with alcoholic potash. Thus the radical $:N.C_6H_5$ is probably not united by both valencies to the same carbon atom.

Anilopyrine dissolves in strong nitric acid, on dilution a reddish-yellow precipitate is formed, which may be separated into a dark red compound, $C_{12}H_8N_4O_2$, almost insoluble in alcohol, and a lemon-yellow compound, $C_{12}H_{10}N_4O_2$, soluble in alcohol. The former yields an amide, $C_{12}H_8N_3.NH_2$, on reduction by tin and hydrochloric acid. Anilopyrine unites with methyl iodide, on heating at 100° C., to form the compound $C_{17}H_{17}N_3.CH_3I$, which crystallises from water in light yellow thick prisms melting at 174° C.

Ammonia reacts with antipyrine chloride in a similar manner to aniline; the reaction is best effected by heating with ammonium carbonate in sealed tubes at 200° C. for 12 hours, pouring into water, extracting with ether, removing the solvent, driving off volatile matter in steam, and taking up in ether. The compound is finally recrystallised from toluene. Iminopyrine, $C_{11}H_{12}N_2(NH)$, forms white needles melting at 116° C. It distils unaltered.—A. C. W.

Sweet Cassava; Hydrocyanic Acid in——. — Carmody. Lancet, Sept. 1900.

Francis some years back (Analyst, April 1877) pointed out that hydrocyanic acid is present in sweet cassava to a considerable extent, but his statement does not appear to have received general attention. For instance, it is stated in Thorpe's "Dictionary of Applied Chemistry" that "the milky juice in the sweet variety is innocuous, whilst that in the bitter is highly poisonous." In view of the extensive use of sweet cassava as a food in the tropics, the author ha investigated the subject, and his results fully confirm th statement of Francis. The following figures were obtaine by the author, those obtained by Francis being also give for the sake of comparison :—

—	HCN, per Cent.	
	Francis.	Author.
Mean	0·0168	0·010
Highest	0·0238	0·019
Lowest	0·0113	0·005

The author separated the hydrocyanic acid from t cassava by repeated extraction with water, and he is of t opinion that the whole of the hydrocyanic acid that exi ready formed in the tuber is removed by the first extractio that removed by subsequent extractions being probab produced by fermentative action. In the course of t investigation it was observed that although the percenta of hydrocyanic acid in sweet cassava is almost identi with that in bitter cassava, yet a means of distinguishi between the two varieties is afforded by the fact that bitter cassava the hydrocyanic acid is nearly uniforn distributed throughout the tuber, whilst in sweet cassava is located chiefly in the skin and outer cortical layer.—A.

Anethol to Anisic Acid; Oxidation of ——. J. Bougau Comptes Rend. 1901, **132**, [12], 782—784.

In a previous communication (Comptes Rend. **130**, June the author, starting from anethol, has converted it by tre ment with iodine and mercuric oxide into the aldeh $CH_3O.C_6H_4.CH(CH_3)CHO$, and this, on further oxidat with silver oxide, is transformed into the correspond acid. He has now continued the oxidation, and obtai from this acid a methoxyphenylmethyl ketone by mean chromic acid mixture. The action of alkaline permanga on this ketone yields $CH_3O.C_6H_4.CO.CO_2H$, whic converted by permanganate in an acid solution into an acid. The same series of reactions is also given by isosa isomethyleugenol, and iso-apiol and appears to be charac istic of the propenyl chain.—T. A. L.

Oil of Cade. Cathelineau and Hausser. Bull. Soc. Cl 1901, **25**, [5], 247—250.

In former communications (this Journal, 1898, 868; 1899, 604) the authors described the results of fract ating this oil with sodium hydroxide solution, and nature of the soluble products. In the present paper deal with the insoluble products. From 400 c.c. of oi cade containing 77 c.c. of matters soluble in caustic solution, they obtained 323 c.c. of an oily substance, w did not dissolve, and which on distillation was sepa into the following constituents :—Substances distil 100°—245° C., 3 c.c.; at 245° to 260° C., 120 c.c 260°—285° C., 140 c.c.; and residue, 60 c.c. The re thus obtained with oils of different origin were very vari and the authors eventually adopted a different method, consisted in treating the insoluble products with s firstly in a neutral solution, then in an alkaline sol and finally extracting the alkaline liquid with eth petroleum spirit.

200 c.c. (188 grms.) were treated with 3 litres of wa a flask holding 10 litres. Steam was then introduced to carry over about 1·5 litre of water per hour, the being regulated so as to maintain the contents of the at practically the same level. The volatile oils were c over at the rate of about 10 c.c. per litre of water. way 105 c.c. of volatile oils (b. pt. 245°—285° C.) distilled with 10 litres of water.

The contents of the flask were mixed with 100 c 40 per cent. sodium hydroxide solution, and the distil with steam continued until no more volatile oils over. This second distillation yielded 21 c.c. of oils boiling almost entirely between 245° and 285° C. B means part of the residual product was decomposed i identical with that obtained in the first distillation, and er substances, probably resinous acids.

xtraction with Petroleum Spirit.—The contents of the k were exactly neutralised with hydrochloric acid, ken with 250 c.c. of petroleum spirit, and left for a day. supernatant layer was then transferred to a flask, ether with 250 c.c. of slightly acidulated water, and the oleum spirit distilled off as completely as possible. On ling, a brown fatty layer of the consistence of lard was upon the surface of the water, whilst a small quantity grm.) of a flocculent substance was deposited. The fatty stance amounted to 68 c.c. = 60 grms.

xtraction with Ether.—The liquid in the flask after the oleum spirit extraction, was evaporated until sodium ride began to deposit, an odour recalling that of amon oil being developed towards the end of the opera-. It was then mixed with 15 c.c. of concentrated hydro-ric acid, and a small quantity of water, and shaken with c.c. of ether. The ethereal layer contained about 1 grm. locculent matter in suspension, and on evaporation led 2·5 grms. of a reddish-brown oil.—C. A. M.

Perfume ("Janthone") from Mesityl Oxide and ippial or Citral; Preparation of ——. Ger. Pat. 8,288, July 2, 1898. Farbwerke L. Durand, Huguenin d Co., and P. Barbier. Zeits. angew. Chem. 1901, **14**, 4], 346.

NE and its homologues are obtained by condensing l with acetone or a homologous ketone and treating the uct with sulphuric acid. The present patent concerns roduction of a similar compound from citral or lippial mesityl oxide. Lippial, $C_{10}H_{16}O$, is present in large nt in the oil of *Lippia citriodora*; it boils at 106°— C. under 10 mm. pressure. The condensation product, ned by the action of alkalis, $(CH_3)_2C:CH.(CH_2)_2.$ $H_3):CH.CH:CH.CO.CH:C(CH_3)_2$, boils at 185° C. r 10 mm. pressure, and has the density 0·9156 at .; it is a yellow oil. The isomeric ketone, janthone, trahydrobenzene derivative containing two ethylene s in the ketone side chain, is obtained by the action id condensing agents. It boils at 162° C. under 10 mm. ure; its density at 20° C. is 0·9452. When diluted s a fine characteristic odour of violets and orris root.

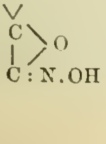
—A. C. W.

ntial Oils; Improvement of the Odour of ——. Ger. t. 118,703, June 29, 1900. J. H. Lavollay and G. E. urgoin. Zeits. angew. Chem. 1901, **14**, [14], 346.

stated that the fineness of the odour of many perfumes ncipally influenced by the degree of oxidation of the tial oils employed. The patentees claim a process for ving the odour of essential oils, which consists in eting them, alone or mixed with the manganate of m or other alkaline earth metal or other insoluble anate, to the action of a suitable electric current. operation is performed in a closed vessel in the cold; xcess of gas is removed; the quantity of manganate is 0 grms. per hectolitre of liquid; the current density from 3—10 ampères per square metre of electrode e. The process should not be continued beyond 20 tes.—A. C. W.

ene Series; Loss of Water, Haloid Acids, Ammonia, in the ——. F. W. Semmler. Ber. 1901, **34**, [5], —719.

nene Oxide Oxime, $C_{10}H_{15}NO_2$.—When terpinene is added to boiling alcoholic potash, a violent on occurs, nitrous oxide is evolved and potassium formed. If the product be at once poured into cold water, white flocks separate; after drying on os plate, the compound has the above formula. It is ed in quantitative yield, but is very sensitive towards nts, even to alkalis; it could not be recrystallised. lts at about 85° C. *In vacuo* it changes to a liquid ride. The author regards the compound as containing oup—



obtained by loss of NOH from the nitrite. The oxime and nitrite yield different reduction products; the former gives principally a base $C_{10}H_{17}NO$, boiling at 140°—150° C. under 20 mm. pressure, whilst terpinene nitrite yields a liquid base, $C_{10}H_{17}.NH_2$, cymene, a ketone, $C_{10}H_{16}O$ (Wallach), and a solid base, melting at 88° C. By reduction of the nitrite, the author has also obtained a hydrocarbon, C_9H_{14}, boiling at 160°—164° C.

Terpinene nitrite is stated by Wallach to be indifferent to bromine; the author has found that it unites with bromine in glacial acetic acid solution; under these circumstances, however, rearrangement of the molecule may take place.

Representatives of the pseudo class (this Journal, 1900, 845) of the terpenes react with Beckmann's solution in a similar manner to terpinene; sabinene and sabinol, when shaken with the reagent, at once give the characteristic brown flocks.

In regard to the formation of terpinene from oil of turpentine, it is doubtless principally formed from the pseudo-pinene, which occurs to the extent of 50 per cent. in crude pinene. Tilden and Williamson found that the hydrocarbons obtained from dipentene dihydrochloride contained, besides inactive limonene, cymene, terpinene, terpinolene, &c.; thus the loss of hydrochloric acid must involve the methyl group. The high boiling point of inactive limonene (dipentene), as compared with that of active limonene, is explained by its containing pseudo-limonene—terpinene—which boils at about 178° C.

The double bond of the pseudo form adds haloid acids with much more difficulty than that of the ortho form, thus dipentene hydrochloride is obtained more readily from limonene than from terpinene, also the dihydrobromide is obtained with more difficulty from carvestrene than from sylvestrene.—A. C. W.

Terpineol; New Method of Preparation of ——. P. Genvresse. Comptes Rend. **132**, [10], 637—639.

PINENE and alcohol are added to a solution of nitrous acid in ice-cold water, the mixture kept cool for some time, and afterwards left at the ordinary temperature for a period of from eight days to two months. On fractionating, alcohol passes over, then a mixture of pinene and terpineol, finally terpineol; a further quantity of terpineol is obtained by refractioning the middle fraction. This, purified by drying, distillation *in vacuo*, solution in aqueous sodium salicylate, and rectification, gives a yield corresponding to about 75 per cent. of the pinene used. Melting-point, 35° C., but liquid much below this; lævo-rotatory, $\alpha_D = -30°53'$ at 22° C.; density of liquid, 0·950 at 18° C.; refractive index, 1·476.

Australene, substituted for pinene, gave also a terpineol, having the same physical constants except that it was dextro-rotatory, $\alpha_D = +5°$.

Limonene gave no result when similarly treated.—J. T. D.

Nerium Odorum; Chemistry of ——. R. C. L. Bose. Proc. Chem. Soc. 1901, **17**, [236], 92.

IN his investigations on the poisonous constituents of *Nerium Odorum*, the sweet-scented oleander, two methods of analysis of the roots were employed by the author, namely, that adopted by Greenish (Pharm. J., 1881, [iii], **11**, 873), with certain modifications, and the method of plant analysis of Dragendorff. A third active constituent, besides the two already discovered in the root by Greenish, neriodorein and neriodorin, has thus been discovered, and named *karabin*, from *karabi*, the Bengali name of the plant.

The root gave the following percentages of the different extracts by Dragendorff's method: light petroleum extract, 2·88; ether extract, 1·38; absolute alcoholic extract, 3·40; aqueous extract, 5·81 per cent.

The ether extract was found to contain the *karabin*. This extract was partly soluble in absolute alcohol, giving a clear yellow solution, and on being evaporated to dryness left a brownish-yellow, sticky residue, *karabin*, which on analysis gave numbers corresponding to the formula $C_{21}H_{49}O_6$.

The alcoholic extract contained a substance identified as the neriodorin, and the aqueous extract contained the neriodorein. Neriodorein is readily soluble in water, neriodorin in boiling water only, while *karabin* is insoluble both in cold and boiling water. Neriodorein and neriodorin are insoluble in ether and benzene, but *karabin* dissolves readily in both. The colour reactions with concentrated sulphuric acid are also distinctive.

The author was also able to separate *karabin* by employing the following modification of Greenish's plan of analysis. The acidified aqueous solution of the alcoholic extract of the root was first shaken up with light petroleum, which removed a quantity of a viscid, yellowish, oily substance. After the separation from the light petroleum, the solution was next agitated with ether instead of chloroform. The ethereal solution on evaporation left a brownish-yellow residue which gave all the reactions of *karabin*. The acidified fluid was next agitated with chloroform, which caused the separation of some oily-looking globules which floated between the two layers of fluids; these were separated, washed, and evaporated to dryness; the residue gave all the reactions of neriodorein. The chloroform solution was then separated, and on evaporation left a golden-yellow brittle residue which satisfied all the tests for neriodorin.

The author considers that neriodorin is a variety of saponin. Neriodorein is very readily soluble in water, forming a pale yellow solution of neutral reaction which froths considerably on agitation. It has the acrid taste of saponin, and satisfied most of the tests for this widely distributed substance. It also closely resembles, in its behaviour with certain reagents, the variety of saponin described by the author and Warden (Pharm. J., 1882, [iii], **12**, 302).

The author believes that both neriodorin and karabin are not glucosides but possess the characters of a resin; neither contains nitrogen.

Cacodylic Acid; Toxicological Investigation of ——. L. Barthe and R. Péry.

See under XXIV., *page* 513.

Cinchona Bark; Determination of Alkaloids in ——. B. A. van Kettel.

See under XXIII., *page* 511.

Cocaïne and Di-iodo-Cocaïne Hydriodide: Determination of ——. W. Garsed and J. N. Collie. Proc. Chem. Soc. 1901, **17**, [236], 89.

See under XXIII., *page* 511.

Morphine; Detection and Determination of ——. F. Wirthle.

See under XXIII., *page* 511.

Morphine; Determination of ——, *and New Reagent for Alkaloid.* N. A. Orlow and P. K. Horst.

See under XXIII., *page* 511.

Camphor Oil; Determination of Camphor in ——. H. Löhr.

See under XXIII., *page* 510.

PATENTS.

Acetic Acid; Manufacturing Chemically Pure ——. J. G. Behrens. Eng. Pat. 3392, 1901.

See under VII., *page* 474.

4-*Dimethylamido*-1-*Phenyl*-2.3-*Dimethyl*-5-*Pyrazolone; Salicylate of* ——. O. Imray, London. From Farbwerke vormals Meister, Lucius and Brüning, Hoechst a/Main, Germany. Eng. Pat. 11,040, June 18, 1900.

The manufacture is claimed of the salicylate of 4-dimethylamido-1-phenyl-2.3-dimethyl-5-pyrazolone, by a process which consists in heating together the base and salicylic acid in equimolecular proportions, with or without solvents. The product is also claimed.—A. C. W.

Toluene Sulphochlorides; Manufacture of ——. W. Thompson, London. From E. Gfeller, Berne, Switz land. Eng. Pat. 11,676, June 27, 1900.

Klaeson and Wallin obtained toluene sulphochlorides the action of chlorosulphonic acid on toluene (Ber. 1848); 40 per cent. of the toluene is lost as sulphonic aci which are dissolved when the reaction product is pou into ice water. The patentee has found that chloro- phonic acid converts the toluene sulphonic acids at 20 40° C. into toluene sulphochlorides almost in theoreti quantity; he claims this process for the manufacture toluene sulphochlorides, and the improvement in Klae and Wallin's process, which consists in converting residual sulphonic acids into sulphochlorides.—A. C. W

Silver Paranucleïn; A New ——. O. Imray, Lon From The Basle Chemical Works, Basle, Switzerl Eng. Pat. 4507, March 2, 1901.

The process for the manufacture of a paranucleïn si compound (containing 30–32 per cent. of silver) sol in water, is claimed, which consists in adding silver nit to an alkaline solution of paranucleïn, precipitating b acid, dissolving the precipitate in soda solution evaporating. The product is also claimed.—A. C. W.

XXI.—PHOTOGRAPHY.

Green Colour-Screen and Red Printing Plate. A. Mi Zeits. Reprod. Techn. 1901, **3**, 22; through Chem. Rep. 1901, **25**, [28], 112.

In preparing negatives for the three-colour printing pro the main difficulty does not occur, as might be expecte connection with the blue printing plate but with the that is, the plate which has to be exposed behind a screen. The trouble lies in the preparation of the se and the author expounds the principles according to this should be made. The absorption curve of the s should be selected so that it prints the yellow-green more strongly than the blue-green. If, as is generall case, the green screen is prepared with a blue-green yellow colouring matter, the green should be used in ponderating proportions. An absorption curve shou aimed at which has its lowest point at a wave leng about 520, and rises rapidly on either side to corresponding with 600 and 500. The green colour-s usually sold generally allow too much yellow light to through, and may be improved by coating with a lay some yellow-absorbing medium, such as a strong solut Brilliant Acid Green.—J. F. B.

Silver Prints; Reduction of the Intensity of ——. Lu frères and Seyewetz. Monit. Scientif. 1901, **15**, 169—170.

The substances used for this purpose are divisible in classes:—1. Those which act uniformly upon all pa the image; and 2. Those which have a special actio the more opaque parts. To the first class belong th of cerium peroxide, the mixture of potassium ferric and sodium thiosulphate, and some metallic salts. Th employed when it is desired to augment the contrast over-exposed print, whilst the second class of substa used for over-developed prints. The latter purpose effected either indirectly or directly by means of p compounds. In the first case the whole of the si converted into chloride by means of ferric chlori the image subsequently developed with a slowly developer, the action being arrested before the print b ton opaque. The unreduced chloride is dissolved in thiosulphate solution.

In the second method peroxide compounds, such sulphates, are used, and notably ammonium pers which can act as reducing or oxidising agents acco the conditions. Two other substances have been have analogous effects. One is hydrogen peroxide solution (Andresen), and the other, potassium perma also in acid solution (Namias) according to the for Potassium permanganate, 0·5 grm.; concentrated s

, 1·0 grm; and water, 1 litre. Both compounds may regarded as acting in an analogous manner as in the ations—

$$NH_4SO_4 + Ag = AgSO_4NH_4$$

—

$$H_2O_2 + Ag + H_2SO_4 = 2H_2O + AgSO_4.$$

account for the fact of the intensity of the darker of the print being reduced more rapidly than that of er parts, the authors suggest the secondary reactions.

$$2(NH_4SO_4) + 2(AgSO_4NH_4) + 2H_2O = 4(NH_4HSO_4) + Ag_2 + O_2$$

—

$$H_2O_2 + H_2SO_4 + AgSO_4 = 2H_2SO_4 + Ag + O_2.$$

ey consider that this secondary reaction takes place rticular on the exterior of the gelatin where, *e.g.*, louble sulphate of ammonium and silver meets with xcess of persulphate, whilst in the interior it proceeds more slowly. An analogous explanation for the n of permanganate is offered, the reactions shown in llowing equations being suggested:—

$$2KMnO_4 + Ag + 4H_2SO_4 = AgSO_4 + 2MnSO_4 + K_2SO_4 + 4H_2O + 2O_2$$

-

$$MnO_4 + 3AgSO_4 = K_2SO_4 + 2MnSO_4 + Ag_3 + 4O_2.$$

authors have also made experiments with periodates, s, iodic, and periodic acids, perchlorates, chlorates, c and perchloric acids, bromates, permolybdates, gstates, pervanadates, and alkali perborates. Some se had a tendency to convert the silver into oxide, us intensify the image, whilst others were without .—C. A. M.

tion, Photographic; New Process of ——. A. Blanc. m. Zeit. Rep. **25**, [22], 84; Bull. Soc. Franc. Phot. 91], 2nd Series, **17**, 131.

bject of the process is to protect the thin parts of the ve without affecting the action of the reducer on those ater density.

negative is placed in a toning bath, containing mer- chloride; this bath consists of mercuric chloride, ; potassium thiocyanate, 4 parts; water, 100 parts; c.c. of this solution a few drops of a 1 per cent. n of potassium auric chloride are added until a slight precipitate begins to form. The negative, after a le amount of toning has taken place, is reduced by of Farmer's reducer. Both the toning solution and r may be best applied by means of a brush.

—J. W. H.

raphic Reducer; Ammonium Persulphate as a ——. Namias. Chem. Zeit. Rep. **25**, [22], 84; Phot. . 1901, **38**, 144.

thor points out that ammonium persulphate acts as er on gelatin-bromide negatives, even in ammoniacal n.—J. W. H.

fication; Photographic ——, Mercury-Sodium-Sul- Process. E. Vogel. Chem. Zeit. Rep. **25**, [22], Phot. Mitt. 1901, **38**, 69.

process the chloride of silver formed in the bleaching gradually dissolved by the sodium sulphite solution r reduction. The intensification on each repetition process doubles the amount of mercury present in ge, and finally the silver is all dissolved out.

—J. W. H.

lithography; New Process of ——. Brit. Journ. Phot. **48**, 1901, 178.

cess, due to H. Schneider, consists in coating the stone after a cleansing in weak nitric acid, with a of gelatin, drying at 40° C., and applying a solution min, 20 c.c.; saccharic acid, 10 c.c.; water, 200 c.c. ne is again dried, and a mixture in equal parts of ysaniline, 2 grms.; zinc chloride, 50 grms.; water, 1,000 c.c.; and (*b*) Potassium bichromate, 14 grms.; ammonium bichromate, 30 grms.; water, 1,000 c.c., is poured over it. After drying, the stone is exposed under the negative for 15 minutes, inked up with a special fatty ink, developed by using a sponge saturated with water, gummed, and dried. After washing with water to remove the gum, with turpentine to remove the ink, and with weak nitric acid to get rid of the gelatin film, the stone is inked up and treated in the usual way.—J. W. H.

XXII.—EXPLOSIVES, MATCHES, Etc.

"Powder" as distinguished from "Explosives"; Essential Requisites of ——. W. J. Williams. J. Franklin Inst., 1901, **151**, 194—207.

WHILST every "powder" is an explosive, the converse is not necessarily true from the service point of view. A powder, in use, *burns* and exerts a *pushing* force; an explosive should *detonate* and should *strike* a shattering blow. The author names twelve essential requisites of a good powder:—(1.) It should develop a high muzzle velocity, but (2) a moderate maximum pressure (depending on rapidity of combustion). With the 0·3-in. Krag-Jorgensen rifle, the maximum pressure of any single round should be 45,000 lb. per sq. in. and the bullet velocity, 53 ft. from the muzzle, should be 1,960 ft. per second. (3.) The specific gravity and gravimetric density, which depends upon specific gravity and size and shape of grain, should be such that the required weight of charge (about 30—40 grains for the 0·3-in. rifle) approximately fills the space available in the cartridge. For an "explosive" used in a shell for example, the best results are obtained when the gravimetric density most nearly approaches the specific gravity, *i.e.*, when there are no interstitial spaces. (4.) The granulation should be so calculated that the ignition-surface should be as nearly constant as possible, in order to secure uniformity of combustion. Thus many cannon powders are made of longitudinally-perforated rods, so that the diminution of the external surface during combustion may be compensated for by the increase of the internal surfaces of the perforations. Guns of 3·2 in. diameter commonly take grains about ½-in. long by ¼-in. diameter. Smaller guns take smaller grains, the rate of combustion and pressure developed increasing as the grain is diminished in size. (5.) The temperature attained during combustion should be as low as possible, in order to minimise the erosive effects. From this point of view the use of nitro-glycerin is objectionable; hydrocarbons, however, are sometimes added as well to act as "coolers." (6.) Certainty of ignition is essential. (7.) The amount of mineral matter or "ash" present should be so small that the powder is practically "smokeless." A smoke-producing explosive is, however, an advantage for bursting charges in shells, as the smoke on explosion indicates the position of the "burst," and therefore the accuracy of the aim, whilst it is annoying to the enemy. (8.) The powder must not be friable, as the production of dust during transport alters the character of the charge, and in extreme cases may lead to excessive pressure in the gun barrel when fired. A grain that developes cracks is as objectionable as one that crumbles under vibration. (9.) Undue sensitiveness to shock excludes a powder from use under service conditions. (10.) The powder should be capable of ready handling in the existing loading-machines. (11.) It must withstand heat, moisture, and cold. A temperature of 130° F. should not increase the pressure developed on explosion above 45,000 lb. per sq. in. nor the velocity more than 100 ft. per second beyond the standard, nor must this temperature cause any chemical change, or any exudation, liquefaction, or vaporisation of an ingredient. Exposure to an atmosphere saturated with moisture should not cause a reduction of velocity of more than 100 ft. per second below the standard, nor should it lead to "hang-fires"; if accidentally exposed to moisture, the powder should be capable of recovering its normal properties on drying in air or by artificial heat. The powder should withstand exposure to a temperature of −40° C. without serious variation of its qualities. (12.) The powder must be stable, undergoing no decomposition by internal reactions, nor any by exposure to light, heat, moisture, change of climate, &c. Rifle or revolver powder finely subdivided must withstand a temperature of 65⅓° C. for at least 20 minutes without discolouring the iodide starch-paper in the heat test. Cannon powder sliced (0·02 in. thick) should not cause discoloration under 10 minutes at 100° C.—W. G. M.

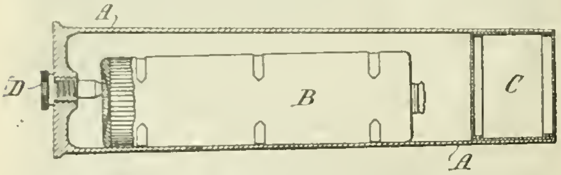
Matches ——; Ignition Material for. F. Deissler, Berlin. Ger. Pat. 119,010, Oct. 4, 1899. (Through Chem. Zeit. 1901, **25**, [25], 271.

With the object of increasing the duration of the reaction between the oxidising and oxidised substances, the thiosulphate of copper or lead is used in conjunction with the sulphocyanide of copper or lead. A suitable ignition composition consists, *e.g.*, of: Copper thiosulphate, 5; copper sulphocyanide, 10; potassium chlorate, 40; glass-powder, 9; antimony sulphide, 3; calcium sulphate 3; flowers of sulphur, 4; and glue in 10 per cent. solution, 26 parts by weight.—C. A. M.

PATENTS.

Guns; New Means for Preventing Erosion of ——. Sir W. G. Armstrong, Whitworth and Co., Ltd., and Sir A. Noble, Newcastle-on-Tyne. Eng. Pat. 9,049, May 16, 1900.

The erosion of guns is stated to be due mainly to the excessive temperature of the gases resulting from the explosion of the charge. In order to decrease the temperature without diminishing the ballistic effect, the patentees employ, in conjunction with the explosive, a case containing water, or preferably solutions of salts, such as ammonium nitrate, or other vaporisable substance of high heat capacity. For ordinary smokeless powder the weight of the water is 30—40 per cent. of the weight of the charge. The various claims relate to different positions of the water in relation to the explosive. The figure represents a gun cartridge composed in the manner preferred; A is the case, B the charge of cordite, C a case filled with water, and D an electric primer. According to this method the projectile would be inserted before the cartridge.—A. C. W.



XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Sulphuretted Hydrogen; Simple Method of Obtaining a Saturated Aqueous Solution of ——, &c. Mollwo Perkin.

See page 438.

INORGANIC CHEMISTRY.—QUALITATIVE.

Gutzeit's Test for Arsenic; Modification of ——. E. Dowzard. Proc. Chem. Soc. 1901, **17**, [236], 92.

An apparatus to free the gas from hydrogen sulphide, &c., by washing, was described, along with a series of experiments which show that lead acetate solution only absorbs hydrogen sulphide, whilst a 15 per cent. solution of cuprous chloride in hydrochloric acid absorbs hydrogen sulphide, stibine and phosphine, but has no effect on arsine.

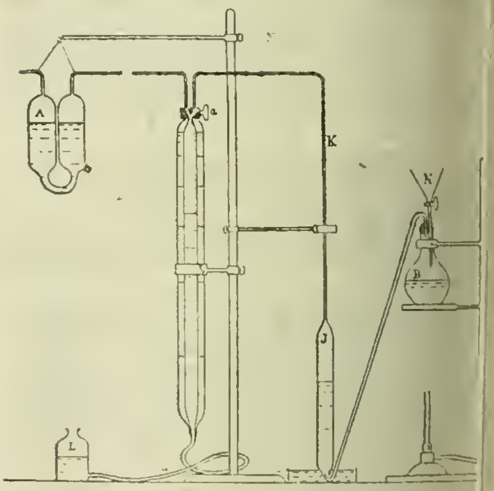
INORGANIC CHEMISTRY.—
QUANTITATIVE.

Fluorine; Determination of —— in Zinc Blende. E. Prost. Zeits angew. Chem. 1901 [12], 292—293.

Bullnheimer (see this Journal, 1901, 282), criticised the method described by the author and Balthasar (this Journal, 1900, 171), asserting that the results yielded it were considerably too low. In reply, the author poi out that if the amount of fluorine in the filtrate be tak into account, this deficiency is greatly reduced. In fo experiments the greatest deviation from the theoreti quantity was then 0·34 per cent.—C. A. M.

Nitrates; Determination of Nitrogen in ——, by Schulze-Tiemann Method. V. Staněk. Zeits. Zuckeri in Böhmen, 1901, **25**, [7], 356—358.

In the determination of nitrogen by this method, the nitr is boiled with a hydrochloric acid solution of ferr chloride, the nitric oxide evolved being collected i graduated tube over dilute alkali solution; the tube is th transferred to a tall cylinder filled with recently boi water, and after a time the volume and temperature of gas are read off. In order to avoid this transference of measuring tube containing the nitric oxide, the author devised the apparatus shown in the figure. It consists flask B, which is fitted with a tap-funnel N and a delivery tube, and which contains the ferrous chlo solution and the hydrochloric acid. This mixture is bo until the flask B is completely air-free. While this is g on, the two-way cock *a* is so adjusted that the capil tube K has connection with the burette, the bottl containing water being then manipulated so that the ve J and the capillary K become filled with dilute alkali. cock *a* is next turned through 180°, the air expelled f the burette by raising the bottle L and the cock closed apparatus then being ready for use. When B is qui free, the end of the delivery tube is placed beneat mouth of J, which dips below the surface of a containing dilute alkali solution. A measured volu previously boiled nitrate solution is now introduced i flask B by means of the funnel which is washed with water, the boiling of the liquid being continued as gas bubbles are evolved. When all the gas has bee off, it is sucked over into the burette, care being tak the hot liquid does not enter the burette. After minutes the levels of the liquid in the bottle L and burette are equalised, and the volume and tempera the gas read off. To test the purity of the nitri collected, it is driven from the burette into the abs vessel A, containing either saturated ferrous s solution or alkaline potassium permanganate s should there be any unabsorbed residue, it is returne burette and its volume subtracted from that of th quantity of gas.—T. H. P.



Phosphates in Potable Waters; Determination o A. G. Woodman and L. L. Cayvan. J. Amer. Soc. **23**, [2], 96—107.

In this paper are given the results of a critical the colorimetric molybdate method used for the est hosphates in waters. The following solutions were :—(1.) Ammonium molybdate: 20 grms. of the pure ral salt in one litre of distilled water. (2) Nitric acid: rt of acid (sp. gr. 1·42) to 5 parts of water. (3) dard phosphate solution: 0·5324 grm. of pure sodium phate ($Na_2HPO_4.12H_2O$) dissolved in freshly distilled r, 100 c.c. of the above nitric acid added, and the e diluted to 1 litre. 1 c.c. of this solution contains 01 grm. of P_2O_5. For comparing the colours, ordinary ler tubes were used. The best results were obtained ıe use of 4 c.c. of ammonium molybdate solution and . of the nitric acid, the test being carried out at the ary temperature of the room. One part of P_2O_5 in 00,000 parts of water could be detected. Fresh phos- standards were used for all comparisons, as it was l that the standards did not keep well. Picric acid ous gave almost the same yellowish-green colour, but these do not keep, as they act on the glass, forming ne picrate. Experiments were made in which quantities ater, containing known added amounts of phosphate, concentrated by evaporation before "nesslerizing." A ot phosphate always took place. It is, therefore, ıble to use the water itself for the estimation without ntration. The effects of silica on the estimation were d. The results of the experiments showed that after rating to dryness, with the addition of nitric acid, and trating by drying for two hours on the water-oven, osphate could be estimated satisfactorily, on taking residue with water. Titanium can be eliminated in ame manner. Vanadium salts give a colour with nium molybdate, which, however, fades in five es, and thus does not interfere with the determination. —W. P. S.

r: Volumetric Determination of Calcium and Mag- um in ——. L. W. Winkler. Zeits. anal. Chem. 1, **40**, 82—92.

author titrates the hardness of the water with an lic solution of potassium oleate, distinguishing the ess due to calcium from that due to magnesium, by ct that in the presence of Rochelle salt and a little potash, only the calcium compounds react with the solution, the magnesium compounds not affecting salt. The total hardness of the water, due to both constituents, is determined under similar conditions, nium chloride and ammonia being added before the on.

first part of the paper describes numerous trial ments, in which the method is tested on standard ons of calcium and magnesium. Calcium may be y estimated from the number of c.c. of standard olution used, whilst magnesium compounds, when d in alkaline solution, were found to give too high , the quantity of soap solution used having to be lied by 0·75 to obtain a correct estimation.

he latter part of the paper the results of analyses of natural waters are given. The agreement between the ts of calcium and magnesium as found gravimetrically the above method shows that the process is reliable curate.—W. P. S.

m; Determination of ——, by the Citrate Method. assen. Zeits. angew. Chem. 1901, **14**, [12], 285—

8 (this Journal, 1898, 950) the author described a of determining calcium, but in a subsequent com- tion (Zeits. angew. Chem. 1899 [48]) showed that e new method and the older acetate method yielded ble results in the presence of large amounts of ese. He has recently studied this source of error, ls that exact neutralisation with dilute ammonium ide (1 : 5) is advantageous, and that there must be a xcess of ammonium oxalate. The following modifi- of the method is now recommended:—An aliquot of the extract of the soil is neutralised with dilute ium hydroxide (1 : 5) until the resulting precipitate nger redissolved on shaking the beaker. 25 c.c. of agner's solution are then introduced, and if the ate does not completely dissolve in a few minutes, the neutralisation must be repeated on a fresh portion of the extract. When the precipitate has dissolved, an additional 12—13 c.c. of the same Wagner's solution (20 grms. of citric acid and 0·1 grm. of salicylic acid per litre) are added, and the liquid diluted to 200 c.c., and heated over a wire gauze. When it is boiling vigorously, solid ammonium oxalate is introduced very gradually, and the boiling continued until no more precipitate is produced. After standing over-night, the precipitate is filtered off, washed, and ignited.—C. A. M.

Oxalic Acid; Preparation of Chemically Pure ——. O. Schmatolla.

See under XX., *page* 496.

Steel; Determination of Aluminium in ——. E. Spatz. Chem. Zeit. Rep. **25**, [22], 79; Zeit. öffentl. Chem., 190, **7**, 6.

The author recommends Classen's method: 1 grm. of the steel is dissolved in dilute sulphuric acid (20 c.c. of 1 : 9) in a platinum dish, 40 grms. of ammonium oxalate are added and the solution electrolysed; aluminium only precipitates after all the iron has been deposited. When tests prove that only a trace of iron remains in solution, the bulk is evaporated to dryness; the residue is fused with a weighed quantity of potassium bisulphate, dissolved in acidulated water, and ammonium phosphate and ammonium hydrate added. The precipitate is dissolved on the filter in dilute hydrochloric acid, reprecipitated with ammonium hydrate, caught on an ashless filter and weighed as a mixture of iron and aluminium phosphate, in which the iron is estimated volumetrically and the aluminium obtained by difference.—J. W. H.

Platinum-Gold-Silver Assay. Oehmichen. Berg.- und Hüttenm. Zeit. 1901, **60**, 137; through Chem. Zeit. Rep. 1901, **25**, [28], 104.

The author recommends the following simplified method of procedure:—The silver is extracted by treating the buttons once with sulphuric acid, and heating until no more gas is evolved. The acid is cooled and poured off, and the platinum-gold is boiled twice for five minutes with nitric acid (1·3), washed and dried. Experiments have shown that the treatment with sulphuric acid removes almost the whole of the silver. If the platinum is low as compared with the gold, it is removed by repeated quartation and parting with nitric acid until the weight is constant. When the quantity of platinum is in excess of the gold, 50—100 mgrms. of fine gold are added and the buttons are dissolved in *aqua regia.* Any insoluble residue (iridium) is filtered off and the gold is precipitated by ferrous sulphate. The precipitate is filtered, washed, dried, and burnt; the ash is cupelled with silver and lead and the button parted with nitric acid. After allowing for the gold added, the difference between the platinum-gold and the gold found, gives the quantity of platinum. As a control, the platinum in the filtrate may be precipitated by zinc, and the deposit cupelled with lead and silver, parted, and weighed.—J. F. B.

Arsenic in Coke; Determination of Minute Quantities of ——. L. Archbutt and P. G. Jackson.

See page 448.

ORGANIC CHEMISTRY.—QUALITATIVE.

Phenol; Characteristic Reaction for ——. P. Fiora, Boll. Chim. Farm. **40**, 76. Chem. Centr. 1901, **1**, [15], 843.

Liquid phenol, when treated with peppermint oil, gives after some time, a greenish-blue coloration, which disappears on heating, but reappears on cooling again. Creosote, guaiacol, resorcinol, &c., do not give the reaction.—A. S.

Turkey Red Oil ; Detection of Iron in ——. Leipziger Färber- u. Zeugdr. Zeit., 1901, [50], **4**, 14, 153.

TRACES of iron in Turkey red oil, which exert a serious effect on the brilliancy of the colours obtained in Alizarin dyeing and printing, are best detected as follows :—

Some 10 c.c. of the oil are placed in a stoppered cylinder and mixed with 20 c.c. of a mixture of equal parts of concentrated sulphuric acid and water and a few drops of potassium ferrocyanide added. The whole is well shaken, 50 c.c. of ether added, and the mixture again shaken. If even a trace of iron be present in the oil, a more or less deep-blue ring appears at the junction of the ether-oil and acid layer.—H. I.

ORGANIC CHEMISTRY.—QUANTITATIVE.

Sulphide Dyestuffs ; Analysis of ——. A. Meyenberg. J. Soc. Dyers and Colorists, 1901, **17**, [3], 60—63.

THE author does not consider the method of analysis given by Richardson and Aykroyd (this Journal, 1896, **15**, 171) and adopted by Sunderland (J. Soc. Dyers and Colorists, 1901, **17**, 3; this Journal, 1901, 243) to be perfectly satisfactory. One obvious danger lies in the possibility that the precipitate produced by ammoniacal zinc chloride, and containing dyestuff, zinc sulphide, and sulphur, may be oxidised in the presence of the alkaline filtrate during exposure to the air, and that sulphite or thiosulphate may be therefore formed at the cost of the sulphide. It is also possible that sulphite may be carried down by the dyestuff in the form of a thiosulphonic acid group, in combination the sulphur in the molecule of the dyestuff. Such a gro by boiling with acids, would be liable to yield sulphur acid, which would cause the precipitation of sulphur, the giving a deficiency of sulphide and too much sulphur. author gives the preference to a method which consist estimating the sulphide by distillation in a current of in absence of air, and collecting the sulphuretted hydr in a standard iodine solution. To assist the decomposi a solution of borax and boric acid is added to the liq The decomposition of the sulphides and polysulphide complete, but is very much slower in the presence sulphur-black than otherwise. In most cases a n colourless solution, containing a black precipitate, re in the distilling flask. After filtering, the thiosulphate sulphite are estimated in the filtrate by first titrating acid till neutral to Methyl Orange, then running solution so obtained into standard iodine solution till co less in presence of starch, and then again neutralising standard acid and Methyl Orange. The dried preci is extracted with carbon bisulphide, which gives the sulphur, the remainder being weighed as pure dyestuff.

The author has employed this method in the inves tion of a number of commercial Sulphide dyestuffs, results differing widely from those of Sunderland. found that none of the dyestuffs tested contained more 37 per cent. of pure dyestuff, and certain of the blac shown in the following table, were found to contain siderable quantities of sulphide and larger amoun thiosulphate than are given by Sunderland.

——	Pure Dyestuff.	Sodium Thiosulphate.		Sodium Sulphide.		Sodiu Sulph
	Meyenberg.	Meyenberg,	Sunderland.	Meyenberg.	Sunderland.	
	Per Cent.	Per Cent.	Per Cent.	Per Cent.		
Immedial Black F F	37	38—40	6·4	8—9	None	Non
„ „ V	37	..	..	12·7	..	Non
Sulphaniline Black B	31	..	3·68	..	None	..
„ „ G	27	50	3·68	1·8—2	None	Non

The author's analyses of the individual dyestuffs do not show such differences in composition as to justify Sunderland's classification into "Sulphide" and "Thiosulphate" blacks, and he considers that the term "Thiosulphate blacks" would be better used to designate those Sulphur blacks which are prepared in aqueous solution by means of sodium thiosulphate, and which exhibit marked differences from the "Sulphide" blacks.

In the case of such a dyestuff as purified Immedial Black F F, the affinity for the fibre is, as with all other Sulphide blacks, due to the reduced state of the dyestuff caused by the sodium sulphide present, and thiosulphate has no other effect on the affinity to the fibre than is exerted by common salt or sodium sulphate.

With respect to the recognition of sulphur dyestuffs on the fibre, the author differs again from Sunderland, especially as regards the action of hydrogen peroxide and of conce sulphuric acid. The best test for distinguishing Anili Sulphur Blacks is that which consists in detecting th given off on treatment with stannous chloride and chloric acid by means of lead acetate paper (Le Färber- u. Zeugdr. Zeit. 1900, **49**, 487; this Journal **20**, 40).

The Sulphur blacks examined fall into three gro somewhat similar behaviour, *viz.* :—

1. Vidal, St. Denis, Cross-Dye, and Eclipse Blacks
2. Immedial and Sulphaniline Blacks.
3. Katigen Black, Sulphur Black T, and Clayto Blacks.

The following table shows the reactions obtai treating cotton dyed with these dyestuffs with the reagents which serve for their detection :—

——	Immedial Black V.	Immedial Black G.	Immedial Black FF.	Vidal Black (Old).	St. Denis Black.	Cross Bl
Alkaline sodium peroxide .	Solution nearly colourless. Fibre bluer.	Solution dirty green. Fibre bluer.	Solution nearly colourless. Fibre bluer.	Solution bright green. Fibre green, much lighter.	Solution bright green. Fibre olive-green nearly stripped.	Soluti greenis Fib: green, stri
Concentrated sulphuric acid.	Violet-black. Easily soluble.	Blackish-violet. Easily soluble.	Violet-black to bluish-violet. Easily soluble.	Olive-black. Sparingly soluble.	Olive-black. Sparingly soluble.	Dull viol Spar solu
Sodium hydrosulphite	All light brown ; colour returns completely on washing.					
Stannous chloride and hydrochloric acid.	Fibre light brown. After washing, violet-black.	Fibre dark brown. After washing, brown-black.	Fibre light brown. After washing, violet-black.	Fibre dark brown. After washing, dark olive.	Fibre dark brown. After washing, olive.	Fibr br After w dark
Washed fibre from preceding test warmed with dilute ammonia.	Solution violet.	Solution nearly colourless.	Solution weakly violet.	Solution nearly colourless.	Solution blackish-blue.	Soluti

——	Katigen Black.	Sulphur Black T.	Sulphaniline Black G.	Eclipse Black B.	Clayton Fast Black BM.	Aniline Black.
ine sodium peroxide .	Solution nearly colourless. Fibre no change.	Solution nearly colourless. Fibre no change.	Solution colourless. Fibre bluer.	Solution light bluish-green. Fibre bluer, lighter.	Solution pale blackish. Fibre rather lighter, no change in shade.	Solution pale brownish. Fibre brownish.
ntrated sulphuric l.	Dull violet-black. Sparingly soluble.	Greenish-black. Sparingly soluble.	Violet-black. Easily soluble.	Blue-black. Rather sparingly soluble.	Black. Slightly soluble.	Brownish-black
m hydrosulphite	All light brown; colour returns completely on washing.					
ous chloride and rochloric acid.	Fibre light brown. After washing, black.	Fibre light brown. After washing, black.	Fibre light brown. After washing, violet-black.	Fibre light brown. After washing, olive-black.	Fibre dark brown. After washing, dark brown.	Fibre brown black. After washing, blackish-purple.
ed fibre from pre- ng test warmed with te ammonia.	Solution colourless.	Solution colourless.	Solution violet.	Solution blue.	Solution nearly colourless.	Solution colourless.

—R. B. B.

Artificial: Identification and Determination in Mixed
brics. M. Duyk. Assoc. belge des Chim.; through
em. Zeit. 1901, **25**, [25], 266.

prepared from cellulose shows amorphous rods with-
central passage when examined under the microscope.
es the characteristic blue coloration of cellulose when
d with dilute sulphuric acid followed by iodine water.
fibres are almost instantaneously dissolved by an
niacal solution of copper,—a reaction which dis-
shes them from natural vegetable fibres, which first
up to a greater or less extent.

author recommends an ammoniacal solution of
for the identification and quantitative determination
ficial silk. This reagent dissolves natural silk, but
ot attack the artificial fibres.

ificial silk is often "*animalised*," *i.e.*, treated with a
l varnish, prepared from fibroin or lanogenic acid—
uces obtained from the decomposition of natural silk
ol. Reference is made to *Simili-Silk*, which consists
main, of mercerised cotton. Its manufacture is
to have greatly increased of late.—C. A. M.

's, Commercial; Determination of Unsaponifiable
tter in ——. P. Neff. Zeits. angew. Chem. 1901,
], 309—311.

uthor includes under the name of "hydrocarbons"
e unsaponifiable constituents, such as lactones, &c.,
are produced in the distillation of oleïne, and may form
ich as 10 per cent. or more of the commercial
t. For their determination, the following method
mmended as yielding concordant results:—10 grms.
oleine are mixed with 75 c.c. of 95 per cent. alcohol
00 c.c. flask, into which is also introduced 5 grms.
assium hydroxide dissolved in as little water as
e. The flask is heated on the water-bath under a
condenser for 45 minutes, after which 50 c.c. of
re added to the hot soap solution. An idea as to
nount of hydrocarbons can be obtained from the
ty of the solution. When less than 3 per cent. are
t, the liquid usually remains clear.

cold contents of the flask are now transferred to a
ing funnel, neutralised with dilute hydrochloric acid,
endered faintly alkaline to phenolphthaleïn, and
with 50 c.c. of petroleum spirit, boiling below
The separation is assisted, if necessary, by the
n of a few drops of alcohol. The lower layer is then
f and 25 c.c. of the petroleum spirit layer pipetted
weighed beaker, evaporated on the water-bath, and
idue dried at 110° C. until constant in weight.
mount multiplied by 20, gives the percentage of
arbons.

experiments with mixtures of oleïne with the last
ts in the distillation of fatty acids were made,
e results quoted are in agreement with the theo-
quantities. As a rule they are very slightly too
ut this is attributed by the author to a slight loss of
m spirit in the manipulation. This was found to
to 0·5—1 c.c. on the 50 c.c. taken, and if a
on be made for this loss, the results are almost identical with the actual amounts of hydrocarbons taken. In practice, however, this trifling error may be neglected.
—C. A. M.

Oleïne; Determination of Unsaponifiable Matter in Commercial ——. A. A. Shukoff. Zeits. angew. Chem. 1901, **14**, [16], 391.

THE author criticises the method proposed by P. Neff (see preceding abstract), for the determination of the unsaponifiable matter in commercial oleine. The chief source of error in the determination of unsaponifiable matter lies in the presence of acid soaps, which have been formed by hydrolysis of the soap solution before extraction. As these acid soaps are easily soluble in the solvents (ether, petroleum spirit, &c.), generally used for the extraction, they are determined with the unsaponifiable matter and thus vitiate the results. The author has previously published a method (see this Journal, 1898, 878), by which the formation of these acid soaps can be avoided. In the method proposed by Neff (*loc. cit.*), the conditions are such as would facilitate the formation of acid soaps, namely, a dilute alcoholic and only faintly alkaline soap solution. The analyses show a uniformly too high proportion of hydrocarbons, and the actual error is probably still greater, as it scarcely appears possible to extract the whole of the unsaponifiable matter from a soap solution by a single extraction.—A. S.

Fats and Waxes; Optical Examination of ——. G. Marpmann. Chem. Rev. Fett-und Harz. Ind. 1901, **8**, [4], 65—68.

THE author's method is based upon the fact that the refractive index of a mixture is the same as the sum of the indices of the individual constituents. An ethereal oil of not too high refractive index is used as the solvent. Beeswax is soluble in all ethereal oils, as also in turpentine oils and terpenes, but not all of the solutions are so homogeneous that the observed refractive index corresponds to the calculated values of the wax and oil. In addition to clove oil, the author tried terpeneless peppermint oil. This oil gave a reading of 50° in the butyro-refractometer at 40° C., corresponding to $^{n}D = 1·45930$. Equal parts of wax or fats of higher melting point with peppermint oil yield a homogeneous mixture at 40° C. Such a mixture of wax and peppermint oil gave a reading of 47° in the butyro-fractometer at 40° C., and from this the refraction of the wax was calculated to be $(2 \times 47) - 50 = 44°$.

Ether, chloroform, higher alcohols, benzene, &c. are less suitable substances for the admixture.—C. A. M.

Glue; Apparatus for Testing ——. R. Kissling. Chem. Zeit. 1901, **25**, [25], 264—265.

THE author has improved the apparatus for testing glue by his method (this Journal, 1900, 833) so that the melting points of six samples can be determined at the same time. In Fig. 1 A is a copper or iron vessel which is filled to two-thirds of its height with water at 50° C., at which temperature it is maintained by means of a small flame. B is a cover which fits upon A. Its bottom is covered with an asbestos board on which rests a ring-shaped holder for the test cylinders and thermometer. Above this is a glass plate *g*.

In making a test 15 grms. of the glue and 30 grms. of water are left over-night in a small Erlenmeyer flask, which is then heated in the water-bath until the glue has completely dissolved. The small cylinders are filled to the mark with the solutions of glue at a temperature of about 40° C., closed with corks, and placed in the holder C, Fig. 2. This has two false bottoms pierced with holes for the tubes, and its bottom consists of brass wire-gauze. The cylinder in which the thermometer is placed is charged with a concentrated solution (1:1) of the best leather-glue. The holder is immersed for an hour in water at 15° C., after which the tubes are transferred to the thermostat (Fig. 1) and the melting points noted, *i.e.*, the temperatures at which the perpendicular edges of the jellies begin to fall.

Fig. 1.

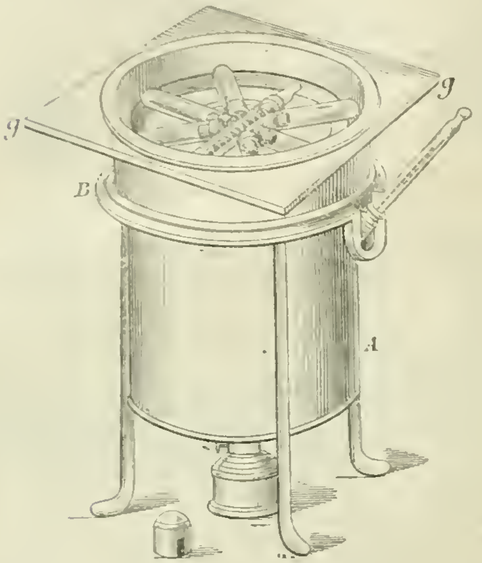
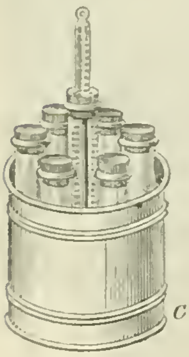


Fig. 2.



The author quotes the following conclusions arrived at by H. Feith:—The determination of the melting point has been found to give very reliable data, especially in cases where the viscosity determination did not do so. It is moreover, in general, preferable to the latter, for it gives immediate results.

A table of the comparative results of the viscosity and melting points of 42 samples is given.

In the mean the following relationships were observed:— A viscosity of 2 corresponded to a melting point of 24° C.; viscosity 3 to m. pt. 26° C.; viscosity 4 to m. pt. 28° C.; viscosity 5 to m. pt. 30° C., &c.

A deviation of more than ± 1° C. in the melting point calculated from the viscosity figures, was observed in 15 of these. In the majority of the exceptions, however, the mode of preparation and the properties showed that the melting points were a better criterion of the value of the glue than the viscosity figures. (See this Journal, 1898, 384 and 776; 1899, 154.)—C. A. M.

Raw Sugars; Determination of the Alkalinity of —— A. Herzfeld. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**, [9], 702—703. (From Zeits. Ver. deutsch. Zuckerind. Dec. 1900.)

The following rules are elaborated for the determination of the reaction (alkaline or not) of commercial raw sugars:—

A concentrated solution of phenolphthaleïn is mad dissolving 1 part of phenolphthaleïn in 30 parts of 90 per alcohol. Neutral distilled water is to be used for dissol the sugar to be analysed. To 10 litres of the water, of the above phenolphthaleïn solution are added, and enough special caustic soda solution (see below) to o a faint persistent red coloration. This water must al be freshly prepared, only a reserve for one or two being kept.

Before testing the sugar, the reddened water is ne lised with the exact quantity necessary of special sulp acid (see below). The alkalinity of the water shoul exceed half a c.c. of acid per 100 c.c.

The strength of the dilute sulphuric acid should c spond to an alkalinity of 0·0001 CaO, that is, it s contain 0·175 grm. H_2SO_4 per litre. Acid of this stre is easily obtained by adding 36 c.c. of normal sulp acid to 9,864 c.c. of water. The caustic soda must corresponding strength to the acid. One litre of the thus contains 0·143 grm. NaOH.

To determine the alkalinity of a sugar, 10 grms. o sample are dissolved in 100 c.c. of neutralised water porcelain dish. If, on dissolving the sugar in the ne water, the liquor becomes coloured red, the sugar mu considered alkaline. If the coloration is faint o decisive, a little sulphuric acid is slowly added. I colour changes, the sugar is to be considered alkalin not, acid.

With very dark sugars, more than 100 c.c. of wa used until the liquid is clear enough for the colour rea to be distinct and certain.—L. J. de W.

Formaldehyde; Gasometric Determination of —— E. Riegler. Zeits. anal. Chem. 1901, **40**, 92—9

When hydrazine sulphate is treated with a soluti iodic acid, the whole of the nitrogen is set free. I aldehyde, however, with hydrazine sulphate, fo hydrazone, and this latter body does not yield any ni when acted on with iodic acid. The process descri this paper and based on these facts is as follows: 20 a 1 per cent. solution of hydrazine sulphate are place nitrometer together with about 20 c.c. of distilled wate 5 c.c. of a 10 per cent. solution of iodic acid are allo run in. After cooling, the contents of the nitromet vigorously shaken for half a minute, allowed to sta minutes, and the volume of the liberated nitrogen i read off. This volume, corrected to 0° C. and 760 pressure is called V_c.

20 c.c. of the above solution of hydrazine sulpha now placed in a small flask, and 5 or 10 c.c. of the s of formaldehyde to be tested are added. (The qua formaldehyde added should not exceed 0·08 grm.) shaking, the mixture is allowed to stand 15 minute transferred to the nitrometer and rinsed in with 20 water. 5 c.c. of the solution of iodic acid are now At the end of 10 minutes the apparatus is shaken f a minute (not longer), allowed to stand two minut the volume of gas read off. The corrected volume instance is called v_c.

As 1 mol. of hydrazine sulphate combines with of formaldehyde to form the hydrazone, 1 c.c. of n at 0° C. and 760 m.m. pressure corresponds to 2·7 of formaldehyde. Therefore, by multiplying the di (V_o—v_o) by the factor 2·7, the quantity of forma is obtained in milligrammes.

Results of actual estimations given in the origin show the method to be an accurate one.

It should be mentioned that, after a time, the hy is decomposed by the iodic acid, but in the short tin to carry out the estimation, this decomposition d affect the results.—W. P. S.

Camphor Oil; Determination of Camphor in — H. Löhr. Chem. Zeit. 1901, **25**, [27], 292.

The valuable constituents of Japanese camphor camphor and safrol. The latter is only containe dark-coloured oils, which have a specific gravity a l or under unity. Since the specific gravity varies a to the proportion of safrol, that property is ut ermining the value of the oil. The oils containing cam- r are valued according to the proportion of that stituent. In practice the camphor is extracted by ying, and pressing the separated camphor; the oil is illed and the proper fraction again cooled; this process epeated until the whole of the camphor is obtained. The hor has applied this procedure to the estimation of phor in the oil; at least 300 grms. must be used. If the sistency indicate a high percentage of camphor, the oil ozen first and the camphor estimated as below. In the distillation the oil is divided into the fractions: below C., 195°—220°, and above 220° C. The second fraction, h contains the whole of the camphor, is kept in a sing mixture for 1 hour, the camphor filtered off on the pump, wrapped in filter cloth, then surrounded by r-paper and pressed for 30 minutes. The cake is pped in fresh paper and left in the press 15 minutes, the camphor is collected and weighed. The filtrate is ionated and the fraction 205°—220° C. frozen and ed as before; one pressing for 20 minutes is now ient. It is necessary to distil five times in order to ct the whole of the camphor. The test analyses quoted atisfactory.

cently the analyses carried out in a State institution in n have been quoted in commerce. The process con- l in a single distillation; the fraction 195°—215° C., solidifies on cooling, being designated "camphor ly." The author has examined two large samples of hich had been so analysed in Japan; they were stated ntain 54·13 and 64·58 per cent. of camphor, whilst uthor found by his process 19 and 21 per cent. ctively.—A. C. W.

ona Bark; Determination of Alkaloids in ——. A. van Kettel. Zeits. angew. Chem. 1901, [13], —315.

proposed method is a modification combining the lime mmonia-ether methods:—Four grms. of the finely rised dried bark are triturated in a mortar with 2 grms. cium hydroxide until the white particles of the latter o longer visible. A sufficient quantity of ammonia to 5 c.c.) is then added, little by little, and the re well stirred. The powder is now transferred to rlenmeyer flask and covered with 100 c.c. of ether, . of which are also used for rinsing the pestle and r. The contents of the flask are vigorously boiled for nutes under a reflux condenser, after which the flask led for 3 to 5 minutes in cold water, and the ethereal t filtered through cotton wool into a separating funnel, sk and the powder being washed with 80 c.c. of ether, e solvent expressed from the powder by means of the

ethereal solution is shaken for three minutes with of 10 per cent. hydrochloric acid, and, after standing inutes, the extract of the alkaloids is run off, and king repeated with 5 c.c. of water.

solution containing the alkaloids is rendered alkaline aken in a separating funnel with 70 c.c. of ether, l to stand for five minutes, and the ethereal extract l with 2 c.c. of water, and transferred to a weighed The alkaline layer is again shaken with 50 c.c. of and the extract added to the first. The ether is l off, and the flask dried in the water-oven until the becomes constant.

method is applicable to other drugs containing ls.—C. A. M.

phine; Detection and Determination of ——. Wirthle. Chem. Zeit. 1901, **25**, [27], 291–292.

IBERGER recommends that a liquid to be examined phine, after extraction in acid and alkaline solution, be mixed with alkaline bicarbonate solution, and ice shaken with chloroform containing 10 per cent. hol (this Journal, 1900, 859—860). In a quantita- imation of morphine, the author could, in certain nly extract a portion of the alkaloid, apparently the amount of bicarbonate was insufficient to the caustic alkali present. The remainder of the ould be extracted when the liquid was acidified with hydrochloric acid and then made ammoniacal. In experiments with 0·02 grm. of morphine hydrochloride in 15 c.c. of ammoniacal solution, 5—6 extractions with the alcohol-chloroform mixture were required to obtain the whole of the alkaloid; nine extractions were required to remove 0·1 grm. The loss of morphine, in drying the extracted hydrochloride during one hour, is counterbalanced by the impurities extracted by the chloroform.

The process of Marquis—neutralising with ammonia, heating to 70° C., adding sodium bicarbonate, and shaking four times with hot acetic ether—was not found to give good results. Partial decomposition of the alkaloid is indicated by the yellow colour of the solution. The reagent for morphine proposed by Marquis, a mixture of 2 drops of formalin with 3 c.c. of strong sulphuric acid, gives a violet coloration with less than 0·1 mgrm. of the alkaloid—a reaction much more sensitive than that with iodic acid, though it cannot be used positively to identify the alkaloid. The red coloration on heating with hydrochloric acid containing sulphuric acid, and the green and violet colorations obtained on adding traces of iodine solution and ether after neutralisation with bicarbonate, are only given if several tenths of a mgrm. of morphine are present.—A. C. W.

Morphine; Determination of ——, and New Reagent for Alkaloids. N. A. Orlow and P. K. Horst. Farmaz. J. 1901, **40**, 91; through Chem. Zeit. Rep. 1901, **25**, [28], 105—106.

Determination of Morphine by Looff's Method.—Looff's method for the determination of morphine in opium (this Journal, 1896, 478 and 834), consists in separating it by means of sodium salicylate. The authors have compared this method with those of Dieterich and of Flückiger, and found that Looff's method yields smaller quantities of morphine. Determinations of the nitrogen in the various preparations, however, led to the conclusion that the morphine prepared by Looff's method was the purest, since it contained 4·72 per cent. of nitrogen, as against 3·57 and 3·51 per cent. in the morphine preparations obtained by the other methods; the calculated proportion of nitrogen in morphine is 4·91 per cent.

Alkaloids; Ammonium Persulphate as a Reagent for ——.—With cocaïne, ammonium persulphate gives a colourless precipitate which is soluble in excess of the reagent, separating at the bottom as a thick colourless liquid. With strychnine, ammonium persulphate yields a granular precipitate. When the following alkaloids are mixed with sulphuric acid, ammonium persulphate gives the following colour reactions:—

Chelidonine: yellow, turning green, then brown.
Chelerythrine: violet, turning black.
Sanguinarine: dark brown.
Corydaline: yellow, then dirty green, finally dirty yellow.
Bulbocapnine: blue, then violet.
Morphine: pale orange.
Codeïne: orange.
Narcotine: orange-red.
Papaverine: yellow.
Narceïne: violet, turning blood-red, finally yellow.
Apomorphine: green, turning blue.

Strychnine, cocaïne, pilocarpine, caffeïne, aconitine, colchicine, colchiceïne, and quinine give no coloration.

—J. F. B.

Cocaine and Di-iodo-cocaine Hydriodide; Determination of ——. W. Garsed and J. N. Collie. Proc. Chem. Soc. 1901, **17**, [236], 89.

THE object of this research was to find a method for the fairly accurate estimation of cocaine in small quantity.

The estimation of cocaine in presence of cinnamyl-cocaine and isatropyl cocaine, and other substances, with which it is associated in coca leaves, has not been attempted, the method only dealing with the estimation of cocaine when free or mixed with benzoyl ecgonine and ecgonine, the products of hydrolysis of pure cocaine. When a solution of cocaine in the form of a salt containing about 1 per cent. of cocaine base is titrated by adding excess of decinormal iodine solution till the supernatant liquid contains excess of iodine, a precipitate of di-iodo-cocaine hydriodide, $C_{17}H_{21}NO_4HI_2$, is formed. The excess of iodine in solution can then be estimated by a decinormal sodium thiosulphate solution. The precipitated di iodo-compound can be collected and weighed, or the cocaine estimated by the amount of iodine used. Any cocaine salt can be used since the potassium iodide in the solution reacts with the salt, producing the iodide. Di-iodo-cocaine hydriodide is a remarkably stable and crystalline compound, crystallising in large, glistening crystals of constant composition.

Cocaine can be estimated in presence of ecgonine, as ecgonine forms a soluble iodo-compound.

Benzoyl ecgonine, however, interferes to a considerable extent with the estimation of cocaine. Making use of the fact that both benzoyl ecgonine and ecgonine are insoluble in ether or light petroleum, a separation can be effected, as cocaine is soluble in both these solvents. The extracted cocaine can then be weighed directly or titrated with iodine.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Testing Precious Stones. U.S. Cons. Reps., May 1901, 51.

In a lecture on precious stones, recently delivered before the Industrial Association of Berlin, Dr. Immanuel Friedlænder said that the testing of diamonds is comparatively simple. The common test for hardness suffices. If the stone resists strong attacks, it is certain to be genuine; if it does not, the damage is insignificant, as only an imitation has been destroyed. This test, however, is doubtful with rubies. If a ruby can be affected by a steel file or by quartz, it is surely not genuine; but such a test with a topaz is liable to injure a valuable stone.

The test for hardness is of no avail with emeralds, as this stone is not much harder than quartz, and in addition possesses the quality of cracking easily.

For examining rubies and emeralds, the optical test is best. A glass magnifying about one hundred times suffices. Every expert knows that almost all precious stones have little flaws. Nearly every ruby and all emeralds have many defects, which are so characteristic that the genuineness of the stones is readily established. Such a test is very necessary with rubies, because the imitations are very deceiving. Their colour is absolutely durable and often much finer than that of the genuine, although it may be stated that a somewhat yellowish tint is always suspicious.

The only reliable way in which genuine rubies can be told from imitations is by the minute air bubbles of the latter, which become clearly visible under the magnifying glass. These are not to be found in the natural gem; on the other hand, the imitations lack certain defects characteristic of genuine rubies—certain vacuums, whose outlines are much more indistinct than those of the air bubbles in imitations.

True emeralds have similar characteristic defects, such as inclosures of liquids and curious dendrites. Sapphires also show peculiar netlike formations.

Aluminium-mercury Couple. Part III. Chlorination of Aromatic Hydrocarbons in Presence of the Couple. The Constitution of the Dichlorotoluenes. J. B. Cohen and H. Dakin. Proc. Chem. Soc. 1901, **17**, [236], 91.

The authors have continued their investigation on the action of the aluminium-mercury couple as a halogen carrier in the preparation of the chlorine derivatives of the aromatic hydrocarbons. They have obtained in this way a series of chlorobenzenes from mono- to hexachlorobenzene as well as mono-, di-, and trichlorotoluenes. Their work was, however, chiefly devoted to the identification of the dichlorotoluenes formed by this process—a subject which has been under investigation since 1866, with very conflicting results. By careful fractional crystallisation of the following solid derivatives of the mixed dichlorotoluenes, nitro-, dinitro-, sulphonic acids and salts, sulphonic chlorides and amides, and the dichlorobenzoic acids obtained by oxidation, and by a comparison of these with the same derivatives of the six isomeric dichlorotoluenes which they have prepared in a pure state, the authors have now proved that four, namely, ($CH_3 = 1$), 1:2:3, 1:2:4, 1:2:6, and 1:3:4, very probably 1:2:5 dichlorotoluenes are formed in reaction. The authors propose to investigate the dibr toluenes in the same manner, as no very satisfactory evid has been given of the nature of the mixture forme brominating toluene.

Magnesium and Aluminium; Reducing Properties of — A. Duboin. Comptes Rend. **132**, [13], 826—828.

Magnesium or aluminium powder, moistened with w and fired by means of a little dry magnesium powder on burns with an intensely brilliant flame. Magnesia alumina) and hydrogen are formed, the latter, of co immediately burning in the air.

A mixture of aluminium powder and alumina, in proportion of four atoms to one molecule, burns brilli when ignited at one point, forming the oxide Al_2O.

Mixtures of magnesium with the alkaline earths, i atmosphere of hydrogen, burn when inflamed by a j burning oxygen, forming magnesia and the correspo metal. The moist magnesium and aluminium powders a referred to, burn in an atmosphere of hydrogen, inflamed by a little of the mixture of baryta and magne Boric acid, mixed with either magnesium or alumi burns in hydrogen, when inflamed by the magnesium baryta mixture: the boron produced in the first case i free from magnesium boride, however. Calcium phos and magnesium react when similarly treated, the pro being apparently calcium phosphide and some solid hyd phosphide. Potassium chromate and aluminium also vigorously, torrents of potassium being evolved as va but when operating in an atmosphere of hydrogen potassium combines with the excess of hydrogen pr The collection of the potassium is thus hindered.—J. '

Alkaline Earth Carbonates; Influence of Alcoho regard to the Action of Acid on the ——. C. V Comptes Rend. **132**, [11], 677—678.

Carette found that in presence of absolute alcohol, or hydrochloric acid reacts on calcium carbonate, bu sulphuric acid has hardly a perceptible action on it, an organic acids such as acetic have no action at all. author finds that: (i.) Methyl alcohol or acetone pr the same effect as ethyl alcohol. (ii.) When sul acid and absolute alcohol are left in contact with ex calcium carbonate, the conversion of the acid into c sulphate, though slow, is after some months complet proportion as water is added, the action becomes rapid, though its rate diminishes as time goes on. perature seems to have little influence. Strontiu barium carbonates behave similarly, though the r speed with barium is lower than with calcium. (iii.) acid gives similar results to those with sulphuric ac the reaction is in all cases very much slower than w latter. (iv.) The completion of the action of nit (with alcohol) on excess of the carbonates is not int with by the presence of excess of the corresponding r

—J. '

Hydrolysis; Influence of Temperature upon — Madsen. Zeits. physik. Chem. **36**, 299—304; Centr. 1901, **1**, [13], 722.

The author determined the value of the constant equation for the velocity of saponification of ethyl by caustic soda at 10° C. and 40° C. The value were 2·24 at 10° C., 13·17 at 39·33° C., and 1 41·81° C. The velocity of saponification of ethy by potassium cyanide solutions at different temp was also determined, and the velocity of saponifica caustic soda in presence of cane sugar, dextrose, a lose, that is by the sodium compounds of these The sugars considerably diminish the saponifying the caustic soda, this being probably due to the neutralisation of the base by the sugar. If C concentration of the sugar, C_1 that of the caustic so C_2 that of the saccharate, then $CC_1 = KC_2$. The K was determined for temperatures from 10° to At 10·5° C., the value of K is 0·04486 for sac 0·01328 for dextrose, and 0·006915 for levulose these figures can be calculated the heat of neutr hat would be liberated if the neutralisation were complete, hat is if no hydrolysis of the salts took place. The lculated values are 3,302 for saccharose, 5,342 for dex-ose, and 6,871 for levulose. The value calculated in is way for hydrogen cyanide is 3,424, as against 2,960 bserved by Berthelot.—A. S.

acodylic Acid; Toxicological Investigation of ——. L. Barthe and R. Péry. J. Pharm. Chim. 1901, **13**, [5], 209—214.

e authors have made a number of experiments with the ew of detecting the presence of cacodylic acid or of senic in the bodies and secretions of persons and animals o have been subjected to a treatment with sodium codylate, either hypodermically or by the mouth. The ine and hair of a patient who had received hypodermic ections of this substance gave (after the organic matter d been oxidised with nitric acid), in Marsh's apparatus, tinct arsenical rings. At the same time, an odour of odyl was detected at the end of the combustion tube. idation of the organic matters supposed to contain cacodyl, h ordinary fusion mixture and potassium nitrate, after atment with nitric acid and drying, did not destroy the odyl. When cacodylic acid itself was added to a atity of fused oxidising mixture, a cacodylic odour was ily detected and a fugitive blackish coloration appeared he point of contact. On extracting the residue with te sulphuric acid, and precipitating with sulphuretted rogen, the characteristic odour could be detected, after wing the liquid to stand in a closed flask for 24 hours. h of the arsenic was precipitated as sulphide, but odour of cacodyl present overcame that of the huretted hydrogen.

ith only mere traces of cacodylic acid, after oxidation, arsh mirror is not obtained, but the odour is always ifest.

he urine of a woman examined 70 days after the last of sodium cacodylate had been given, gave a feeble aical mirror. $\frac{1}{100}$ of a mgrm. of cacodylic acid gives a nct odour, and the whole series of experiments carried show the extreme difficulty of decomposing the cacodyl cule.—W. P. S.

ty Acids; Action of Zinc-Dust on ——. A. Hébert. Comptes Rend. **132**, [10], 633—635.

listilling stearic acid with zinc-dust at 350°—400° C., in ndeavour to procure unsaturated acids of the fatty p, it was found that the products, besides carbon de and water (accounting for the oxygen of the stearic and small quantities of gaseous hydrocarbons, consisted e most part of liquid and solid members of the olefine . By fractionating and then brominating the fractions, us members of the series from C_{17} to C_{90} were found e mixture.—J. T. D.

chlorglucose, Acetochlorgalactose, and Acetochlor-tose. Z. K. Skraup and Kremann. Sitz. Akad. ssensch. Wien. Zeits. angew. Chem. 1901, **14**, [15],

crystallised acetochlorhydrose has been more closely d, and it is shown that galactose yields acetochlor-ose $C_6H_7O_5(C_2H_3O)_4Cl$ in an exactly similar manner. sugar yields acetochlorlactose at the ordinary tem-ure on treatment with acetic anhydride saturated with us hydrogen chloride. It crystallises very well, the acetochlorsaccharose prepared in the same way orphous. Both acetochlorglucose and acetochlor-ose are converted on heating with excess of phenyl-ine into compounds $C_{24}H_{30}O_3N_6$, which are optically e and are probably identical.—J. F. B.

nd Soot from Various Sources; Mineral Constituents ——. W. N. Hartley and H. Ramage. Proc. Royal 68, (1901), 97—109.

thor's conclusions are as follow :—

he presence of nickel, as shown by the examination (from house and other chimneys), is not positive e that the dust from the clouds comes from other terrestrial source.

2. The dust which fell on the 16th and 17th of November 1897 (in a garden on the outskirts of Dublin, remote from any factory chimneys), with its regularity in composition and its similarity to meteorites, being magnetic, also its comparative freedom from extraneous matter, exhibits properties which are quite in favour of its cosmic origin. Moreover, its composition is totally unlike that of volcanic dust and flue dust from various chemical and metallurgical works. This dust for the most part fell on a perfectly calm fine night, and there was no rain for 24 hours or more afterwards.

The authors draw attention once more to the very wide distribution of gallium in very minute proportions; it occurs in all aluminous minerals, in flue dust of very various kinds, in soot and atmospheric dust, also in a great variety of iron ores. Bauxite contains it in larger proportion than any other mineral, but the quantity even in this substance is very small. They have hopes of finding it concentrated in some mineral, as thallium, caesium, germanium, and indium are. Indium and thallium, the other members of the same group of elements, are found in blende and pyrites, and accordingly gallium might be expected to occur in a concentrated state in a sulphide, arsenide, or similar compound. Judging, however, from its analogy with aluminium, there does not seem to be much probability of this.—L. A.

Prizes.

FEDERATION OF THE AGRICULTURAL UNIONS OF ITALY.

Prize Competition.

Although of late years there has been considerable progress in the methods of preparation of the different sorts of sulphur used for combating diseases of plants, and the demand, in consequence, has greatly increased; yet the methods actually employed for estimating the degree of fineness of these preparations are now antiquated, and leave much to be desired, especially as regards the mixtures of sulphur and copper sulphate.

The Federation of the Agricultural Unions of Italy, together with the Agricultural Unions of Padua and Florence, considering the necessity of encouraging special studies on this subject, and having obtained contributions from many other agricultural unions, has now decided to open an international prize competition for the sum of 1,000 frs. in gold, to be awarded to the person who discovers and makes public the best method for obtaining exact and constant results in the determination of the fineness of the flowers of sulphur, and of mixtures of sulphur and copper sulphate.

Competitors must send in their papers in a sealed envelope to the head office of the Federation (*Ufficio direttivo della Federazione italiana dei Consorzi agrari, Piacenza, Italy*) before March 1, 1902.

The papers will be examined by a special commission to be named by the "Reale Accademia dei Lincei, Rome," whose decision will be without appeal.

E. CAVALIERI,
President.
Piacenza, March 1, 1901.
G. RAINERI,
Director.

New Books.

FORTSCHRITTE DER THEERFARBENFABRIKATION UND VERWANDTER INDUSTRIEZWEIGE. An der Hand der systematisch geordneten und mit kritischen Anmerkungen versehenen Deutschen Reichs-Patente. Dargestellt von Dr. P. FRIEDLAENDER, Vorstand der chem. Abtheilung des k. k. tech. Gewerbemuseums in Wien. Fünfter Theil. 1897—1900. Julius Springer's Verlag, Berlin. 1901. Price, M. 40.

LARGE 8vo volume, containing preface, table of contents and text, filling 960 pages. This is followed by an index of German patent numbers of Volumes I. to V., also of French patents, English patents, and American patents. Finally, there are the alphabetical indexes of patentees and subjects.

The subjects represented by the patent abstracts in this work, are grouped as follows:—I. Intermediate Products of the Coal-tar Industry. II. Triphenylmethane Dyestuffs. III. Anthracene Dyestuffs. IV. Imidoquinone Dyestuffs. V. Acridine Dyestuffs. VI. Indigo. VII. Sulphur Dyestuffs. VIII. Azo Dyes. IX. Dyestuffs and Compounds of Various Composition; Dyeing and Printing Processes. X. Pharmaceutical Products. XI. Appendix.

Indikatoren der Acidimetrie und Alkalimetrie. Von Dr. Fritz Glaser. C. W. Kreidel's Verlag, Wiesbaden. 1901. Price M. 3.20.

8vo volume, with preface, table of contents, 124 pages of subject-matter, and the alphabetical index. The work is divided into two parts, the General and the Special Sections. General: — I. Characteristics of Indicators. II. Use of a Substance as Indicator. III. Classification of Indicators. IV. Use of Indicators on the basis of this classification. V. Delicacy of Indicators. VI. Theory of Indicators. VII. Influence of different Neutral Liquids. VIII. Influence of the Reaction Products and of the Salts occurring in Solution. IX. Behaviour of Indicators in Hot Solutions. X. Control of Normal Solutions. XI. Classification of New Indicators. Special: — (i.) Indicators sensitive to Alkalis. (ii.) Semi-sensitive Indicators. (iii.) Indicators sensitive to Acids. (iv.) Less important Indicators. (v.) Test Papers.

Chemisch-technisches Repertorium. Uebersichtlicher Bericht über die neuesten Erfindungen, Fortschritte und Verbesserungen auf dem Gebiete der technischen und industriellen Chemie, mit Hinweis auf Maschinen, Apparate und Literatur. Herausgegeben von Dr. Emil Jacobsen. 39. Jahrgang. 1900. Zweites Halbjahr. Erste Hälfte. Mit in den Text gedruckten Illustrationen. R. Gaertner's Verlagsbuchhandlung, Hermann Heyfelder, Schönebergerstr. 26, Berlin, S.W.

This is the number of the "Repertorium" for the first half of the second half-year of 1900. It treats of the following subjects:—I. Building Materials, Cements, and Artificial Stone. II. Dyestuffs, Dyeing, and Calico Printing, Coal-Tar Products. III. Fats, Oils, Illuminating and Heating Materials. IV. Fermented Liquors. V. Tanning, Leather, and Glue Manufacture. VI. Textiles. VII. Glass and Earthenware. VIII. Wood and Horn. IX. Indiarubber and Gutta-percha. X. Cements and Adhesives. XI. Lakes, Varnishes, and Paints. XII. Metals.

Guide to the Search Department of the Patent Office Library, with a Dictionary of "Trade or Fancy" Words. (Patent Office Library Series, No. 4.) Published at the Patent Office, 25, Southampton Buildings, Chancery Lane, London, E.C. 1901. Price 6*d*.

Chimie des Matières Colorantes Organiques. Par R. Nietzki. Avec Préfaces de C. Friedel et E. Noelting. Traduite sur la III^e^ édition allemande, et mise au courant des derniers progrès d'après la IV^e^ édition allemande par Charles Vaucher, Camille Favre, et Alfred Guyot. Georges Carré et C. Naud, Editeurs, 3, rue Racine, 3, Paris. 1901. 10 fr.

This work commences with two prefaces, the first by E. Noelting, the second by C. Friedel. Then follows an introduction of 30 pages, and subject-matter of 392 pages. The work concludes with a table of contents and the alphabetical index, and, finally, a bibliographic index. The subject is treated under the following subdivisions:—I. Nitrated Colours. II. Azo Dyestuffs. III. Dyestuffs derived from the Hydrazones and Pyrazolones. IV. Oxyquinones and Quinone-oximes. VI. Dyestuffs derived from Imidoquinone, *viz.*, the Indamines, Indophenols, Thiazines and Thiazones, Oxazimes and Oxazones, Azines, Indulines, Quinoxalines, and Fluorindines. VII. Aniline Black. VIII. Dyestuffs derived from Quinoline and Acridine. IX. Thiazol Colours. X. Oxyketones, Xanthones, Flavones, &c. XI. Indigo Group of Colours. XII. Dyestuffs of unknown constitution, among which are Canarine, Murexide, Cochineal, &c.

Trade Report.

LEGISLATION.

A Bill to amend the Akali, &c. Works Regulatio
Act, 1881.

Be it enacted by the King's most Excellent Majesty, b
and with the advice and consent of the Lords Spiritu
and Temporal, and Commons, in this present Parliame
assembled, and by the authority of the same, as follows:-
1.—(1.) Paragraph (*b*) of section 3 of the Alkali, &
Works Regulation Act, 1881, is hereby repealed, and tl
following paragraph shall be substituted therefor:—

"(*b*.) Of the acid gases of sulphur, or of sulphur a
nitrogen, which are evolved in the process of man
facturing sulphuric acid or sulphates in the work,
such an extent that the total acidity of those gases
each cubic foot of residual gases, after completion
the process and before admixture with air, smoke,
other gases, does not exceed what is equivalent
four grains of sulphuric anhydride."

(2.) In section four of that Act the words from "
addition" to "last preceding section" shall be repea
and the following words shall be substituted therefor:—

"In addition to the condensation of acid gases,
aforesaid, the owner of every alkali work shall use the b
practicable means for preventing the discharge into
atmosphere of all noxious gases and of all offensive ga
evolved in such work, or for rendering such gases harm
and inoffensive when discharged, subject to the qualificat
that on the basis of the amount of acid gas per cubic f
no objection shall be taken under this section by
inspector:—

"(*a*) To any muriatic acid gas in the air, smoke,
chimney gases escaping into the atmosphere f
any process by a chimney or exit flue where
amount of such acid gas in each cubic foot of
smoke, or chimney gases, so escaping does not ex
the amount limited by the last preceding section

"(*b*) To any acid gases of sulphur, or of sulphur
nitrogen, in the residual gases escaping by the
flue from any process connected with the manu
ture of sulphuric acid or sulphates, where the
acidity of such acid gas, in each cubic foo
residual gases so escaping, after completion of
such process and before admixture with air, sm
or other gases, does not exceed the amount li
by the last preceding section."

(3.) In section eight of that Act the words from "Ev
to "sulphuric anhydride" shall be repealed, and the fo
ing words shall be substituted therefor:—

"Every sulphuric acid work as defined in the sch
to this Act shall be carried on in such manner as to s
the condensation to the satisfaction of the chief insp
derived from his own examination or from that of
other inspector, of the acid gases of sulphur or of su
and nitrogen, which are evolved in the process o
manufacture of sulphuric acid in that work, to su
extent that the total acidity of those gases in each
foot of residual gases, after completion of the proces
before admixture with air, smoke, or other gases, do
exceed what is equivalent to four grains of sul
anhydride."

(4) In section nine of that Act the words fron
objection" to "last preceding section" shall be re
and the following words shall be substituted therefor

"On the basis of the amount of acid gas per cubi
no objection shall be taken under this section
inspector to any acid gases of sulphur, or of sulph
nitrogen, in the residual gases escaping by the e
from any process connected with the manufact
sulphuric acid where the total acidity of such acic
in each cubic foot of residual gases so escaping
completion of any such process and before admixtu
air, smoke, or other gases, does not exceed the
limited by the last preceding section."

2.—(1.) This Act may be cited as the Alkali, &c.
Regulation Act 1901, and this Act and the Alk

ks Regulation Act, 1881, and the Alkali, &c. Works latiou Act, 1892, may be cited together as the Alkali, Vorks Regulation Acts, 1881 and 1901.

) This Act shall come into operation on the first day nuary one thousand nine hundred and two.

TARIFF CHANGES AND CUSTOMS REGULATIONS.

Intermediate Duties on Sugar in the United Kingdom.

Parliamentary paper has been issued, containing a " of the statement relating to intermediate duties on made by the Chancellor of the Exchequer when g the Budget." The statement consists of the fol- " table showing the ' intermediate duties ' referred to sugar resolution " :—

Degrees of Polarisation.	*Percentage of Duty on Refined Sugar—*i.e.*, of 4*s.* 2*d.* a Cwt.	Duty per Cwt.	
		s.	*d.*
eeding 76	48·0	2	0
ng 76 and not exceeding 77 ...	49·6	2	0·8
77 ,, ,, 78 ...	51·2	2	1·6
78 ,, ,, 79 ...	52·8	2	2·4
79 ,, ,, 80 ...	54·4	2	3·2
80 ,, ,, 81 ...	56·0	2	4
81 ,, ,, 82 ...	57·6	2	4·8
82 ,, ,, 83 ...	59·2	2	5·6
83 ,, ,, 84 ...	61·0	2	6·5
84 ,, ,, 85 ...	62·8	2	7·4
85 ,, ,, 86 ...	64·6	2	8·3
86 ,, ,, 87 ...	66·4	2	9·2
87 ,, ,, 88 ...	68·4	2	10·2
88 ,, ,, 89 ...	70·4	2	11·2
89 ,, ,, 90 ...	72·3	3	0·4
90 ,, ,, 91 ...	75·2	3	1·6
91 ,, ,, 92 ...	77·6	3	2·3
92 ,, ,, 93 ...	80·0	3	4
93 ,, ,, 94 ...	82·4	3	5·2
94 ,, ,, 95 ...	84·8	3	6·4
95 ,, ,, 96 ...	87·2	3	7·6
96 ,, ,, 97 ...	89·6	3	8·8
97 ,, ,, 98 ...	92·0	3	10
98	100·0	4	2

olumn represents not only the percentage of the full duty le on sugar of a given polarisation, but the halfpence and a halfpenny chargeable. Therefore 100° = 50*d.*, or 4*s.* 2*d.*; = 36·4*d.*

on Gold and Platinum Salts in Sweden.

following alteration approved by the Swedish nt on the 11th April, has been made in the duty ain imports into Sweden. Chloride of gold, n-chloride of gold, sodium-chloride of gold, potas- tinum chloride and chloride of platinum are in be dutiable at the rate of 8 öre per kilog. (4*s.* 6¼*d.* instead of at the rate of 15 per cent. *ad valorem* as technical preparations not specially mentioned in .

United States of America.

Customs Decisions.

lowing is a list of some Decisions relative to the n of the United States Customs Tariff which have been issued by the Treasury Department at on for the guidance of United States Customs l others:—

—The article known as cutch and dealt in as such ast ten years, although not the product of the techu tree, is entitled to free entry under the of paragraph 542 of the tariff. As an article or to the adoption of the tariff, was well known rce by a name used in the Act, it is entitled to on under the said name, irrespective of the m which it is derived or the process of its pro-

ks.—So-called "brilliant star matches," "gold "brilliant green matches," "bengalische matches," and "meteor matches" are not dutiable as matches under paragraph 423 of the tariff, but are fireworks dutiable at the rate of 20 per cent. *ad valorem*, under section 6 of the Tariff Act, as unenumerated manufactured articles. Such articles are made and used only as pyrotechnical playthings, and have no practical use whatever.

Gutta-percha Manufactures (*Chatterton's Compound*).—The article known in commerce as "Chatterton's compound," which is made from tar, resin, and gutta-percha, is found to be composed in chief value of gutta-percha, and is, therefore, held to be dutiable under the provision for manufactures of that substance in paragraph 450 of the tariff at the rate of 35 per cent. *ad valorem*, and not as a chemical compound under paragraph 3.

Recovered Olive Oil.—The article known as "recovered olive oil," an oil obtained in cleaning wool and containing 30 per cent. of olive oil and its fatty acids, as against 70 per cent. of petroleum and wool grease, is not entitled to free entry as olive oil for manufacturing purposes under paragraph 626 of the tariff, but is dutiable under paragraph 3, as an expressed or rendered oil not specially provided for, at the rate of 25 per cent. *ad valorem.*

Olive Solide.—Merchandise described as "*olive solide*" is dutiable under the provision for "extracts or decoctions of logwood or other dyewoods" in paragraph 22 of the tariff at the rate of seven-eighths of 1 cent per lb.

Products of Crude Petroleum.—All invoices relating to products of crude petroleum must be accompanied by a United States Consular certificate showing the place where the petroleum contained therein was produced. In the absence of the requisite evidence, liquidation of the entry will be suspended and the duties estimated at a rate equal to that levied by the country imposing the highest rate of duty on such petroleum. (See also *Board of Trade Journal* for the 14th March last, p. 640.)

I.—GENERAL.

German Patent Office during 1900.

Chem. Zeit., April 10.

The number of applications increased from 21,080 in 1899 to 21,925 in 1900. The number of patents granted increased in still greater proportion: from 7,430 to 8,784. The expired and terminated patents numbered 5,854; 25,115 remained in force at the end of the year. Up to the present, 996 patents have remained in force the longest allowable time of 15 years. Of these, the class of dyestuffs claims more than any other, namely, 72.

Mineral Production of Germany.

Eng. and Mining J., April 27, 1901.

The coal production of Germany for the year 1900 is given by the preliminary reports of the Government, as below, in metric tons:—

—	1899.	1900.	Changes.	Per Cent.
Coal	101,639,753	109,271,726	I. 7,631,973	7·4
Brown coal	34,204,666	40,279,332	I. 6,074,666	17·5
Totals	135,844,419	149,551,058	I. 13,706,639	10·1

The very considerable increase in brown coal was due to the opening of new mines and the more active working of old ones. Besides home sales, there was a considerable demand for export to Austria during the strike of the miners in that country.

The production of metallic ores in Germany and Luxembourg is reported as below, in metric tons:—

—	1899.	1900.	Changes.	Per Cent.
Iron ores	17,989,635	18,964,367	I. 974,732	5·4
Copper ores......	733,619	774,775	I. 41,156	5·6
Zinc ores	664,356	639,215	D. 25,141	3·8
Lead ores........	144,370	148,230	D. 3,860	2·7

The output of mineral products of minor importance was, in metric tons:—

——	1899.	1900.	Changes.
Graphite	5,196	9,248	I. 4,052
Asphalt	74,770	89,685	I. 14,915
Petroleum	27,027	50,375	I. 23,348
Rock-salt	861,123	927,784	I. 66,661
Kainit	1,108,159	1,178,527	I. 70,368
Other potassium salts	1,384,972	1,874,346	I. 489,374
Magnesia salts	2,032	1,754	D. 278
Boracite	183	232	I. 49
Silver and gold ore	13,506	12,537	D. 969
Tin ore	72	81	I. 9
Cobalt, nickel, and bismuth ores.	1,270	4,495	I. 3,227
Uranium and tungsten ore	50	13	D. 7
Manganese ore	61,329	59,203	D. 2,126
Arsenic ore	3,834	4,380	I. 546
Pyrites	144,623	169,447	I. 24,824
Alunite and alumina sulphate.	533	350	D. 183

It will be seen that there was an increase in almost all the mineral products. This was especially marked in the group of potash salts, of which Germany has at present a practical monopoly.

COLOURING PLANTS IN GERMAN EAST AFRICA.

Foreign Office Annual Series, No. 2568.

Although plants containing colouring matter are nowadays of reduced value, yet an examination is at present being made of the wild *Indigofera*, of the yellow wood of the *Cardiogyne Africana*, of the yellow bark of the *Ochna Alboserrata* and the *Zanthoxylon*, of the red-coloured *Randeia malleifera*, and of the purple *Cassia goratensis*.

Thousands of beautifully coloured hand-made mats of plaited straw are exported yearly to Zanzibar, Arabia, and India. The colours used are five in number, and it may not be misplaced to record here how the natives obtain them.

Red.—A yellow root, *Curcuma* (Kiswahili, *Manjano*), found almost everywhere, is dried, stamped, and left to soak for a week in a little alum and water. This mixture is then boiled together with a red root, the *Rubia Cordifolia* (Kiswahili, *fua*), which is imported from India.

Yellow.—A piece of the bark of the *Namavele* acacia, called in Kiswahili, *Mungamo*, is pounded in a mortar and boiled with the strip of mat it is intended to colour.

Orange.—The same process is performed as with yellow, only a little curcuma is added.

Green.—The strip of mat is boiled with a concoction made up of the green leaves of *Ricinus communis*, *Jatropha curcas*, and *Cordyla Africana* (Kiswahili, *mche*), which have previously been bruised.

II.—FUEL, Etc.

CONSUMPTION OF COAL DUST IN GERMANY.

U.S. Cons. Reps., May 1901.

Many experiments have been made of late to fire furnaces with coal dust, principally with apparatus having some form of fan blower to introduce the fuel into the furnace. Not much success has attended the application of these devices. The Schwarzkopff apparatus has, however, met with favour in Germany, owing to the facility it affords for utilising slack or low-grade coal. A German Imperial Commission appointed to test smoke-consuming appliances made trials of this apparatus, and the report is favourable. As to the conditions of the process, a highly heated fire chamber is necessary for the ignition of the coal dust. Contact with the boiler walls interferes with ignition, so that in fitting up a boiler for coal-dust firing a fire chamber lined with fireproof material has to be provided, because only such a chamber can be kept constantly at the required high temperature. This is most easily accomplished with flue boilers when the flues are lined for a length of from 5 to 8 ft. with fireproof material. Metallurgical firings do not offer any difficulty to the arranging of the fire chamber, because the whole furnace possesses the high temperature required. In these cases, the fire chamber can be considerably shorter.

The necessity of a fire chamber is not an inconvenie but a special advantage in coal-dust firing, because it ins a perfect combustion, a high temperature of the gase the start, and protection against the formation of ne flames. At high temperature, there will be always per combustion to carbon dioxide and water, while at temperature the more refractory hydrocarbons do not l at all, or but imperfectly, causing the formation of soo smoke. Finally, these chambers offer for boiler firing case of stoppage, the advantage that by the heat store the fireproof walls the steam pressure is longer maintai The apparatus seems also to insure a smokeless combus

III.—TAR PRODUCTS, PETROLEUM, E

PETROLEUM INDUSTRY OF RUSSIA.

U.S. Cons. Reps., May 1901.

At present the principal object of the trade is resid for fuel, the heavier the crude the better price it br Bibi-Eibat crude contains some benzine and a trifle illuminating oil than the crude from the other districts less residuum; consequently it is at present worth three-fourths to one-half a kopeck per pood less tha crude from the other fields. There is some crude i other districts which brings 1 kopeck per pood more the ordinary oil, because it is sufficiently heavy to be as fuel without the necessity of running it through the to take off some illuminating distillate.

Refining.—The results of refining in 1899 showed clearly that the principal object of the refiner changed residuum in the beginning of the year to illuminating the last four months of the year, the yield from the the first eight months being 24·8 per cent. refined 56·59 per cent. residuum, while in the last four mon was 31·78 per cent. refined and 48·35 per cent. resi This state of affairs was in a measure reversed in 19 the yield the first three months of the year was 29· cent. refined and 52·5 per cent. residuum, whil average for the year was 25·52 per cent. refined and per cent. residuum, against an average for the pr year of 26·48 per cent. refined and 54·75 per residuum. This change was, of course, due to the in the price of refined.

A committee of the petroleum trade made last yea was said to be a very thorough investigation of tl ditions existing in the Russian rural districts, with to forming an intelligent idea of the possibili increasing the home consumption of refined oil, wit reported in the press, the most appalling discoveri the poverty of the peasantry as far as an illumin concerned. The report of this committee made sensation for a time, but I have not been able to se copy of it. The gist of it was that practically there refined consumed in Russia; that the price in all railway towns was, for the majority of the pop prohibitory. This is confirmed by the small per consumption.

A great change might be wrought by the abolitio 60 kopecks per pood (30·91 cents per 36·112 poun With her immense population and long winters days, were the tax abolished, Russia might easily more refined than the present known territory could

Residuum.—No increase in the demand for resi expected this year, because of the anticipated inc the production of coal from the mines with which has been competing. A meeting of mine owners last autumn at Kharkof, and it was there decided would just about double the 1900 output of coal If the coal output is increased materially, both residuum will be much cheaper, with a possible redu the demand for the latter. On January 1, 1901, th in stock at Baku about 61,000,000 poods (30 galls.) of residuum, and at the natural rate of outp basis of crude production, that stock will be inc probably 130,000,000 poods (650,000,000 galls.) b (the opening of Volga navigation). With no p of the demand reaching more than 260,000,0 (1,300,000,000 galls.) for the year, they will open t with half the necessary quantity in stock; and eve use in crudo production, they will produce probably 00,000 poods (150,000,000 galls.) residuum per month, ut it is very probable that before the navigation season nch more than half over they will have the year's nd supplied. If this proves to be the case, nothing big decline in the price of not only residuum, but also, is to be expected.

TPUT OF PETROLEUM FROM BAKU IN THE YEARS 1899 AND 1900.

U.S. Cons. Reps., May 1901.

Oil.	1899.	1900.
	Million Galls.	Million Galls.
nating..............	516	617
ating..............	57	67
uum	1,224	1,318
....	121	195
Total..........	1,919	2,198

VII.—ACIDS, ALKALIS, AND SALTS.

COPPER SULPHATE IN GREECE.

Foreign Office Annual Series, No. 2573.

ng to the Peronosporos pest, sulphate of copper is to become one of the most important items in the of this country. It is reckoned that about 7,000 to ons will be required annually, and this will almost mported from abroad, as the local output can never large proportions.

year, owing to the importation of parcels from the Kingdom, which were adulterated with sulphate of nd other substances, an attempt was made by local cturers to decry the British article, but, luckily, the conviction of the Greek in British trade honesty ed most importers to sift this question, and they ound that by applying to the proper quarters they ain the genuine article containing 98 to 99 per cent. hate of copper, and it is most probable that on equal the principal portion of the requirements will be d from the United Kingdom.

Currant Bank called for tenders for the supply of ons of sulphate of copper, and although there was competition to secure this order the contract was the firm offering the British chemical at the price 10*s.* c.i.f. Patras. The retail price at present is 5*l.* 5*s.* There is no import duty on this article.

CHEMICALS IN SOUTH CAROLINA.

Foreign Office Annual Series, No. 2572.

large amount of fertilisers manufactured here the importation of considerable quantities of ls which are used in connection with phosphate as ; most of the chemical imports are brought in ships, and last year were as follows:—Pyrites (for sulphuric acid), 14,922 tons; kainit, 46,118 tons; 27,037 tons; manure salt, 8,137 tons; nitrate of 715 tons; potassium chloride, 11,276,386 lb., and of potash, 588,712 lb.; the total value of these being 778,353 dols. (about 155,676*l.*), in comwith chemical imports during the year before total value of 827,792 dols. (about 165,558*l.*), a last year of 49,439 dols. (nearly 10,000*l.*).

CHEMICAL INDUSTRY IN FRANCE.

. Gullet. Rev. des Prod. Chim., April 1.

e sulphuric acid produced in France in 1899 was lead chambers, but it is announced that a works, to be erected at Lyons by the Volta Lyonnaise, the contact process of the Badische Company. Of rks which produce sulphuric acid, two burn sulphur, ie, and the rest pyrites. During the last few years, d has been made in two places by Dr. Valentiner's method. One of these is the powder works of Angoulême. Soda is made in eight factories in France. Of these, three work by the Leblanc process, four by the ammonia-soda process, and one by an electrolytic process.

PRESENT STATE OF CHEMICAL INDUSTRY IN RUSSIA.

Chem. Zeit., April 10; *through Chem. Trade J., May* 4.

Of the old chemical manufactures, two of the principal ones, potash and saltpetre, have considerably diminished in importance. The reduction in the exports of potash is due partly to the clearing of the forests, and partly to the competition of the Stassfurt potash salts. Russian saltpetre, which, it is true, only sufficed for the home consumption, especially for the manufacture of gunpowder, is now only made to a small extent, partly in consequence of the introduction of Chile saltpetre, and partly because smokeless powders have taken the place of black powder. Recently, however, the manufacture of sulphuric acid and alkali has been introduced. In 1890 about 100,000 Mtr. Ctr. of soda were manufactured, but this production has now risen to about ten times as much. Of the total chemical manufactures, sulphuric acid and soda, together with the connected articles, alum and various salts and acids, account for about half the value; colouring matters and lacquers form a third quarter; and all the other chemical manufactures are comprised in the remaining quarter. In Russian business circles, the hope is entertained that, in consequence of the wealth of the raw materials supplied by nature, it will be possible before long to place on the market quite a number of productions. At present Russia depends largely upon imports from abroad, and only supplies to Western Europe a few chemicals in relatively small quantities, such, for instance, as phosphorus.

BAVARIAN *vs.* CEYLON GRAPHITE.

U.S. Cons. Reps., May 1901.

This mineral is one of the most valuable products of Bavaria and is almost a monopoly, as the only formidable competitor in the supply of natural graphite is the Island of Ceylon. The production of graphite in Ceylon has, however, diminished from 30,000 tons to some 12,000 or 15,000 tons annually, causing a great rise in prices. The price of Ceylon graphite ranges from 250 dols. to 375 dols. per ton. In Bavaria the graphite deposits are found near Passau, and are inferior to the Ceylon graphite, as, while the latter is nearly pure, the former has about 60 to 75 per cent. earthy substances mixed with it. The Passau graphite, however, can be purified by a very simple and inexpensive process, and a substance produced that is quite equal to the Ceylon graphite. Unfortunately, owing to local conditions, this process is little used, as the deposits are divided among a number of proprietors who work on a small scale in the cheapest manner possible. The result is that there is great waste of the raw material, and it is alleged that nearly 90 per cent. of the mineral is absolutely thrown away owing to this unscientific and shortsighted system of working, which must lead to the premature exhaustion of the deposits. In 1898 there were 49 graphite works in Bavaria, employing only 216 men, which produced 4,593 tons of graphite, worth 97,915 dols.

IX.—CEMENTS, Etc.

ARTIFICIAL BUILDING STONE IN GERMANY.

U.S. Cons. Reps., May 1901, 61.

The manufacture of this stone is growing to enormous proportions in Germany, and factories are springing up everywhere.

The following is a rough sketch of the simplest and best system known for producing this stone—one which, it is said, offers an absolute guarantee of superior quality:

Hydraulic lime, as well as fat or rich lime, may be used; hydraulic lime is preferred, however, if the price warrants it. Of the different kinds of sand, the cleanest is the most suitable, but a small admixture of clay is not objectionable. In fact, it can be said that all kinds of sand suitable for building purposes or for the preparation of mortar may be used. The proportions are from four to six parts of lime to 94 or 96 parts of sand, the small variation depending on the quality of the sand. After pulverising the lime in a ball mill, both substances are mechanically measured and then thoroughly mixed by machinery. This mixture is then pressed into the shape of stones, which are afterwards piled on flat cars and pushed into a cylindrical boiler. The boiler is then hermetically closed and steam turned on at from eight to nine atmospheres. In about ten hours, the process of hardening is finished, and the stones are ready for use.

The process of hardening the stones in the boiler is explained as follows:—

By the operation of high-pressure steam on the freshly pressed stones, through the influence of the calcium hydroxides on the silicic acid of the sand, different kinds of calcium silicates are formed, which are the accepted standard in the process of hardening. The exact time for hardening is determined by the quantity and the nature of the silicic acid in the sand.

The erection of a plant in Germany for the manufacture of 12,000 stones per day will cost, including buildings, about 16,000 dols.; for one of 25,000 per day, about 22,000 dols. To manufacture 1,000 stones, 250 by 120 by 65 mm. (9·84 by 4·66 by 2·56 ins.), there are required, beside the sand, one workman, 450 lb. of lime, 200 lb. of coal, and about 10 cent's worth of grease and oil.

With this same material, face and fancy stone may also be produced. While these bring a much higher price, the common lime- and sand-stone in Germany commands a price of from 5 dols. to 9 dols. per 1,000, in accordance with the prices paid for clay-brick stone in the several districts. The net cost for 1,000 stones ranges from 2·25 dols. to 3 dols., but does not exceed the latter sum.

The essential points of advantage in the manufacture of the lime-and-sand over the clay-brick building stone are:

(1) The cost of production is much lower.

(2) With a smaller investment, considerably more stone can be produced.

(3) The production can take place in all seasons of the year and at all hours.

(4) The stone has a much higher compressive strength—about 550 lb. per sq. cm. (0·155 sq. in.).

(5.) Coloured, face, and fancy stone can be produced.

(6.) The stone has a much better and smoother appearance, and there is no loss on account of breakage.

(7.) All drying sheds and brick kilns necessary for the production of clay brick are done away with. A space of 65 by 65 ft. is all that is needed for the building of a lime and sand stone factory producing 12,000 stones per day.

Another factor of importance in this system is that instead of sand granulated cinder from the blast furnaces may be used when the mode of manufacture is identical with that of the lime- and sand-stone. Waste of all kinds of sand-stone and of building stones, which contain silicic acid, are equally useful and make a good stone.

Reconstructed Granite.

Eng. and Mining J., April 27, 1901.

This substance is natural granite pulverised and re-formed under pressure and a high heat into blocks and other forms. It was used at first for ornamental blocks, but was later found to be well adapted for making insulators for electric work. Its latest use is for linings of sulphite digesters for treating wood pulp. It is well adapted for this and similar purposes, as the material is not affected by acids, and chlorine does not act on it at any temperature.

Cement at Para.

Foreign Office Annual Series, No. 2580.

Cement exported to Para by British manufacturers is put up in barrels too large and too loosely constructed. The smaller and more compact barrels used to pack German cement are better adapted for the requirements of this market.

X.—METALLURGY.

Zinc Industry in the United States.

Foreign Office Misc. Series, No. 550.

The British Vice-Consul at Chicago, states that th are now in the United States four fields of zinc ore, N Jersey, Wisconsin, Colorado, and the field which inclu a part of Missouri, Arkansas, and Kansas. The first these is practically controlled by the New Jersey Z Company.

The second is not very well worked, although it has b in use the longest of any field in the United States, there is still much land undeveloped and showing g prospects which can be purchased for from 6*l*. to 10*l*. acre, and land partly developed at from 12*l*. to 20*l*. Ne all this land is agricultural and is considered worth a two-thirds of the price asked for that purpose. Wisconsin zinc fields cover an extent of 70 miles by miles, and are approached by two or three railways w connect with Milwaukee on the lake. Furnace coals at the distance of 120 miles from the coal mines about per ton.

In the third district, Colorado, zinc is only a bye-prod

The fourth is a large district, and has the present ad tage of a supply of natural gas, and includes the known Joplin district. Land can be bought there at gre varying prices according to the development and ret shown, undeveloped land being obtainable as low as per acre, while rich mines are valued at 1,000*l*. per acre

It is reported that the miners of the Joplin district contracted to export to Europe 60,000 tons during coming year.

The cost of reducing a ton of zinc ore to metal with is now about 40*s*., an increase in cost of 4*s*. in four y during which time the cost of coal and freights have r whilst the metal can be made by the use of natural ga 28*s*. per ton, as the prices asked for this fuel have hit been small, but the owners of the land are beginni ask better prices for their property. Anyone sta smelting works must look carefully into the chances failure of the gas, and consider whether it is not bett go to a part of the States where there is no natural g long as it is not too far from a coal supply.

Many people hold that the metal made from natura has defects from which coal-made metal is free, being brittle and more easily affected by the air, and that th a slightly better return also from coal retorts from same class of ore.

The approximate yield of zinc ores in the United for 1900 was about 425,000 tons of 2,000 lbs.

The home consumption may be apportioned as follo Manufactured into metal, 150,000 tons; and into materials, 150,000 tons; while 125,000 tons were ex to Europe.

The yield of metal for the year 1900 was about 1 tons, of which about 100,000 tons will have been con in the United States, and the remainder, 20,000 exported chiefly to the United Kingdom. Zinc oxid other paint materials, containing more or less zinc about 60,000 tons, of which about 5,000 tons were exp almost all of this was pure oxide of zinc.

About 85 per cent. of this product is used in the facture of paint, while the remainder is used for floo table baizes, wallpapers, and enters into the manufa of india-rubber, earthenware glazing, ointment, and cine, and is also used in the chemist's laboratory.

At least 90 per cent. of the paint materials ar directly from the ores, with anthracite coal as th The other 10 per cent. is made on the French syste spelter or its bye-products, such as galvanisers' dro scraps, &c.

By far the largest amount is used in galvanising w other iron and steel products. A considerable quant into the manufacture of brass and electrical app such as battery zincs, &c. There is also a consum connection with separating and refining the precious

The zinc rolling industry is very important, and p a large number of articles, such as roofing shee rs, sign plates, scullery appliances, jar and bottle ers, toys, &c.

1894 a 60 per cent. ore went as low in price as ls. 6*d*. per ton, while in 1899 the same quality of ore to over 10*l*. 10*s*. and in February 1901, it was about ls.

e very high prices during 1898 and 1899 caused an ordinary development in zinc mining with the usual ; that what was thought, in 1896-97, to be a prospective mine was changed to a considerable surplus, and for st year the mine-owners have been facing the problem, ially in the Joplin district in Missouri, of how to te successfully about 500 mines when less than half t number could supply all the furnaces now in blast United States, and arrangements are being made to arge quantities of ore to Europe.

TUNGSTEN ORES IN COLORADO.

report of the Commissioner of Mines of Colorado 00, quoted in the New York *Engineering and Mining al* of 13th April says that the existence of tungsten n several Colorado counties has been known for years. The ore occurs in the form of huebnerite, state of manganese, wolframite, a tungstate of iron anganese, and scheelite, a tungstate of lime. Until the past few years no known attempt has been made arket tungsten ores. During the year 1900 the tion was as follows:—San Juan County, 5,000 lb., cent. tungstic acid, and 6,000 lb., 68 per cent.; r County, 80,000 lb., 65 per cent. tungstic acid; a f 91,000 lb.

ore was marketed in Eastern cities, and is reported ing been sold, at place of delivery, at prices ranging *s*. 4*d*. to 14*s*. 7*d*. per unit tungstic acid. The conon of tungsten ores in the United States is quite l, and the price is subject to a wide range. In 1898 ces varied from 8*s*. 4*d*. to 25*s*.; in 1899—1900, from to 14*s*. 7*d*. per unit. At present time the best ion obtainable is 4*s*. 2*d*. to 8*s*. 4*d*. per unit tungstic livered at works.

URANIUM IN COLORADO.

Eng. and Mining J., May 4, 1901.

Colorado production of uranium ore, 1897—1900 ve, was as follows: 1897, 17 short tons, value 9,010 1898, 33 tons, value 16,500 dols.; 1899, 43 tons, 1,500 dols. The production for 1900 is reported as : Gilpin county, 13,155 lb., average 16 per cent. n oxide; Montrose county, 2,000 lb., average 16 per 1,500 lb., average 15 per cent.; 140,000 lb., average cent.; 60,000 lb., average 6 per cent.; 90,000 lb., 10 per cent.; or a total for Montrose county of lb. Total for the State, 306,655 lb.

manager of the Black Prince Mine at Uranium, se county, reports in addition to above, 100 tons of a ore on hand, containing 3 per cent. to 5 per cent. ium oxide. The value of the 1900 production been determinable. At the present time uranium e being bought in Denver and paid for in accordith the percentage of uranium oxide contained. rrying 8 to 10 per cent. of uranium oxide, 17·50 r unit; 10 to 15 per cent., 18 dols.; 15 to 20 per 9 dols.; 20 per cent. and over of uranium oxide, per unit. Uranium ores at present find a ready rket at above rates.

NEW USE FOR CADMIUM.

Eng. and Mining J., May 4, 1901.

new Edison electric storage battery, if it will do claimed for it, will develop a market for cadmium that metal has never had, and will correspondingly producers of spelter in Upper Silesia, who also admium as a by-product. The capacity for the on of cadmium in Upper Silesia is very large, but s never yet been an important demand for it, and ently its recovery has been undertaken by only a few concerns and in a limited quantity, most of the cadmiferous furnace product, from which it might be obtained, being permitted to go to waste, in so far as cadmium is concerned.

COPPER PRODUCTION OF THE WORLD.

Eng. and Mining J., May 4, 1901.

For a number of years Messrs. Henry R. Merton and Company, of London, have been collecting statistics of copper production, and their approximation to the actual results is usually very close indeed. We give below the output of copper for the year 1900, using their figures for all other countries, but giving for the United States the production as collected for *The Mineral Industry*. The figures are in long tons, of 2,240 lb. :—

——	1899.	1900.	Changes.
Argentina	65	75	I. 10
Australasia	20,750	23,000	I. 2,250
Austria	915	865	D. 50
Bolivia	2,500	2,100	D. 400
Canada	6,730	8,500	I. 1,770
Chile	25,000	25,700	I. 700
Cape of Good Hope	6,490	6,720	I. 230
England	635	650	I. 15
Germany	23,460	20,410	D. 3,050
Hungary	590	490	D. 100
Italy	2,965	3,000	I. 65
Japan	28,310	27,840	D. 470
Mexico	19,335	22,050	I. 2,715
Newfoundland	2,700	1,900	D. 800
Norway	3,610	3,935	I. 325
Peru	5,165	8,220	I. 3,055
Russia	7,210	8,000	I. 790
Sweden	520	450	D. 70
Spain and Portugal	52,168	52,872	I. 704
Turkey	920	520	D. 500
Totals	210,038	217,297	I. 7,259
United States	259,517	268,887	I. 9,370
Totals	469,555	486,184	I. 16,629

It will be seen that the countries reporting considerable increase are Australasia, Canada, Mexico, and Peru. The only large decrease was in Germany. Other changes are not of great importance.

In Germany, as heretofore, by far the greater part of the production—18,390 tons—came from the mines of the Mansfield Company, and the decrease in their output was 2,395 tons. In Mexico, the Boleo Mine is credited with 11,050 tons, a little over half the total production. In Spain the Rio Tinto Company showed a gain, while the Tharsis fell off considerably.

MINERALS IN THE URALS.

U.S. Cons. Reps., May 1901.

There are three copper plants in operation, which in 1891 produced 174,000 poods (2,800 tons) of metal, but have only been running in an irregular way during the past two years, during which time they produced 230,000 poods.

The Ural platinum deposits are the only mines that are being successfully worked, and they furnish 96 per cent. of the world's supply. The most valuable territory is owned and operated by a French syndicate, but there are a few private mines still in the hands of the peasants which are being worked after the old methods. These mines produced 258 poods (9,317 pounds) during the year 1891, and 332 poods (11,989 pounds) during 1900, but the price rose from 8,000 to 14,000 rubles (4,120 dols. to 7,210 dols.) during the past few years.

Salt has been produced in the Urals since the sixteenth century; it is obtained from wells and evaporated, the brine strength being from 12° to 26° Behme. The output increased from 15,000,000 to 20,000,000 poods (540,000,000 to 720,000,000 pounds) in 1900.

There are considerable deposits of manganese ore in the Urals, as well as in the south of Russia, and works are now being erected to work and prepare it for the market.

XI.—ELECTRO-CHEMISTRY, Etc.

PROPOSED ELECTRO-CHEMICAL UNITS.

It is an indication of the growing importance of electrochemistry as a separate branch of science, says the *Electro-Chemist and Metallurgist*, that at the recent congress at the Paris Exhibition, Dr. Le Blanc, representing the German Electrochemical Society, brought before one of the meetings for their consideration certain fundamental electro-chemical units, some of which had already been discussed and adopted by the third International Congress of Applied Chemistry held at Vienna in 1898. The following definitions were suggested :—

"Conductivity"; to be expressed in ohm-centimetres and designated by the letter K. A body has unit conductivity when a cylinder of the body of a square centimetre cross-section and 1 centimetre high has a resistance of 1 ohm.

"Molecular Conductivity" is the conductivity (as defined above) divided by the number of gramme-molecules dissolved in a centimetre cube.

The "Quantity of Electricity" necessary for the separation of a gramme-equivalent (96,450 coulombs) is to be designated by the letter F (after Faraday).

The "Concentration Equivalent" of a solution is the concentration expressed as the number of gramme-equivalents, *n*, dissolved in a cubic centimetre.

"Dilution equivalent" $= \frac{1}{n}$, is the reverse of this quantity.

"Conductibility Equivalent," A, is the quotient given by conductivity divided by concentration-equivalent, or $A = \frac{K}{n}$.

The "Electrolytic Mobilities (mobilites electrolytiques)" of anion and cathion to be represented by 1^a and 1_k respectively. Then

$$1^a + 1_k = A, \text{ and } \frac{1a}{A} = \frac{1a}{1a + 1k} = n.$$

"Velocity," to be expressed in centimetres per second for a P.D. of 1 volt per centimetre, is to be represented by U in the case of the cathions, and V for the anions.

The above quantities have been used by Kohlrausch and Holborn in their recent work on "The Conductibility of Electrolytes."

XII.—OILS, Etc.

SOAP IN NICARAGUA.

[Foreign Office Annual Series, No. 2585.

The quantity of common soap imported from the United Kingdom is increasing rapidly, and is much better liked than other soaps on account of its reasonable price, good washing qualities, and hardness. The most saleable soap at present is blue mottled, in boxes of 12 or 24 bars, each weighing 3 lb., and costing about 15*s*. 6*d*. per cwt. In shipping soap it is very important that the boxes should not be too lightly constructed, so that they can resist the knocking about in transhipment.

MANUFACTURE OF COCOANUT BUTTER IN MANNHEIM.

U.S. Cons. Reps., May 1901, 63.

The manufacture of cocoanut butter is an industry of some importance in this city. The Mannheim factory is said to be the only one of any considerable size in Germany. It has an output of about 10 tons of butter per day. The business was started in 1886, and shows a steady increase. The product is sold under the name of "Palmin"—a registered trade name—or cocoanut butter. It is manufactured from the kernels of cocoanuts, and is used as a substitute for butter and lard in cooking. As sold, it is generally white in colour, almost tasteless, melts at about 80° F., and is of about the consistency of mutton or beef tallow. When desired by consumers, as bakers, confectioners, &c., the product is coloured to resemble ordinary butter. When furnished to dealers, it is unlawful to colour it. It is stated that the substance does not become rancid easily, that it will keep for three or four months in a co room.

Cocoanut butter is generally put up in square packag wrapped in parchment paper, a small percentage being so in tin cans. The latter are hermetically sealed for shipme during hot weather. The product is sold at one pri throughout Germany, namely, about 16 cents per pound, about half the price of ordinary butter. It is handled somewhat limited quantities by about 50 grocers in t city.

The kernel of the cocoanut is imported in thoroughly dri strips, forming the "copra" of commerce. It is subjected various refining processes by which all the free acids a other substances are separated, leaving only the vegeta fat. In the later stages of the manufacture the prod resembles ordinary butter recently churned. It is plac in machines similar to the separators used in creameries, which the water and other foreign substances are separat by centrifugal force. In the manufacture of cocoa butter, a by-product, consisting of free acids and ot substances, is obtained and sold to soap manufacturers.

XIII. C.—PIGMENTS, PAINTS, Etc.

TOTAL YEARLY CROP OF RUBBER FROM THE AMAZ VALLEY (INCLUDING BOLIVIA AND PERU) DURING THE YEARS 1877—1900.

Foreign Office Annual Series, No. 2580.

	Tons.		Tons
1877	7,598	1889	15,30
1878	7,898	1890	16,89
1879	7,926	1891	18,43
1880	8,635	1892	18,99
1881	9,492	1893	19,73
1882	10,018	1894	19,47
1883	11,158	1895	20,98
1884	11,782	1896	22,31
1885	12,696	1897	22,25
1886	13,390	1898	25,37
1887	15,690	1899	25,37
1888	15,998	1900	26,6

SHIPMENTS OF RUBBER TO THE UNITED STATES A EUROPE (TOTAL RUBBER CROP OF THE AMAZON VALLEY) DURING THE YEARS 1896-97 TO 1899-19

Foreign Office Annual Series, No. 2580.

—	Quantity.			
	1896-97.	1897-98.	1898-99.	1899
	Tons.	Tons.	Tons.	T
United States	9,848	11,422	12,398	12
Europe	12,368	10,796	12,848	14
Total	22,216	22,218	25,246	26

XIV.—TANNING, LEATHER, GLUE SIZE, Etc.

TANNING PLANTS IN GERMAN EAST AFRICA.

Foreign Office Annual Series, No. 2568.

The *Acacia Catechu*, the bark of which is expo large quantities from India and Burmah, grows most parts of the colony. Other trees which occ quently in German East Africa, and which are mucl elsewhere for tanning purposes, are *Acacia A. Pterocarpus erinaceus*, and the mangrove.

XV.—MANURES.

PHOSPHATES SOURCES OF SUPPLY.

Foreign Office Annual Series, No. 2572.

It is estimated that the quantity of phosphate rock r last year to supply the world's demands was 2,850,0 and as Europe alone consumes about 2,000,000 tons ıay bo of interest to state that the sources of supply ; as follows:—Florida, 500,000 tons; South Carolina, 000 tons; Tennessee, 150,000 tons; Africa, 400,000 ; France, 350,000 tons; Belgium, 300,000 tons; and sia and Norway about 50,000 tons. In addition to this ıt 900,000 tons were consumed in America and 50,000 in Japan and Australia.

FERTILISER MANUFACTURE AT BALTIMORE.

Foreign Office Annual Series, No. 2570.

essrs. Armour and Co., of Chicago, have begun the ufacture of fertilisers near Baltimore. Phospate rock ken from Forida and Tennessee, and the blood, tankage, other ingredients are brought from the immense ghtering houses of the Company at Chicago and Kansas the acid used being purchased here. About 200 are now employed, and it is expected that the output be about 60,000 tons a year, of the value of from)00*l.* to 250,000*l.*

CONSUMPTION OF BASIC SLAG.

Eng. and Mining J., May 11, 1901.

the various materials known as chemical fertilisers or cial manures none has advanced so rapidly in farmers' ır in recent years as basic slag. In 1880 the produc- of this slag in the Grand Duchy of Luxemburg and in ıany was only 4,326 tons, in 1890 it was 358,320 tons, a 1899 it had risen to 953,570 tons. The production sic slag in Europe now exceeds 1,700,000 tons annually. atest year for which full statistics of the production onsumption of basic slag were available is 1899, for period M. Grandeau has brought the details together *Journal d'Agriculture Pratique.* The countries of st annual consumption are Germany, 895,500 tons; ce, 170,000 tons; Great Britain, 128,000 tons; ia-Hungary, 92,000 tons; Belgium, 89,000 tons; en, 58,000 tons; and Italy, 56,500 tons. The countries atest annual production, as measured by the output of are Germany, 1,009,000 tons; Great Britain, 267,000 France, 166,000 tons; Belgium, 131,000 tons; and ia-Hungary, 63,000 tons Great Britain is the only ry in Europe in which the production largely exceeds onsumption, more than half the total output in 1899 g been exported to different countries, headed by any, which took 34,000 tons, and France, which took 0 tons. In Germany about half the phosphoric acid in fertilising is obtained from basic slag.

XVI.—SUGAR.

SUGAR IN AUSTRIA HUNGARY.

Foreign Office Annual Series, No. 2583.

ıgary, Russia, Roumania, and Belgium are success- competing with Austrian sugar in exports to Turkey, , Syria, &c. Italy used to import Austro-Hungarian but she now possesses 28 sugar manufactories.)-Hungarian sugar exports to Japan have also sed, as Japan is now erecting her own sugar es. India still remains one of the largest consumers stro-Hungarian sugar. Until 1894–95 sugar con- in India was to a great measure imported from tius, which furnished 64 per cent. of the whole t. In the following three years, 1895–98, Austro- rian sugar exports to India continually increased at ne rate as German. As soon as countervailing duties ntroduced in India the importation of Austro-Hun- sugar, contrary to all expectation, increased, and took ond place, whilst Germany took the third. In 1898–99 vas a slight diminution due more to the famine than introduction of additional duties.

total sugar importation at Trieste from the Austrian ces of Bohemia, Moravia, Lower Austria, Silesia, , and from Hungary has been, during 1900, 1,427,615 s, against 1,610,379 quintals in 1899, making a e in 1900 of 182,764 quintals.

Table showing the Quantity of Sugar Exported from Trieste to the United Kingdom and British Colonies during the Years 1899–1900.

To	Quantity.	
	1899.	1900.
	Met. Tons.	Met. Tons.
Great Britain and Ireland	3,610	7,176
Aden	2,461	2,387
Africa	33	145
Cyprus	869	796
Egypt	2,631	2,555
Gibraltar	344	413
India	26,966	29,216
Malta	3,026	3,478
Zanzibar	..	51

XVIII. C.—DISINFECTANTS.

REMEDIES FOR INSECT PESTS IN THE WEST INDIES.

H. Maxwell-Lefroy, Imp. Dept. of Agric. for the W. I., Pamphl. No. 5.

The use of poisons offers a method that is generally applicable to insect attacks. Poisons are of two kinds, "Stomach-poisons" and "Contact-poisons". The former destroy insects when eaten with their food, the latter destroy them when they come in contact with their bodies. Insects that bite leaves, bark or fruit and eat what they bite, can be killed by putting a stomach-poison on their food. These poisons are enumerated in list A. Clearly, this method is of no use against sucking insects, which push a slender tube into the plant and do not eat the outside. For these, contact-poisons are used, and since many sucking insects are fixed to the plant or move but little, this method is very effective; for such poisons see list B.

Substances poisonous to man should not be applied to fruit or vegetables immediately before they are to be picked.

Poisons.

List A. Stomach-poisons:—

Arsenical-Poisons.

1. *Paris Green*, mixed with twice its weight of flour, dust or lime, both finely powdered.
2. *Paris Green*, 1 lb. with 2 lb. of lime, dissolved in 200 galls. of water.
3. *London Purple*, mixed with twice its weight of flour, dust or lime, both finely powdered.
4. *London Purple*, 1 lb. with 2 lb. of lime, dissolved in 180 galls. of water.
5. *London Purple* or *Paris Green*, may be used with soap, by adding 1 lb. of soap to every 50 galls. of No. 2 or 4.

Other Poisons.

6. *Hellebore*, mixed with twice its weight of cheap flour, both finely powdered.
7. *Hellebore*, 1 oz. in 2 quarts of water.
8. *Pyrethrum* (Buhach), mixed with twice its weight of cheap flour, both finely powdered.
9. *Pyrethrum* (Buhach), 1 oz. in 1 gall. of water.
10. *Tobacco* (refuse), as dry powder.
11. *Tobacco* (refuse), 1 lb. steeped in 1 gall. of water for 24 hours.

List B. Contact-poisons:—

12. *Kerosene Emulsion* (hard soap).—Dissolve ½ lb. of hard soap in 1 gall. of boiling water. Add 2 galls. of kerosene to the hot liquid and immediately churn, with a syringe or force-pump, till the mixture becomes creamy. This is the stock solution. Make up to 33 galls. Use only rain water, or soft water (*i.e.* without lime, &c.).
13. *Kerosene Emulsion* (soft soap).—Dissolve 1 quart of soft soap in 2 quarts of hot water; add 1 pint of kerosene to the hot mixture and immediately churn, with a syringe or force pump, till the whole is creamy. Add an equal amount of water, and it is ready for use. Any water may be used.

14. *Rosin Wash.*—Mix 20 lb. of rosin, 3½ lb. of 98 per cent. caustic soda, and 3 pints of fish oil. The rosin and caustic soda must be pounded before mixing. Cover this with about 2 ins. of water and boil. When the liquid is clear, *slowly* add water, still boiling the mixture, till the whole is made up to 15 galls. This is the stock solution and can be made up to 100 galls. when cold, using only rain water or soft water.

15. *Rosin Compound.*—Mix 4 lb. of powdered rosin, 3 lb. of powdered washing soda, and 1 gall. of water. Boil, and when all is dissolved, *slowly* make up to 5 galls. Boil the mixture till it becomes of a clear brown colour. This is the stock solution. Make this up to 30 galls.

16. *Whale Oil Soap.*—Dissolve 1 lb. of soap in 1—2 galls. of warm water.

17. *Rosin and Whale Oil Soap Compound.*—Mix 1 gall. of water with 3 lb. of powdered washing soda and 4 lb. of powdered rosin. Boil till dissoved, and while boiling, make up *slowly* to 5 galls.

In a separate vessel boil 10 lb. of whale oil soap with 5 galls. of water. These may be mixed while hot to make the stock solution, or when cold, mix these two with 35 galls. of cold water, pouring both into the water together while actively stirring the mixture. However mixed, the final amount must be 45 galls.

18. *Tobacco and Soap.*—Dissolve 1 quart of soft soap, or ½ lb. of hard soap, in 5 galls. of water, and add 2 quarts of strong tobacco decoction (No. 11).

Use of the Poisons.

The arsenical poisons, such as London Purple or Paris Green, are of universal application against caterpillars and other pests that destroy foliage, but it must be remembered that arsenic is not quickly washed off by rain. Hellebore, on the other hand, very soon loses its poisonous properties, and becomes harmless after some exposure to air. Pyrethrum is harmless to higher animals, but has a powerful influence on insects. Those in list B. are the contact poisons for application to plants infested with mealy bug, scale insects, &c.

The prices of the materials mentioned in list A. are subjoined, as quoted in New York:—

	Cents per Lb.
Paris Green	25
London Purple	6—15
Hellebore	20
Pyrethrum	35

In Barbados (Messrs. C. F. Harrison and Co.) the following may be obtained:—

	Cents per Lb.
Paris Green	54
London Purple	30
Refuse tobacco	4

The cost of washes in list B. has been calculated per 100 galls. of wash ready for application, exclusive of fuel and labour. These figures are approximate and represent, as closely as possible, firstly, the cost of the materials in large quantities in Barbados, free of duty; and, secondly, the cost at retail prices as quoted in Barbados.

——	Cost per 100 Galls.	
	Dols.	Dols.
Rosin compound	0·70	0·91
Rosin wash	1·29	1 90
Rosin and whale oil soap compound	1·47	2·15
Kerosene emulsion (hard soap)	1·87	2·87
Whale oil soap (strong)	4·50	10·00
Kerosene emulsion (soft soap)	22·40	35·20
Tobacco and soap	..	1·00

In making kerosene emulsion with hard soap, water containing lime should not be used, as the oil will separate out on the surface after making the emulsion; rain water or soft water is necessary in this case and is preferable for all washes.

Other Remedies. — Special preparations are sold for applying to trees. In the form of greasy mixtures, rosin and castor oil, whale oil soap and washing soda, soft soap and carbolic acid are recommended for this purpose, these must not be allowed to remain long on the tr After two to three months, at most, they should washed off.

Grain may be freed from weevils by exposing it 24 hours in an air-tight receptacle to the fumes of carl bisulphide at the rate of one teaspoonful (1 drach per cubic foot of space. This will kill every insect wi 24 hours and will not damage the grain. Carbon bisulp is obtainable in cans from 7 lb. upwards at about 5*d*. pe Benzol may be used in the same way, taking rather m per cb. ft. as it is less powerful. As both these substa are very inflammable, care must be exercised in using th

Cockroaches can be destroyed by mixing equal part molasses, or chocolate, and boric acid, and spreading on small pieces of tin or cardboard, which are placed cupboards or under furniture. The mixture is not poiso to dogs and other domestic animals. Books in the tro should always be lightly painted over with the follo mixture to preserve them from cockroaches:—1 oz corrosive sublimate, 1 oz. of carbolic acid, 2 pint methylated or rum spirits. The paste used for bin books and similar work should be poisoned by adding of copper sulphate to every pound of paste.

BOARD OF TRADE RETURNS.

SUMMARY OF IMPORTS.

Articles.	Month ending 30th Ap	
	1900.	1901.
	£	£
Metals	2,507,807	2,393
Chemicals and dyestuffs	500,206	626
Oils	874,087	929
Raw materials for non-textile industries.	4,807,635	4,313
Total value of all imports	42,681,876	46,392

SUMMARY OF EXPORTS.

Articles.	Month ending 30th A	
	1900.	1901
	£	£
Metals (other than machinery)	3,968,636	3,50
Chemicals and medicines	892,007	81
Miscellaneous articles	2,968,242	3,01
Total value of all exports	22,645,147	21,98

IMPORTS OF MISCELLANEOUS ARTICLES FOR MON ENDING 30TH APRIL.

Articles.		Quantities.		Value.
		1900.	1901.	1900.
				£
Cement	Tons	7,918	15,685	17,694
China and earthenware.	Cwt.	31,481	36,728	79,592
Drugs	Value £	..	..	90,247
Glass:—				
Sheet	Cwt.	110,667	89,740	61,717
Plate	„	43,039	53,612	47,560
Flint	„	39,133	38,225	78,163
Bottles	Gross	131,348	170,669	54,460
Other	Cwt.	20,432	24,329	37,772
Glue and gelatin	„	20,217	19,587	45,273
Leather, unmanufactured.	„	103,569	126,690	693,284
Oil seed cake	Tons	37,789	36,916	238,801
Paints and pigments.	Value £	..	..	101,593
Paper, pasteboard	Cwt.	524,153	529,341	363,138
Scientific instruments.	Value £	..	..	57,371
Soap and soap powder.	Cwt.	14,009	23,954	18,182
Zinc manufactures.	„	33,018	27,750	13,518

IPORTS OF METALS FOR MONTH ENDING 30TH APRIL.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
er :—			£	£
.... Tons	4,543	8,898	56,009	125,760
ulus .... ,,	6,609	8,790	264,159	378,009
wrought ..... ,,	6,092	5,355	460,909	384,578
pig and sheet ,,	14,758	16,988	246,662	228,159
es .... ,,	55,076	55,511	96,674	98,866
silver .... Lb.	75,056	381,129	9,505	46,360
ore....... Value £	..	..	85,177	75,697
.... Cwt.	45,208	54,405	303,602	318,365
.... Tons	7,166	5,730	155,253	96,463

PORTS OF OILS FOR MONTH ENDING 30TH APRIL

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
out....... Cwt.	67,019	33,852	81,924	41,012
.... Tuns	1,543	1,796	59,408	65,206
.... Cwt.	54,065	77,946	67,676	89,325
um :—				
iuating.. Gall.	14,710,487	19,526,601	343,721	386,512
icating... ,,	4,457,379	2,998,455	127,799	97,309
.... Tons	1,996	6,503	49,719	142,258
tc. .... Tuns	798	1,215	16,864	22,165
tine ..... Cwt.	31,713	15,627	61,842	19,156

IPORTS OF RAW MATERIAL FOR NON-TEXTILE INDUSTRIES FOR MONTH ENDING 30TH APRIL.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
ruvian .. Cwt.	7,131	6,150	15,866	17,741
ouc ...... ,,	58,047	30,206	886,655	544,038
.... ,,	4,590	5,853	12,129	16,379
c. .... ,,	14,590	5,495	46,210	15,713
rcha .... ,,	9,406	5,410	97,255	74,136
aw :—				
.... ,,	95,983	35,185	275,199	102,004
.... ,,	39,557	55,425	87,989	131,827
.... ,,	746	683	24,972	24,818
—				
.... Tons	3,564	2,144	17,314	9,622
.... ,,	4,250	6,798	19,297	26,494
.... Cwt.	106,810	47,745	144,746	66 936
gs .... Tons	1,767	1,485	17,759	14,969
.... ,,	17,961	21,276	69,821	94,414
ood..... ,,	35,413	33,518	181,890	189,278
.... Cwt.	167,614	141,058	40,842	31,850
d stearin ,,	197,205	206,796	260,452	263,114
.... No.	1,534,645	1,530,717	143,127	146,529
.... ,,	1,311,170	1,409,316	138,470	132,512
soda... Tons	30,824	28,115	261,238	230,156
e of lime ,,	29,667	24,881	53,209	42,191

TS OF CHEMICALS AND DYESTUFFS FOR MONTH ENDING 30TH APRIL.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
ounds... Cwt.	28,247	24,250	13,742	7,754
materials ,,		19,862		6,908
.... ,,	5,706	28,012	3,373	14,348
.... ,,	32,408	26,437	6,874	5,731
potash.. ,,	25,947	21,843	22,207	18,746
other Value £	..	..	135,296	135,914
gambier. Tons	2,519	2,217	52,535	48,316
.......Value £	..	..	17,335	17,035
nd others ,,	..	..	49,107	40,611
.... Cwt.	2,574	8,774	34,841	128,602
.... ,,	24,160	37,688	9,180	15,516
.... Tons	3,587	4,215	37,049	44,753

EXPORTS OF METALS (OTHER THAN MACHINERY) FOR MONTH ENDING 30TH APRIL.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Brass............ Cwt.	10,477	10,096	56,491	49,882
Copper.......... ,,	53,503	70,870	211,498	269,338
Lead............. Tons	2,217	2,393	42,983	42,462
Plated wares... Value £	..	..	31,809	35,908
Tin .... Cwt.	7,176	9,250	50,573	56,681
Zinc .... ,,	12,523	11,747	12,732	9,927

EXPORTS OF DRUGS AND CHEMICALS FOR MONTH ENDING 30TH APRIL.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Alkali .... Cwt.	332,021	..	99,014	..
Bleaching materials ,,	112,053	66,747	32,591	22,434
Chemical manures Tons	27,614	36,689	187,270	203,133
Copper sulphate .. ,,	9,844	6,187	231,960	148,692
Medicines....... Value £	..	..	94,907	119,207
Soda compounds :—				
Ash............. Cwt.	..	99,330	..	21,511
Caustic .... ,,	..	91,067	..	45,795
Bicarbonate .... ,,	..	24,454	..	8,477
Crystals .... ,,	..	11,610	..	1,798
Sulphate........ ,,	..	25,384	..	2,062
Other sorts ..... ,,	..	23,852	..	11,554

EXPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 30TH APRIL.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Gunpowder..... Lb.	497,500	Cwt.2,993	10,976	9,631
Candles......... ,,	1,795,400	1,607,100	32,755	28,591
Caoutchouc..... Value £	..	..	116,747	84,765
Cement......... Tons	35,094	27,968	65,923	54,723
Products of coal. Value £	..	..	156,464	111,333
Earthenware ... ,,	..	..	189,364	148,145
Stoneware ...... ,,	..	..	13,917	14,372
Glass :—				
Plate .... Sq. Ft.	150,689	Cwt.4,014	8,930	6,794
Flint .... Cwt.	6,886	7,242	17,270	18,738
Bottles .... ,,	64,284	80,998	29,739	38,872
Other kinds ... ,,	16,601	18,701	18,300	20,993
Leather :—				
Unwrought .... ,,	9,756	10,555	109,682	110,221
Wrought......Value £	..	..	33,956	34,626
Seed oil .... Tons	4,023	3,652	97,641	90,342
Floorcloth.......Sq. Yds.	2,374,900	2,315,600	106,516	110,638
Painters' materials Val. £	..	..	166,040	154,624
Paper.............. Cwt.	85,036	88,158	130,816	137,686
Rags............... Tons	5,310	5,017	33,190	29,812
Soap .... Cwt.	72,392	82,656	79,167	88,060

Monthly Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

APPLICATIONS.

7845. W. Foulis. Improvements in apparatus for charging retorts. April 16.

8161. A. Duchemin. Improvements in centrifugal drying machines or hydro-extractors. April 20.

8209. T. A. Appleing. Improvements in apparatus for cooling or refrigerating liquids in the glass or open vessel. April 22.

8367. G. Scott and Son (London), Ltd., and F. W. Scott. Improvements in evaporating apparatus. April 23.

8370. E. S. Bevan. Improvements relating to the filtration or cleansing of furnace gases in malt and other kilns. April 23.

8476. H. M. Ashley. Improvements in furnaces. April 25.

8500. W. Defries and V. I. Feney. Improvements in apparatus for purifying liquids. April 25.

8534. C. Rigg. Furnace for roasting or calcining ores and other substances. April 26.

8642. E. E. Murphy. Improvements in and relating to carbonating apparatus. Complete Specification. April 26.

8747. F. Rough and E. A. Greathed. Improvements in carburetters. April 29.

8811. F. Kaeferle. Improvements in or relating to pressure-reducing apparatus. Complete Specification. April 29.

8815. F. Kaeferle. Improvements in syphon pipes for pressure-reducing apparatus. Complete Specification. April 29.

8868. C. V. A. Eley. An improved apparatus for cooling liquids. April 30.

8925. Davey, Paxman and Co., Ltd., and T. S. King. Improvements in and relating to superheaters. Complete Specification. April 30.

8942. F. W. Saatmann. Improvements in drying and absorbing apparatus. May 1.

9296. R. Kurka. Improvements relating to filters. May 1.

9315. L. Koch. Improvements in and connected with superheaters. May 6.

9519. J. Wezel. Improvements in or connected with furnaces. Complete Specification. May 7.

9585. B. Oertel. Improvements in and relating to furnaces. May 8.

9706. F. C. J. Bird. Improvements in a still for recovering alcohol or other volatile solvent from solid substances. May 10.

9825. C. Holcroft. Improvements in regenerative furnaces and apparatus connected therewith, and in gas producers for the said furnaces. May 11.

Complete Specifications Accepted.

1900.

7854. F. T. Brearley. Annealing furnaces, and tools for use therewith. May 1.

8428. J. E. J. Baxter and G. E. Simpson. Furnaces. May 1.

10,048. G. F. Restall. Apparatus for stirring, mixing, and otherwise treating substances. April 24.

10,580. O. Imray—From F. Morani, Italy. Electric furnaces of great power. May 1.

10,900. G. D. Howard.—From J. Cormack, Newfoundland. Air coolers and refrigerators. April 24.

11,799. R. Moodie. Apparatus for cooling vapours, gases, liquids, and the like. May 15.

11,932. R. P. Gandillot. Heating or drying chambers, May 8.

12,190. J. Foster. Evaporating vessels for concentrating liquids. May 8.

12,233. A. J. Boult.—From A. Nicolas, France. Centrifugal drying apparatus. May 15.

12,316. E. G. Scott. Removing solids and liquids from vessels containing them. May 15.

12,617. C. W. Vollmann. Condenser for refrigerating apparatus. May 15.

1901.

6248. G. Schober. Refrigerating or cooling apparatus. May 8.

II.—FUEL, GAS, and LIGHT.

Applications.

7697. J. Cavargna. Improvements in or relating apparatus for producing carburetted hydrogen in furn for the purpose of assisting combustion therein, and the consumption of smoke. April 15.

7715. W. P. Thompson. Improvements in obtaining in utilising hydro-carburetted air and in apparatus there April 15.

7865. G. Crossley and F. Crossley. Incandescent bur April 17.

7902. E. W. Cooper. A new or improved veget charcoal or carbon, and methods or processes for the ma facture or preparation thereof. April 17.

7997. W. Kennedy-Laurie Dickson. Improvements and relating to incandescent gas lighting. April 18.

7998. W. Kennedy-Laurie Dickson. Improvem relating to the manufacture of concentrated sulphuric Complete Specification. April 18.

8129. C. H. Schill and W. G. Primrose. Improvem in or relating to apparatus for the manufacture of April 20.

8268. H. A. F. B. H. Tönnies. Improvements relati acetylene gas generators. April 22.

8275. A. J. Boult. — From Société Lumière B Belgium. Improvements in or relating to incandesce Bunsen gas burners. Complete Specification. April

8281. A. J. Boult. — From Société Lumière Belgium. Improvements in or relating to mantle sup for incandescent gas burners. Complete Specific April 22.

8372. H. J. Haddan.—From The Adams and We Company, United States. Improvements in acet generators. Complete Specification. April 23.

8449. L. Mond. Improvements in gas prod April 24.

8548. F. S. Lavarack. Improvements relating to production of ozone. April 25.

8572. S. Cowper-Coles & Co., Ltd., and S. Cowper- An improved process for the manufacture of coal briq April 26.

8762. F. R. L. Srathy and A. J. Riley. Improv relating to acetylene gas lighting. April 29.

8817. A. J. Boult.—From Société Lumière. Belgium. Improvements in high-pressure incan gas lighting plant. Complete Specification. April

8877. M. Graham. Improvements in hot coke con Complete Specification. 30 April.

8881. C. J. Johnson. Apparatus for manufacturi Complete Specification. April 30.

8905. L. T. D'Altoff. Improvements relating manufacture of gas. Complete Specification. Apri

9053. R. N. Lennox. Apparatus for the produ ozone. May 2.

9222. J. Fischer. Improvements in and rel incandescent gas burners. Complete Specification.

9224. G. Hookham. Improvements in mantles candescent gas lamps. May 3.

9321. C. B. Tully. Improvements in and relati manufacture of water-gas. May 6.

9331. R. Larghans. Improvements in and relati manufacture of incandescent mantles. May 6.

9460. F. Missire and M. L. Missire. Improve mantles for incandescent gas lighting. May 7.

9513. J. St. Clair Legge. Improvements in for carburetting air. May 7.

9542. E. Price. A porous carburetter. May 8.

9658. F. S. Kennedy. The permanent incande light mantle. May 9.

9660. J. H. Stevens. A self-intensifying at gas apparatus. May 9.

61. F. Schmitt. Improved apparatus for generating storing acetylene gas. Complete Specification. May 9.

33. W. K. Dickson. Improvements in and relating to tles for incandescent gas lighting. May 10.

18. J. Altman. Improved burner for incandescent gas ing. May 11.

22. H. Koppers. Improvements relating to coke ovens. plete Specification. May 11.

Complete Specifications Accepted.

1900.

0. A. Firth and R. Jackson. Vaporizers or carting apparatus. May 15.

1. G. Seagrave. Apparatus for generating acetylene April 24.

9. G. W. Johnson.—From La Compagnie Française acétylène dissous, France. Means for generating lene gas, and lighting by means of such gas. April 24.

3. P. R. de Faucheux d'Ilumy and R. McKenzie. facture of anthracite briquettes. May 15.

5. J. St. Clair Legge. Vapour incandescent lighting. 1.

2. W. Hooker. Incandescent gas and vapour burners. 5.

7. J. H. Ross. Acetylene gas generators or the like.

5. A. Wilson. Gas producers. April 24.

5. R. A. Nielsen. Manufacture of incandescing for incandescence lighting. May 8.

55. The Petolite Fuel Syndicate, Ltd., and E. John- Manufacture and production of combustible material npound, more especially intended for use in the acture of briquettes of artificial fuel. May 8.

06. H. Prescher. Apparatus for the self-ignition of May 15.

87. L. A. Maingard. Artificial fuel. May 15.

1901.

T. Kautny and R. W. Lotz. Acetylene gas generators.

G. Kohl. Incandescent bodies, and method of cturing same. May 15.

W. P. Thompson.—From A. Wasmuth, Germany. for strengthening incandescent bodies for gas May 1.

H. H. Kinloch. Apparatus for and method of ng and moulding peat or turf. April 24.

H. Borchardt. Means for lighting gas. May 1.

E. Lisle and G. F. Prew. Carburettors. April 24.

F. Hoffmann. Production of compressed gas for or heating purposes. April 24.

K. Schultze. Manufacture of incandescent bodies and other lighting. May 1.

H. Koppers. Treatment of gas liquor. May 8.

W. Garrett and J. C. Cromwell. Gas producers.

C. A. Allison.—From A. H. Bronson, United Process of manufacturing gas, and apparatus for actising the same. May 15.

F. Sasse. Gas purifying apparatus. May 8.

C. G. Richardson. Art of incandescent gas May 8.

.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Application.

R. Fallnicht. Process for producing solidified Complete Specification. May 4.

Complete Specification Accepted.

1901.

5232. W. Heinemann. Process for recovering the by-products from coke-kiln gases. April 21.

IV.—COLOURING MATTERS and DYESTUFFS.

Applications.

7726. R. B. Ransford.—From L. Cassella and Co., Germany. Manufacture of dialkylamido-oxydiphenylamines and dyestuff therefrom. April 15.

7919. R. B. Ransford.—From L. Cassella and Co., Germany. The manufacture of *p*-mono-alkylamido-*p*-oxydiphenylamines and dyestuffs therefrom. April 17.

8120. R. B. Ransford.—From L. Cassella and Co., Germany. The manufacture of new 2.7-amidonaphtholmonosulphoacid and dyestuffs therefrom. April 19.

8528. H. H. Lake.—From Farbwerk Mühlheim vormals A. Leonhardt and Co., Germany. Improvements relating to the manufacture of colouring matters. April 25.

8636. C. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of directly dyeing sulphurised dyestuffs from 1 : 8-dinitronaphthalene. April 26.

8800. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of mordant-dyeing monoazo dyestuffs. April 29.

8923. F. de Brandel and A. de Baudry d'Asson. A new product especially applicable for use in the manufacture of colours and inks, and process of manufacture of the said product. April 30.

8924. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in the manufacture or production of anthracene derivatives. April 30.

9088. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of dis-azo-dyestuffs from ortho-diamido-phenol-para-sulphonic acid. May 2.

9613. J. Y. Johnson.—From Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture of indigo. May 8.

9694. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture and production of colouring matters and intermediate products derived from methylanthraquinone. May 9.

9774. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of acylated derivatives belonging to the indigo group. May 10.

Complete Specifications Accepted.

1900.

9081. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of colouring matters of the anthracene series and of intermediate products relating thereto. May 15.

10,844. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of black disazo dyestuffs. May 8.

11,035. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of new colouring matters of the acridine series. May 8.

11,042. C. D. Abel.—From The Actiengesellschaft für Anilinfabrikation, Germany. Dyeing and printing. May 8.

11,922. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of amido-ammonium azo-dyestuffs. May 15.

1901.

2009. W. P. Thompson.—From The Firm of Gebrüder Flick, Germany. Processes for the preparation of a soluble indigo paste. March 27.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Applications.

7737. E. J. Taylor and S. Taylor. Improvements in and relating to the treatment of raw or manufactured wool, cotton, and other fibres or fibrous materials or articles, and the manufacture of substances suitable therefor. April 15.

8076. A. J. E. Hill. A process for giving cotton yarns and fabrics certain silk-like properties. April 19.

8473. J. T. Pearson. Improvements in and relating to the treatment and packing of silk, wool, cotton, and other fibrous substances and fabrics in their raw, manufactured, and partly manufactured state. April 25.

9378. E. Leconte. Improvements in retting flax, hemp, and other textile plants. May 6.

9482. B. J. B. Mills.—From P. Mugnier, France. Improved fabrics and process of manufacturing the same. May 7.

Complete Specifications Accepted.

1900.

8267. C. Baswitz. Process and composition for rendering textile fabrics and the like non-inflammable and waterproof. April 24.

22,954. J. C. W. Stanley. Treatment of cotton-seed hulls, and the obtaining of certain useful products therefrom. May 15.

1901.

4125. H. H. Lake.—From National Package Company, United States. Manufacture of fibrous compositions. May 8.

7480. H. H. Lake.—From K. Weldon, United States. Apparatus for use in the mercerisation of yarn. May 5.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, and BLEACHING.

Applications.

7688. R. Meyer and W. C. Foulds. Tom toms for dyeing works. April 15.

7923. P. Barboutau. Improvements in the xylographical printing of colours in graduation on paper and textile fabrics. April 17.

9184. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Process for producing red shades on wool. May 3.

9720. R. Illingworth, J. T. Mazey, and G. Naylor. Improvements in apparatus for dyeing and otherwise treating fibrous material in a spun or other state. May 10.

Complete Specifications Accepted.

1900.

9587. G. W. Johnson.—From Kalle and Co., Germany. Printing of indigo, or indigo and other colouring matters. May 1.

10,709. C. H. Hope. Colour printing of textile fabrics. May 1.

12,976. R. F. Schule. Dyeing yarns, and apparatus therefor. April 24.

19,250. J. Hussong. Dyeing machines. Jan. 16.

21,236. G. Bethmann. Process for dyeing wool or other animal fibre with aniline black. May 1.

1901.

228. C. Rigamonti and G. Tagliani. Kiers for bleaching cotton fabrics. May 8.

3518. F. Taylor, A. Cooke, B. W. D. Montgomery, and The Lishman Process Bleaching Company, Ltd. Appliances to be employed in the process of bleaching. May 15.

VII.—ACIDS, ALKALIS, and SALTS.

Applications.

7710. J. Potut. Improvements relating to the manufa ture of sulphuric acid. Complete Specification. Fil April 15. Date applied for Oct. 6, 1900, being date application in France.

7932. J. Hargreaves. Improvements in treating a obtaining metallic chlorides and oxides. April 18.

7999. A. Zanner. Improvements relating to the man facture of concentrated sulphuric acid. Complete Spe fication. April 18.

8230. J. Y. Johnson.—From The Atmospheric Produ Company, United States. Manufacture of nitrogen co pounds from atmospheric nitrogen. Complete Specificati April 22.

8257. G. W. Johnson.—From The Stassfurter Chemis Fabrik vormals Vorster und Grüneberg, Germany. I provements in the purification of potassium cyani April 22.

8527. W. H. Akester. Improvements in the manufact of picric acid and its compounds. April 25.

8545. J. Wetter.—From The Firm of E. Haën, Germa Improvements relating to catalytic bodies and to manufacture of sulphuric anhydride. April 25.

8834. S. Cowper-Coles and Co. Ltd., and S. Cow Coles. An improved process for abstracting arsenic f sulphuric acid, and apparatus in connection therew April 30.

9125. R. Abrey. An acid-proof composition. May

9133. G. Plath. Improvements in apparatus for distillation of nitric acid. May 2.

9398. A. Gatensohn. Improved method of prod picric acid. Complete Specification. May 6.

Complete Specifications Accepted.

1900.

5644. F. M. Spence, D. D. Spence, and H. Spe Manufacture of aluminous compounds. Feb. 6.

9231. C. P. Bary. Manufacture of stannic acid by bustion of tin vapour. April 24.

11,753. W. C. Sellar. Treatment of calcium fluori the production of silico-fluorides. May 15.

12,182. W. Schulthess. Production of calcium hy and apparatus therefor. May 15.

15,233. J. Thesen. Extraction of iodine and othe ducts from seaweed. April 24.

20,023. M. Depangher and V. U. Pontini. Proc manufacturing a deodorising, washing, or bleaching May 15.

22,201. T. J. Smith. Carbonised bromides. May

1901.

284. H. A. Frasch. Nickel salt, and process of n same. April 24.

2010. U. Wedge. Process and apparatus for the ment of chemical compounds for oxidising or raising to a higher oxide. April 24.

VIII.—GLASS, POTTERY, and ENAMELS

Applications.

8608. W. C. Morison. Improvements in and co with mixing substances for pottery, and such like April 26.

9087. W. S. Rawson and R. D. Littlefield. Tr of magnesite for the manufacture of refractory artic structures. May 2.

9820. W. P. Thompson. From La Société po ploitation des Brevets, Henri Starm, France. Impro in kilns, drying chambers and conveying appara pottery or ceramic wares, bricks, and the like. Ma

Complete Specifications Accepted.

1900.

,286. G. Ott. Method of and apparatus for fusing elain and the like. May 8.

1901.

96. W. Haley. Apparatus for pressing and moulding s-ware. April 24.

—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Applications.

07. S. Potter. Improved fireproof floor and ceiling. l 17.

92. F. Boas. Improvements in the manufacture of ing materials. Complete Specification. April 22.

56. G. Weber. Improvements in the production of tions of stone. April 25.

9. J. Bowler. Improvements in the manufacture of ial stone and bricks. April 26.

0. N. W. Curtis and A. E. Carey. Improved con- s cement kiln and drying floor. April 26.

1. F. Boenke. Improved fireproof, artificial stone , or tiles for building purposes. Complete Specifica- April 27.

9. T. M. Thom. Improvements relating to the acture of lime. April 27.

7. W. S. Rawson and R. D. Littlefield. *See* Class

. J. Cozermak. Improvements in the manufacture ation marble. Complete Specification. May 6.

. J. L. Gordon. An improved cement for general g purposes. May 7.

. R. J. Stalker. Improvements in or relating to unds or compositions for preserving wood. May 9.

. F. A. Beny and J. Heinrigs. A new or improved tus for slaking lime. Complete Specification.).

Complete Specifications Accepted.

1900.

G. Warren. Kilns and drying process for cement ilar materials. May 8.

3. H. Schmidt. Kilns for burning cement, limes, like. May 8.

9. W. Dünkelberg. Manufacture of artificial stone, aratus therefor. May 1.

1901.

H. H. Lake. From D. Wachtel and Co., Germany. on of slaked lime. April 24.

S. S. Bromhead. From G. Möller and P. Pfeiffer, . Process for the manufacture of solid blocks of ut of cement slush. April 24.

B. B. Lashbury and H. S. Spackman. Apparatus ing cement. April 24.

E. C. Brice. Manufacture or production of bricks or blocks, or other building material.

S. Schougaard and J. Evans. Method of making stone. May 15.

W. P. Thompson. From H. P. Dodge, United Treatment of lime. May 15.

X.—METALLURGY.

Applications.

. V. L. R. T. Vilderola. Improvements in and the production of copper. April 15.

. B. Wheatley. An improvement in the manu- of metallic alloys. Complete Specification.

8153. W. B. Johnson.—From The Pittsburg Reduction Company, United States. An improved process for the purification of aluminium. Complete Specification. April 20.

8172. J. Houghton. Improvements in and relating to the casting of metals. April 20.

8175. E. Herter. Improved method of and means for casting and simultaneously refining raw zinc and other metals excepting iron. Complete Specification. April 20.

8208. J. Scott. Improvements in and relating to the casting in chills of iron or steel articles. April 22.

8321. A. A. Lockwood. An improvement in the process in the extraction of gold and silver from their matrix by a cyanide solution and the recovery of the same direct. April 23.

8333. A. D. Elbers. Process of treating molten blast furnace slag. April 23.

8376. H. Brandenburg and A. Weyland. Process for extracting tin from ores or slags. Complete Specification. April 23.

8397. G. Rigg. Process and apparatus for treating mixed zinc blende and pyrites, so as to render their separation by magnetic treatment possible and practicable. April 24.

8450. A. Reynolds. An improvement in metallurgical converters. April 24.

8511. M. Ullmann and B. Schlag. An improved method of soldering or joining together aluminium and other metals and substances and material therefor. April 24.

8605. O. Massenez. Improvements relating to the manufacture of phosphoric iron. April 26.

8732. J. Esson and G. H. Taylor. Improved process for the conversion of cast iron into steel, also brass and other metals and alloys into substances harder than steel. April 27.

8904. H. H. Lake.—From W. E. Simonds, United States. Improvements relating to alloys, and to processes for the production thereof. Complete Specification. April 30.

9124. W. S. Mather. Improvements relating to crucibles for smelting. Complete Specification. May 2.

9263. H. Elmqvist. Smelting process for casting metal. Complete Specification. May 4.

9503. J. C. Clancy and L. W. Marsland. Improvements in the extraction of gold, silver, lead, zinc, and other metals from sulphide ores. Complete Specification. Filed May 7, date applied for Jan. 24, 1901, being date of application in Queensland.

9676. The British Aluminium Company, Ltd.—From A. H. Cowles, United States. An improved electric smelting process and apparatus to be used therein. Complete Specification. May 9.

Complete Specifications Accepted.

1900.

8801. W. H. Hyatt. System for the improvement of aluminium and aluminium alloys. May 15.

11,085. E. T. Zohrab. Furnaces for smelting and dephosphorising iron and other ores. April 24.

16,065. F. Haenle. Beating of leaf metal. May 15.

18,386. J. Inshaw. Manufacture of hollow blooms for producing seamless tubes, hollow shafting axles, and other hollow articles from common puddled iron or other metals. April 24.

23,660. M. Seligsohn. Method or process of treating ores. April 24.

1901.

3044. E. C. H. Pape and W. S. Henneberg. Crushing and lixivating ores and metallurgical products. April 24.

5207. A. M. Clark.—From The Nichols Chemical Co., United States. Metal casting apparatus. May 1.

5877. A. Reynolds. Converter treatment of metals and their compounds, and apparatus for that purpose. May 8.

6655. W. H. Wheatley.—From Société Général des Aciers Fins, France. Manufacture of steel. May 15.

7316. H. H. Lake.—From J. E. Hewitt and C. T. Coe, United States. Alloy and process for the production thereof. May 15.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

Applications.

7935. G. J. Gibbs. Improvements in or relating to the grids of secondary batteries. April 18.

8280. R. Fortun and E. Semprun. Improvements in or relating to accumulators or secondary batteries. Complete Specification. April 22.

8598. G. F. W. Kloth, O. H. G. Bünning, and J. G. L. D. Kunhardt. Improvements in or relating to accumulators or secondary batteries. Complete Specification. April 26.

8717. W. Fritsche. Improvements in or relating to secondary cells or batteries. April 27.

8932. F. M. Chaplet. Improvements in primary electric batteries. April 30.

8985. L. Bénier. An improved thermo electric battery. Complete Specification. May 1.

9023. L. Bristol. Improved means for testing secondary batteries. May 1.

9187. C. P. Elieson and V. de Bobinsky. Improvements in electrical accumulators. May 3.

9213. G. B. Puchmuller. A new or improved galvanic cell. May 3.

Complete Specifications Accepted.

1900.

6312. H. A. Cohn and E. Geisenberger. Apparatus for the production of soda and chlorine, by the electrolysis of chloride of sodium, the invention being also applicable for the production of potassium, sodium, aluminium, or other metals of the same class. May 15.

11,260. A Tribelhorn. Electric accumulators, and electrodes therefor. May 8.

13,951. J. Weiss. Electric muffles or furnaces. May 15.

1901.

2490. T. A. Edison. Storage batteries. May 1.

4568. H. J. H. Pickard and J. S. Evans. Accumulator plates. May 1.

XII.—FATS, OILS, AND SOAP.

Applications.

8198. J. Doull. Improvements in the method of treating whale carcases and other substances for the extraction of grease and utilisation of bye-products. April 20.

8483. J. H. P. M. Delattre, of La Société Anonyme d'Epuration des Eaux-Vannes d'Extraction des Matières Grasses par les Procédés Delattre. A process for treating fish and fish refuse and in apparatus therefor. April 25.

9039. J. Hogarth. *See* Class A.

9838. A. G. Salamon.—From A. Verley, France. Improvements in the purification of vegetable oils. May 11.

Complete Specifications Accepted.

1900.

2372. A. Merry and J. H. Noble. Manufacture of soap. May 15.

9048. M. Winkelmann. Process for producing fat lacs. May 15.

11,053. C. Allworth. Soap. May 15.

13,201. F. Linde. Method of preparing rape-seed oil and other sweet oils. May 8.

16,989. C. L. Culmann. Process of and apparatus for producing soap. May 8.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, Etc.

Applications.

7921. H. Langbein. Improvements in and conne with the chemical purification of graphite. April 17.

7954. G. Fry. Improvements in or relating to manufacture of varnishes. April 17.

8995. A. Bente. A new or improved proce apparatus for the manufacture of soot from tar. Com Specification. May 1.

9233. M. Condron. An improved preservative position. May 4.

9828. S. Ammundsen. A varnish substitute and process for producing same. Complete Specifica May 11.

Complete Specifications Accepted.

1900.

8820. E. R. Blundestone. New process and metho producing white lead. April 24.

9282. F. A. Hyndham and W. B. Banyard. Manufa of pigments or paints. May 1.

11,108. E. Beringer. Manufacture of zinc sul suitable for pigments and of sulphocyanides as a product. April 24.

XIV.—TANNING, LEATHER, GLUE, AND SIZ

Applications.

7712. J. Muir. Improvements in and relating t manufacture of leather. April 15.

9025. L. B. Trant, G. Soldani, and P V. San M Improvements in tanning. Complete Specification.

9556. C. Dreher. Process for producing fast c upon any kind of leather by the employment of tit salts combined with tanning material or with m colours. May 8.

Complete Specifications Accepted.

1900.

17,253. L. Geveart-Naert. Manufacture of a leather. May 1.

1901.

3062. G. S. Falkenstein and C. Falkenstein. making artificial leather. May 15.

6815. R. W. James.—From W. A. Hall, United Composition of casein glue. May 8.

XV.—MANURES, Etc.

Applications.

9514. T. Storer 'and R. McAlley. An improve the treatment for fertilising purposes of the distiller known as burnt or pot ale. Complete Speci May 7.

9773. J. Carstairs. An improved process for duction of fish guano. Complete Specification. M

XVI.—SUGAR, STARCH, AND GUM, Et

Applications.

8086. G. B. Schwerin. Improvements relatin extraction of sugar. April 19.

8331. C. D. Ekman. Manufacture of adhesive suitable for use as a substitute for gum arabic a soluble gums. April 23.

9496. A. Kaczorowski. Improved process and for covering or liquoring sugar loaves. May 7.

Complete Specifications Accepted.

1900.

05. F. R. Bramsch. Process for purifying molasses sugar juices for the purpose of obtaining German .. May 15.

06. F. R. Bramsch. Process for obtaining German and alcohol from molasses or sugar juices without ion of cereals and without lactic acidity. May 1.

33. L. A. Morel. Process of manufacturing gluten. 15.

XVII.—BREWING, WINES, SPIRITS, Etc.

Applications.

14. W. Palethorpe. Improvements in spargers or clers particularly for use in brewing. April 15.

6. H. W. Spiller. Improved method of and apparatus e treatment of beer. April 16.

7. J. L. Tuckett. The manufacture or production of proved yeast extract. April 18.

2. A. G. Southby. Improvements in brewing barley eers. April 20.

7. C. W. Ramsey. Improvements in or relating distillation and purification of alcoholic liquids. 20.

. O. Imray.—From Joshua Brothers Proprietary, Victoria. An improved method of accelerating the ng of whisky, brandy, and other strongly spirituous . Complete Specification. April 23.

. E. S. Beaven. *See* Class I.

. A. M. Clark.—From L. Nathan, Switzerland, and e, Germany. Method of and apparatus for brewing d the like. April 25.

. R. B. Ransford.—From L. W. Gans, Germany. cess for obtaining the contents of yeast cells. 7.

M. P. Davies and E. Wilding. Improvements in ing to yeast. April 29.

H. A. Hobson and the Concentrated Beer Com- imited. Improvements in brewing beer. May 1.

T. Larkin. An improved kiln or apparatus for malt, hops, or the like. May 2.

G. Jacquemin. Process of preparing and method low fermentation brewery yeasts fermenting at a mperature. May 3.

F. G. Riley. Improvements in mash tuns for purposes, and boiling liquids by steam. May 6.

T. Storer and R. McAlley. *See* Class XV.

Complete Specifications Accepted.

1900.

J. House and E. W. Lancaster. Apparatus for ng, collecting the gas given off during the process ntation, and afterwards using the same to re- e ales, lager beers, and other beverages. May 8.

W. P. Thompson.—From J. H. Lavollay and G. , France. Process for the purification of crude April 24.

E. Scholes. Bottling of beer and other beverages.

E. Barbe. Process and apparatus for the manu- f vinegars from alcohol, wine, cider, beer, &c.

III.—FOODS, SANITATION, Etc., and DISINFECTANTS.

Applications.

A.—Foods.

V. L. Wise.—From B. Bache - Wüg, Norway. ents in and relating to the preservation of eggs articles of food. Complete Specification. May 30.

9039. J. Hogarth. Improvements in and relating to the treatment of alimentary substances and beverages, oils, and other oxidisable materials. May 2.

9091. A. Herzen. A process for the preparation of pepsinogenous meat extract. Complete Specification. Filed May 2. Date applied for Nov. 10, 1900, being date of application in Belgium.

9215. H. Marquardt. An improved process for preserving milk, cream, and like substances, and apparatus for use therein, and for transporting the said substances. Complete Specification. May 3.

9562. L. W. Broadwell and W. T. Birch. Solidified milk as an improved form of food. May 8.

9648. A. E. Cressall. Improvement in food preparations. May 9.

9653. W. Manasse. An improved process for preserving foods. May 9.

B.—Sanitation; Water Purification.

7689. R. J. G. Wood. System for treating and utilising sewage. April 15.

7694. H. Stillman. Apparatus for purifying water. April 15.

7806. H. H. Lake.—From J. M. A. Lacomme and W. Lauder, United States. Improvements relating to apparatus for use in the purification of water. Complete Specification. April 16.

8088. A. G. Brookes.—From W. Trippe, Germany. Improvements in the treatment of waste liquors from the manufacture of sulphite cellulose in order to render the same useful and to obtain certain products therefrom. Complete Specification. April 19.

9183. A. G. Bloxam.—From E. Dillan, Germany. Improved method of treating liquids with ozone for sterilizing and other purposes. Complete Specification. May 3.

9299. E. G. Scott. Improvements in the production and recovery of waste liquors. May 4.

9337. T. J. Barnard. Improvements in or connected with the profitable disposition of sewage sludge and other similar costly nuisances. May 6.

C.—Disinfectants.

7719. J. Wetter. — From The Aktiengesellschaft für Theer- und Erdöl-Industrie, Germany. Improvements in or connected with the treatment of phenols to render them soluble in water. Complete Specification. April 15.

Complete Specifications Accepted.

A.—Foods.

1900.

7397. W. Pemberton. Apparatus for softening and purifying water. April 24.

23,893. R. Hengstenberg. Preservation and sterilisation of food products and other substances of all kinds. May 15.

1901.

3750. J. Meyenberg. Process of making a substitute for mothers' milk. May 8.

B.—Sanitation; Water Purification.

1900.

9819. R. H. Reeves. Method of treating sewage and sewage effluents. May 8.

11,046. E. Burmeister. Treatment of town's sewage and other waste liquids. May 15.

C.—Disinfectants.

1900.

10845. A. Zimmerman.—From The Chemische Fabrik auf Actien vormals E. Schering, Germany. Manufacture of antiseptic compounds. April 24.

XIX.—PAPER, PASTEBOARD, Etc.

Applications.

8063. A. Browne.—From J. B. G. Bonnaud, Belgium. Improvements in the treatment of nitro-cellulose for various useful purposes. April 19.

8072. E. Zühl. A new or improved process for the manufacture of a celluloid-like substance. Complete Specification. April 19.

8301. A. Williams and W. C. Parkin. A process for rendering celluloid non-inflammable. April 23.

8719. F. Müller and T. Hilsdorf. A process for the manufacture of sensitive paper for pictures in sepia tint. April 27.

9501. T. Rosenthal. Improvements in processes for making paper-like materials. May 7.

9766. J. Turner. Improvements in the manufacture of paper. May 10.

Complete Specifications Accepted.

1900.

9517. G. J. Wildridge. Manufacture of paper. May 1.

1901.

630. L. H. A. von Giese. Process of and means for rendering non-transparent or opaque paper temporarily transparent. April 24.

4326. E. Fühl. Method of producing a celluloid-like substance. May 8.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

Applications.

8165. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of new pharmaceutical compounds. April 20.

9091. A. Herzen. *See* Class A.

Complete Specification Accepted.

1901.

1467. J. Takamine. Glandular extractive products consisting of the active principle of the suprarenal glands, and process of making same. May 15.

XXI.—PHOTOGRAPHY.

Applications.

7969. O. Gros. Improvements in photographically sensitive surfaces. April 18.

9120. W. E. Evans.—From La Société Anonyme des Pellicules Françaises, France. Improvements relating to the manufacture of photographic films. Complete Specification. May 2.

9763. W. Ohse. Process for producing pictures in relief on metal, celluloid, gypsum, or the like by means of photography. May 10.

Complete Specifications Accepted.

1900.

12,913. C. D. Abel.—From Actiengesellschaft Anilin Fabrikation, Germany. Photography. May 8.

14,530. J. W. Foster. Method of and means for treating exposed photographic films. April 24.

1901.

6307. F. R. Vandyke. Process of direct photo-zin graphy. May 1.

XXII.—EXPLOSIVES, MATCHES, Etc.

Applications.

7867. E. Bailey. Electrical explosive gases. April 1

8101. M. Fiedler. Improvements in explosives. Co plete Specification. April 19.

8329. C. J. R. Le Mesurier. An improved explo April 23.

8365. O. Imray.—From J. L. Norris, United States. new or improved explosive. Complete Specificat April 23.

8821. F. Volpert. Improvements in the manufactur ammonia explosives. Complete Specification. April 2

8935. J. Morris. Improvements in and relating to manufacture of gunpowder. April 30.

9582. C. Helcké. A new or improved explosive. M

Complete Specifications Accepted.

1900.

7152. E. H. Eisenhart, G. M. Justio, and C. W. M Machinery for the manufacture of matches and b and depositing matches therein. April 24.

10,456. J. de Macar. New explosives. May 1.

12,854. A. Reichwald.—From the firm of F. Kr Germany. Percussion fuses for projectiles. May 1.

1901.

2253. J. B. Bernadon. Smokeless explosives or col and process for making same. April 24.

XXIII.—GENERAL ANALYTICAL CHEMIST

Complete Specifications Accepted.

1900.

22,856. S. L. Fox. Instruments for ascertainin amount or proportion of hæmoglobin in blood. April

1901.

7014. S. S. Bromhead.—From The Chemische Helfenberg Actiengesellschaft (formerly E. Diet Germany. Process for producing reagent paper w sensitive to several chemical substances at the same May 15.

PATENTS UNCLASSIFIABLE.

Applications.

8813. W. L. Wise.—From C. Bade, United Composition of matter suitable for use in substitut various natural and artificial materials. April 29.

8848. H. C. Bull and F. L. Marshall. Improvem or connected with the production of diamonds, rubi other precious stones. April 30.

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Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—

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T. W. Hogg.
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H. S. Pattinson.
John Pattinson.
W. W. Proctor.
W. L. Rennoldson.
G. Sisson.
J. E. Stead.
J. E. Stock.

Hon. Local Secretary and Treasurer:
F. C. Garrett, Durham College of Science, Newcastle-on-Tyne.

The following take office in July next:—*Chairman:* W. L. Rennoldson. *Vice-Chairman:* N. H. Martin. *Committee:* J. T. Dunn, F. S. Newall, and Harry Smith.

New York Section.

Chairman: Clifford Richardson.
Vice-Chairman: V. Coblentz.

Committee:

C. F. Chandler.
L. Fadé.
B. B. Goldsmith.
J. Hartford.
J. Hasslacher.
E. G. Love.
G. H. May.
R. W. Moore.
T. J. Parker.
R. C. Schüpphaus.
T. B. Stillman.
G. N. Williamson.
D. Woodman.

Hon. Treasurer: R. C. Woodcock.

Hon. Local Secretary:
H. Schweitzer, 40, Stone Street, New York, U.S.A.

The following take office in July next:—*Committee*
Aspinwall, M. T. Bogert, A. P. Hallock, E. J. Lederle, and

Nottingham Section.

Chairman: F. Stanley Kipping.
Vice-Chairman: J. O'Sullivan.

Committee:

L. Archbutt.
S. F. Burford.
F. J. R. Carulla.
R. M. Caven.
W. Scott Herriot.
J. M. C. Paton.
A. L. Stern.
J. J. Sudborough.
S. Trotman.
G. J. Ward.
J. White.

Hon. Treasurer: S. J. Pentecost.

Hon. Local Secretary:
J. T. Wood, 29, Musters Road, West Bridgford, Notting

The following take office in July next:—*Chairman:* L. A
Vice-Chairman: F. Stanley Kipping. *Committee:* H. B.
and J. O'Sullivan.

Scottish Section.

Chairman: Sir Robt. Pullar.
Vice-Chairman: W. Frew.

Committee:

W. Carrick Anderson.
E. M. Bailey.
G. T. Beilby.
H. Bumby.
J. Christie.
W. J. Chrystal.
John Clark.
C. J. Ellis.
W. Foulis.
G. G. Henderson.
Robt. Irvine.
D. S. Jerdan.
A. D. Ker.
J. G. F. Lowson.
J. McCulloch.
J. B. Readman.

Hon. Secretary and Treasurer:
Thomas Gray, c/o John T. Tannahill, 44, West George
Glasgow.

The following take office in July next:—*Committee:* I
W. Ivison Macadam, T. L. Patterson, and D. J. Playfair.

Yorkshire Section.

Chairman: George Ward.
Vice-Chairman: J. J. Hummel.

Committee:

J. E. Bedford.
H. K. Burnett.
A. W. Cooke.
T. Fairley.
W. M. Gardner.
H. Grandage.
Edw. Halliwell.
S. G. Rawson.
G. W. Slatter.
A. Smithells.
A. Turnbull.
Thorp Whitaker.

Hon. Local Secretary and Treasurer:
H. R. Procter, The Yorkshire College, Leeds.

Hon. Assistant Secretary: A. Turnbull.

The following take office in July next:—*Vice-Cha*
Fairley. *Committee:* E. A. Brotherton, A. J. Murp
Watson, and J. B. Wilkinson.

NOTE.—The names in *italics* are those of Members of Committee who retire at the end of the current session.

NOTICES.

Annual General Meeting.

e Annual General Meeting will be held in Glasgow, on esday, July 24th, and following days. A programme e found in the May number of the Journal. A ticket mbership is enclosed herewith.

accordance with the provisions of Rule 18 of the aws, notice is hereby given that those Members whose are placed in *italics* in the list of Council will retire their respective offices at the forthcoming Annual ng.

Ivan Levinstein has been nominated to the office of lent; Mr. Jos. W. Swan, F.R.S., has been nominated -President under Rule 11; and Mr. Robert Irvine, . Messel, and Mr. J. M. C. Paton have been nominated Presidents under Rule 8.

Hon. Treasurer and Hon. Foreign Secretary have ominated for re-election to their respective offices.

Edw. Divers, F.R.S., Prof. W. R. Eaton Hodgkin- Ph.D., Mr. David Howard, and Mr. Max Muspratt een nominated, under Rule 18, to fill four vacancies the Ordinary Members of Council. No Ballot will uired.

Changes of Address.

n notifying new addresses, members are requested to em distinctly, and state whether they are temporary manent. Multiplication of addresses is also to be l as tending to create confusion. When sending ptions, the use of the form attached to the application n the verification of addresses, on which the safe of the Journal depends.

ors of communications read before the Society, or its Local Sections, are requested to take notice that Rule 43 of the Bye-laws the Society has the right of of publication for three months of all such papers. ment of this Bye-law renders papers liable to be by the Publication Committee, or ordered to be ed for the Journal, in which case no reprints can shed to the author.

Secretary would be glad to receive offers from s and others who may have complete copies of Vol. 397, of the Society's Journal to dispose of.

Arsenic.

ew of the great public interest which has been by the Arsenic Epidemic, it has been decided to , in pamphlet form, uniform with the Journal, the liscussions, and abstracts dealing with the detection rmination of Arsenic and other associated elements, ve appeared in the Journal since the beginning of . To these have been added extracts bearing on ct from other sources, including a description, from 's new book on Arsenic, of the Marsh test, in the own words, and dated 1836. Copies, price 1*s*. y be obtained from Messrs. Eyre and Spottiswoode.

OF MEMBERS ELECTED 24th JUNE 1901.

Arthur S. D., Penn Steelworks, Hoxton, N., ufacturer.

rold O., c/o Southern Cotton Oil Co., Savannah, U.S.A., Chemist.

Arthur L., M.D., 13-15, North Street, Baltimore, U.S.A., Analytical Chemist.

gmund, 35, Frankfort Street, New York City, A., Metallurgical Chemist.

Dolden, Arthur G., Avondale, Dawlish Road, Leyton, Essex, Analytical Chemist.

Fairlie, Jas., Camelon Chemical Works, Falkirk, N.B., Manufacturing Chemist.

Ferrell, Jos. L., 2220, Race Street, Philadelphia, Pa., U.S.A., Mechanical Engineer.

Greaves, Albert E., Goole Alum Works, Goole, Yorks, Works Chemist.

Hartzell, Harry S., 22, North 8th Street, Allentown, Pa., U.S.A., Chemist.

Hershey, Aldus N., c/o Sharp and Dohme, Baltimore, Md., U.S.A., Chemist.

Hyman, Leonard W., New York Central and Hudson River R.R., West Albany, N.Y., U.S.A., Analytical Chemist.

Jacobsen, Rudolph C., 154, Lake Street, Chicago, Ills., U.S.A., Editor "Hide and Leather."

Ogden, Richard L., c/o Pittsburg Gas and Coke Co., Otto, Allegheny Co., Pa., U.S.A., Chemist.

Parker, Col. Richard H., N.Y. Testing Laboratory, Long Island City, N.Y., U.S.A., Analytical Chemist.

Redpath, Leon Wallace, U.S. Naval Torpedo Station, Newport, R.I., U.S.A., Chemist.

Richmond, Sylvester O., c/o A. H. Allen, 67, Surrey Street, Sheffield, Analytical Chemist.

Rogerson, John W., 101, Leadenhall Street, London, E.C., Maltster.

Schlichting, Emil, 103, North Front Street, Philadelphia, Pa., U.S.A., Chemist.

Schwartz, David, c/o Southern Cotton Oil Co., Gretna, La., U.S.A., Chemist.

Tulloch, Wm. F., 7, West George Street, Glasgow, Merchant.

Warburton, Frank, Woodhouse Hill, Hunslet, Leeds, Manager.

Wren, E. Cecil, Glencoe, Eaglescliffe, R.S.O., Co. Durham, Vinegar Brewer.

CHANGES OF ADDRESS.

Annis, Dr. E. G., l/o Huddersfield; Public Health Dept., Town Hall, Greenwich, S.E.

Bloxam, W. Popplewell, l/o London; Presidency College, Madras, India, Professor of Chemistry.

Bolton, E. Richards, l/o Gateshead; 7, Leazes Terrace, Newcastle-on-Tyne.

Briggs, J. F., l/o Wandsworth; 1, Presburg Road, New Malden, Surrey.

Burls, F. B., l/o Stratford-on-Avon; 13, Langdale Road, Greenwich, S.E.

Chemical and Metallurgical Society of South Africa; Journals to Box 2596, Johannesburg, Transvaal.

Cohen, Dr. H., l/o North Spring Avenue; c/o S. Mandle, 3943, West Pine Boulevard, St. Louis, Mo., U.S.A.

Coleman, W. H., l/o Ashton New Road; 4, Sunnyside Terrace, North Road, Clayton, Manchester.

Crake, Wm., l/o 397; 394, Staniforth Road, Sheffield.

Cullen, Wm., l/o Gravesend; c/o South African Explosives Co., Modderfontein, Transvaal; and (Journals) Craig Knowe, Irvine, N.B.

Davidson, R. Holden, l/o Widnes; United Alkali Co., Ltd., Ammonia Soda Works, Fleetwood.

Dawson, Jas., l/o St. Vincent Place; British Dyewood and Chemical Co., 53, Bothwell Street, Glasgow.

Durant, H. T., l/o Salvador; retain Journals until further notice.

Fallon, J. M. H.; Journals to Box 771, Havana, Cuba.

Fehrlin, Dr. H. C., l/o Milwaukee; Belvidere House, 4th Avenue and 18th Street, New York City, U.S.A.

Fleming, Wm. P.; Journals to c/o Thos. Cook and Sons, Ludgate Circus, E.C.

Forbes, Paul R., l/o Boston; c/o Walsh, Hall, and Co., Yokohama, Japan.

French, Alf., l/o London; St. Bartholomew's Hospital, Rochester, Kent.

Galbraith, Wm., l/o Leeds; Mount Mine, Perranporth, R.S.O., Cornwall.

Green, J. Wilberforce, l/o Sydenham; 55, The Avenue, Kew Gardens, S.W.

Heileman, W. H., l/o Pullman; U.S. Dept. of Agriculture, Elwell, Iowa, U.S.A., Expert Field Assistant.

Hewitt, T. Lacey, l/o West Bromwich; Galen House, Malvern Link.

Huntington, Dr. H.; Journals to University Club, 1, West 54th Street, New York City, U.S.A.

Ichioka, T., l/o Stevenston; 15, Higashikatamachi, Hongo, Tokio, Japan.

Littlejohn, Jas.; Journals to c/o South African Banking Corporation, Johannesburg, Transvaal.

Lowe, Jas. S., l/o Edinburgh; Clemencia Estate, Bel Air Station, Mauritius.

McCrae, Dr. Jno., l/o Leeds; 7, Kirklee Gardens, Kelvinside, Glasgow.

Neilson, A. M.; Journals to 38, Brisbane Street, Greenock, N.B.

Orr, Robt., l/o Great Western Terrace; c/o Jas. Miller, Son, and Co., 79, West Nile Street, Glasgow.

Picard, H. F. K., l/o Gracechurch Street; 44, London Wall, E.C.

Samuel, W. Cobden, l/o West Norwood; 66, Croxted Road, West Dulwich, S.E.

Sayer, Harry, l/o St. George's Square; Heathlands, Rus
Road, Wandsworth Common, S.W.

Smith, J. Cruickshank, l/o Davenport Road; Tiri
Felday Road, Catford, S.E.

Sorel, E., l/o Avenue d'Orléans; 138, Boulevard Ra
Paris, VI^e.

Stein, Sigmund, l/o Vauxhall Road; 214, Upper Parli
Street, Liverpool.

Strangman, J. Pim; retain Journals until further noti

Sulman, H. L., l/o Gracechurch Street; 44, London
E.C.

Tennant, Jas., l/o Newcastle; Alex. Fergusson and
Ltd., 38, McAlpine Street, Glasgow, Lead and (
Manufacturer.

Timmans, W. G., l/o Windmill Hill Lane; 108, Peel S
Derby.

Uhlig, Wm. C., l/o South Brooklyn; c/o Hygeia D
Water Co., 319, West 12th Street, New York
U.S.A.

Vreeland, C. D., l/o Chicago; Upper Montclair,
U.S.A.

Webb, Wm. J., Journals to 90, Ash Street, Yonkers,
U.S.A.

Wilson, Ellwood, l/o Liberty; Saranac Lake, Frankli
N.Y., U.S.A.

Wilson, W. W., l/o Busby; The Grange, Carrbrook
Stalybridge.

Wright, A. C., l/o Newland Avenue; 15, Nort
Cottingham, Hull.

CHANGE OF ADDRESS REQUIRED.

Wyckoff, G. H., l/o Rochester, N.Y., U.S.A.

Death.

Truby, Charles; at Urmston, near Manchester. Ma

STATEMENT OF REVENUE AND EXPENDITURE FOR THE YEAR 1900.

(Made up to the 23rd April 1901.)

REVENUE.

	£ s. d.	£ s. d.
Annual Subscriptions for 1900:—		
1 subscription received in 1898	1 5 0	
64 subscriptions received in 1899	79 16 0	
3,091 subscriptions received in 1900	3,863 10 0	
54 subscriptions received in 1901	67 10 0	
(Sundry odd balances of subscriptions)	3 4 1	
		4,015 5 1
3,210		
292 Entrance Fees	306 12 0	
Life Composition Fees....................	60 0 0	
Subscriptions on account of the "Collective Index".....................	..	38 0 6
Investments:—		
Interest on Metropolitan 3 per cent. Consolidated Stock	128 2 10	
Interest on Gas Light and Coke Company's 3 per cent. Consol. Deb. Stock.	17 6 6	
Interest on North British Railway 3 per cent. Consolidated Debenture Stock .	31 5 8	
Interest on Midland Railway 2½ per cent. Perpetual Preference Stock..........	17 14 2	
Interest on Great Eastern Railway 4 per cent. Guaranteed Stock..............	25 3 6	
Interest on New Zealand 3 per cent. 1945 Stock...............................	28 15 0	
Interest on New South Wales 3 per cent. 1935 Stock...........................	13 18 11	
Interest on South Eastern Railway 4½ per cent. Preference Stock...........	29 3 0	
Interest on Southwark and Vauxhall Water Company 3 per cent. Debenture Stock...........................	14 5 0	
Interest on Deposit Account at Bank ..	30 14 1	
		336 8 8
Journal:—		
Advertisements...........................	570 6 0	
Sales	422 19 1	
Loss by fire—Amount received from publishers............................	50 0 0	
		1,048 19 1
		£5,438 13 4

EXPENDITURE.

	£ s. d.	£ s. d.	s.
Journal Sales:—			
Publishing		1,983 4 6	
Editorial:—			
Editor's Salary	500 0 0		
Editor's Expenses.........	46 9 10		
Abstractors' Accounts.....	506 14 8		
Indexing Journal..........	89 2 0		
Patent Lists...............	71 10 3		
Portion of Secretary's salary	100 0 0		
Foreign Journals..........	9 6 6		
Sundry Journals	3 1 9		
		1,326 5 0	
Insurance of Stock		7 4 9	
			3. 1
Printing Sundries..			1
Sectional Expenses...			
Secretary's Salary (Portion not included in Editorial Journal Expenses)			
Annual Meeting Expenses			
Honorary Treasurer's Assistant			
Stationery			
Office Expenses...			
Library (Binding Books)................................			
Auditors' Fee..			
Investment.—Purchase of 1,000*l*. Southwark and Vauxhall Water Company's 3 per cent. Debenture Stock.		1,000 1 0	
Solicitors' charges			
Sundries			
Bank Charges			
Treasurer's Petty Cash, Postage &c.			
Secretary's Petty Cash, Postage, &c.			
Balance of Revenue over Expenditure			
			£

THE TREASURER—IN ACCOUNT WITH THE SOCIETY OF CHEMICAL INDUSTRY FOR THE YEAR 1900.

r. Cr.

		£ s. d.	£ s. d.
sh on Deposit (1st January 1900)		500 0 0	
lance at Bank (1st January 1900). ...		221 1 7	
sh in Treasurer's hands (1st January 1900)......................		13 3 0	
sh in Secretary's hands (1st January 1900)......................		7 8 11	
			741 13 6
nual Subscriptions:—			
2 for the year 1898...............		2 10 0	
54 for the year 1899		67 10 0	
3,091 for the year 1900 (less 5s. short paid)		3,863 10 0	
88 for the year 1901 (less 5s. 9d. short paid)		109 14 3	
1 for the year 1902.............		1 5 0	
Sundry odd balances and excess payments on Annual Subscriptions..................		3 4 1	
3,236			
			4,047 13 4
rance Fees (292 at 1*l*. 1*s*.)		..	306 12 0
Composition Fees (3 at 20*l*.).......		..	60 0 0
scriptions received for the "Collective ndex"...........................		..	52 10 6
rest from Investments:—			
etropolitan 3 per cent. Consolidated Stock....	£ s. d. (4,476 9 2)	128 2 10	
s Light and Coke Company's 3 per cent. Consolidated Debenture Stock..............	(600 0 0)	17 6 6	
rth British Railway 3 per cent. Consolidated Stock..............	(1,084 13 4)	31 5 8	
dland Railway 2½ per cent. Perpetual Preference Stock.........	(736 0 0)	17 14 2	
at Eastern Railway 4 er cent. Irredeemable uaranteed Stock	(654 0 0)	25 3 6	
w Zealand 3 per cent. 45 Stock	(1,000 0 0)	28 15 0	
w South Wales 3 per nt. 1935 Stock	(485 4 8)	13 18 11	
th Eastern Railway per cent. Preference ock...............	(673 0 0)	29 3 0	
thwark and Vauxhall aterCompany's 3 per nt. Debenture Stock	(1,000 0 0)	14 5 0	
	(10,709 7 2)		
rest on Deposit Account at Bank .		30 14 1	
			336 8 8
al:—			
lvertisements		624 0 0	
les		415 10 9	
		1,039 10 9	
unt received from Publishers for e loss of Journals destroyed by fire their premises		50 0 0	
			1,089 10 9
			£6,634 8 9

		£ s. d.	£ s. d.
By Journal Expenses:—			
Publishing		2,090 12 5	
Editorial:—	£ s. d.		
Editor's Salary	500 0 0		
Editor's Expenses	46 8 10		
Abstractor's Accounts .	494 13 0		
Indexing Journal......	88 2 0		
Patent Lists...........	71 2 3		
Foreign Journals	9 6 6		
Sundry Journals	3 17 5		
Portion of Secretary's Salary..............	100 0 0		
		1,313 10 0	
Insurance of Stock		7 4 9	
			3,411 7 2
Sundries Printing, &c.		..	57 14 7
Sectional Expenses:—			
Liverpool Section..................		28 6 1	
London Section....................		63 16 1	
Newcastle Section		17 17 6	
Manchester Section		49 6 0	
New York (U.S.A.) Section.........		123 0 0	
Nottingham Section		26 15 6	
Scottish Section		38 18 10	
Yorkshire Section		20 8 9	
			368 8 9
Secretary's Salary (Balance not included in Editorial Expenses)			350 0 0
Library (Binding Books)			6 5 4
Expenses in connection with Annual Meeting......			160 6 3
Honorary Treasurer's Assistant			52 10 0
Stationery			47 1 9
Office Expenses, &c.:—			
Rent		102 7 0	
Cleaning, Attendance, &c...........		12 18 8	
Lighting		4 14 1	
Furniture and Sundries; Fire Insurance...........................		5 0 0	
Clerical assistance...		62 7 6	
			187 7 3
Auditors' Fee		..	10 11 6
Solicitor's Charges....................		..	2 3 0
Purchase of 1,000*l*, Southwark and Vauxhall Water Company's 3 per cent. Debenture Stock		..	1,000 1 0
Sundries		..	2 1 7
Bank Charges..........................		..	3 15 4
Treasurer's Petty Cash, and Postage....		14 5 1	
Clerical assistance:—			
Writing up Subscriptions......		15 11 6	
Writing up new Register		10 10 0	
			40 6 7
Secretary's Petty Cash and Postage....		..	61 7 7
Cash on Deposit (31st December 1900)..		650 0 0	
Balance at Bank (31st December 1900).		218 14 4	
Balance in Secretary's hands (31st December 1900)		4 6 9	
			873 1 1
			£ 6,634 8 9

e compared the above Statement with the Vouchers, Counterfoils of the Receipts issued, and other records, and are of opinion it xhibits the Cash transactions of the Society for the year 1900. The amounts of the Metropolitan 3 per cent. Consolidated, 3 per Zealand, and 3 per cent. New South Wales Stocks have been confirmed by the Chief Accountant to the Bank of England. s for the remaining investments have been inspected, and the Bank Balances have been certified to us by the Bankers.

Swithin's Lane, London, E.C.,
16th April 1901.

(Signed) MIALL, WILKINS, RANDALL, & Co.,
Chartered Accountants.

London Section.

Meeting held on Monday, June 3rd, 1901.

MR. OTTO HEHNER IN THE CHAIR.

DANGER INCIDENTAL TO GAS-FIRING IN SMALL GASWORKS.

BY G. CECIL JONES.

tely had occasion to enquire into the circumstances a fatal accident, which occurred in a gasworks with of about 3½ million cubic feet per annum, and I the conclusion that special precautions should be as-firing is to be safely introduced into works so small as this. The retort house of the works in question is small and ill-ventilated; the height of the walls to the springing of the roof is 16 feet; the distance between the front of the stack and the opposite wall is 12 feet, and the retort mouthpieces, &c., project two feet beyond the face of the stack, reducing the clear space to 10 feet, even when no part of the floor is occupied by coal or coke. High up in the roof are ample outlets for hot air, but no provision has been made lower down for the admission of cold air, which finds its way in as best it can under two small doors, the space below which is often much reduced by the presence of small coal and coke. Until two years ago the house held three settings of one, two, and three retorts respectively, all direct-fired; the two smaller settings were then replaced by a regenerative setting of five retorts. Regeneration is not carried to the greatest possible extent, and the generator is only about 3 feet 6 inches deep; coke is supplied by hand to the generator about twice as often as the retorts are charged. The works are in charge of a highly intelligent working foreman, who in summer works unassisted, and in winter has one other man to do the night work. Neither of these men knew that the gases made in the generator of the new setting were more dangerous than the furnace gases of the older plant.

At 7 o'clock one morning in November last, the labourer who did the night work, a strong, healthy, and sober man, was found dead a few feet from the generator charging hole. The condition of the fire showed that this had been attended to about 4.30 a.m., but the retorts had not been drawn and recharged as they should have been at 5 o'clock. The man had clearly succumbed shortly after firing the generator. His appearance was consistent with poisoning by gas, that is by carbon monoxide, and the coroner allowed his jury to return a verdict to this effect. Unfortunately, no post-mortem examination was ordered, so that it is just possible that death was due to some other cause. The absence of absolute proof of the cause of death led to the failure of the widow's action for compensation for the loss of her husband. Had she succeeded, the fact and circumstances of the accident would have been widely reported, and there would have been no necessity for this paper. But even if proof were forthcoming that the man's death was due to some other cause than gas-poisoning, I should still hold that special precautions were necessary, where it was proposed to introduce gas-firing into small works.

There are several reasons why the use of gaseous fuel is attended with more danger in small works than in large. In large works a larger and deeper generator is generally used, and a shoot conveys hot coke to this from one or more of the retorts in the setting every five or six hours; the workman has no occasion to stand near the generator mouth, which is filled by the inrushing stream of coke during the short time that it is uncovered. In small works, with a small generator, it is necessary to add fuel more frequently, and this is done by hand, the man standing over the generator mouth. Further, in large works, even if there is some slight danger of a man being overcome by generator gases, he is never alone, but has someone near him who can carry him into the open air or render him other assistance.

The employment of a one-man shift is unavoidable in very small works, but it is easy to provide suitable inlets for fresh air, and not very difficult to devise some means whereby the workman would be prevented from inhaling carbon monoxide while firing the generator. Where generators of carbon monoxide are used in other industries, it is usual to provide a hopper with valve and cover, which prevents the outrush of gas when fresh fuel is added. The gas in these generators is usually at a pressure above that of the external air; it is assumed that the gases in a gasworks generator are at a slightly diminished pressure, but I am not sure that this is a safe assumption. For example, in a house constructed like that which I have described, there is a large volume of hot air under the roof tending to rise into the outer air, but prevented from doing so freely by the lack of inlets for the admission of cold air. When the generator cover is removed, I think it quite possible that the pull of the hot air in the roof might exceed the chimney draught, which, for reasons of economy, is always checked as far as possible. The importance of good ventilation where retorts are gas-fired has been insisted on repeatedly, because, where this has been overlooked, trouble with choked ascension pipes has been experienced; to this reason must now be added, in the case of small retort houses at least, that of safety. I think it necessary to repeat, what is already well known but too often forgotten, that no system of ventilation is good which fails to provide air inlets as well as vents.

The relative advantages of direct and gaseous firing have hitherto been considered solely from the point of view of economy, but I think gas engineers will be glad to have early warning of any dangers attending the use of gaseous fuel, so that they may take the necessary precautions before a crop of accidents causes a material rise in the rate of insurance of workmen employed in their industry.

Errata.

This Journal, May 1901.

Page 426, col. 1, line 32 from bottom: for "no" "not."

Page 426, col. 2, line 25 from top: for "tannin" "tanning."

Page 426, col. 2, line 34 from top: for "was" "were."

Page 433, col. 2, line 19 from top: for "tonnage" "tannage."

Page 433, col. 2, line 17 from top: after "oak insert "tannage."

Page 437, col. 2, line 26 from top: for "sulphate" "sulphide."

Newcastle Section.

Meeting held on Thursday, May 16th, 1901.

MR. W. L. RENNOLDSON IN THE CHAIR.

SUGAR IN SWEDES. PART I.—ANALYTIC METHODS.

BY S. H. COLLINS, F.I.C.

It is well known and recognised that the food value root crop depends on the amount of dry matter co in it. It is, perhaps, equally well known, but equally realised, that, of this dry matter, the sugar most valuable part.

In Table I. some figures are given showing how greater are the variations of the amount of sugar any other constituent in the same variety of swede.

Table I.

Monarch Swedes.

—	Small.	Large.	Small.	Large.	Small.	Large.	Small
Water (by drying at 60° C.)	88·59	90·34	89·36	90·01	89·23	89·63	89·45
Amides, &c.	0·57	0·57	0·61	0·48	0·36	0·34	0·52
Albuminoids.	0·47	0·57	0·56	0·58	0·54	0·48	0·63
Sugars (as $C_6H_{12}O_6$).	6·14	4·21	5·29	5·02	5·67	5·43	5·11
Pectins, &c.	2·70	2·68	2·49	2·32	2·60	2·48	2·67
Woody fibre.	0·96	1·07	1·09	1·03	1·07	1·11	0·9
Ash	0·57	0·56	0·60	0·56	0·53	0·53	0·6

In Table II. some figures are given showing ho is the variation of the amount of sugar in the in swede, of the same variety, of about the same si grown in the same way. Between individuals th ences are greater than between varieties.

Table II.

—	Max.	Min.
1st lot of 25 XL All Swedes..............	7·8	4·5
2nd " " "	7·4	4·7
3rd " " "	8·0	4·9
1st lot of 25 Monarch Swedes............	8·0	3·7

Hence any investigations on the composition o must embrace many varieties, and a multitude o duals. If much work is to be done on this subject, a rapid method of analysis becomes neces

As the differences in the amounts of sugar are an error, which would ordinarily be considered e becomes here immaterial. Since the feeding v cane sugar, dextrose and lævulose, are nearly eq unnecessary for the purposes of the present invest tinguish between them. The objects of the usual methods analysis of sugar beets and sugar cane are, on the other id, to distinguish between these varieties of sugar.

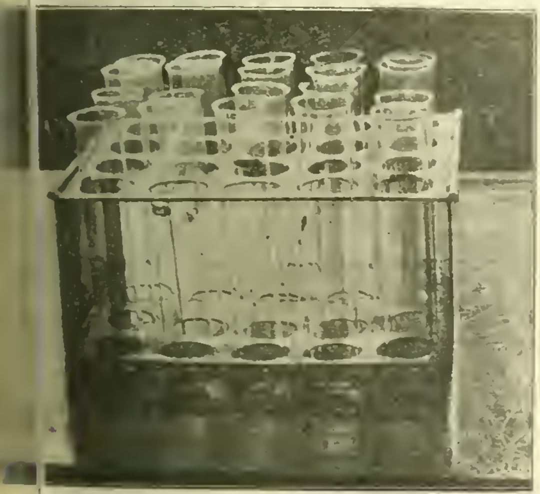
Not merely the objects of beet analysis, but the methods polarisation, are also quite out of the question here. ce the sugars in swedes have very different rotary ver, any method of analysis must depend on reduction. rapid work gravimetric methods are of little use, and n the usual volumetric Fehling test is laborious. My ntion was naturally directed to colorimetric methods, and, believe, no colorimetric modification of Fehling's method ever been published, these notes are now given.

he general principles of the method to be described rist in causing the sugar to reduce Fehling's solution, then measuring colorimetrically the excess of copper ch remains unreduced.

order to apply this method to turnips, it is necessary move other reducing substances, and to hydrolyse any sugar which may be present.

bout 10 grms. of swedes, 100 c.c. of water, and 1 c.c. concentrated solution of lead acetate are ground up ther in a mortar and allowed to stand some hours ffuse. Of the filtrate 50 c.c. are inverted by 0·5 c.c. trong sulphuric acid. A simple apparatus for this ose is a metal test-tube stand (Fig. A) fitted with graduated at 50 c.c., and placed in a steamer such as l for bacteriological work. Since the dilution is so considerable errors in measurement would have no al effect on the result. The whole of the lead is tated by the sulphuric acid. About 20 minutes in amer is, I find, ample for the complete inversion of ne sugar. The tubes and their stand may be cooled by immersion in cold water, or left to cool of lves.

Fig. A.



aliquot portion (2—5 c.c.) is removed by a pipette, ing taken not to touch any of the precipitated lead te, and added to the Fehling solution. For this e I find the most convenient apparatus is a metal similar to the one used for inversion, but smaller, ted with test tubes, all carefully selected to be of the iameter, say 16 mm. Each test-tube contains 10 c.c. ling's solution of half the usual strength. For ethod I am now describing, 250 c.c. of copper te solution (69·3 grms. of crystallised copper e per litre), and 250 c.c. of alkaline tartrate (100 grms. of caustic soda and 350 grms. of le salt per litre), and 500 c.c. of water form the d solution, of which 10 c.c. are placed in each test-

ll be noticed that the sugar solution used is acid, ll neutralise varying amounts of the soda in the Fehling's solution. That this has little or no effect will be seen by studying the results quoted later. On placing the test-tubes containing both copper and sugar in the steamer for 30 minutes, the precipitated cuprous oxide settles completely at the bottom. The stand and its tubes are allowed to cool for a few minutes, and the colour of the supernatant liquid judged by comparison with standard tints.

The standard tints contain 0·125, 0·250, 0·375, 0·500, 0·625, 0·750, 0·875, and 1·00 c.c. of the copper sulphate solution respectively. To this is added in each case 2·5 c.c. of the alkaline tartrate solution, and the whole made up to 14 c.c. with water.

The reason for this method of making the standard tints, is that the colour produced by the copper is much modified by varying amounts of tartaric acid. In the actual analysis the amount of tartaric acid is constant; it must also be constant in the standard tints. It is obviously convenient to dilute the copper sulphate solution to one-tenth the strength before making the standard tints. These tints are respectively 5, 10, 15, 20, 25, 30, 35, and 40 per cent. of the total amount of Fehling's solution used.

For most purposes 4 c.c. of sugar solution, will be a convenient amount, and for this reason 14 c.c. has been made the standard. If 3 c.c. be used, 1 14 must be added to the excess of copper as measured by the standards, and so on. It is evident that this method differs from that usually employed, and it becomes necessary to determine the ratio between the copper and the sugar. The results are set out in Tables III. and IV. The cane sugar was inverted under precisely the same conditions as the swedes.

TABLE III.

Anhydrous Dextrose.	Solution used.	Colour.	Corrected Colour.	Copper reduced.	Factor.
Grms.	C.c.			[Total=1]	
0·0215	2	9	7	0·93	0·0231
0·0193	2	17	15	0·85	0·0227
0·0171	2	27	23	0·77	0·0222
0·0149	2	38	33	0·67	0·0223
0·0223	3	5	5	0·95	0·0235
0·0203	3	10	9	0·91	0·0223
0·0183	3	23	21	0·79	0·0232
0·0163	3	30	28	0·72	0·0226
0·0143	3	40	37	0·63	0·0227
0·0217	4	7	7	0·93	0·0233
0·0192	4	17	17	0·83	0·0231
0·0177	4	24	24	0·76	0·0233
0·0162	4	30	30	0·70	0·0231
0·0147	4	37	37	0·63	0·0233
0·0220	5	3	3	0·97	0·0227
0·0203	5	11	12	0·88	0·0229
0·0184	5	16	18	0·82	0·0224
0·0166	5	25	27	0·73	0·0227
0·0148	5	32	34	0·66	0·0224
				Average	0·0228

TABLE IV.

Invert Sugar.	Solution.	Colour.	Corrected Colour.	Copper reduced.	Factor.
Grms.	C.c.			Total=1	
0·0200	2	8	7	0·93	0·0215
0·0182	2	17	15	0·85	0·0214
0·0173	2	25	21	0·79	0·0219
0·0164	2	30	26	0·74	0·0221
0·0146	2	40	34	0·66	0·0221
0·0207	3	6	6	0·94	0·0221
0·0193	3	12	11	0·89	0·0217
0·0181	3	18	17	0·83	0·0218
0·0207	4	5	5	0·95	0·0218
0·0189	4	11	11	0·89	0·0212
0·0172	4	18	18	0·82	0·0210
0·0193	5	8	9	0·91	0·0212
0·0172	5	17	18	0·82	0·0210
0·0151	5	30	32	0·68	0·0222
0·0129	5	36	39	0·61	0·0212
		Grammes of invert sugar to reduce all the copper added			= 0·0216

The conclusion to be drawn from these figures is that the reducing power is equal at all parts of the scale. No single determination differs from the mean by more than 3 per cent.

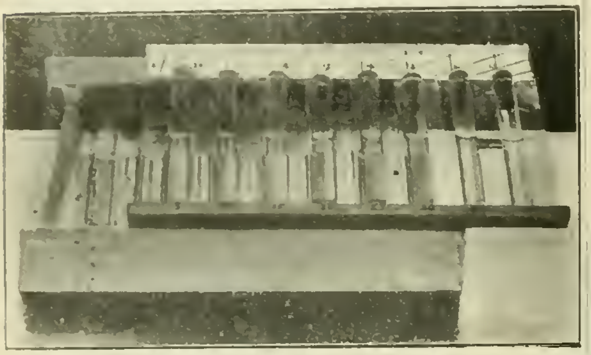
It will be seen that the sugar has a much greater reducing power than that usually assigned to it. This is due to the concentration and long period of heating.

For the purposes of the analysis of swedes, I propose to use the figures from invert sugar only.

If this method be used for fresh swedes the colours obtained match the standards well. If dried swedes be used for analysis, a yellow colour is imparted to the solutions, and various shades of greenish blue are obtained, to judge the depth of blue in which is difficult.

To get over this difficulty, I use the following simple form of colorimeter (Fig. B). On one pane of glass a row of test tubes containing alternately plain water and a graduated series of yellow solutions is placed; on another pane a row of test-tubes containing the standard blue solutions is placed over the yellow tubes, blank spaces being left over the plain tubes to take the tubes used for the actual analysis. The pane holding the blue tints slides over the pane holding the yellow tints, producing any desired combination, and the whole is placed in a wooden frame at an angle of 45°, with a white base board. A special scale enables one to read directly the milligrammes of sugar. A suitable material for the yellow solutions is Methyl Orange.

Fig. B.



I now proceed to discuss the question of sampling. A swede is not homogeneous, the top half being richer than the bottom half. Owing to the ease with which they can be taken at the farm and forwarded, I have used borings taken either with a cork borer or an auger to form the sample. Table V. shows the percentage of sugar (as "invert") in borings made in different directions, but passing through the centre in all cases. It will be seen that whilst there is some difference between the figures, for rough purposes the single boring is a true sample. There is no constant difference between borings in one direction or another, hence a number of borings would be a true sample of a number of swedes. In order to find out how many swedes it is necessary to take in order to obtain a true sample of a variety, the figures given in Table II. may be employed. If a swede of maximum percentage of sugar were replaced by one of minimum percentage, or *vice versâ* in the Monarch swedes in Table II., then the average of—

TABLE V.

	Yellow Turnip.		Swede.	
	Large.	Small.	Large.	Small.
Short horizontal bore	4·73	4·02	6·32	6·76
Long " "	4·41	4·05	6·06	6·77
Vertical bore	3·90	4·50	6·58	6·71

6 swedes would be altered from 5·40 to 4·70 or 6·10; of
12 " " " 5·04 " 5·76; of
25 " " " 5·23 " 5·57.

Even if 25 swedes be taken, the errors of sampling greater than the errors of the method of analysis gi above.

In conclusion it is clear that the greatest errors occu taking a sample of a variety of swedes, the errors sampling a single root being smaller, and the errors of colorimetric method of analysis smaller still.

This colorimetric method might, with a few modificati be utilised for the estimation of starch in potatoes, other foods.

On the subject of the composition of swedes, data accumulating, and I hope before long to be in a positio make a further communication on the matter.

DETERMINATION OF CALCIUM IN HIGH-GR FERRO-SILICON.

BY G. WATSON GRAY, F.I.C.

HIGH-GRADE ferro-alloys of late years, especially t produced in the electric furnace, have presented m interesting points to the metallurgical chemist, and at same time some troublesome ones to the analyst.

Having recently come across a ferro-silicon conta calcium, and not having noticed this element rec before in a ferro alloy, I have ventured to read this p so that its presence may be noted by users, and its go ill effect on the steel observed

I have noticed the presence of magnesium and alumi in ferro-chromes for some time past, but calcium has absent. The presence of magnesium and aluminium i to be wondered at, seeing that chrome ores contain elements in large amounts, and the reduction of the ch ore being brought about in the electric furnace. The to some extent, may be expected with ferro-silicon doubt calcium compounds constitute a large proporti the flux.

I append an analysis of ferro-silicon containing calci

	Per Cent
Silicon	44·05
Iron	45·28
Chromium	1·62
Manganese	3·51
Aluminium	0·47
Calcium	3·29
Magnesium	0·44
Carbon	0·52
Sulphur	0·045
Phosphorus	0·013
Copper	Trace
Nickel	Trace
Titanium	Nil.
Tungsten	0·42
	99·65

Regarding the analysis of ferro-silicon, the grades may conveniently be brought into solution by and in some cases by bromine, but the high grades such treatment. They are, however, readily broke by Stead's tribasic mixture, and as I use this reag ferro-chrome, I likewise used it with success for ferro- until the present case, where calcium and magnesiu to be looked for. (I may here mention that I have g the use of sodium peroxide for such work, owing varying amounts of impurities it contains, some of are very objectionable.)

In looking round for some means of decon the ferro-silicon without the introduction of calciu magnesium, I made use of the reaction:—

$$K_2CO_3 + Si = K_2SiO_3 + C.$$

On trying the reaction I found it to take place, only with potassium carbonate but with ordinary mixture. The mode of procedure is then similar ordinary analysis, but there are a few points of which require to be attended to.

One gramme of the ferro-silicon, somewhat finely is mixed with 4 grms. of fusing mixture in a p crucible, covered, and heated over the Bunsen flame on a strong reaction takes place. When this first part is mplete, which is readily seen by removing the cover, the ucible is somewhat more strongly heated over the Bunsen me until fusion is complete. The mass is then treated with ter, and removed as completely as possible to a No. VII. rcelain dish, the crucible being cleaned by hydrochloric id, which is added to the liquid in the dish, the dish being vered with a clock glass. Hydrochloric acid, however, ils to remove all the iron from the platinum crucible, so at it is necessary to dry the crucible in the flame and ce 1 grm. of bisulphate of potash in it, and heat at a red heat until the iron is removed from the sides of the cible. This mass is then dissolved out of the crucible, d might be added to the liquid in the dish, but I prefer precipitate the iron, &c. by ammonia and add the cipitate and filtrate to their respective places. The ntents of the dish are brought to a boil. The iron is in spongy condition, dissolving slowly. 10 c.c. of nitric d are now gently added, and after the bulk of the ction has taken place, the cover is washed and removed, the whole evaporated to dryness, to render the silica luble. The dried and heated mass is then treated with c.c. of hydrochloric acid, to redissolve the iron, &c. The a is collected on an ashless paper, dried, the paper burnt and the residue finished in the muffle, weighed, evape-d with hydrofluoric acid and again weighed, and the in weight calculated into silicon.

he residue in the crucible may be removed by fusing carbonates of soda and potash, and dissolving out with rochloric acid, or, better, by again heating with 1 grm. isulphate of potash and dissolving in water. If the ple contains chromium the bulk of it is likely to be d here, in which case the basic sulphate of chromium require to be boiled and concentrated with hydro-ric acid to bring it into solution. If tungsten be ent it will be found at this stage, and will require to be ed off, washed with acid and water, burnt off, and hed.

e ammonia precipitates, three in number, are all burnt ransferred to a beaker, dissolved in hydrochloric acid, orated to dryness, and any silica or tungstic acid, which scaped separation previously, recovered.

is may appear unnecessary, but silica, when present in amounts in such analyses as those of silicious iron or clays, may go to augment the amount of alumina. solution is then saturated with sulphuretted hydrogen to ve copper and any trace of platinum, as the platinum feres with the estimation of the iron if performed by ing with stannous chloride and titrating with bi-nate. The separation of the iron, maganese, inium, chromium, calcium, and magnesium are pro-d with by the usual methods.

lphur and phosphorus may be obtained from the one on. I use the same process as for ferro-chrome. Take s. of the sample and 15 grms. of tribasic mixture and in the muffle for 1½ hours. The oxidised mass is then erred, in the case of a ferro-silicon, to an evaporating , treated with excess of hydrochloric acid, evaporated ness, and the silica removed. The iron and phosphoric re precipitated by ammonia and removed. The filtrate dered very slightly acid, and the sulphates precipitated arium chloride. The ammonium hydrate precipitate hed off the paper into the original beaker, and ent bisulphite of ammonia or soda added to reduce on. The filter paper is washed with sufficient hydro-c acid to dissolve the iron, and the washings added ammonia precipitate and bisulphite. The remaining of the estimation are too well known to require further .

nly silicon, sulphur, and phosphorus are required, it sible to get all these from the one portion.

magnesia is prepared from the natural carbonate esite) by first calcining and then pounding. This magnesia very free from sulphur and phosphorus, is necessary to determine the several impurities in the re prepared.

determination of the total carbon is also made by the method as that used for ferro-chrome, that is, by g together in an agate mortar 0·5 grm. of the very finely powdered alloy with 5 grms. of ignited oxide of copper (this requires grinding, not merely mixing), and then 7 grms. of recently ignited fused chromate of lead mixed with it. The 12·5 grms. are then transferred to a suitable sized Meissen porcelain boat and heated for 2¼ hours in Fletcher's No. 2 organic furnace in a current of oxygen, the carbon dioxide produced being collected in potash bulbs provided with calcium chloride tube, as is usual.

It is always desirable to do a blank test with each fresh stock of oxide of copper and chromate of lead.

New York Section.

Meeting held on Friday, May 24th, 1901.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

ADDITIONAL NOTES ON CEMENT TESTING.

BY OTTO H. KLEIN AND S. F. PECKHAM.

We had the pleasure of bringing before this Society at the meeting held 25th May 1900, the results of a research that had been in progress for more than a year, in the Physical and Chemical Laboratories of the Commissioners of Accounts, of the City of New York, upon the relations between physical tests and chemical analyses of cement.

Before proceeding to discuss the main proposition of this paper, viz., the merits of the method of analysis which was described in our former paper, we wish to call attention, first, to the "Progress Report of the Special Committee on the proper manipulation of tests of cement," made to the American Society of Civil Engineers, and published in the Proceedings of that Society, Vol. XXVI., No. 4, April 1900.

This report consists of the various replies to a long list of questions, offered by many persons and submitted by the Chairman of the Committee, Professor G. F. Swain, without comment.

In reply to question 5, "What elements or compounds should be determined?" Professor Henry Carmichael of Boston (who is an acknowledged authority as a cement expert) says, "Hydraulic cement consists of a double silicate of lime and alumina (including iron oxide) which is readily soluble in dilute hydrochloric acid, leaving little or no insoluble residue. In addition to the soluble silica and the oxides of calcium, aluminium and iron, good cement contains traces of the oxides of magnesium, sodium, and potassium, together with traces of carbonates, sulphates, chlorides, and combined water, and finally minute amounts of insoluble sand or cinder."

In reply to question 6, "What do you consider the best methods of determining these compounds with sufficient accuracy"? Professor Carmichael continues, "The sample is ground fine in an agate mortar. One gram is carefully weighed out in a shallow porcelain dish and well covered with a 3 per cent. solution of hydrochloric acid. After several hours the cement should completely dissolve in this acid with the exception of a small amount of sand, mostly black cinder from the fuel employed in making the cement. The residue, if any, is filtered off and determined. The clear solution is evaporated to dryness on a water bath in a flat dish. Hydrochloric acid is poured over the dry residue, and the acid is then evaporated. Add a few drops of same acid, again drive off acid. Moisten residue again with same acid and boil up with pure water. The silica is rendered insoluble by the above operation and can be filtered off and weighed. The silica which thus dissolves in the dilute acid, and is in turn rendered insoluble, is the silica which is available in the setting of the cement. The filtrate from silica is boiled with a few drops of nitric acid, and pure ammonia is then added, which precipitates the oxides of iron and aluminium. With the ammonia is added also ammonium chloride in sufficient quantity to retain the lime in solution. After boiling for some time, the oxides of iron and aluminium are filtered off, and after drying are ignited and weighed." Here follow directions for separating the iron and aluminium. "To the filtrate from iron and aluminium oxides is added a slight excess of ammonium oxalate whereby the lime is precipitated as oxalate which is filtered off, ignited at a dull red heat in a platinum crucible and weighed as carbonate."

His scheme offers further details for the determination of the ingredients which he says are found in good cement in traces; for the determination of water and carbon dioxide by ignition; and for the determination of free lime by titration.

This scheme closely resembles our own, while differing from it in several important respects. It was worked out without any knowledge whatever on the part of either party concerning the other.

Following this scheme of Professor Carmichael is another scheme by R. L. Humphrey, of Philadelphia, who writes as follows: "One half grm. of the finely pulverised sample dried at 100° C., is thoroughly mixed with four or five times its weight of sodium carbonate, and fused in a platinum crucible until CO_2 no longer escapes; the crucible and its contents is placed in a beaker, and 20 or 30 times its quantity of water, and about 10 c.c. of dilute HCl is added; when complete solution is effected, it is transferred to a casserole and placed on a water bath, and evaporated to dryness several times. The mass is taken up with dilute HCl and water, heated for a short time and filtered, washing the residue on the filter thoroughly with hot water. The filter is dried, ignited, and weighed. This weight (less ash) gives the amount of SiO_2."

"The filtrate is brought to boiling, and ammonium hydrate added in slight excess; the boiling is continued until the odour of ammonia is no longer perceptible. Filter and wash. Re-dissolve in hot dilute HCl, again precipitate with ammonia and filter through the previous filter and wash with boiling water. The precipitate dried, ignited, and weighed (less ash) gives the amount of Al_2O_3 and Fe_2O_3."

Then follows a method of separating iron from alumina: "The filtrate from the iron and alumina is heated to boiling, and boiling ammonium oxalate is added until a precipitate is no longer formed. After boiling for a few minutes, it is set aside for a short time; when the precipitate has settled perfectly, decant the clear liquid through a filter, wash by decantation, dissolve the precipitate in hot dilute HCl, using as small a quantity as possible to effect a complete solution, heat to boiling and add ammonia, heat on a water bath for a few minutes; when the solution clears, filter through the previous filter, wash thoroughly with hot water. Dry the precipitate, ignite to constant weight, and weigh as CaO, or determine the lime volumetrically by titration with potassium permanganate." He then determines the ingredients occurring in small proportion. He determines SO_3 in a separate portion after removing the silica.

We wish to call attention secondly, to correspondence which we have lately held with a prominent manufacturer of cement, in which he made the following criticisms on our paper.

"(*a*) Experiments made by us show that the solubility of commercial Portland cements in dilute acid depends greatly upon the fineness of grinding. (*b*) We have found no cements which, if ground to extreme fineness in an agate mortar, show more than a fraction of one per cent. of insoluble matter. (*c*) It seems to us, therefore, that your separation of the components of cement into active and inactive constituents is not well grounded. (*d*) We think it probable that the active index would be somewhat reduced if the cement is dissolved as completely as possible. (*e*) Since even the monosilicate of lime, Wollastonite, is readily decomposed by acid, it is evident that the residue should contain practically no lime, and would consist of a minute amount of uncombined clay. (*f*) It is impossible that this should reach more than a fraction of 1 per cent. in a good cement. (*g*) Further, that the use of sufficiently dilute acid and fine grinding will give a clear solution without any separation of gelatinous silica. (*h*) In our opinion, no conclusion can be drawn from the amount of lime soluble in water. (i) This would also depend greatly on the degree of pulverisation. (ii) It is generally held, as you know, that all cements are decomposed by water into calcium hydrate and a hydrated mono-silicate. (iii) If this is true, the action of water would be progressive and prolonged action of sufficient water would dissolve out all the lime. (iv) In fact, Le Chatelier found this to be the case."

To which we replied, the first sentence of your letter furnished a key to the whole matter. You say "that experiments made by us show that the solubility of commercial Portland cements in acid depends greatly upon the fineness of grinding." Believing that this fact, as stated by you, has been proved beyond any question, we insist that every sample of cement should be analysed in exactly the condition in which it is brought to the laboratory; that is, that the specimen shall be neither dried nor pulverised nor in any manner treated in such a way as to either lesse or increase the differences that exist between the sample as they are brought upon the works or are subjected t physical tests.

We have not yet found a weighable amount of lime i any of the residues from dilute acid that we hav examined.

We think that if you read our paper carefully you wi see that no conclusions are drawn from the amount of lim soluble in water. It is, however, an observed fact, that a good cements contain about 5 per cent. of such solubl lime.

If you would advocate the uniform grinding of samples cement to an impalpable powder, in an agate mortar, i order that they may be more completly dissolved an brought into solution, we insist that we do not agree wit you. We believe that cement of proper fineness for use soluble in 10 per cent. hydrochloric acid without gelatinis tion, and that any matter not so soluble, contained commercial cement, is not cement at all, and is, and shou be classed as "inert matter."

To which he replied, (*j*) "your separation of t constituents of cement into 'active and inactive constituent by the action of 10 per cent. hydrochloric acid on the co mercial cements appears to me to be without foundatio (*k*) The varying amounts of insoluble matter obtained you on treating the same cement with acid of varyi strengths and in various ways appear to show that t amount of insoluble matter depends upon the meth employed, rather than upon the chemical character of t cement analysed. (*l*) I have found that most commerc Portland cements, if ground to great fineness, give scarc any insoluble residue on treatment with sufficient quant of 5 per cent. acid. (*m*) The high percentage of insolu matter obtained by you simply results from the co paratively coarse grinding of the cement. (*n*) Y certainly will not contend that the composition of coarser particles is materially different from that of the ones, or that the chemical character of the cement changed by grinding the coarse particles to uniform finen with the rest. (*o*) Your choice of 10 per cent. acid, method of mixing appear to me to be wholly arbitrary, the conclusions drawn from the amount of insoluble ma obtained to be quite unjustified. (*p*) Since coar ground cement gives a considerable residue when tre with dilute acid, while finely ground cement g practically none, and since this residue consists chiefl silica, and contains, as stated by you, practically no l it appears to me evident that this insoluble matter re chiefly from local separation of silica contained in coarse particles. (*q*) The lime and other constitu contained in these particles are, however, dissolved, an included by you in the group of active constitu (*r*) The injustice of this is apparent. (*s*) If the sili the coarse particles is inactive, the lime must be so (*t*) It is undoubtedly correct to submit commercial sam of cement to physical tests as they are received, wit grinding. (*u*) To submit these samples to che analysis, however, without making them homogeneou grinding, is certain to lead to erroneous conclu (*v*) In burning, however, a disturbing factor enters. this is the ash of the coal dust used as fuel. (*w*) Thi adds at least 2 per cent. to the silica, alumina, and oxide of the product. (*x*) It is, however, brought combination with the lime of the charge sufficiently to ecome wholly soluble in acid, but not uniformly enough to llow the lime of the raw material to be raised to a orresponding extent. (*y*) I believe fully that the best Portland cements are thoroughly homogeneous in character, nd that the excess of silica, alumina, and iron over that alled for by the formula is due to the ash of the fuel and o the general practice of carrying the lime a little below he maximum in order to offset possible fluctuations in the ixture."

We asked our correspondent to send us a sample of the uel ash.

He replied, "(*z*) it will be impossible to send you a mple of the coal ash to which your refer, as this melts with the clinker with which it comes in contact in the tary kilns. (*za*) The amount of fuel used is about 50 lb. to the barrel of cement. (*zb*) The ash of this fuel about 8 per cent., and if all absorbed by the clinker ould add about 3 per cent. of silica, iron, and alumina to e latter."

We wish to discuss in association these methods of alysis and this correspondence, all of which comes from questioned authority and is strictly professional, for ey all represent a purpose that is in fundamental position to our own purpose.

The purpose of the research described in our former per was to ascertain whether or no any correspondence uld be established between the results of a chemical alysis and the physical tests of cement. It was not to fend or defame any brand of cements, to contrast any e cement with another, or to contrast American cements h foreign cements; or one class of foreign cements h another class of the same, although some very expected results obtained from the research led inci- tally to such comparisons. This object was kept clearly view from first to last, and while the different brands of ent examined represented in nearly every case nothing a name, still, the different samples were designated lly by numbers that were purposely made different in two laboratories. The cements first analysed were ught to the office from various works in progress in city. They gave results that were extremely unsatis- ory apparently for various reasons that we do not care ake the time and space to discuss here. Keeping the et of our research in view we solicited samples of hly ground cement from a number of manufacturers dealers. We still found that, when these fresh, and in t instances high class, cements were analysed by the ods described in the books, no correspondence could be rved between the physical tests and chemical analyses.

elieving that nature could not contradict herself, we convinced that there must be some defect in the tion put to nature in the chemical analyses; in other ls, that the chemical analysis was not properly con- ed. This led us to conclude that the purpose of an ysis was not satisfied when an inadequate method, in respects, of ultimate analysis was followed.

r no cement on the market consists of chemically pure aulic cement. Assuming the correctness of the rches that led up to and include those of the Messrs. berry, we have a right to further assume that hydraulic nt consists of tri-calcic silicate and ferro-aluminiate e proportions indicated by the equation—

$$\frac{\text{CaO}}{(2\cdot8 \times \text{silica}) + (1\cdot1 \times \text{alumina and ferric oxide})} = 1$$

commercial cement therefore consists of the above- d compound plus, not a trace, but an unavoidable ntage of the ashes of the coal employed as fuel, also ver-burned clinker, also of under-burned clinker, of obined clay, of magnesia, of sulphates, of alkalis, and mall percentage of water and CO_2.

assume that these impurities are unavoidable, because the nature of the case no cement can be manufactured ut them, and no cement that we have examined has entirely free from them, and we believe that we have ned some of the best cements now made in the .

With these is found in some commercial cements a variable amount of carbon, ranging in those we have examined from zero to nearly 2 per cent.; this carbon is not a proper constituent of a cement; no good cement contained more than a trace of it; it is, and must be from the nature of the case, a source of weakness, especially when it is in the form of an oily soot from imperfect combustion of oil used as fuel. These methods of analysis do not offer any opportunity for the determination of this impurity. There is also found plaster of Paris, introduced purposely to influence the setting of the cement; when moderate in amount this is not an injurious ingredient. Also a percentage of quartz sand; Stillman's and Humphrey's methods of analysis offer no opportunity for the determination of this ingredient. Also a percentage of unburned rock or clinker which results in the presence of carbonate of lime and which is inert, having no cementing properties; Stillman's method furnishes no opportunity for the determination of this ingredient.

Cements made from marl are liable to contain glauconite, which is a mineral containing a comparatively large amount of alkalis. Cements made from slag are also liable to contain alkalis. We have no reason to suppose, however, that alkalis exist in any injurious amount in any of the samples that we have examined, and they were therefore not determined.

The question, therefore, to be put to nature is, how much hydraulic cement does this mixture contain as it is brought to the laboratory? And what else does it contain that it should not?

In order to answer this question, it may first be determined how much of the sample of cement is volatile at a bright red heat. We have found by repeated examples that an ordinary Portland cement of good quality will give about 4 per cent. or less, of matter volatile at a red heat. A number of tests showed that this amount was not materially increased by the use of a blast lamp. In a few instances the increase amounted to a few tenths per cent., but in a majority of instances it was not appreciable. This loss at a red heat was found in a majority of instances to very nearly correspond with the amount of carbon dioxide determined directly, but in those instances where this loss was large, amounting to more than 10 per cent., the difference between these two factors increased as the loss increased, showing that in those cases where this loss is large, an increasing proportion of such loss is water. If more satisfactory, the percentage of carbon dioxide can be directly determined, but even when it is so determined, the matter volatile at a red heat should always be ascertained.

The problem of analysis is simply an ordinary problem in mineral analysis. The physical tests have been made upon the sample as brought to the laboratory, and in such a manner as to exhibit the greatest possible difference between this sample and all other samples. The samples were neither dried nor pulverised, because either drying or pulverising, or both, would make another and different sample to be tested from the on submitted. Our correspondent admits this, and if he did not, everybody else does; yet, referring to his sentence marked (*u*) he claims that to submit these samples to chemical analysis, without bringing them into homogeneous condition by grinding, is certain to lead to erroneous conclusions. Both schemes of analysis that we have quoted require that the sample shall be ground, and one of them that it shall be dried. We have found the loss that good cements sustain when dried at 100° C. is not of practical importance; with bad cements it is otherwise. We also believe that right here is the keynote to the controversy. We believe that in discussing any subject the disputants must be agreed as to their subject, or, they may argue for ever and both be correct in reaching diametrically opposite conclusions In this case, the two chemists and our correspondent are agreed that the samples should be pulverised to an impalpable powder, and we on the contrary believe that as soon as a sample is pulverised it is converted into a new sample. This our correspondent practically admits (*see* sentences *a*, *b*, *d*, *f*, *g*, *l*, *m*, *p*, *q*, *s*, *y*). We claim that the sample should be analysed as received and thus made to exhibit the greatest possible differences, as is the case in the physical tests. If the samples are pulverised and thus brought uniformly into solution, certain differences are lost, and it is not strange that the physical tests and chemical analyses do not correspond. The same result follows when the samples are fused with sodium carbonate, and when the sample is dissolved in concentrated HCl. In both instances the distinction between the silica that is combined into tri-calcic-ferro-alumino-silicate, or cement, and the silica that exists as sand or fuel ash or as unburned clay, is lost.

In our former paper we did not base any distinction of "active" and "inactive" constituents on the action of 10 per cent. HCl (*o, j*). We base those distinctions on the researches of the Messrs. Newberry, and we insist that, if those researches are conclusive, and we believe that they are, our conclusions follow from the nature of the case. There was nothing arbitrary in using 10 per cent. HCl. It is nothing but the ordinary dilute HCl found on every laboratory shelf. There is nothing arbitrary in using a sieve to scatter the cement upon the acid and prevent the development of sufficient heat to render a part of the silica insoluble.

Moreover, our correspondent admits that a theoretically perfect cement, will contain in spite of anything, 3 per cent. of fuel ash and 1 per cent. or less of unburned clay (*r, w, z, za, zb*). These materials are not cement. Why should they, or any part of them, be brought into solution with the cement if it could be avoided? Let us suppose that that an unskilful or dishonest manufacturer uses more coal than is necessary, or poor coal, and thus increases his coal ash to 6 per cent., and his unburned clay to 4 per cent., why should the 6 per cent. be dissolved by fine grinding, or the 10 per cent. be dissolved by fusing with sodium carbonate? In other words, why should a method of analysis be pursued that destroys all differences, while the physical tests are conducted in such a manner as to exhibit all differences?

That this contention is correct is proved by the results of our analytical work. No. 149 (Chemical Laboratory) was a cement that gave the highest figures in physical tests (Physical Laboratory, No. 88). They were, one day neat, 429 lb.; seven days neat, 784 lb.; seven days mortar, 209 lb. When analysed this cement gave:—

	Per Cent.	
Insoluble in 10 per cent. HCl	3·79	
Soluble silica	19·43	
Alumina and iron oxide	8·34	
Lime	63·44	91·21 %
Magnesia	Trace	
Sulphates (in terms of SO_3)	1·89	
Volatile at a red heat	1·39	
Undetermined	1·72	
Total	100·00	

$$\text{Active index} = \frac{63\cdot44}{2\cdot8 \times 19\cdot43 + 1\cdot1 \times 8\cdot34} = 1\cdot005$$

That is to say, we have here a commercial cement that consists of 91·21 per cent. of cement, 3 per cent. of fuel ash, 0·79 per cent. of unburned clay, 1·89 per cent. of sulphuric anhydride, 1·39 per cent. of carbon dioxide and water, and 1·72 per cent. of ingredients not determined. This is practically a perfect cement, and the other six best American cements so nearly approximated this cement in composition that with it they averaged as follows: one day neat, 259 lb.; seven days neat, 683 lb.; seven days mortar, 257 lb.

	Per Cent.	
Insoluble in 10 per cent. HCl	4·38	
Soluble silica	18·45	
Alumina and iron oxide	9·45	
Lime	61·89	89·80 %
Magnesia	1·78	
Sulphates (in terms of SO_3)	1·87	
Volatile at a red heat	1·79	
Undetermined	0·38	
Total	100·00	

$$\text{Active index} = \frac{61\cdot89}{2\cdot8 \times 18\cdot45 + 1\cdot1 \times 9\cdot46} = 0\cdot997$$

That is to say, these seven American cements a 89·8 per cent. pure, with 3 per cent. of fuel ash, 1·38 p cent. of unburned clay, 1·78 per cent. of magnesia, 1·8 per cent. of SO_3 as sulphates, 1·79 of carbon dioxide an water, and 0·38 per cent. undetermined. If a method analysis can be used that will separate this unburned cl and fuel ash from the cement, why does it lead to erroneou conclusions? Why should a method be used that mak it impossible to distinguish between the silica and alumi in the unburned clay and fuel ash, and the remainder those ingredients that are properly combined to for cement.

In the answer to these questions lies the whole matter controversy.

In order to test these conclusions further, we wrote our correspondent, and asked him to send us a sample the coal he was using, the mixture that was burned, a the clinker that resulted from the burning. With gr kindness he immediately complied with our request.

We labelled the samples: Coal, 449 B; Mixture, 449 Clinker, 449 D.

We found the clinker to consist of small nearly spheri masses, about the size of peas, that had been vitrified, a that were hard under the pestle, and also larger pieces t were more or less spongy and softer under the pestle.

449 B yielded 11·95 and 11·76 per cent. of ash, average of 11·85 per cent., which, at 400 lb. to the bar of cement, equalled 4·44 lb. to 100 lb. or 4·44 per ce of ash instead of 3 per cent. Of this ash, 22·92 per ce was soluble in 10 per cent. hydrochloric acid. The consisted of:—

	Per Cent.
Silica	42·94
Alumina and ferric oxides	41·41
Lime (CaO)	9·52
Sulphates (in terms of SO_3)	3·58
Undetermined	2·55
	100·00

The sulphates (see SO_3 above) were wholly solubl dilute hydrochloric acid.

449 C contained 19·79 per cent. insoluble in di hydrochloric acid. This insoluble portion contained silica, 68·774 per cent., and alumina and iron oxide lime, 31·226 per cent. These figures are equivalen 13·62 per cent. and 6·17 per cent. of the amount ta The soluble portion contained soluble silica 0·17 per c alumina and iron oxide 0·60 per cent., lime (C 41·16 per cent. These results are equivalent in r numbers to: clay, 20 per cent.; marl, 80 per cent.

449 D, when finely pulverised, gave:—

	Per Cent.		Per C
Insoluble in 10 per cent.	4·62	and	3·
Soluble silica	18·24	„	19·
Alumina and ferric oxide	8·74	„	8·
Lime (CaO)	65·64	„	65·
Magnesia (MgO)	..		..
Sulphates (in terms of SO_3)	Trace		Tra
	97·24	„	97·
Undetermined	2·76	„	2·
	100·00	„	100·

These analyses were made on two separate po pulverised separately. The insoluble portion did contain a trace of lime.

449 D.—5·0331 grms. of the small unbroken clinker placed in a flask with 250 c.c. of 10 per cent. H March 15th, at 3 p.m. On March 16th, at 9 a.m., the of the acid was very marked; each mass was covere a shell of white silica. On March 18th, at 9 a.m., n remained of most of the spheroids but a white sl silica. A few of them were but little acted on. morning of the 20th the residue of silica was white, and the solution had the colour of proto-chlor

on. The contents of the flask were then analysed, and ave :—

	Per Cent.
Insoluble silica	20·95
Soluble silica	2·09
Alumina and ferric oxide	8·43
Lime	66·69
	98·16

449 D.—5·0908 grms. of the large porous pieces of inker were placed in a flask with 250 c.c. of 10 per cent. Cl, on March 20th. The action of the acid was very equal. Some of the pieces were completely decomposed 18 hours; others, apparently containing more iron, sisted its action for several days. On March 26th, one ece was still brown, and was broken down with difficulty. The contents of the flask were then analysed, and ve :—

	Per Cent.
Insoluble silica	22·01
Soluble silica with trace of iron	1·56
Alumina and ferric oxide	8·97
Lime	66·72
	99·26

These results show that our correspondent was mistaken assuming that (*y*) "the best Portland cements are roughly homogeneous in character," as his own clinker not homogeneous. Moreover, these analyses prove ond question that the results of the action of acid out he same bottle and acting on material from the same le, depends upon the size of the masses of cement. The samples of clinker above set forth were purposely und of different degrees of fineness.

e then asked our correspondent to send us samples of , mixture, clinker, and ground cement that would be early as possible representative of the same batch of ture. These were received by us, and numbered: Coal, E; Clinker, 449 D; Mixture, 449 C; Cement, 449 B.

19 E yielded 10·63 per cent. of ash, which is equal to per cent. of ash in the clinker. When analysed, this yielded :—

	Per Cent.
Silica	43·30
Alumina and ferric oxide	38·69
Lime	9·12
	91·11

ere was undetermined CO_2 and a trace of H_2S.

9 D.—The clinker was finely pulverised. It contained ce of sulphates and no magnesia.

alysed it gave —

	Per Cent.
Insoluble in 10 per cent. HCl	2·81
Soluble silica	20·61
Alumina and ferric oxide	8·69
Lime	65·62
	97·73

C gave on analysis :—

Silica	14·62
Alumina and ferric oxide	9·21
Lime	41·05

clay had absorbed some water.

s mixture is slightly different from the first, containing e more clay.

B.—The physical tests were: 1 day neat, 369 lb.; s neat, 720 lb.; 28 days neat, 756 lb.; 7 days r, 209 lb.; 28 days mortar, 326 lb. The cement alysed as usual. It gave :—

	Per Cent.	Per Cent.	Per Cent.
Insoluble in 10 per cent. HCl	3·73		
Soluble silica	19·65		
Alumina and ferric oxide	7·95		95·60
Lime (CaO)	64·27	91·87	
Sulphates (in terms of SO_3)	1·54		
Magnesia (MgO)	..		
Volatile at a red heat	3·11		
	100·25		

$$\text{Active index} = \frac{64{\cdot}27}{2{\cdot}8 \times 19{\cdot}65 + 1{\cdot}1 \times 7{\cdot}95} = 1{\cdot}008$$

This sample when analysed by Humphrey's method gave :—

	Per Cent.	Per Cent.
Silica	22·36	
Alumina and ferric oxide	7·52	95·92
Lime	66·04	

449 F.—A mixture of pulverised fire-brick and lime was made, having approximately the ultimate composition of a cement. When analysed by our method the results were as follows :—

	Per Cent.
Insoluble in 10 per cent. HCl	33·25
Soluble silica	0·11
Alumina and ferric oxide	0·28
Lime	60·89
	94·53

The insoluble portion contained :—

	Per Cent.		Per Cent. of whole.
Silica	58·52	=	19·45
Alumina and ferric oxide	26·98	=	8·97
Lime	11·98	=	3·98
Magnesia, undetermined	..		..
			32·40

Analysed by Humphrey's method it gave :—

	Per Cent.
Silica	19·82
Alumina and ferric oxide	8·68
Lime	66·44
Magnesia, undetermined	..
	94·94

Humphrey's method is not a proper method of mineral analysis.

Whatever portion of the material is soluble should be dissolved without fusion. Fusion in the manner described introduces a large amount of sodium chloride into the assay to no purpose, and should therefore be avoided. So much sodium chloride makes it difficult to separate the silica completely, and prolongs the scheme to no purpose. Moreover, the results given above speak for themselves.

Believing that the results obtained by the method of analysis used by ourselves, and the interpretation of which they are capable, furnish the strongest possible argument for its general use, we submit the following suggestions respecting it :—

The samples should be taken and preserved in a well-stoppered bottle.

The sample for analysis should be exactly like the sample submitted to physical tests. It should be subjected to no treatment whatsoever that will change its properties in any manner. It should be neither dried nor pulverized.

Five grms. should be weighed out and gradually introduced into 250 c.c. of not stronger than 10 per cent. HCl, in such a manner as to avoid any appreciable rise in temperature. The solution should be vigorously stirred at intervals for half an hour. If effervesence follows it indicates the presence of carbonates. Traces of H_2S are to be expected. A black residue indicates carbon or soot, which may be estimated by gathering the residue on a balanced filter, weighing, burning off the carbon and again weighing.

Our correspondent regards this residue as the coarse particles of the cement deprived of lime by "local separation" whatever that may mean. There is not a particle of evidence to support any such contention. The residue from 10 per cent. HCl is not coarse. It is fine as ashes, and is ashes. He says that it is not safe to add to the raw material lime enough to convert the silica and alumina of this fuel ash into cement; hence it is properly to be inferred that the lime and ash will not unite to form cement. That being the case, the cement is dissolved away from the ash and unburned clay, the former of which can only be brought into solution by prolonged action of the acid on the material in very fine powder. To us, this means, which we have discovered of separating the cement from that which is not cement, seems extremely fortunate, and we cannot understand why anyone else who desires to distinguish between good and bad cements should think differently.

The filtered solution is evaporated to dryness over a water bath, the residue carefully and completely desiccated, drenched with concentrated HCl, taken up in water, the silica filtered off, dried and ignited as "soluble silica." This is a proper designation to be applied to this material, as it has been wholly dissolved by the action of the weak acid upon the cement. It is also that silica which is in combination to form cement, provided that it is not augmented by the silica that forms the bulk of the fuel ash, and, in Humphrey's scheme, also by the silica of the unburned clay.

The filtrate from the silica is made up in a graduated flask to 1 litre, and two portions of 100 c.c. each, are precipitated with ammonium hydrate, the ammonia boiled off and the precipitate brought upon a filter and filtered while hot. Mr. Humphrey very properly dissolves this precipitate in dilute HCl and reprecipitates, passing the filtrate through the same filter. In no other way can the iron and alumina be freed from lime and magnesia, if either exists in considerable quantity.

The united filtrates are brought to a temperature near boiling, and the lime is precipitated as oxalate. After being allowed a sufficient time to settle, the lime may be filtered off and determined, either as oxide or carbonate, or titrated with potassium permanganate, as suits the convenience of the operator.

If extreme accuracy is required, the filtrate from the lime will be evaporated to dryness, ammonium salts expelled, and the magnesia precipitated with hydrogen ammonium phosphate. For practical purposes this evaporation is not necessary, but the magnesia may be determined in the filtrate from the lime.

For practical purposes too, the sulphates may be determined in the filtrate after removing the magnesia, after it has been acidulated, but the original solution is better. To test this point, the sulphates were determined (*a*) in the original hydrochloric acid solution of a cement freed from silica, (*b*) in the same solution from which the iron and alumina had been precipitated, (*c*) in the same solution from which the iron and alumina had been precipitated and the ammonia had been boiled off, (*d*) from the solution after removing magnesia. The determinations (*a*) and (*c*) varied by 0·03 of 1 per cent., (*d*) was one-tenth of 1 per cent. greater, while (*b*) was very much less than either of them. According to our experience, barium sulphate thrown down in presence of iron and alumina always contains traces of these oxides.

With the determination of the matter volatile at a red heat, these results furnish all of the analytical data necessary to form a judgment concerning the quality of any cement, either Portland or Rosendale, and with slight modifications the method may be applied to concretes. To cast these results into the form of an "active index" or "inactive constituents" will not change the results in any respect, but may be useful in comparisons, as are many wholly artificial devices.

It was originally our purpose to discuss the significance of results obtained by us in the determination of the lime and alumina of cements soluble in water, both gravimetrically and by titration, but the length of this paper leads us to defer this till another occasion.

THE MANUFACTURE OF NITRIC ACID.
PART I.

BY C. H. VOLNEY, PH.D.

The increase in the consumption of strong nitric acid which has taken place in the last 30 years, has necessarily led to improvement in the process of manufacture of the acid.

The process of producing the acid from sodium nitrate and sulphuric acid had always been considered a simple matter, and as late as 1870, the condensation was effected by surface air cooling in large Woulfe's bottles, or tourilles, of stoneware. Later on, gradually the condensation by water cooling was introduced, and the principal improvement in this industry for quite a long time related to the perfecting of the apparatus for condensing the acid vapours.

Reviewing the literature on this subject, we find that perfection of these condensing apparatus kept pace the progress in the manufacture of chemical stoneware two directions: the apparatus, consisting of combinat of tubes and coils cooled by water, large receivers, to for condensing and regenerating acid vapours, were tu out with a perfection which had not been previo considered possible; and the material of which these ve were made was improved with a view to resist the ef of acid vapours and heat in a most remarkable degre that at the present time the old form of Woulfe's bottl tourille, which formerly occupied the most conspic place in the still house, has almost completely disappe from a modern plant, and is only used as a receive condensed acid, and not any more exclusively as a conde

From the time that condensation by water cooling found to be superior to air cooling, the forms of appar the providing of tubes and receivers, in fact all the d necessary to increase the efficacy of the whole appa underwent gradual changes, and thus the apparat to-day, used for the condensation of nitric acid vap has assumed a different appearance, caused by the ad of water cooling, and the regeneration of nitrous vapo

In general, the principles here mentioned have acted upon in all modern plants; we find in the resp literature data which result from the working of dif systems. These have, for the past 10 years, been disc and illustrated in detail, so that a discussion would b a reference to the literature of the day on that subject.

It may, then, at present, be accepted that the modern acid plant consists of a water-cooling system in conn with surface cooling and a regenerating tower; the is usually provided with lifting pumps, whereby the li repeatedly brought to the top of the tower and then over and over again in contact with the acid va Hereby an acid of 1·38 sp. gr., and even higher, obtained.

The retorts have in principle undergone hardl change. The material is still cast iron, and the and size is somewhat varied according to the ideas constructor of the apparatus. They are usually ma of greater dimensions than formerly, so that one-h or more, of nitre may be used at one time. They a provided with an outlet for the liquid bisulphate.

In relation to the process of decomposition, ve improvements have been developed during the last 30 The quantities of material, that is, the proportion b sodium nitrate and sulphuric acid, as well as the tration of the latter, and the treatment of the mix the retort, have undergone little, if any, change.

When I later undertake to discuss, beyond mere proposed processes, it is done for the importance give or the other improvement, either by patent literatu investigations and arguments given in a number of and journals or hand-books.

Since 1890 considerable material in reference condensation apparatus has accumulated. The p made by Oscar Guttmann,* to substitute tubes tourilles, were gradually developed, and after applyin with an efficient system of cooling for a sufficient nu tubes by water,† and connecting his system with th Rohrmann condensing towers, he could report workings of this system in a number of factories e large scales in Europe. The published results acc a surprising yield, viz., 98 per cent. monohydr 2 per cent. from the condensing towers as acid sp. gr. The economical results of the work were satisfactory, as he reports that for 3·5 kilo. of mon only 1 kilo. of coal was consumed. As the towers c almost all the nitrous and other gases, the sys fulfilled the purpose in an excellent manner.

The production of concentrated acid, as well as free from nitrous oxides, chlorides, &c., has been and effected by partial condensations‡ by Frasch and Rohrmann, and others. The removal of roxide (N_2O_4) always takes place on addition of water to e monohydrate, and the end results depend upon the gree of heat to which the liquid or the gases are bjected. But they will consist of monohydrate and seous nitrogen oxide, thus :

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* Zeits. angew. Chem. 1890, pp. 507 and 700.

† O. Guttmann, Zeits. angew. Chem. 1893, p. 37.

‡ Frasch, Ger. Pat. 82,578, 1894; Diterle and Rohrm Pat. 85,240, 1896.

$$N_2O_4 + H_2O = HNO_3 + HNO_2$$
$$3NO_2 + H_2O = 2HNO_3 + NO$$

The latter is converted in the presence of atmospheric ygen again into peroxide, so that in the presence of water mately HNO_3 is obtained. It is however assumed that water cooling and quick and efficient condensation, the nohydrate condenses without absorbing any considerable ount of these lower oxides of nitrogen, and at the sent time the systems of Guttmann, Lunge, Rohrmann, tenhausen, Griesheim, &c., fulfil these purposes satis- torily according to published results. The intricate nbinations, as well as the nature of material in these aratus, should however be seriously considered, and tainly will form some drawback in practical working.

t may be safely assumed at present, that by the use of ient water cooling in connection with sufficient con- sing and regenerating apparatus, a concentrated and tically pure acid can be produced economically.

'he material, which forms the source of all nitric acid sumed for use in arts and manufactures, is still sodium ate, and the old theory of its decomposition of huric acid into acid sulphate and nitric acid is still rally accepted. Some progress in the right direction is g made in this process of decomposition, indicated by proposals to use polysulphate, formed by the action of huric acid on the nitrate. I shall return to this subject discussing the processes themselves.

nprovements in apparatus which are supposed to effect theoretical decomposition more or less, have been pro- d by Guttmann and Valentiner. The former* inserts, ie tubes leading from the retorts to the condensing ratus, a hot air blast, which not only exerts an oxidising ence on the acid vapours coming from the retorts, but d also necessarily produce more or less of a vacuum in etorts themselves ; the latter† proposes the distillation e acid *in vacuo*.

though Guttmann himself recommends the introduc- of air in connection with the hot air blasts, inserted een the retorts and condensing apparatus, I am ed to assume that thereby an influence is produced e process by the quickened removal of the acid vapours e suction of the air blast, which will necessarily lessen ressure in the retorts, and also protect the mono- te from contact with the hot surfaces of the apparatus. e been unable to find in the technical literature of , so far, any data which might throw light on the ss in the retorts during the distillation in this ates, and no direct experiments and determinations of rature seem to have been made or published. We therefore, to accept the favourable results obtained rom as the effects of the hot air on the distilling n connection with the system of water cooling and ration.

specification of the Valentiner patent describes the ation of nitric acid from dry saltpetre and sulphuric 66 Bé. in a vacuum. It states also, that the mono- e commences to distil as soon as all the air is ted, but that the distillation is assisted " essentially " ting.

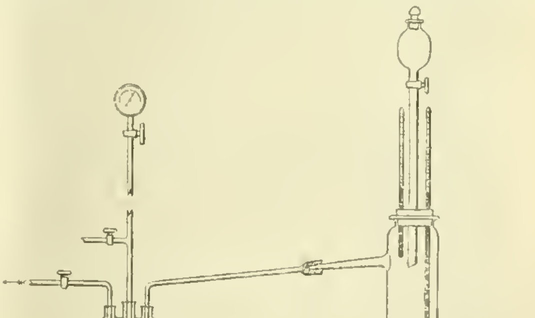
r‡ he recommends the distillation *in vacuo* also for nufacture of monohydrate from diluted nitric acid ncentrated sulphuric acid. We find detailed reports practical working of this system in periodicals for t five years, giving results of the working on larger of the system. §It appears, however, that now the y be accepted, and that the distillation of con- ed acid from dry sodium nitrate and sulphuric acid Bé., has been abandoned, and that weaker, or chamber acid is used. This is evidently owing to practical difficulties, such as excessive foaming and running over of the salt mixture, &c. The result is, that at the present time, a sulphuric acid of 60 Bé. is used, furnishing diluted nitric acid of some 40 Bé., and that for the production of stronger acid a second distillation of dilute nitric acid and stronger sulphuric acid is necessary.

The reports which have been published on the practical working of the Valentiner system are very favourable, both in view of quality and quantity of the acid, and it appears that the handling of the apparatus with the air pumps and manipulation of vacuums can be done effectively by attentive and trained workmen. Lately Guttmann* has offered a lengthy comparison between the systems of Guttmann-Rohrmann, and Valentiner. From the statements furnished it would appear that 100 parts of saltpetre yield in the Guttmann apparatus 99 parts acid of 1·502 sp. gr., to 83 parts of 1·500 sp. gr. in the Valentiner apparatus.

It is claimed to be one of the special advantages of the vacuum distillation that it takes place at a proportionately low temperature ; that consequently the apparatus does not suffer as much as in the usual practice ; it may be also supposed that the resulting nitric acid is less subjected to the decomposing effects of the heated surface of the retort.

In the publications to which I have had access I find nothing definite in regard to the effect of the vacuum on the chemical process in the retort ; that is, on the decomposition of sodium nitrate by sulphuric acid. Dr. Bergmann† states that the retort is provided with a long thermometer for the control of the temperature, and that the distillation of the nitric acid begins at 85° C. Evidently, this thermometer indicates the temperatures of the distilling vapours, and not that of the salt mixture in the retort. In the descriptions of the apparatus and of the working of the same, which have come to my knowledge, this is the only reference to the temperatures, and an investigation of the process itself, as it takes place in the retort *in vacuo*, appears not to have been given in any of the publications. If we consider the distillation of a mixture of two such liquids as nitric acid and sulphuric acid *in vacuo*, we can understand that monohydrate, which boils under 760 mm. pressure at 81·5° C., will distil at a lower temperature than that under less pressure. It is presupposed, however, that the nitric acid, in this case, exists as free acid.

But when we have a mixture of sodium nitrate and sulphuric acid, the nitric acid must be produced first in a free state before it can be distilled ; that is, the sodium nitrate has first to be decomposed by the sulphuric acid. The question therefore, is whether this decomposition,



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uttmann, Zeits. angew. Chem. 1890.
lentiner, German patent, 63.207, 1892.
tiner, German patent, 88,321, 1895.
rulev, Mémorial des poudres et salpetres, 1897 (France).
Zeits. anal. Chem. 1899 12. Bergmann. *ibid*. 1899, 42.

* Zeits. angew. Chem. 1901.
† Zeits. angew. Chem. 1899, 42

in vacuo, takes place at a lower temperature than under the ordinary atmospheric pressure. As I cannot find that this question has been investigated, I have made the following experiments in a retort of strong glass, of the shape shown in the attached sketch, connected with the receiver, air pumps, vacuum gauge, and provided with thermometers to measure the temperatures of distilling vapours, of the residues in the retort, and of the oil bath. I subjected 100 grms. of dry sodium nitrate and 110 grms. of concentrated sulphuric acid to distillation.

The series of observations, made under a vacuum of 300 mm., show the following:—

Time.	Temp. of Oil Bath.	Temp. of Salt Mixture.	Temp. of Distilling Acid.	Remarks.
P.M.	C.	C.	C.	
1.35	..	20	..	.. ..
1.50	75	36	25	Little gas.
1.55	110	40	35	Quietly boiling.
	145	55-65	45	Distilling.
2.00	116	100	75	Distilling violently.
2.02	127	101	70	Foaming.
	108	102	62	
	120	106	78	All nitre not yet dissolved.
	130	..	78	Foams.
	147	..	73	Foams violently.
2.12	160	112	78	Nitre dissolved.
		115	78	" "
	125	115	67	Distilling lessens.
2.17	125	115	66	" "
2.22	136	116	66	Light yellow vapors.
	148	118	70	Distilling.
	150	124	71	" foaming.
2.34	153	127	76	" "
	144	128	76·5	Quiet, distilling.
2.40	132	124	72·5	Salt separating.
2.50	144	124	76	Foaming ceases, distils quietly.
	149	127	79	Distilling lessens.
	150	128	76	" "
3.00	151	129	76	" ceases.

The temperature of the oil bath was regulated as the distillation required. It follows from the series of observations, that at a temperature of 65°—100° C. of the retort contents, the monohydrate distils, showing a temperature 45°—75°, ending the first phase of the action of sulphuric acid on the sodium nitrate.

In the retort is then a quantity of undecomposed nitrate and a liquid polysulphate of sodium. This latter, when the temperature of it has risen to 100° C., commences to further decompose the remaining sodium nitrate, entering thus on the second phase of the process, and its temperature rising from 100° to 129°, the rest of the nitric acid—to the greatest part clearly consisting of monohydrate, distils over, showing under 300 mm. pressure a boiling point of 70° in average. Comparing the temperatures thus obtained with those appertaining to the distillation under 760 mm., we find that the latter furnishes the monohydrate by distilling from the salt mixture in the retort at 97°—122° C., the boiling point of the acid under that pressure lying between 77°—90°. The second phase takes place at a temperature of the salt mixture of 130°—165° C. The second portion of the nitric acid, also practically a monohydrate of 1·505 sp. gr., shows a boiling point of 94°—100°, under 760 mm. pressure; and the rest of the acid results at a temperature above 165° of the retort contents, and is the yellow acid containing the decomposition products by heat of the monohydrate. It will be seen from this that the effect of the polysulphate of sodium on the rest of the sodium nitrate in the retorts commences under 300 mm. pressure at 100° C. and is finished at 129°, whereas under the higher pressures this process commences at 130° and is not finished at 165°.

As Dr Bergmann (this Journal, 1899, 1122) states that the distillation of nitric acid from sodium nitrate and sulphuric acid takes place in the Valentiner retorts at a vacuum of 600 mm. I shall present in the continuation of this paper the results of my investigations at that pressure, and also of the distillation of mixtures of nitric and sulphuric acids.

THE IMPROVEMENT OF INSTRUCTION IN TECHNICAL CHEMISTRY.

BY ALBERT LACHMANN.

In attempting to discuss so broad a subject as the meth
of teaching technical chemistry employed in this coun
one is met at the outset by numerous difficulties of in
pretation. No two of the thirty odd institutions claim
to prepare students for the practice of technical chemi
seem to agree on the topics necessary for study, the o
in which these should be taken up, the extent to wh
anyone should be cultivated, or the actual subject-ma
of courses given under the same name, to say nothin
the non chemical subjects in the curriculum, such
mathematics, literature, analytic mechanics, and o
"strains and stresses." In some colleges, chen
engineering seems to mean a mixture of less chem
and less engineering than is required of either chemist
engineers; whereas in others "analytical chemists"
turned out after one or two years experience on "unkn
and complex ores." It is plain, therefore, that in ord
arrive at any comprehensive view of actual and of desi
conditions, it will be necessary to define, in a ma
somewhat more precise than usually customary,
fundamental aims of technical education with referen
chemistry.

The Unity of Chemical Practice.—Stated in its ba
terms, the aim of such technical education must neces
be, adequate preparation for professional practice. T
sure, this definition merely re-states the problem i
we must immediately ask, what do we mean by ade
preparation, and what by professional practice? L
consider the latter question first. At first sight
professional practice of the chemist appears as an ex
ingly complex affair, incapable of closer statemen
chemist may be a mineral analyst, a food analy
metallurgist, a manufacturer of heavy or of fine chen
a gas chemist, an electro chemist, a pharmace
chemist, a dyer, a manufacturer of coal tar produ
fermentation chemist, to leave out further subdivision
last but not least, a teacher of chemistry, perhaps the
technical of all. It will be said that this is far too br
picture of the chemist's activity; and that the wh
technical practice may be summed up under three d
heads—analysis, manufacture, instruction. Indeed,
be safely said that this represents the opinion o
majority of American and English chemists. And ye
analyst, the manufacturer, the teacher, are merely ch
thinking by the same mental processes, applying th
general laws, attacking very similar problems, di
only in the accidental circumstances of the material
work with. The analyst sacrifices time and mo
the cause of accuracy, the manufacturer gives up ac
for the sake of time and money, the teacher wears
out in the effort to be accurate without wasting eithe
or money.

The fundamental unity of chemical practice is not
discovery. It was "made in Germany" some fort
ago, and, although not patented, the Germans en
exclusive monopoly of its use. The analyst, the m
turer, and the teacher are continually exchangin
experiences through a sort of chemical clearing
Young docents frequently spend two or three yea
factory for the purpose of broadening their knowle
factory sends its problems to the university labora
be solved. An investigator in need of expensive sub
or of mechanical appliances to handle large
material, need only apply to the nearest factory to
machinery placed at his disposal, or its wares furni
little or no cost. The larger factories have the
research laboratories, in which a hundred and more u
graduates and professors spend months and years o
investigations, and are paid liberal salaries, even
results are technically worthless. One factory
purchased the entire scientific library of Kekul
manufacture of nearly all the numerous coal-tar
consists merely of laboratory methods on a larg
and the scientific problems solved in this connecti

en of the utmost importance and benefit to "pure" ience. Certain large establishments prefer their chemists have had training in pure science only, and then give em from three to six months of technical training in eir own works and at their own expense. The specifitions of chemical patents constitute an important ction of scientific literature, and the German Chemical ciety spends large sums of money for the purpose of stracting and indexing them. If we also take into nsideration the unquestioned pre-eminence of Germany all branches of chemical practice, what better demonation can we give of the fundamental unity of the fession.

Present Status of Instruction.—We are now in a better ition to return to the former question: What do we an by "adequate preparation"? For no matter what ultimately be agreed upon, it will be identical in its t two or three years for all classes of students. It is a at comfort to have this important point definitely settled dvance; for one of the main difficulties in arranging college curricula has been the supposed necessity of viding two or more co-ordinate sets of courses in mical instruction. This has been a great strain on the hing staff as well as upon the financial resources of the ratory.

n examination of a number of college catalogues brings the fact that at present all students do follow essen y the same courses for about two years. These courses lly consist of one or two terms of general inorganic uistry and simple laboratory work, one or two terms of itative, and one or two terms of quantitative analysis; hese combined so as to occupy from two to three years e rate of 8 to 15 hours per week. It would seem, then, we have the present American conception of "adequate aration"; for the subsequent courses are almost riably special short ones in various branches of work. may well ask: Is this preparation really adequate? I k not; but before considering it in detail as the main ness of this paper, a few words must be said concerning special addenda, the "finishing courses."

en in some of our best institutions, these final courses perilously near the standard of the "polite deport t" and "philosophy" of young ladies' seminaries. e is an unfortunate lack of caution in the claims ished in their catalogues. Lack of space prevents ion of many of the choice extracts I have found; two ree will suffice, however, for purposes of illustration. college offers a course of 44 lectures on the following s: "Metallurgy, glass, ceramics, chemicals, illumi g gas, bleaching, photography, petroleum, brewing, and liquors, vinegar, fats and oils, essential oils and s, sugar, starch, glucose, milk, distillation of wood, , tanning, &c., &c." In order to cover the ground, lectures must be illustrated with a kinetoscope. her institution claims to prepare its students for: allurgy and mining, chemical manufactures, dyeing, hing, tanning, sugar-refining, &c., and for work as tical chemists, assayers, or teachers of chemistry." laim is based upon three lectures per week for two , and two laboratory courses of 12 hours per week which may be taken in one year. A third college a course of three hours per week for one semester "Qualitative and quantitative examination of air, food, disinfectants, baking powders, flour, bread, tea, , cocoa, spices, milk, butter, lard, beer, and other ts."

nay be objected to the above that college catalogues otoriously optimistic. The fact would seem to be istrated; none the less, such exaggeration is of very nable value, and should be discouraged for the t of the "raw graduate," if for no better reason. It appear, moreover, that the majority of colleges er training in analytical methods equivalent to ete technical training; nearly all of them give l courses in water analysis, analysis of fuels, iron and &c. The importance of such analytical training is btedly over-estimated; a student who must con y neglect the factors of time and cost in his work es too one-sided a training. The same objection is to be raised to many of the so-called courses in "technical work." If they do not consider time and cost as the essential factors, they have no better claim to a "technical" nature than the ordinary beginner's preparation of hydrogen or chlorine. But more of this later.

Let us now examine more closely the nature of that preliminary preparation which we have found to be so nearly uniform throughout the United States. In the way of lectures, there is always a course on inorganic chemistry, occasionally a short one on organic, infrequently a very brief treatment of "general" or theoretical chemistry incorporated with the above or as a separate course. Modern theories, and the details of organic chemistry, are usually left for advanced and optional courses. The time spent on these lectures varies greatly; but perhaps a fair estimate is three hours per week for two years (of about 35 weeks each). In many, in fact in most, colleges this average is not maintained. The laboratory training includes one, very infrequently two terms of general introductory work, ranging from three to six hours each week. On the whole, this course may be described as satisfactory. Then follows a course in qualitative analysis, averaging 12 hours per week for one or two terms. Recitations accompany it in many instances, mainly for drill in writing equations, it would seem. In a few of the better institutions, but only in very few, the subject is made to serve as a practical demonstration of the theory of solutions. Finally, from one to three terms are spent in quantitative analysis, also averaging perhaps twelve hours a week. The subject matter of this last course also varies greatly with the college; at the best, there is included training on a few alloys, sulphide ores, silicates, and a number of volumetric methods on technical products. The feeling cannot be repressed that in this course results call for a disproportionate expenditure of time. It is with the training afforded by the above that the student proceeds to follow his natural bent, and to acquire the special technical skill needed for his professional activity.

Outline of the Proposed Improvements.—The technical preparation of the teacher need not concern us further. Every college and university is practically a technical school for training teachers first of all, and for training technologists only secondarily. Not that the training of teachers of chemistry is incapable of great improvement; but on the whole it is so much more satisfactory, that the improvement of instruction in other technical branches is more imperative. Moreover, taking as our major premiss the essential unity of chemical practice, be it that of analyst, manufacturer, or teacher, it follows that the main deficiency in the present training of our teachers is exactly the lack of knowledge we are deploring and endeavouring to remedy. Should it be possible, therefore, to generate within the college walls the mental atmosphere of the busy world where things must be mastered as well as ideas, we shall also have ministered to the wants of the budding preceptor.

Having thus wearied you by a circuitous return to our starting point, in order to eliminate possible objections based upon differences in the point of view, let us again take up the question: "What do we mean by adequate preparation?" If, in the following discussion, the proposals I have to make shall appear a trifle too radical, I trust you will bear in mind that they spring from a conscious and deliberate idealism; and should the views here expressed really prove to have a basis of truth, any merely practical difficulties will yield as surely as the difficulties of manufacturing Indigo yielded to the idealism of the German professor.

I take it, then, that an adequate preparation for the technical chemist has been secured when (1) a sufficiently broad general foundation of inorganic, organic, and physical chemistry has been laid in the class-room and in the laboratory; (2) when the "chemical instinct," *i.e.*, the ability to think in chemical terms, has been developed; (3) when sufficient analytical skill has been attained to ensure accuracy in following new methods; (4) when enough preparative skill has been acquired to make any compound with maximum purity in maximum yield, at the lowest possible expense under given conditions; (5) when speaking acquaintance with current chemical thought, both pure and applied, has been reached; and (6) when time has been found to accomplish all this.

The Broad Foundation of Chemical Knowledge.—First, then, as to the general foundation of inorganic, organic, and physical chemistry in the lecture-room and laboratory. I think that the present equipment of our students in this line is too meagre. The plan seems to be to give very elementary courses in all three subjects, and then to assume that this information will multiply by cell-division in the laboratory atmosphere. Another very prevalent view among teachers is that if you only give the student fundamental ideas, the facts will take care of themselves. My own experience is that, for the amount of time spent in study, the outfit of actual information about chemical substances is unreasonably small. The unfortunate policy of feeding students on peptonised and malted facts may avoid mental indigestion in college, but it predisposes them to colic afterwards. Certain very prominent text-books have had a bad influence in this direction, by seeking to eliminate all possible difficulties of comprehension and any reference to partially solved problems. It is not uncommon for students to ask if they "have to remember the names of those substances" in their lessons, after a few weeks with those books; indeed, the question is not unreasonable, if we consider that the names constitute the sole remaining difficulty. Again, both text-books and teachers seem afraid that the students will know too much, and prune out all except matter of the first importance. To be sure, excess of detail must also be avoided if clearness of presentation is sought; but is not the present tendency somewhat too violent a reaction from the methods of our forefathers? One very prominent teacher told me some years ago that each year he takes up less material in his lecture courses; what will become of them in 10 years more? It is the function of the teacher to guide students through the maze of facts as through a crowded city, that later they may find their own way about; not to whisk them around in a closed trolley-car, on the globe-trotter principle.

One difficulty lies in the use of text-books which are, really, only elaborated outlines of a lecture course. The result of using such books is that the student's horizon is bounded by the cover-boards. A lecture must be straightforward and consistent if it is to have any value at all; but the printed page can be read over and over again, and its details mastered gradually. The text-book alone can provide the large number of facts that must be assimilated; the lecturer's syllabus is properly a key to the text-book, and no more. The teacher thus has a perfect right to demand of his students a greater knowledge of detail than he himself presents in his lectures. Another obstacle to the absorption of the proper number of facts lies in the almost universal attempt to treat a subject once and for all. This does not seem rational, nor do the student's mental limitations make it feasible. To take up the metaphor of the crowded city, the first efforts of a good guide result in a general survey, pointing out the topography, main thoroughfares, and most important activities. Then come historical landmarks, and those sights which distinguish this city from all others; finally, a detailed study of each quarter, of special industries, and of prominent people. We can follow no better plan in teaching a new science, giving a broad survey first, then repeat, filling in many new details; finally going over it a third and a fourth time if necessary. In this way the student's memory will be aided rather than overtasked; the relationship of parts to the whole, one of the most difficult of problems to him, will certainly be clearer; and the relative importance of various topics will stand out prominently. Then we shall avoid the necessity of turning out "chemists" whose sole acquaintance with chemistry as distinguished from analysis was formed in the freshman year, and discontinued immediately thereafter. Chemical facts ought to be systematically studied each year of the college course.

But little need be said in addition to the above concerning the laboratory work to be correlated with this plan. I should merely wish to emphasise that substances should be studied from the preparative, analytical, and physico-chemical sides simultaneously; the artificial division of the science for purposes of classification should influence th course of instruction little, if at all, during the first tw years.

The Chemical Instinct.—Chemistry is a science whic reasons about facts through a medium of abstractions. W observe colours, smells, and precipitates, and we talk abo atoms, molecules, and space configurations. The thinkin chemist must continually bridge the gulf that lies betwe fact and fancy; if he can do this freely, and avoid met physics, he possesses the chemical instinct. To devel this instinct in the student is the most important and mo difficult problem of the teacher. Aside from intuiti inherent teaching power, I know of but one plan f fostering this instinct; every topic should be present in the form of a problem. Chemistry has advanced to present proportions because of the problems presented it; all research work is a series of correlated problems; t installation of every manufacturing plant, of every n process, the regular operation of every established facto is a series of problems; every analysis for whatsoe purpose is a problem; teaching is one vast problem. T main preliminary to the solution of any problem is a cl and complete realisation of its nature. What is aimed what are the difficulties, what means are available? Th questions should be as definitely in the mind of the stud at every point of his college work as they must necessa be in his later professional activity.

Analytical Skill.— Perhaps no portion of chemi instruction is better given than training in analytical wo Methods have been worked out with such precision, mechanical aids are so perfect, that given time, patience, care, anybody may become a fairly skilled analyst. Mo over, teachers seem agreed that intoductory work, both qualitative and in quantitative analysis, should precede special analytical courses. Perhaps it may seem superflu to offer any suggestions for the improvement of this por of chemical training. I shall discuss this later. At point I wish to speak of these special courses. It already been shown that they constitute the crux of "technical" training of this country. It seems to me they tend to destroy the unity of analytical practice inducing the student to specialise far too narrowly and too soon. Students often spend the whole of their t and fourth years at college on these courses alone, and deliberately sacrifice the sole opportunity of their live acquire a broad and thorough training for all fu emergencies. I have known students at one of the lar universities of the land to avoid all courses on theore and organic chemistry, on the ground that they w have no use for them at a blast furnace—that co sending most of its graduates into the iron industry. Su no college should thus encourage its students to ne their opportunities. A little of the wise and far-sig co-operation practised by German employers would fu immediate relief from this state of affairs. Experience shown that the employer does not suffer by cho broadly-trained chemists in place of stall-fed analysts.

Besides, most of the "technical methods of analy taught in our colleges have a way of getting antiqu Each year witnesses some new committee of tech societies for the purpose of improving analytical met By the time these methods get into the text-books (co plates being valuable) another committee is under If such analytical instruction is reserved until the last at college, and then based upon the reports of committees, the student will be more likely to ac really useful knowledge, and have more time for br study.

Skill in making Preparations.—Until quite recentl only training in the preparation of chemical substance afforded by organic chemistry; latterly, a number of co have introduced courses in inorganic preparations as These courses constitute excellent discipline, as far a go; they do not go far enough. The actual preparat chemical substances may serve three purposes. It n intended to place the substance in the student's han study; if no more is sought, it is often cheaper and quicker to furnish it out of laboratory stock. It n intended to illustrate the reaction. In combinatio first purpose, this end is eminently desirable for inners; for advanced students it wastes too much time roportion to the result, such illustration would be met vell by the use of chalk and blackboard. And finally, uy be intended as a study of chemical technology. As i, it must inevitably take cognizance of the aims of nology, which are to prepare a substance in given grade arity from the available "Ausgangsmaterialien" at the lest cost of time and money. It involves a sufficiently plete knowledge of the materials employed, strictest omy of time, labor, and reagents, the demonstration of equired purity, and a calculation of cost and value. If stance be prepared along these lines, to the amount of grm. or of one ton, it constitutes an exact duplicate of ical methods. The factory may employ cast-iron vats ice of flasks, and filter-presses in place of funnels; it the more "technical" by virtue of its appliances.

will be objected that no university can make soda-ash lphuric acid on technical lines. To be sure; but it not attempt to. The first condition of success in any taking is a clear understanding of one's limitations. college cannot do much more than teach the factory ; if it does that much well, enough will be accomd at present. Moreover, chemical industry is not d to the production of heavy chemicals at the rate of ons a day. Innumerable substances are manufactured tively small quantities, and by methods which do not widely from standard laboratory manipulations. are wholly within the power of the college. I would e that each college inaugurate as a part of its ilum, required of all its graduates in chemistry, a ar's course in the actual economical preparation of tory supplies. It can manufacture most of its own ally pure reagents, ammonia, and its salts, the proof the rarer minerals, either much more cheaply than n be bought or imported under existing revenue laws. actically all its organic preparations from a few al products. Even if it should cost a little more e these substances than to buy them, the gain in experience to instructor as well as to students is he extra cost. The equipment for this work need expensive. For the chemically pure reagents, for e, the same outfit of large evaporators and crystallishes, solution tanks and filter presses can be used. ed of great care in cleaning these out for use on t materials would be an excellent feature of the be controlled by analysis. By systematic planning, ratory could manufacture from 30 to 60 substances in quantities to last five years; at the end of that t would have supplied all its wants, and could begin e over again. In one year of such work the student gather more experience than a factory would yield for no factory can undertake to slow down its re for the benefit of a novice.

nection with this laboratory instruction, the usual on chemical technology will certainly be more of results. Such lectures should not be omitted, hing else likely to broaden the student's acquainth facts. Indeed, these lectures are able to supply ion not obtainable in the factory, viz., the ion of factory methods, and the deeper principles erlie all technical work and are taken for granted— ness world drives them home with a club. Finally, hardly be said that frequent visits to every ment within reach should be a constant feature of gical training. In my own college course the t visits" materialised just once, when three large were visited in the course of two hours—another n of the optimism of college catalogues.

ntance with Current Chemical Thought.—The of familiarising students with new facts at first self-evident, and realised by all conscientious The main difficulty would appear to be the hment of the task. I know of only one method— not of well-doing, and to keep everlastingly at it. meetings of students and instructors on an basis, be it a "seminar" or a "chemical society," w facts are discussed without reference to their ion, comprehensive lectures on recent progress, essays by the students themselves, the current numbers of journals laid out in a cosy reading-room in the laboratory (the librarian must be overcome by fair means or foul)—all of these methods persisted in for two or three years will solve many a "complex unknown" cerebral obstruction. *Ad astra per aspera.*

Where to Find the Time.—The ambitious programme I have outlined now calls for the consideration of a purely practical problem: How can we find the time to accomplish all this? Even as our courses stand, there is barely time within the four years at college to complete the minimum of chemical work; where is there room for all the extra lectures and laboratory exercises that a really thorough technical preparation would seem to call for? I am afraid that my suggestions will contain many heresies.

For one thing, our college authorities must be made to realise that the main essential of training in technical chemistry is a knowledge of chemistry. This somewhat axiomatic doctrine is by no means universally accepted. Thus, the chemical engineers in two prominent institutions (Columbia, Pennsylvania) take considerably less chemistry than other students in chemical branches. Now while other topics are certainly necessary and valuable assets for chemical engineers, there must be a limit somewhere. The main problems before even the chemical engineer are chemical; those of the teacher and analyst almost wholly so. I will not presume to outline just how much or how little of these extraneous courses should be incorporated in the curriculum for technical chemists; but I should like to venture upon the principles which may fitly guide those more directly concerned with the task. I should say, then, that the question should be considered upon its own merits: no inherited prejudices, no educational theories should stand in the way of the prime fact that in studying chemistry a knowledge of chemistry comes first. The problem of general education and culture must not be allowed to interfere in any way; where cultural education is also sought, the time needed for it must be debited to its own account, and not written off the technical calendar. The two problems are absolutely distinct, and have no relation to one another. This must be insisted upon, since college faculties are only too prone to ignore it altogether. Better for a college not to give any technical courses at all, than to play at makebelieve and ruin the careers of its graduates. If four years at college are not enough for both general and technical education, take six eight, or ten—but take enough to do the work thoroughly. I would say, also, that the non-chemical subjects should be reduced to the lowest possible figures, and chemistry be given the benefit of every doubt. Wherever feasible, these subjects should be a part of the general education, and thus serve both ends; such would be, *e.g.*, German and French, physics, first-year chemistry, mathematics, &c. The cardinal rule should always be kept in mind, that it is better to know one thing well, than to have a smattering of many and command of none. We must not expect to see in each of our students a Helmholtz or a Ludwig Mond; if any of them are destined for such versatility they will have little need of our poor instruction.

One solution of the time problem, then, is to insist that enough time must be granted, and all extraneous matter reduced to a minimum. By the same token, however, it behoves us as conscientious chemists to do our best to shorten the time required for our own subject for the benefit of the student, it might be observed, not for the benefit of the college faculty. By the aid of one further heresy, I feel able to indicate where an important saving of valuable time may be accomplished. I would abolish from the curriculum the study of qualitative analysis, the archtype of anachronisms. We owe a tender feeling to the kindly nurse who brought us up carefully, and taught us the dark ways and vain tricks of the phosphates; but our nurse is old and decrepit, and no longer able to guide the toddling steps of the beginner. It will not be difficult to prove this. The study of qualitative analysis is intended to give knowledge of a useful art, and specific exercise in chemical thinking. It achieves neither purpose.

Systematic Qualitative Analysis as a Useless Art.—The problem of systematic qualitative analysis, as taught in our schools, is to recognise all the ingredients of a given mixture. As a matter of fact, however, how much of this art have we achieved? We are able to recognise a limited number of inorganic acids and bases under special circumstances; and the instructor must exercise great self-restraint not to make his unknowns "too hard." As for the rarer acids and earths, to say nothing of the vast bulk of organic compounds, as well as for the commoner acids and bases in the presence of these latter substances, we must admit our inability to follow any comprehensive "scheme" of analysis. The analysis of such mixtures resolves itself into a series of special tests; and our only check upon the correctness of the analysis comes through the quantitative necessity of finding 100 per cent. of the ingredients. This limitation is clearly recognised by the professional analyst. Thus, the chemists of the United States Geological Survey never carry out qualitative analyses of the rocks they investigate; they assume that all of some 20 or 30 ions are or may be present, and check the absence of any one during the progress of the quantitative analysis. Nor do they undertake to analyse one single sample for all of these 30 ingredients; two or more possible ones constitute a group that is examined by itself, without reference to the other contents. Again, the analyst is seldom, if ever, called upon to make a complete analysis of an absolutely unknown brew; on the contrary, he is usually asked to estimate some two or three ingredients, whose presence is either known or whose absence is to be demonstrated. The assayer never makes other than a quantitative analysis of gold and silver ores. For the food analyst, all is grist that comes to his mill—moisture, fats, carbohydrates, proteids, and ash.

Where then is our boasted art of qualitative analysis, and where the need of dragging every chemist through the wearisome unknowns, so fearfully and wonderfully made, the like of which man never saw before nor will again? Why spend from two hundred to four hundred valuable hours to teach an art which does not exist? At the same time, it will be objected, the numerous qualitative tests referred to must be learned, and as well this way as any other. Not so; the important qualitative reactions of all the important substances should be studied in the first instance, when the substances themselves are studied, not be kept on ice for a "systematic" course. In the laboratory instruction in elementary chemistry time can be found for the methods of recognising the acids and the metals the student works with, while he is working with them. We must counteract our mania for subdivisions and classifications, and teach chemistry as a unit. To be sure the regular "scheme" for the metals and acids is a useful thing occasionally, and students ought to be familiar with it; but it can be taught in one week to any student having a fair supply of analytical reactions among his mental baggage. I would teach these reactions by the side of a course in chemical preparations, rather than in a course by themselves.

Qualitative Analysis as an Inferior Discipline.—The intrinsic value of qualitative analysis is thus seen to be small. Its pedagogic merit is not much greater. As a matter of fact, teachers know only too well that it requires herculean exertions on their part to prevent students from rushing through the course mechanically. The majority of text books are the merest skeletons of outlines, omitting a vast bulk of details "because they interfere with a clear grasp of the subject." One is strongly reminded of the way in which Latin is, or used to be, taught; the object being to reproduce its literature and culture, the literature and culture are left out to have more time for the syntax. So with qualitative analysis, the object being to train analysts, the analytical facts are left out to have more time for the system. Nor are we alone in our troubles; permit me to quote from the recent vice-presidential address of Professor W. H. Perkin to the British Association:—

"It has always seemed to me that the long course in qualitative analysis which is usually considered necessary, and which generally precedes the quantitative work, is not the most satisfactory training for a student. There can be no doubt that to many students qualitative analysis is little more than a mechanical exercise; the tables of separation are learnt by heart, and every substance is treated in precisely the same manner; such a course surely not calculated to develop any original faculty wh the student may possess. I question whether any re competent teacher will be found to recommend t system as one of educational value or calculated bring out and train the faculty of original thought students."

With this quotation I am content to rest my case.

What shall we substitute for it?—One important ques remains. The art of testing unknown substances n always be an integral portion of the chemist's outfit the present course, designed for that very end, fails to te it, what alternative have we to offer? The plan I vent to suggest may be found worth a trial.

I propose, first of all, to annul the divorce of chem analysis and chemical preparation. Many colleges introduce quantitative experiments into their begin course, such as (I quote in part from a circular issue a conference of teachers at Chicago in 1896) def proportions by volumetric methods, multiple propor from the oxygen evolved from potassium chlorate perchlorate, equivalent weight of zinc, weight of a lit air, water of crystallisation in copper sulphate (stages), neutralisation of normal acids and bases, &c along with these quantitative experiments the stude also taught the descriptive features and qualitative te the substances studied, as well as the fundamental fac physical chemistry (also recommended and elaborate the Chicago conference), I should say that there we course eminently satisfactory. If time permits, a might be spent with great profit on this work. should come a course of the same general order, but difficult. Starting with a metal, a mineral, or technical product, the student should prepare a ser salts or other compounds of some ten or more n He should study the problem of obtaining the d compounds; submit his plan to the instructo criticism; prepare his substances, and analyse qualitatively and quantitatively. The analyses shou be complete, but merely for effective purity and unde impurity; for economy of labour should be taught, work done that is not of direct value under the circumstances. By a proper selection of materi teacher will be able to present to his pupils, two or three terms, all of the important qualitati quantitative methods of separation. Nor is it ne for each student to do exactly the same work; in should call it undesirable. Students would then lea each other as well as from the teacher, and a lab "atmosphere" would then be created where studen learn by a process of cutaneous absorption, as they do in Germany. The work, moreover, should be r regularly in the accompanying "seminar"; current a periodical literature should be searched for ad information bearing on each student's topics; innu little opportunities for research will present the and the most ought to be made of them; a well- course of lectures should run parallel with the lat work and expand its horizon, for the whole field of ch cannot be reviewed in the laboratory; and then, I ve believe, the instructor will have a class of intereste enthusiastic students. Special schemes of separat "systematic" analysis now so widely curre examination of milk and honey can then be t the special things they are, and made to take thei places in the economy of chemistry.

Conclusion.

In conclusion, allow me to summarise the prop have tried to maintain:—

(1) The practising chemist, be he teacher, an manufacturer, is of one kin.

(2) For that reason, the training for these p ought to be identical for several years at least.

(3) At present this training is inadequate.

(4) There is needed a much broader foundatio chemistry.

(5) The "chemical instinct" needs cultivation.

(6) Analytical training should be general rather than ecial.

(7) The college should establish *bonâ fide* courses in eparations, on a working scale.

(8) Acquaintance with current thought must be stered.

(9) Time must be made for this programme by cutting f all but the most important non chemical topics.

(10) Time can also be saved by eliminating qualitative alysis, because it is useless as an art, and inefficient as a scipline.

(11) The place of qualitative analysis should be taken properly organised laboratory courses.

Perhaps it will be best to leave the twelfth and last nclusion to the charity of my hearers.

THE DETERMINATION OF MANGANESE IN FERRO-MANGANESE AND NICKEL IN STEEL.

BY GEORGE L. NORRIS.

s method is based upon the separation of iron from the er metals by the solubility of ferric chloride in ether, l in its details is very similar to the well known ether thod for the determination of nickel in steel.

The details of the method are as follows :—½ grm. of o-manganese is dissolved in 15 c.c. of nitric acid of 2 sp. gr. in a beaker, evaporated to dryness, and heated a few moments to drive off all the nitric acid The idue is then dissolved in 30 c.c. of dilute hydrochloric l (equal parts of water and acid). This solution is then led to ordinary atmospheric temperature, and transferred 200 c.c. separating funnel, rinsing out the beaker with tle hydrochloric acid. To the solution in the separating nel add a drop or two of bromine and 40 to 50 c.c. of one, shake hard for a moment to mix the contents, then 75 c.c. of ether and shake again for two or three nents. Allow the solutions to separate and draw off the eous layer into a 600 c.c. beaker, washing out the traces aining in the funnel with a little dilute hydrochloric . Add to the solution in the beaker about 300 c.c. of water, which will drive off most of the acetone and ether ent. Bring to boiling point, add about 5 grms. of um acetate, and then precipitate the manganese the ng solution as phosphate, by the addition of 20 c.c. of a er cent. solution of sodium ammonium phosphate and xcess of ammonia.

fter the precipitate has been ignited and weighed, it is ssolved in a little dilute hydrochloric acid, and the l amount of silica present is filtered off and weighed. usually only amounts to a few tenths of a milligram. e is seldom any iron present. In case chromium is nt in the ferro-manganese, it can be determined in the ochloric acid solution of the ignited phosphate. This st conveniently done by reprecipitating the chromium osphate in the slightly acid solution in the presence dium acetate.

e use of acetone in the ether separation is of distinct otage, as being miscible in both ether and water, it its the ether to more readily remove the ferric chloride the aqueous solution. The bromine is used to nt the reduction of any ferric chloride during the ation.

e method is equally applicable to manganese ores and anese in steel. In the case of ores these can be lved direct in strong hydrochloric acid, then diluted an equal amount of water, and the separation made as .

is method has been in constant use for over a year, g which time it has been very thoroughly checked. A e of ferro-manganese containing 81·12 per cent. as uined by several prominent chemists, gave by this d 81·13 per cent. and 81·16 per cent., the time ed for a determination being about 15 minutes.

determining nickel in steel by means of this acetone separation, 1 grm. of steel is dissolved in 20 c.c. of acid of 1·20 sp. gr., evaporated to dryness, taken up in of dilute hydrochloric acid (equal parts of water and acid), transferred to a 200 c.c. separating funnel, and one or two drops of bromine and 40 c.c. of acetone added. After thoroughly mixing, 50 c.c. of ether are added and the solution violently agitated for a moment or two. The aqueous solution is then drawn into a second separating funnel and a second separation made with 50 c.c. more of ether.

The aqueous solution contains, besides the nickel, manganese and traces of iron, any chromium, aluminium, and copper that may have been present in the steel. Draw this solution from the funnel into a 600 c.c. beaker, add about 300 c.c. of hot water, bring to boiling point, add 10 grms. of sodium acetate and 10 c.c. of a 10 per cent. solution of sodium ammonium phosphate, and after boiling for a moment or two, add an excess of ammonia and continue boiling for a few moments. All the metals present excepting nickel and copper are precipitated and readily filtered. No nickel is lost in this precipitate. The filtrate is made acid with hydrochloric acid and the copper precipitated with hydrogen sulphide and filtered. The filtrate is then nearly neutralised with ammonia, brought to boiling point, and the nickel precipitated as sulphide, filtered, ignited, and weighed as oxide.

When chromium is present, unless sodium acetate is used, the precipitated phosphates have a tendency to go through the filter.

The results obtained by this method are a little higher, about two-tenths of a per cent., than when acetone and bromine are not used. By the use of acetone the ether separation is more quickly made. Three recent determinations by this method gave 3·81 per cent., 3·88 per cent. and 3·87 per cent.

THE SYNTHESIS OF INDIGO.

BY J. MERRITT MATTHEWS, PH.D.

1. *Introductory.*

UNTIL within quite recent times Indigo had its chief source in the plant raised principally in India and surrounding countries and islands. If we glance into the history of the dyer's art, we find that Indigo was one of the first dyestuffs of common use; its application in India and Egypt dates from times too remote to be reached by authentic history. Its introduction into European countries was of more modern date, this being accredited to Marco Polo, who carried it back with him from his journeys in India about 1300. Previous to this time, however, Indigo dyeing had been carried out to quite an extent in Europe by the use of woad, a plant which contains a certain amount of Indigo, and is capable of being utilised in a manner similar to that of the indigo plant itself. In fact, there appears to have been quite a conflict at the time between woad and indigo, resulting in the latter triumphantly establishing its superiority. At this point it may be well to call attention to the fact, in view of the present conflict between natural and synthetic Indigo, that Indigo, on its first introduction into Europe, was anathematised as a pernicious drug, and was spoken of as the "devil's food"; and furthermore, was regarded as a very inferior dyestuff, by no means the equal to woad in fastness of colour nor beauty of shade. In fact, so bitterly was its adoption opposed that laws were passed in several countries forbidding its use. However, as the natural law of the survival of the fittest will overcome all statutory edicts, true superiority must in time work out its own justification.

Although Indigo has been so well known as a dyestuff from antiquity, it is interesting to find that, notwithstanding its large and almost universal use throughout the world, very little was known of its chemical nature and constitution until comparatively recent years. It is also a highly significant point that this natural product was really the starting point for the artificial colour industry. Aniline, which may be said to form the basis of the vast majority of these products, was first discovered, we are told, by Unverdorben in 1826, who obtained it by the destructive distillation of Indigo. This, indeed, is a remarkable coincidence when considered in relation to the synthetic reconstruction of this dyestuff from aniline products. In fact, if we look into the derivation of the word aniline itself, we will find that it comes from anil (and this in turn from the Sanscrit word nila, meaning Indigo, and also signifying dark blue), the Portuguese name for Indigo; hence, etymologically considered, so called aniline dyestuffs are in reality Indigo dyestuffs. Again, it appears that Picric Acid, probably the oldest artificial dyestuff known, was first prepared by Haussmann in 1788, by the action of nitric acid on Indigo.

As Indigo has always been the most important dyestuff in practical use—its consumption probably exceeding that of any other—it is a matter of considerable surprise to find that its production has been regulated so little by what may be termed scientific supervision. The fact that it has always been in such constant demand probably accounts for this lack of care, as the Indigo producer could always find a ready market and a good price for his article, he was not much given to worrying about improvements or progress until of late years. Or, it may be, that like most natural processes, the raising of Indigo is not capable of any pronounced scientific refinement. Since the introduction of the artificial coal-tar dyestuffs, however, chemists naturally endeavoured to obtain a substitute for this all important vegetable dyestuff, as they had in mind several considerations:—

In the first place, Indigo is comparatively difficult to obtain in a uniform condition, so many are the influences of weather, soil, season, cultivation, preparation, &c., in determining the quality and quantity of the dyestuff produced from year to year; it may be said to fluctuate with the varying whims of nature, the conditions of which are but little understood, and hence not capable of proper control.

Secondly, Indigo is a peculiar dyestuff, in that its application radically differs from all others, its dyeing being carried out by what are to be regarded as clumsy and laborious methods in comparison with the ordinary processes of dyeing.

Thirdly, the commercial side of the problem was, of course, an attractive one; Indigo dyeing was high priced, and stood for a high standard of excellence. Substitutes for this dyestuff would, in consequence, have a large demand. This striving to replace Indigo in many of its applications by cheaper products and those more easily applied, has led to the result that there are more blue dyestuffs known than any other colour, and this is especially true of those which have their chief application to cotton.

We may be sure that it was not long after the artificial dyestuffs had been firmly established, that the attention of colour chemists was focussed on Indigo, with the certain result that the chemical nature and constitution of this body was soon ascertained. The next step was, naturally, its synthesis and its preparation by this means on a commercial scale. The solution of the problem relating to the constitution of Indigo is a fascinating subject to the student of organic chemistry, and the results which have been obtained form a beautiful demonstration of the truth and validity of chemical theory and philosophy. The successful synthesis and commercial preparation of this dyestuff, which soon followed the knowledge of its chemical constitution, has been one of the most brilliant achievements of technical chemistry, and exemplifies in a most striking manner the superiority of scientific methods.

II. *The Constitution of Indigo.*

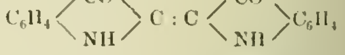
A full discussion of the chemical studies involved in the demonstration of the proper constitution of natural Indigo would be a too involved and lengthy task for the scope of this paper; but in order to understand and appreciate the working out of its synthesis, it will be necessary that we review in a cursory manner the leading points which resulted in the establishment of the chemical formula of Indigo.

Indigo, as it exists in the plant, appears to be combined in the form of a glucoside, which is known by the name of *indican.* This substance under the hydrolysing influence of acids or of an enzyme is resolved, like other natural glucosides, into a glucose, there also being formed Indigotin, which is Indigo Blue. The reaction proceeds accordi
to the following equation:—

$$\underset{\text{Indican.}}{2C_{26}H_{31}NO_{17}} + 4H_2O = \underset{\text{Indigotin.}}{C_{16}H_{10}N_2O_2} + \underset{\text{Indiglucin.}}{6C_6H_{10}O_6}.$$

The formula of Indigo here given was established
Sommaruga by analysis and determination of its vapo
density, its empirical formula, C_8H_5NO, having been p
viously ascertained by Crum and Laurent. In 1865 Bae
undertook a systematic investigation in reference to
chemical constitution of Indigo, and, after fifteen years
patient labour and research, this chemist and his colla
rators solved the problem, and effected the synthesis of t
dyestuff. The greater part of the work was of theoreti
interest, and had no industrial application, and it was
until almost twenty years more had passed that the probl
received its practical solution. But it was the work
Baeyer, in ascertaining the constitutional formula of Indi
that laid the basis of all the future chemical work w
respect to this dyestuff, and for this reason it will be w
to review the main points of the problem.

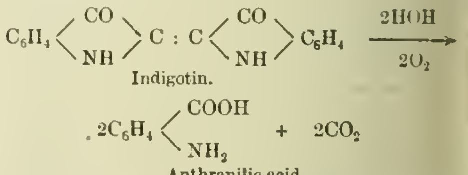
The constitution which Baeyer finally assigned
Indigotin was the following:—



$$C_6H_4\left\langle\begin{matrix}CO\\NH\end{matrix}\right\rangle C:C\left\langle\begin{matrix}CO\\NH\end{matrix}\right\rangle C_6H_4$$

Now, bearing this in mind, we may understand ho
was deduced from the following reactions and decomposi
products which Indigo was found to give.

1. Indigotin is converted into anthranilic acid by ox
tion in the presence of alkalis:—

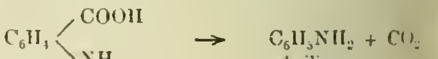


$$C_6H_4\left\langle\begin{matrix}CO\\NH\end{matrix}\right\rangle C:C\left\langle\begin{matrix}CO\\NH\end{matrix}\right\rangle C_6H_4 \xrightarrow[2O_2]{2HOH} 2C_6H_4\left\langle\begin{matrix}COOH\\NH_2\end{matrix}\right. + 2CO_2$$

Indigotin.

Anthranilic acid.

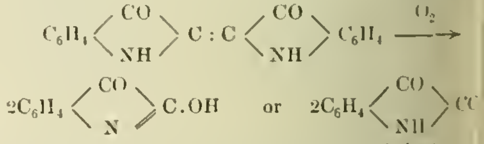
From this it is easy to understand the formation
aniline by the distillation of Indigo with caustic alk
the anthranilic acid being further decomposed:—



$$C_6H_4\left\langle\begin{matrix}COOH\\NH_2\end{matrix}\right. \rightarrow C_6H_5NH_2 + CO_2$$

Aniline.

2. Isatin is formed by the oxidation of Indigo:—

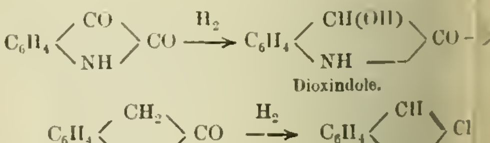


$$C_6H_4\left\langle\begin{matrix}CO\\NH\end{matrix}\right\rangle C:C\left\langle\begin{matrix}CO\\NH\end{matrix}\right\rangle C_6H_4 \xrightarrow{O_2} 2C_6H_4\left\langle\begin{matrix}CO\\N\end{matrix}\right\rangle C.OH \text{ or } 2C_6H_4\left\langle\begin{matrix}CO\\NH\end{matrix}\right\rangle C$$

Isatin.

Pseudo-isatin.

At first isatin was given the formula of its tauto
body, but from reactions which were afterwards obse
the first formula was assigned to it. This peculiar wa
ing of the hydrogen atom from the imido group o
Indigo to the hydroxyl group is also to be observed in
compounds possessing the nature of inner anhydride
isatin. The successive reduction of isatin yields i
dioxindole, oxindole, and finally, indole, as follows (
the tautomeric formula for isatin):—



$$C_6H_4\left\langle\begin{matrix}CO\\NH\end{matrix}\right\rangle CO \xrightarrow{H_2} C_6H_4\left\langle\begin{matrix}CH(OH)\\NH\end{matrix}\right\rangle CO$$

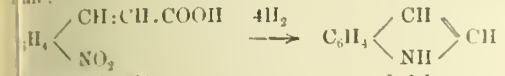
Dioxindole.

$$C_6H_4\left\langle\begin{matrix}CH_2\\NH\end{matrix}\right\rangle CO \xrightarrow{H_2} C_6H_4\left\langle\begin{matrix}CH\\NH\end{matrix}\right\rangle C$$

Oxindole.

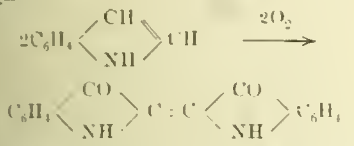
Indole.

1. This last body, indole, was prepared from ortho-nitro- namic acid, by heating with iron filings and caustic ali :—



trocinnamic acid. Indole.

. By the oxidation of indole, Indigo itself was again luced :—



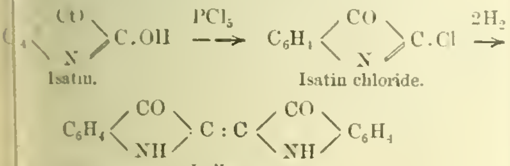
, in fact, was one of the first syntheses of Indigo.

By proving oxindole to be an inner anhydride of -amidophenylacetic acid, the formula of isatin was ned out in a logical manner; and then, from the ation of Indigo by the reduction of isatin chloride, ormula of Indigo itself was deduced.

3. *Syntheses of Indigo.*

e first synthesis of Indigo was effected in 1870 by er, and since then numerous chemists have accom- d this by a widely-different series of processes, he more important of these it will be our purpose to ite.

From isatin (Baeyer and Emmerling, 1870).—This treated with phosphorus pentachloride, gives isatin de, which on reduction is converted into Indigo :—

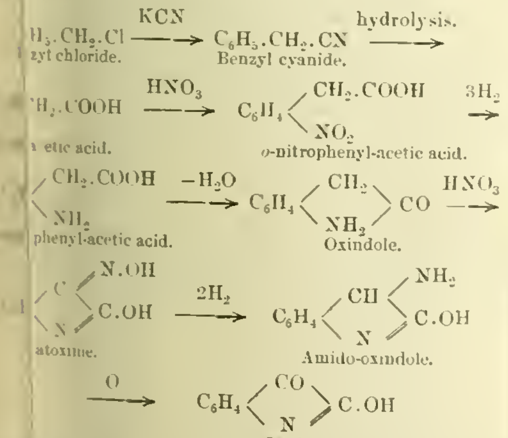


Isatin. Isatin chloride.

Indigo.

itself was synthesised as follows :—

From benzyl chloride (Baeyer, 1878).—When benzyl le is treated with potassium cyanide, benzyl cyanide ned, which on hydrolysis with alkalis gives phenyl- acid; this, by reaction with nitric acid, furnishes an nitro-compound. The latter on reduction is converted e corresponding amido-body, which on condensation ehydrating agents gives oxindole. Nitrous acid acting ndole forms a nitroso-compound, which, on reduction, erted into the amido-body, and isatin is finally formed oxidation of this latter compound :—



zyl chloride. Benzyl cyanide.

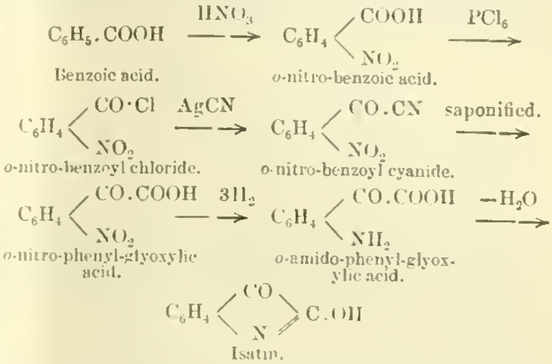
etic acid. o-nitrophenyl-acetic acid.

phenyl-acetic acid. Oxindole.

atoxime. Amido-oxindole.

Isatin.

rom benzoic acid (Claisen and Shadwell).— acid yields on nitration an ortho-nitro-derivative; tion of phosphorus penta chloride on this, the corre- g nitro-benzoyl chloride is produced. The chlorine is replaced by the cyanide radicle by means of silver cyanide, and then on saponification the nitro-phenyl-glyoxylic acid is formed. This latter body on reduction is converted into the amido acid, which condenses with the elimination of a molecule of water to form isatin :—



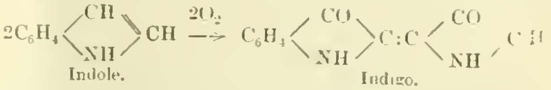
Benzoic acid. o-nitro-benzoic acid.

o-nitro-benzoyl chloride. o-nitro-benzoyl cyanide.

o-nitro-phenyl-glyoxylic acid. o-amido-phenyl-glyoxylic acid.

Isatin.

(2) *From indole* (Nencki, 1875).—When indole is oxidised by means of ozone under suitable conditions, it is converted into Indigo :—

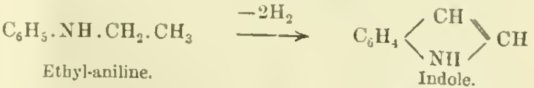


Indole. Indigo.

Indole itself was synthesised as follows :—

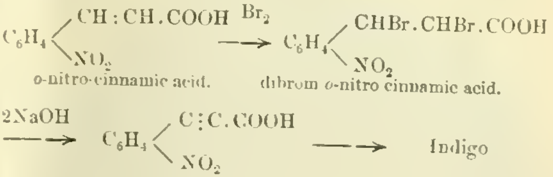
(*a*) *From ortho-nitro-cinnamic acid*, as has already been indicated above.

(*b*) *From ethyl-aniline* (Baeyer and Caro, 1877).—The vapours of ethyl-aniline, on being passed through a red-hot tube, condense to the closed indole ring :—



Ethyl-aniline. Indole.

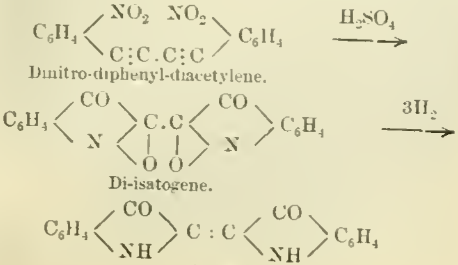
(3) *From ortho-nitro-cinnamic acid* (Baeyer, 1880).—This was the first synthesis which was patented. The propiolic acid compound was also used in printing in connection with sodium xanthate for the production of Indigo directly on the fibre. Ortho-nitro-cinnamic acid, being a body containing two unsaturated carbon atoms, combines with two atoms of bromine forming a dibrom-derivative. This latter compound, on treatment with caustic alkali, loses two molecules of hydrogen bromide, whereby the corresponding phenyl-propiolic acid is produced; and this substance, on being warmed with an alkali, is converted into Indigo :—



o-nitro-cinnamic acid. dibrom o-nitro cinnamic acid.

o-nitro-phenyl-propiolic acid.

(4) *From dinitro-diphenyl-diacetylene* (Baeyer).—The production of Indigo from this body furnished chemists with a proof that all of the carbon atoms in this dyestuff were linked together.

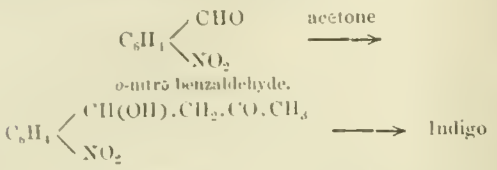


Dinitro-diphenyl-diacetylene.

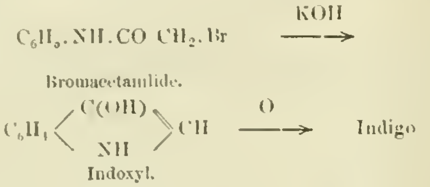
Di-isatogene.

Indigo.

(5) *From ortho-nitro-benzaldehyde* (Baeyer and Drewsen).—When acetone is allowed to condense with nitrobenzaldehyde, the usual ketone body is formed, which in turn suffers an inner condensation with the elimination of a molecule of water and the splitting off of acetic acid, resulting in the formation of Indigo :—

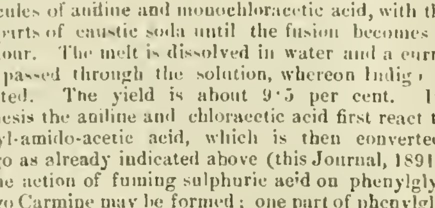


(6) *From brom-acetanilide* (Flimm) (this Journal, 1890, 281).—This body is formed by the action of aniline on bromacetyl bromide : by treatment wich caustic alkalis it is converted into indoxyl, which on oxidation gives rise to Indigo :—



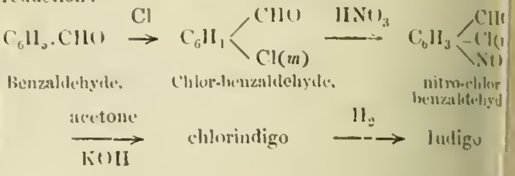
In carrying out this reaction, it is recommended to heat equal parts of bromacetanilide and caustic potash, until a homogeneous melt is obtained. This is dissolved in dilute acid, and ferric chloride is added, which causes the precipitation of Indigo. The yield of the dyestuff, however, is very small, being only about 4 per cent.

(7) *From phenyl amido-acetic-acid* (Heumann) (this Journal, 1890, 1121).—This substance, otherwise known as phenyl-glycocoll, is fused with two parts of caustic potash out of contact with the air. After cooling, the melt is dissolved in water, and a current of air is conducted through the solution, which causes the precipitation of pure Indigo. By using phenyl-glycocoll-*o*-carboxylic acid, the Indigo is formed at a lower temperature of fusion. In the reaction it is probable that Indigo-white is first formed, and this body, by the oxidising influence of the air, is converted into Indigo :—

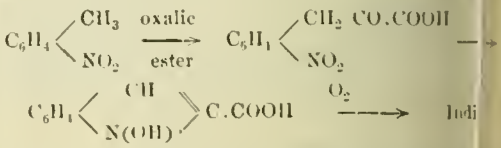


A variation of this synthesis, is to heat a mixture of equal molecules of aniline and monochloracetic acid, with three to four parts of caustic soda until the fusion becomes orange in colour. The melt is dissolved in water and a current of air is passed through the solution, whereon Indigo is precipitated. The yield is about 9·5 per cent. In this synthesis the aniline and chloracetic acid first react to form phenyl-amido-acetic acid, which is then converted into Indigo as already indicated above (this Journal, 1891, 827). By the action of fuming sulphuric acid on phenylglycocoll, Indigo Carmine may be formed ; one part of phenylglycocoll is mixed with 20 parts of sand and then added to 20 parts of sulphuric acid, containing 80 per cent. of anhydride, the temperature being kept below 30° C. A yellow liquid is obtained, which is mixed with sufficient concentrated sulphuric acid to combine with the excess of sulphuric anhydride present. The liquid assumes a blue colour, and yields Indigo Carmine on being salted out. The yield is about 60 per cent.

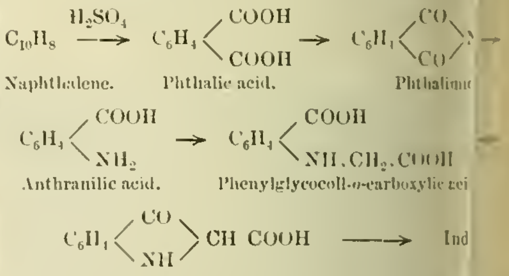
(8) *From Benzaldehyde* (Muller, 1883).—The chlorination of benzaldehyde yields meta-chlorbenzaldehyde ; on nitration this yields the ortho-nitro-derivative, which on heating with acetone and caustic potash, is converted i chlorindigo, from which Indigo itself is obtained reduction :—



(9) *From Nitrotoluene* (Reissert).—On heating o nitrotoluene with oxalic ester a nitrophenyl-aceto-fo acid is formed ; on reduction this yields an inner anhy which on oxidation gives Indigo. The yield is said t 23 per cent. :—



(10) *From Naphthalene.*—This synthesis represen latest development of the subject, and is the one on wl principally based the commercial success of synthetic I It really includes Heumann's process of using p glycocoll-o-carboxylic acid as has been described but it derives this latter body from naphthalene in a n that allows of its practical commercial application. been found that if naphthalene be treated with fumin phuric acid it is decomposed into phthalic acid ; thi is then converted into phthalimide, and thence in thranilic acid. By the action of chloracetic acid th is transformed into the phenylglycocoll compound which Indigo is then made in the manner already sho



The early syntheses of Indigo were of little or to the manufacturer, as the yield of dyestuff was in and the materials employed for its production expensive to allow of its being manufactured on mercial scale, in competition with the natural dyest first, the most promising synthesis appeared to which used ortho-nitrobenzaldehyde as a starti and the methods for making this compound were s perfected, as to bring it within the limit of cost industrial preparation of Indigo. But at this poin difficulty arose which was impossible to surmou raw material for the preparation of the nitrobenz is toluene, and it appears that for every part finally produced by this method, there is required at four parts of toluene. As the annual consumption for the entire world is estimated at about pounds, and as the total production of toluene i not much surpass this figure, it means that th output of toluene would have to be quadrupled i satisfy the demand of this chemical for the ma of Indigo alone, to say nothing of its other uses, that in order to successfully compete with the natu the artificial product must be capable of being quantity sufficient to supply the world's presen for that dyestuff. As toluene is derived from th industry in connection with benzol, and since ev toluene obtained means also four parts of benzo be necessary for the manufacturer to create a d

at extra amount of the latter product in order to make
e toluene commercially available, and such a task would
far greater even than making Indigo. It was then that
e derivation of the phenylglycocoll compound was dis-
vered from naphthalene, and the known method of making
thalic acid by oxidation with fuming sulphuric acid was
ule use of. This method furnished a raw material which
s both cheap and abundant; in fact, there was a surplus
naphthalene, and a quantity sufficient to supply all the
nands of the Indigo trade. It is interesting to note
it in this connection, another important development in
lustrial chemistry was effected, and one which will
ntually have considerable influence on other lines of
rk besides synthetic Indigo. It was found that the
d chamber process for the manufacture of sulphuric
l was not adequate to the production of the enormous
ntities of fuming acid required for the preparation of
phthalic acid from naphthalene, so the new sulphuric
l process, known as the "contact" method, was per-
ted. The Badische Company, to whom this valuable
rk was due, have become in consequence, the largest
ducers of sulphuric acid in the world, and are using
00 tons of the fuming acid annually for the prepara-
of their phthalic acid. In the manufacture of the
r chief chemical employed, the monochloracetic acid,
e quantities of pure chlorine were demanded. The
cesses of Weldon and Deacon proved to be unsatis-
ory, and the attention of the manufacturers was turned
he new electrolytic process for the preparation of
rine from alkali chlorides, with the result that the
hod was so far perfected that the necessary conditions
realised. Hence the chlorine is now prepared electro-
ally, and is used in a liquid condition.

may be said that synthetic Indigo became a commercial
ty in 1897, for it was in that year that it began to
ar in sufficient quantity to seriously compete with the
ral dyestuff. Since then the amount manufactured
been growing with great rapidity—a fact which may
nade apparent by a glance at the following statistics:—

Imports of Natural Indigo to Germany.

	Lb.
First six months of 1899	1,771,805
" " 1900	961,837

ing a decrease of about 15 per cent.

Exports of Synthetic Indigo from Germany.

	Lb.
First six months of 1899	1,191,700
" " 1900	2,085,447

ing an increase of about 75 per cent. Of the above
unt of synthetic Indigo exported from Germany during
first six months of 1900, the United States took
19 lbs.

Imports of Natural Indigo to England.

—	Lb.	Value, Dols.
9	5,897,700	4,930,450
0	3,351,800	2,610,445

ng a decrease of about 40 per cent. in one year.

cording to a recent publication of the Indian Govern-
the exports of Indigo from the provinces of Calcutta
Madras have been as follows:—

	Lb.
1895–1896	17,242,000
1899–1900	9,777,900

g a decrease of about 43 per cent.

se figures are very significant in their meaning. We
it behold in them the rapid extinction of the natural
industry, which forms one of the bulwarks of eastern
and commercial activity. It is the case of the madder
ersus synthetic Alizarin over again, and we can have
ubt as to the outcome of the strife. It is merely one more step in the progress of industrial chemistry along the lines of human ingenuity, and this problem having been solved, the time is ripe for the development of other fields.

Erratum.—This Journal, May 1901, page 445, col. 2, line 30 from top: after "Ceylon" insert "graphite."

Nottingham Section.

Meeting held at University College, on Wednesday, June 5th, 1901.

PROF. F. S. KIPPING, F.R.S., IN THE CHAIR.

THE CONSTITUTION OF GLASS.

BY W. JACKSON, A.R.C.S., AND E. M. RICH, B.SC.

The constitution of glass has been the subject of a great deal of work at different times by many workers. The result of these labours is that there are several views held on the subject. Sometimes one hears the chemical formula of a glass used with the same degree of assurance as that of sulphuric acid, the inference being that a glass may be considered as a definite chemical compound.

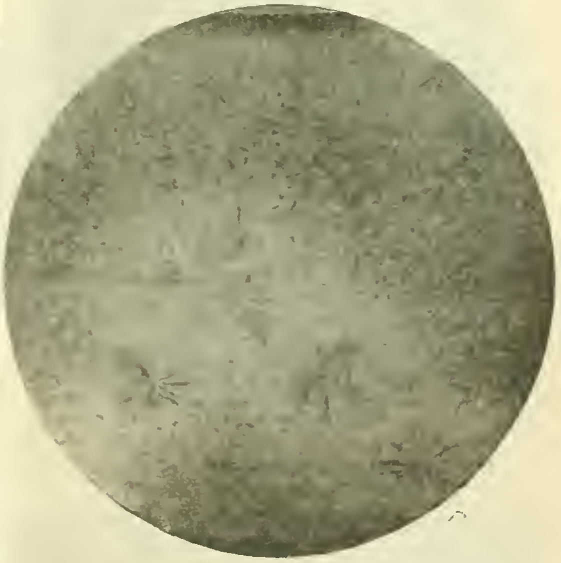
The view that glasses are "mutual solutions" of silicates has found much favour. To quote Benrath (Die Glasfabrikation), p. 25:—

"If one considers that the contents of silica in commercial glasses is very variable, and that at a higher temperature more of this acid can be taken up than can be retained by the glass as the temperature falls; that further, felspathic minerals may be taken up and again separated by a molten glass; finally, also sulphates, phosphates, borates, metallic oxides and metals (gold) may enter into the constitution of glasses, it would appear that these facts allow of no other explanation than that commercial glasses are quickly solidified solutions, not only of different silicates in each other, but even solutions of basic oxides or silica and other salts and metals, in molten silicate. Whether in all glasses some fundamental silicate, a compound, say—

$$Na_2O.CaO.6SiO_2 \text{ or } Na_2O.CaO.4SiO_2,$$

is to be taken as the solvent or not, must remain a question so long as nothing more definite is known than at present;

Fig. A.

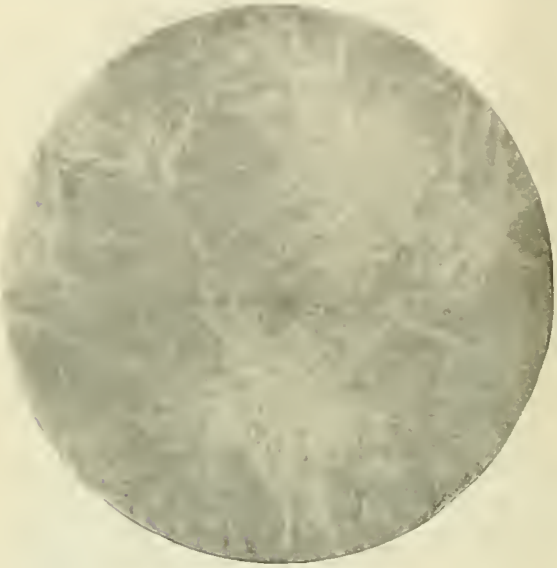


Negative Glass. Etched × 50.

yet many of the observations appear to speak for such an assumption."

On the other hand, Damas (Comptes Rend. 1855, **40**, 321), speaks of glass as being "an indefinite mixture of definite silicates": and in support of this contention many

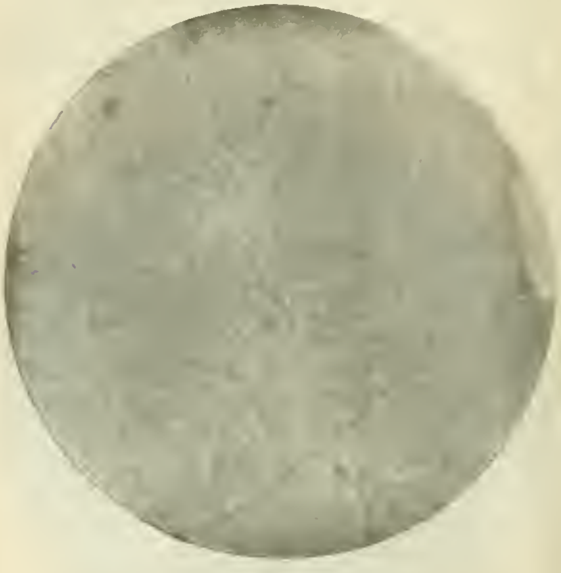
Fig. B.



Clock Glass. Etched × 50.

acts may be cited. The phenomena of devitrification afford strong evidence; for it has been shown that this change in the character of a glass is due to crystallisation of one or more of its constituents. To quote again from Benrath (*ibid.* p. 20): "It appears that the composition of the

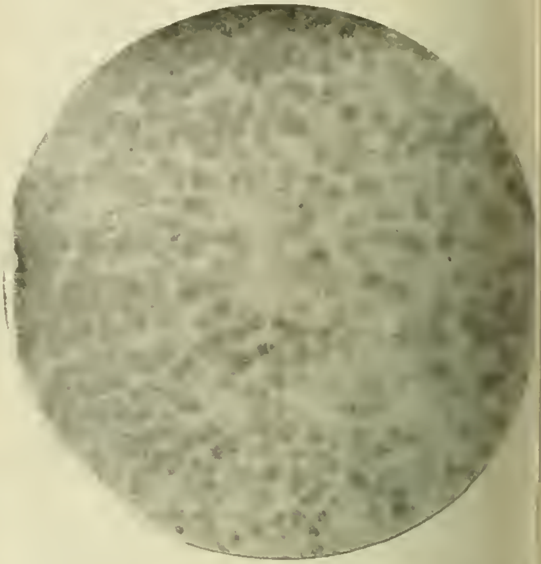
Fig. C.



Sheet Glass (Chance Bros.). Etched × 50.

crystalline portion of a devitrified glass differs from the amorphous matrix. The difference is, however, not great; nor could one expect it to be so, for the devitrified glass consists almost entirely of an entanglement of fine needles or six-sided plates which do not lie in close contact. The spaces between are filled with the undevitrified matrix, which we may consider as the solidified mother liquor of the separated crystals. A mechanical separation of these portions is not possible, and so the analysis of a mixture of at least two unknown bodies gives no clear insight into the constitution of either."

Fig. D.

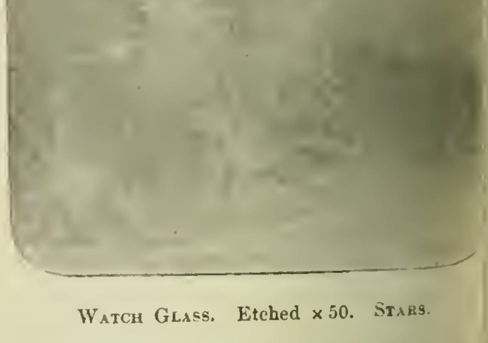


Sheet Glass (Chance Bros.). Etched, dil. HF. × 50

By suitable chemical means—fractional solution—it h been possible to separate a devitrified glass into disti constituents. In one case free silica, and in anoth felspathic minerals have been recognised.

It would thus appear that a devitrified glass is a hete geneous mixture, and while support is lent to the the that the original undevitrified material is likewis

Fig. E.



Watch Glass. Etched × 50. Stars.

mixture it cannot be accepted as conclusive proof. can conceive the formation of such a heterogeneous ture, when a glass is devitrified by being kept for a at a high temperature, on the assumption that one aling with a mixture, more or less homogeneous, and an agglomeration or segregation of the constituents place giving rise to crystalline forms. But on the hand it is also conceivable that there is a real ion, as described by Benrath, supersaturated at a high

Fig. F.

[Watch Glass. Etched × 50. Rod.

ture with some definite silicate or other compound gradually crystallises out. Hence the facts of ation may lend support to either theory

Fig. G.

rd Crown (Chance Bros.). Etched × 50.

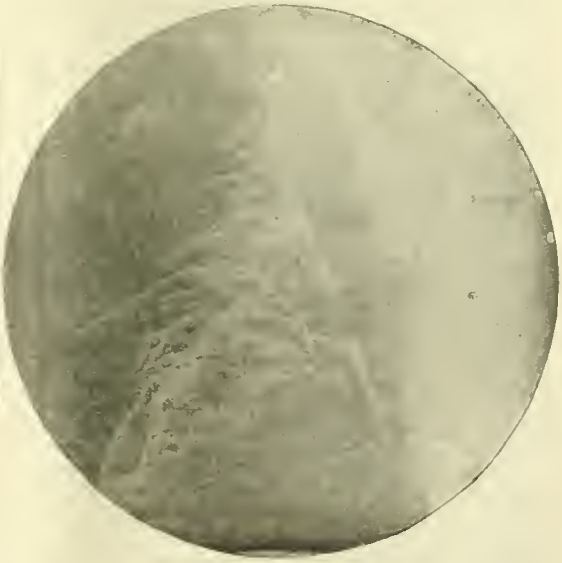
by Leydholt (Comptes Rend., 1852, **34**, 565), is t in this connection. He found that if a clear glass, in the condition in which it solidified from subjected to the action of concentrated hydrofluoric acid it is etched, and microscopic crystalline forms may be detected. Such forms are clearly indicated in the micro-photographs shown below, and which have been prepared according to Leydholt's method. It will be seen that common sheet glass (Chance Bros.), the glass of a

Fig. H.

Hard Crown (Chance Bros.). × 50.

photographic negative and cover-glasses used in the laboratory all show well-developed crystal forms or at any rate forms strikingly similar to those detected in sections of obsidian, pitchstones, &c., under the microscope. In every case the forms are starshaped, or rods with crystalline radiations on both sides, and are particularly well developed

Fig. K.

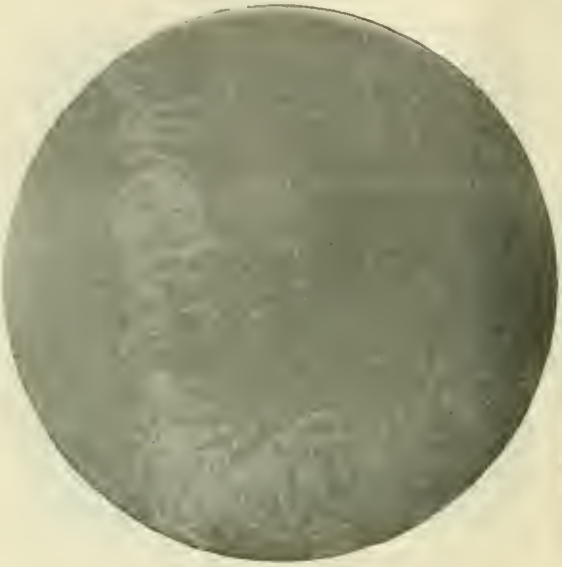


Dense Flint Chance Bros.). Etched × 50.

in the glass of a sensitive plate. There is also shown the appearance of the glass surface when acted upon by dilute hydrofluoric acid. In this case the surface is irregularly broken up, with no sign of crystalline structure.

The forms developed on the surface of a lead glass are very different. In every case examined—dense optical flint glass, light optical flint glass and soft crown glass (containing oxide of lead) from Messrs. Chance Bros., the same characteristic forms have been developed with no trace of the forms common in ordinary glasses or optical glass free from lead. They consist of sets of parallel-curved filaments extending on both sides of an axis to varying distances. In different glasses the curves are surprisingly similar and may in many cases be actually superposed. It would hence appear that the formation is not due to accidental irregularity in texture of the glasses.

Fig. L.



Light Flint (Chance Bros.). Etched × 50.

It would thus appear that the ideas now prevalent as to the structure of steels and alloys, and which are based largely on the crystalline forms developed by etching polished surfaces, must be extended to glass, for we see that even the best optical glass presents similar phenomena.

To further elucidate this point it would appear that the regular chemical methods are bound to fail, for the only means of opening up these compounds result in their decomposition. The proximate constituents of the glass are destroyed in the effort to separate them.

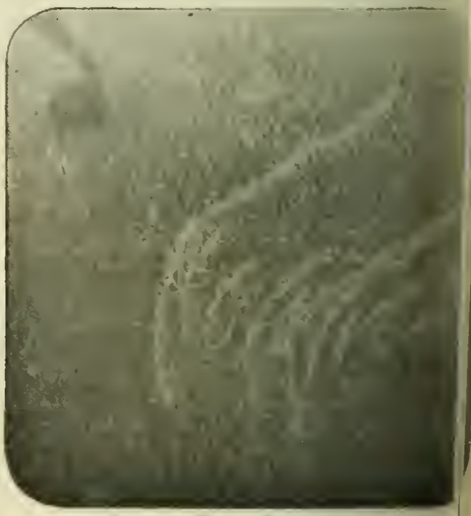
Certain physical methods, however, seemed to us worthy of trial. We argued that if glass is a definite chemical compound all parts of it should be possessed of exactly the same physical properties, no matter how small the pieces of glass examined may be. The same would be expected if glass is a "mutual solution" of silicates. Applying the term "solution" in its strict sense, the substances are in such a condition that unless the degree of division is molecular in its fineness, all particles must be possessed of the same properties, and have the same composition. Hence, whether glass is a definite chemical compound or a mutual solution, physical methods would be expected to fail in bringing about a separation of the material into distinct proximate constituents. If, however, glass is but a more or less uniform mechanical mixture of various compounds, it appeared to us that a physical method of attack might be successful. Differences in specific gravity, hardness, and toughness, would be likely to exist between the different members of the mixture, and taking advantage of these differences it might be possible to effect at any rate a partial separation.

Experiments on these lines have been carried out, and the results seem to show that the theory of mechanical mixture is likely to be correct. Necessarily the homogeneity of the mixture will be different in different glasses,
according to the processes adopted in the manufact
The more complete and prolonged the fusion of
batch, and the more vigorous the agitation of the gl
the greater will be the homogeneity of the mixture. W
the very best glasses, for instance, optical glasses, therel
one would not expect to find this physical method
separation to be so successful as with commoner glas
Yet the circumstance that a separation in such a case mi
be impossible would not necessarily condemn the the
The fact would be indicated that the components have l
so intimately mixed, or so finely scattered through
other, that physical means fail to get between them for
separation.

Faraday, by examining the higher and the lower por
of a flint glass batch, has been able to show a differenc
chemical composition. The lower layer of glass was ri
in lead oxide, and therefore heavier, than the upper lay

In our experiments, however, we have sought to d
mine whether such difference might not also be detect
different portions of a small piece of glass, not excee
2 c.c. in volume. In Faraday's experiments the differen
would be explained by assuming the heaviest portio
batch had settled out. Using, however, such
volume of glass as we have used, this settling is ou
question.

Fig. M.



Soft Crown (Chance Bros.). Etched × 5

The problem was investigated as follows:—

Several lead fritts—which are glasses used by po
glaze-making—and which were quite clear excep
presence of a few small bubbles, were ground in
and the lightest or finest material was floated off fr
to time with water into a Schone's Elutriation Ap
From this ground material the finest and lightest
were separated by a current of water having a ve
about 0·7 m.m. per sec. The maximum diamete
particles would not exceed 0·01 m.m. The portio
over by the water and the coarser remainder
apparatus were dried at 100° C. and the content
oxide determined. The method of analysis was a
The fritt (0·5 grm.) was decomposed at a gentle
platinum dish with 5 c.c. of re-distilled hydroflu
A few drops of concentrated sulphuric acid we
and the whole evaporated to dryness and gentl
until all silicon fluoride and acid fumes were d
The residue was moistened with hydrofluoric acid
evaporated with sulphuric acid to ensure complet
position. The residual sulphates were dissolved
hydrochloric acid and the lead precipitated as su
sulphuretted hydrogen. This was filtered, wa

ed in a porcelain crucible with a drop of nitric and huric acids and weighed as lead sulphate.

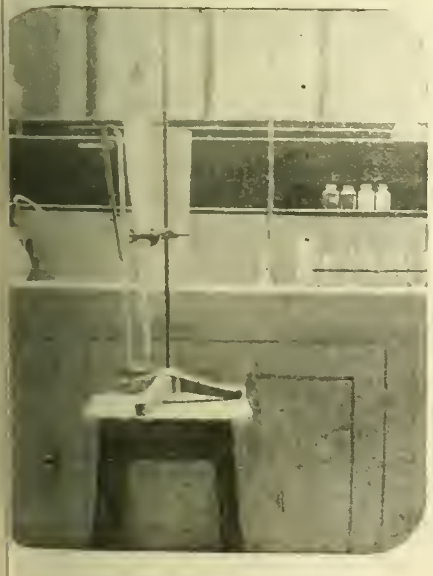
e following table shows the results obtained with ous fritts :—

Material Carried over by 'elocity of Water 0·7 mm. per Second.	Material left in Elutriation Apparatus.
Per Cent. PbO.	Per Cent. PbO.
32·24	33·9
32·69	35·24
31·92	34·8
31·26	35·5
30·5	34·9
47·7	48·6
30·4	33·8
31·1	37·38

om these results it is plain that in every case the finest on has a lower percentage of lead oxide than the nder. The average difference is about 10 per cent. of ad contents of the fine fraction.

se variations in the analyses may be due either to real ences in the composition of the two portions of the or to contamination of the finely ground portions with ial ground off the mortar and pestle used in their ration. In the latter case the contamination would be exceedingly fine condition and would therefore be associated with the finest fractions of the fritts, in it would cause a reduction of the lead contents. oint was examined as follows :—One of the fritts was d in a weighed agate mortar and the finest portion d off with distilled water. This and the coarse nder were dried, and the lead oxide present was to be 31·6 per cent. in fine fraction, 34·6 per cent. in fraction. No loss of weight was observed when the ortar and pestle were re-weighed. Hence it appears hed that the finest portions were not contaminated erial from the mortar, and that therefore there is a fference in the chemical composition of different s of these glasses when separated in this way.

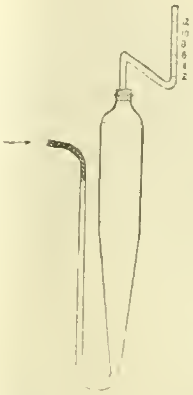
Fig. 1.



View of Elutriation Apparatus.

physical properties taken advantage of are probably ess and hardness—which would affect the ease with fine material may be obtained—and also specific . In fact it would appear to us that the last-mentioned y may have been the most important from this point of view; for decrease in the contents of lead oxide in a glass is associated with a decrease of the specific gravity. [Except of course in such as thallium glasses containing elements of greater atomic weight than lead]. Hence, if all the particles of glass submitted to elutriation were of the same size and shape, such as possessed the lowest lead contents would be the first to be carried over. This agrees entirely with the results obtained. We doubt, however, whether the specific gravity was the sole property taken advantage of: for it is well known that glasses vary in elasticity or resiliency according to lead contents. The glasses containing little or no lead oxide are more brittle than those with higher contents of that oxide. Hence it might be easier to obtain a fine powder from the more brittle constituents of a glass than from the tougher. It is, hence, difficult to decide whether the specific gravity, the toughness or both properties were the agents of the separation.

Fig. 2.



Elutriation Apparatus. Sectional Diagram.

The following are the complete analyses of the two portions into which one of the fritts used was divided :—

——	Finest or Lightest Portion.	Coarse Residue.
Silica	48·78	46·06
Lead oxide	31·00	34·10
Alumina and ferric oxide	6·82	6·09
Lime	11·12	11·46
Alkalis	2·28	2·36
	100	100

These results may be expressed in formulæ as follows :—

$$\text{Fine...}\left\{\begin{array}{l}0{\cdot}37\ \mathrm{PbO}\\0{\cdot}53\ \mathrm{CaO}\\0{\cdot}10\ (\mathrm{NaK})_2\mathrm{O}\end{array}\right\}0{\cdot}018\ \mathrm{Al_2O_3}.2{\cdot}16\ \mathrm{SiO_2}.$$

$$\text{Coarse}\left\{\begin{array}{l}0{\cdot}38\ \mathrm{PbO}\\0{\cdot}52\ \mathrm{CaO}\\0{\cdot}10\ (\mathrm{NaK})_2\mathrm{O}\end{array}\right\}0{\cdot}015\ \mathrm{Al_2O_3}.1{\cdot}96\ \mathrm{SiO_2}.$$

From these formulæ it would appear that the finest portion is almost exactly a disilicate. Assuming Al_2O_3 to be a base, the ratio of basic to acidic oxygen is 1:4·09, whereas for a disilicate the ratio should be 1:4·00.

It seems therefore to be established that potters' lead fritts consist merely of a more or less heterogeneous mixture of at least two distinct compounds.

Our attention was now turned to commercial glass, for it appeared to us that what was found to be true of fritts might be found to apply, to some extent at any rate, to ordinary glass.

The first glass examined was a piece of a clock glass. It was prepared by grinding and elutriation as previously described. The fine and coarse fractions gave the following analyses :—

——	Fine.	Coarse.
Silica	71·03	71·18
Alumina and ferric oxide	3·54	2·00
Lime	16·23	15·08
Magnesia	0·72	0·65
Alkalis	8·68	11·83
	100·2	100·74

The equivalent of the alkalis was 33·25.

These figures give the following chemical formulæ :—

$$\text{Fine} \ldots \left\{\begin{array}{l} 0{\cdot}66\ CaO \\ 0{\cdot}04\ MgO \\ 0{\cdot}30\ (NaK)_2O \end{array}\right\} 0{\cdot}08\ Al_2O_3 . 2{\cdot}70\ SiO_2.$$

$$\text{Coarse} \left\{\begin{array}{l} 0{\cdot}584\ CaO \\ 0{\cdot}034\ MgO \\ 0{\cdot}382\ (NaK)_2O \end{array}\right\} 0{\cdot}04\ Al_2O_3 . 2{\cdot}56\ SiO_2.$$

The fine part is richer in the lime and silica principally.

Daubrée (Ann. des Mines, V. Serie, 1857, **12**, 297) has shown that by digestion in a sealed tube with superheated steam at a high temperature, ordinary glass is decomposed into quartz, wollastonite, and alkaline silicate. It would appear that a similar separation has been attained by our physical method. It can be shown that the fine part may be considered to consist of 76 per cent. of the original glass, 10·7 per cent. of wollastonite or similar minerals, 12·5 per cent. of free silica. (See Appendix.)

Similar experiments have been carried out with English flint glass. Results as follows :—

——	Finest or Lightest Fraction.	Coarse Fraction.
Silica	55·94	53·74
Lead oxide	33·70	34·50
Alumina and ferric oxide	0·90	0·48
Alkali	9·44	11·24
	100·00	100·00

Equivalent of alkalis: fine, 37·5; coarse, 43.

and these give the formulæ—

$$\text{Fine or light} \ldots \left\{\begin{array}{l} 0{\cdot}54\ PbO \\ 0{\cdot}46\ (NaK)_2O \end{array}\right\} 3{\cdot}35\ SiO_2.$$

$$\text{Coarse or heavy} \left\{\begin{array}{l} 0{\cdot}542\ PbO \\ 0{\cdot}458\ (NaK)_2O \end{array}\right\} 3{\cdot}13\ SiO_2.$$

The difference appears to be in the silica contents.

But here, again, one cannot say what particular property has been taken advantage of. Mr. W. J. Pope, to whom our best thanks are due, suggested that we should try the effect of methylene iodide on our separation and so get rid of all effects but those of variation in specific gravity. The glass was finely powdered and was then placed in methylene iodide in which it floated. Benzene was added until some portion of the glass settled out. The liquid and suspended glass were then decanted. More benzene was now added to the suspension until the whole of the glass settled out, then methylene iodide until some portion was re-suspended. This was decanted and constituted the lightest fraction of the glass. On analysis the light portion was the same as that separated by elutriation, but the heavy part had the following composition :—

Heavy Flint Glass.

Silica	52·96
Lead oxide	35·03
Alumina and ferric oxide	0·78
Alkalis	11·23
	100·00

Formula :—

$$\left.\begin{array}{l} 0{\cdot}547\ PbO \\ 0{\cdot}453\ (NaK)_2O \end{array}\right\} 3{\cdot}06\ SiO_2,$$

from which it seems the heaviest constituent of the flint glass is practically a trisilicate.

That this glass as a whole is not a definite compound nor a mutual solution of silicates seems to be plain; for it will be observed, on comparison of the formulæ, that the ratio of the bases to each other is nearly the same in all three cases (*viz.*, 1·207; 1·195; 1·181), but the silica contents vary much more. The degrees of saturation are 3·35, 3·13, 3·06 in the lightest fraction, the glass as a whole, and the heaviest fraction respectively. It would seem that the lightest fraction may contain 95 per cent. of heaviest f tion, with 5 per cent. of free silica.

The specific gravities of the fine portion and the gla a whole were 3·14 and 3·19 respectively.

We have attempted to get a similar separation of constituents of certain optical glasses received from Me Chance, both the methylene iodide method and elutri being adopted. But to the present we have not succe in getting any appreciable difference in the various tions. Though the development of crystalline form the surface of these glasses by the action of hydrofl acid betokens some want of homogeneity, it is not su ently pronounced to enable our method to detect it. fact was, however, quite in accordance with our exp tions on the grounds previously mentioned.

It would hence appear that glass must be consider be a mixture of various silicates and oxides more or homogeneous according to the method of manufacture ordinary crown and flint glass the mixture is suffici imperfect to allow the constituents to be readily sepa by grinding; but the optical glasses show a much gr degree of homogeneity. The particles of the indiv constituents forming the mixture appear to have reduced to such a small size, and to be so unif distributed by the processes of manufacture, that gri fails to separate them. Still, we can conceive that by refinement of the method we have adopted, it m possible, even in these cases, to bring about a separat fractionation of the mixture. Possibly, however, the of sub-division of the constituents may be molecula so, the hope of effecting physical separation would h be abandoned.

As to whether such a molecularly fine mixture is considered a "solution" or merely a mechanical mixt a question we will leave to the physicist.

Appendix.

Clock glass :—

$$\text{Fine portion} \left\{\begin{array}{l} 0{\cdot}66\ CaO \\ 0{\cdot}04\ MgO \\ 0{\cdot}30(NaK)_2O \end{array}\right\} 0{\cdot}08Al_2O_3 . 2{\cdot}70Si$$

$$\text{Coarse portion} \left\{\begin{array}{l} 0{\cdot}584\ CaO \\ 0{\cdot}034\ MgO \\ 0{\cdot}382(NaK)_2O \end{array}\right\} 0{\cdot}04Al_2O_3 .\ 2{\cdot}56Si$$

Multiplying each coefficient in formula for fine by as to obtain a formula having 0·382 $(NaK)_2O$ become—

$$\left.\begin{array}{l} 0{\cdot}84\ CaO \\ 0{\cdot}05\ MgO \\ 0{\cdot}382\ (NaK)_2O \end{array}\right\} 0{\cdot}1\ Al_2O_3 . 3{\cdot}438\ SiO_2\ ($$

Deducting the formula of coarse (2) from (3), the is—

$$\left.\begin{array}{l} 0{\cdot}256\ CaO \\ 0{\cdot}016\ MgO \end{array}\right\} 0{\cdot}06\ Al_2O_3 : 0{\cdot}878\ SiO_2,$$

which may be represented as, molecularly,—

0·27 $(CaMg)O . SiO_2$ Wollastonite or similar py mineral)

0·60 free silica,

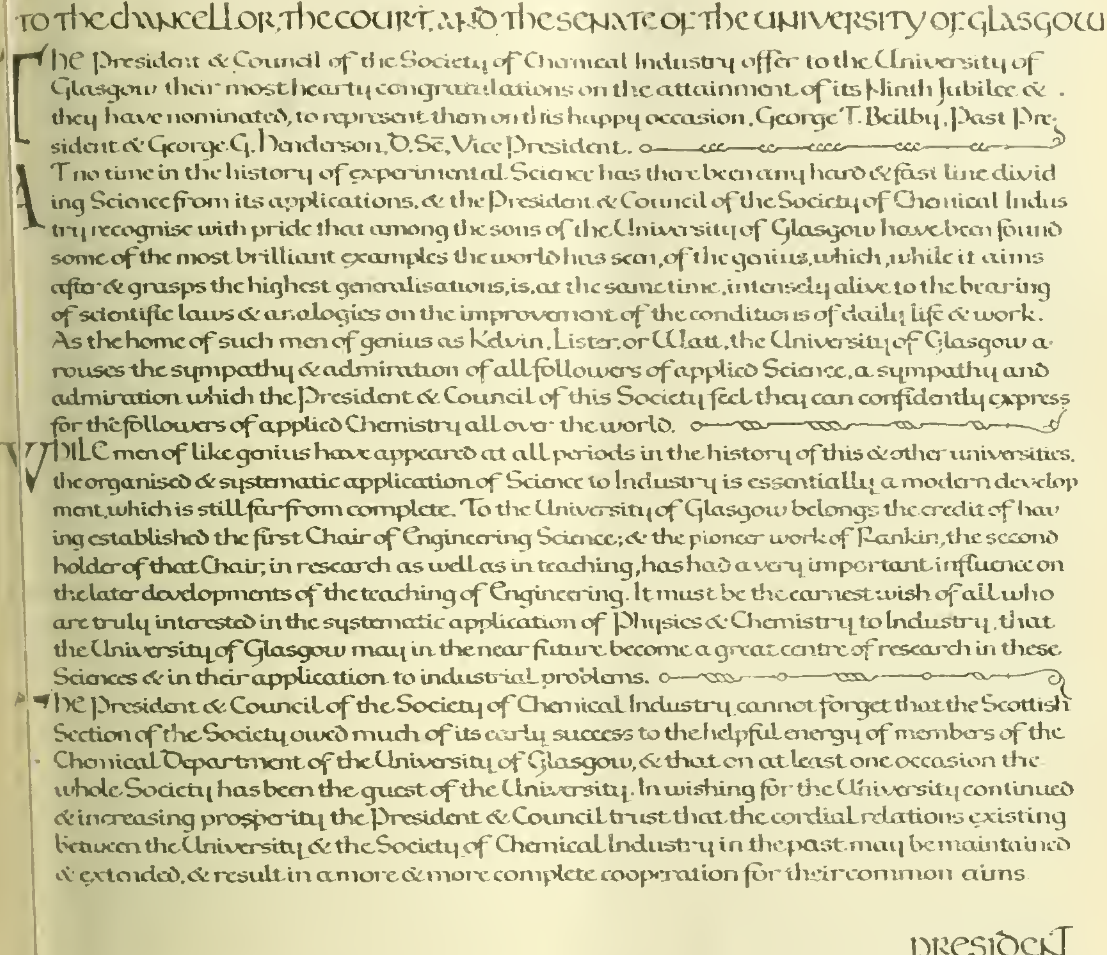
or, in percentages,—

76 per cent. of glass as a whole,
10·7 per cent. of pyroxenic mineral,
12·5 per cent. of free silica.

The small amount of alumina is neglected.

NINTH JUBILEE OF THE UNIVERSIT GLASGOW.

The celebration of the 450th Anniversary foundation of the University of Glasgow took place 12th last and following days. On next page will b a reproduction of the address presented on beha ncil of this Society by Mr. George Beilby and Prof. G. Henderson, D.Sc., the appointed delegates on this asion. The address was engrossed on vellum by Mr. W. Graily Hewitt of the County Council School of Arts and Crafts, 316, Regent Street, London, W. The large capitals and scrolls were in raised gold.



TO THE CHANCELLOR, THE COURT, AND THE SENATE OF THE UNIVERSITY OF GLASGOW

THE President & Council of the Society of Chemical Industry offer to the University of Glasgow their most hearty congratulations on the attainment of its Ninth Jubilee & they have nominated, to represent them on this happy occasion, George T. Beilby, Past President & George G. Henderson, D.Sc., Vice President.

AT no time in the history of experimental Science has there been any hard & fast line dividing Science from its applications, & the President & Council of the Society of Chemical Industry recognise with pride that among the sons of the University of Glasgow have been found some of the most brilliant examples the world has seen, of the genius, which, while it aims after & grasps the highest generalisations, is, at the same time, intensely alive to the bearing of scientific laws & analogies on the improvement of the conditions of daily life & work. As the home of such men of genius as Kelvin, Lister, or Watt, the University of Glasgow arouses the sympathy & admiration of all followers of applied Science, a sympathy and admiration which the President & Council of this Society feel they can confidently express for the followers of applied Chemistry all over the world.

WHILE men of like genius have appeared at all periods in the history of this & other universities, the organised & systematic application of Science to Industry is essentially a modern development, which is still far from complete. To the University of Glasgow belongs the credit of having established the first Chair of Engineering Science; & the pioneer work of Rankin, the second holder of that Chair, in research as well as in teaching, has had a very important influence on the later developments of the teaching of Engineering. It must be the earnest wish of all who are truly interested in the systematic application of Physics & Chemistry to Industry, that the University of Glasgow may in the near future become a great centre of research in these Sciences & in their application to industrial problems.

THE President & Council of the Society of Chemical Industry cannot forget that the Scottish Section of the Society owed much of its early success to the helpful energy of members of the Chemical Department of the University of Glasgow, & that on at least one occasion the whole Society has been the guest of the University. In wishing for the University continued & increasing prosperity the President & Council trust that the cordial relations existing between the University & the Society of Chemical Industry in the past may be maintained & extended, & result in a more & more complete cooperation for their common aims.

PRESIDENT

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of these specifications may be obtained by post by 8d.—the price now fixed for all specifications postage —to C. N. Dalton, Esq., Comptroller of the Patent Office pton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS, AND MACHINERY.

PATENTS.

Incrustation in Steam-Generators; Mixture for Preventing ——. A. von Fritz, Vienna. Eng. Pat. 19,339, Oct. 29, 1900.

A mixture is made of about 30 parts of "Japan earth," 24 parts each of "barium chlorate" and of potash, and 22 parts of myrobalans, which mixture, after powdering, is digested in 40 litres of water. The insoluble residue may be separated, or stirred with the liquid before use. Or the solid mixture may be added to the feed water in the proportion of 1 kilo. to each cubic metre of the water. The "barium chlorate" may be replaced by any other barium salt.—E. S.

Stone, Artificial; Manufacture of ——, and Apparatus therefor. W. Dünkelberg, Steinhausen, Germany. Eng. Pat. 20,639, Nov. 18, 1900.

The invention relates to a press in which the opposite sides of a block are subjected to pressure by plungers, "differentially"; the upper plunger being moved twice, whilst the lower one is moved once, or *vice versâ*.—J. W. H.

Vacuum Filters or Apparatus for Separating Liquid from Materials, and for Washing and Saturating Materials with Liquid. C. B. Symonds, Wirksworth, Derbyshire. From T. Breakell and W. Hopwood, both of Bolwar, Venezuela. Eng. Pat. 7723, April 26, 1900.

The apparatus is applicable for separating liquids from slimy materials, such as clays, fine sands, chemical precipitates, &c., for washing such materials, or for saturating them with water or chemical solutions. It consists of a revolvable cylinder or barrel having a periphery adapted for carrying the material to be treated, means for withdrawing air and liquid from the interior of the barrel, and means for applying the material to the periphery of the barrel and for removing it therefrom. The periphery of the barrel is covered with wire gauze, felt, or the like, and a filter cloth, &c., and takes up the material from a suitably arranged container, the removal of the material from the periphery being effected by a counterbalanced scraper. The barrel is carried by a hollow perforated axle, which is connected to a suction device. Water or other liquid may be applied to the material on the periphery of the barrel, between the points where the material is taken up and removed.—R. A.

Filter Applicable for Use in Sewage Treatment, Ore Reducing, and the like Processes. J. I. Pullon, Leeds. From E. C. van Blarcom, Mexico. Eng. Pat. 7884, April 28, 1900.

A self-clearing or continuous filter, consisting of a screen cylinder carrying the filtering medium. This rotates so as to produce the desired fluid pressure. There is also a spiral scraper rotating at a different speed, to produce a scraping action on the surface of the filtering cylinder. With this there is also a hollow trunnion, forming an inlet pipe of suitable dimensions for the admission of the material to be filtered. Externally, there is an outer fixed casing and cross diaphragms suitably to direct the incoming material and to separate the solid portions from the liquid effluent. —L. A.

Tanks, Boiling Vessels, and similar Receptacles; Manufacture of ——. L. Nobis and A. Wenzel, both of Vienna. Eng. Pat. 11,514, June 25, 1900.

The receptacles are constructed of an iron framework covered with concrete, the framework consisting of frame bars bent to the shape of the vessel required, and two reticulated or lattice-work partitions, which are attached one to the outer side and the other to the inner side of the frame bars. Each partition consists of two layers of round, square, or flat iron bars, and these partitions are attached by inserting them in slotted strips fixed to the frame bars, the reticulations of one partition being arranged in alternation with those of the other. The partitions are also secured to the frame bars and to each other by interwoven iron or steel wire. To ensure tightness of the joints at the caps, nozzles, manhole covers, &c., the iron at these places is covered with red lead and sand, and then coated with soluble glass.—R. A.

Evaporating Vessels for Concentrating Liquids. J. Foster, Glasgow. Eng. Pat. 12,190, July 6, 1900.

The evaporating vessel, in which the liquid to be concentrated is heated by hot air or furnace gases, &c., is provided with a baffle plate adapted to deflect and retard the currents of hot air or other heating medium. The baffle plate is arranged vertically at the side of the vessel opposite to the hot-air inlet, extending across the vessel and nearly to the top and bottom thereof. A transverse rib or partition connects the baffle plate to the "down-comer" circulating duct, and the space above this partition communicates with the hot-air outlet, which the heating air or gas reaches by passing through suitably arranged apertures in the partition and baffle plate, and through the spaces above and below the latter. In a modification the baffle plate is replaced a channel or annular space, which branches or exten towards the hot-air inlet from the opposite side of the ves apertures being formed in the bottom and ends of the w of this channel for the passage of the heating medium the outlet.—R. A.

Steam or Vapour of any Desired Pressure from Liqu Heated under Pressure but not Boiling; Process Apparatus for Producing ——, and the Application the Process for Concentration of the Liquids. C. Stef Vienna. Eng. Pat. 12,805, July 16, 1900.

The liquid to be vaporised, while not boiling, is transfer from the vaporising space, or receptacle, at a temperat corresponding to the desired pressure, through a hea under higher pressure, where it is heated to a higher t perature, still without boiling. The liquid is then retu to the vaporising space, where, under the lower pres maintained in such space, steam or vapour separates. energy of the returning liquid is applied to work a mo such as a Pelton wheel or turbine, which actuates a p for forcing the liquid through the heater. This pro may be employed for the concentration of liquids, suc sugar juice, &c. Several arrangements of apparatus carrying out the process are described in the specificatio —R.

II.—FUEL, GAS, AND LIGHT.

Coals; Effect of Washing Certain Cape Breton — H. S. Poole. Proc. and Trans. Nova Scotian Science, 1899—1900, **10**, 246.

The results are given of a series of tests as to the effe washing coals.

(1.) Tests on 50-ton samples from each of the foll mines:—

—	Raw Coal.		Washed Co	
	Ash.	Sulphur.	Ash.	Sul
	Per Cent.	Per Cent.	Per Cent.	Per
Hub	7·50	3·24	4·37	
Caledonia	15·00	3·02	7·05	
Stirling	11·09	4·23	5·50	
Gowrie	11·55	5·26	6·01	

(2) A test of 10,000 tons of coal from the Do Coal Company gave the following average results:—

—	Raw Coal.	Washed Coal.	Coke Wa C
Moisture	2·10	1·97	
Volatile combustible matter.	31·00	33·21	1·
Fixed carbon	56·83	60·00	88·
Ash	10·07	4·82	9·
Sulphur	2·38	1·79	1

(3) In order to test the efficiency of the coal wa laboratory trial was made. The results obtained laboratory are compared with those obtained by me the coal-washer, in the following table, the samples dried at 212° F.:—

—	Raw Coal.	Laboratory Test.		Treated in Coal Washer.	
		Washed Coal.	Shale.	Washed Coal.	Shale.
Moisture	..	..	..	..	..
Volatile combustible matter.	33·06	33·79	31·43	34·07	30·82
Fixed carbon	55·9[illegible]	61·33	15·33	61·26	23·21
Ash	11·01	2·89	48·08	4·67	41·22
Sulphur	2·41	1·64	5·16	1·70	4·48

ls; *Determination of the Calorific Power of*——. O. ebuffat. Gaz. chim. ital. **31,** [1], 78—82. Chem. entr. 1901, **1,** [17], 971.

ER a short critical description of the methods for the rmination of the calorific value of fuels, the author, on ground of his own experiences, and the results obtained her investigators, rejects the proposals of Antony and ola concerning Berthier's method (see this Journal, , 1092). In order to obtain accurate results, it is ys necessary to employ a calorimeter or calorimetric . In making calorimetric determinations, commercial ressed oxygen is now generally used, and in this con- on, attention is drawn to the fact that electrolytic en contains small quantities of hydrogen, and, con- ntly, may give high results.—A. S.

Producer; Riché ——. P. Corbier. Génie Civil, 00, **37,** 149—151. Proc. Inst. Civil Eng. **143,** [1], —73.

author describes the Riché wood-gas producer for eing gas suitable for driving gas-engines and for g purposes (see this Journal, 1900, 1092). In each , 10—12 kilos. of wood can be distilled per hour, g 70—90 cb.m. of gas having a calorific value of calories per cubic metre. The composition of Riché gas is: carbon dioxide, 20; carbon monoxide, 20; ne, 15; and hydrogen, 45 per cent. by volume. The is of high temperature, owing to the absence of n.

ractice, 1,000 cb. m. of Riché wood-gas are produced illing 140 kilos. of wood, and burning 56 kilos. of average quality, or 160 kilos. of wood; the residue s of 26 kilos. of wood charcoal. The value of the l varies with the kind of wood. The presence of re in the wood necessitates more fuel in the furnace, s not affect the quality of the gas produced.—A. S.

n Gas (Carburetted Air); Production of ——. De odil and De Morsier. Mém. de la Soc. des Ingén. de France, 1900, 403. Proc. Inst. Civil Eng. **143,** 48—50.

uthor gives a description of the van Vriesland us, comprising a carburettor, motor, feeder, and or, for the production of "aërogen gas" or air ated with the vapour of gasoline or light petroleum e carburettor, which acts also as a compressor of ogen gas produced, is a horizontal hollow drum, at both ends, which rotates within a stationary cal wrought-iron casing, also closed at both ends; n is carried on a central longitudinal shaft, which ut through stuffing-boxes in the ends of the casing. m itself is double, having an inner cylindrical shell n outer; and the annular space between them is sub- by means of four helical partitions into a succession l channels of rectangular section, which wind round like the threads of a quadruple-threaded screw. rout end of the drum, each channel has an inlet through the drum head. The clear space between and the casing is kept filled with gasoline from , up to one-third the height or diameter of the the space of the upper two-thirds is occupied by tted through a controlling valve on the top of the As the drum revolves, the inlet aperture of each in succession dips beneath the surface of the liquid, ertain quantity of the latter enters; during the r of the revolution, air enters the channel, and orifice again dips into the liquid, there is a portion trapped between the liquid now entering and that tered in the preceding revolution. Thus the air d the gasoline below are being continuously forced helical channels from the front to the back end of , and the air is passing over surfaces always freshly ith gasoline. Each helical channel is, in effect, an lean screw working horizontally, partly in liquid ly in air. At the back end of the drum, each annel is turned radially inwards, to deliver into the hollow end of the central shaft, through which both ne and the aërogen gas pass into a closed chamber; the gasoline collecting at the bottom returns thence through a U-tube into the bottom of the carburettor casing, whilst the aërogen gas passes off through a pressure regulator on the top of the chamber, and is delivered for consumption. The two discharge pipes are provided with throttle valves, so that the aërogen gas becomes compressed in the chamber, and exerts a back pressure on that in the helical channels.

The apparatus is now being used at Montgeron, near Paris, France, at Brocklesby and Fleeby, Lincolnshire, England, and in Holland.

In the apparatus which has been in constant use since June 1898, at Breukelen, Holland, and which is capable of supplying 250 burners, the carburettor or drum, is 0·8 m. ($31\frac{1}{2}$ ins.) diameter inside and 0·9 m. ($35\frac{1}{2}$ ins.) outside, and 1·36 m. ($53\frac{1}{2}$ ins.) long; the casing containing the drum is 0·98 m. ($38\frac{1}{2}$ ins.) diameter and 1·4 m. ($55\frac{1}{8}$ ins.) long; the total length, including the chamber at the back end, is 1·79 m. ($70\frac{1}{2}$ ins.). The section of the helical channels is 45 mm. ($1\frac{3}{4}$ ins.), parallel to the driving shaft, by 50 mm. (2 ins.) radially. The gasoline used has a sp. gr. of 0·65 and distils over completely at 80° C.—A. S.

Hydrogen Sulphide; Determination of ——, *in Illuminating Gas.* C. C. Tutwiler.

See under XXIII., *page* 621.

PATENTS.

Combustible Material or Compound; more especially intended for use in the Manufacture of Briquettes of Artificial Fuel; Manufacture and Production of ——. Petolite Fuel Syndicate, Limited, and E. Johnson, both of London. Eng. Pat. 10,055, May 31, 1900.

To an absorbent material containing moisture (such as sawdust), are added in succession petroleum, resinous matter, finely and freshly powdered unslaked lime, and pitch. When the mass is cold, it is crushed or ground, and mixed with small coal, town refuse, dried sewage sludge, or other briquette material.—R. S.

Fuel, Liquid; Apparatus for Burning ——. H. H. Lake, London.—From B. Rein, Rochester, U.S.A. Eng. Pat. 5329, March 13, 1901.

Vapour burners for boilers or steam generators, especially for motor vehicles, are provided with means for starting the generator and burner without the use of a torch. The vapour generator is arranged at the side of the main burner, and consists of a metallic shell, the shell being provided with air inlets and a number of "retorts drilled in its wall" one of the retorts supplying the main burner and another an auxiliary burner. The latter heats the retorts, and a portion of the flame passes through an opening in the side of the burner into the main burner for lighting it. The supply and discharge pipes are separately governed and regulated.—R. S.

Vapour Burning Apparatus and Systems. E. Philipson, H. M. Baker and W. B. Sabel, all of Brooklyn, U.S.A. Eng. Pat. 19,195, Oct. 26, 1900. (Internat. Convent., date claimed April 3, 1900.)

The burner is provided with a vaporising tube having a nozzle, the orifice of which regulates the flow of hydrocarbon vapours from the vaporising tube, and which is kept clean automatically while in operation, by a plunger working within the vaporising tube and an extension thereof. The plunger is moved in one direction by oil pressure, and in the other by vapour pressure assisted by a spring: or the plunger may be operated by electrical means. The hydrocarbon vapour mixes with air in a special tube. The air and the oil supplies are regulated by valves provided with means for operating them both by one continuous movement in one direction, but during the reversal of that movement, only the oil supply valve is operated. An automatic device is supplied for measuring the charge of oil used, this device being situated between the fluid reservoir and the cup, which is provided with an igniter.—R. S.

Carburetted Air Producer with Automatic Regulation. G. Fischer, Risa, Germany; M. Richter, Dresden, Germany; H. Mestern, Vienna; F. Woda, Vienna; and P. Pallester, Vienna. Eng. Pat. 9609, May 24, 1900.

The production of carburetted air is regulated automatically by the demand. The apparatus for doing this consists of a combination of an improved carburettor, a pressure-reducing device, an air reservoir or accumulator, and a hot air or other suitable motor of any construction. The air to be carburetted passes first through the motor jacket so as to cool the motor cylinder and warm the air. The air then passes into a reservoir provided with a loaded escape valve, from which it either passes into the carburettor or escapes into the outside air without being carburetted according to the amount of carburetted air required. To prevent any irregularities in the pressure of the air supplied to the carburettor, the air next passes through a pressure-equalising device. It then enters the carburettor through a central tube, and passing downwards, escapes through a number of small holes at the bottom into the carburetting liquid. To keep these small openings clean, the entering air is caused to act upon rotating vanes mounted on a vertical shaft provided at the bottom with brushes which rotate in contact with the small openings. A portion of the produced carburetted air is led to the motor for use therein.—R. S.

Compressed Gas for Lighting or Heating Purposes; Production of ——. F. Hoffmann, Altona, Prussia. Eng. Pat. 4982, March 8, 1901.

The gas is compressed by a rotary pump inserted in the gas conduit and having a cylinder eccentrically arranged in a casing, the cylinder being provided with radially movable slides pressed outwards by springs so as to press tightly against the walls of the casing. To equalise the pressure on either side of the pump, in the gas conduits, a weighted elastic branch tube is provided; or instead of this, a spring valve may connect the compressed gas conduit with the suction conduit.—R. S.

Electric Furnaces of great Power. O. Imray. Eng. Pat. 10,580, 1900.

See under XI. A., *page* 588.

Coke-kiln Gases; Process for Recovering the by-products from ——. W. Heinemann, Bochum, Germany. Eng. Pat. 5232, March 12, 1901.

The cool raw gas from the kilns is treated with steam, preferably by means of a steam injector. The condensing steam separates the particles of tar and absorbs the ammonia. The steam may be introduced into the main conduit from all the kilns belonging to one battery.—R. S.

Gas Purifying Apparatus. F. Sasse, Cologne-on-the-Rhine. Eng. Pat. 6735, March 30, 1901.

To the cistern of a gas scrubber or washer is fixed an up-standing ring, the upper edge of which is, according to the pressure employed, more or less above the lower rim of the washer. By this means the washer may be cleaned during use without allowing air to enter.—R. S.

Acetylene Gas; Apparatus for Generating ——. G. Seagrave, Walthamstow. Eng. Pat. 7751, April 26, 1900.

The bell of a gasholder, which receives the gas for distribution through a purifier to the burners, actuates a valve on a water service, so that, when the bell is nearly at its lowest position, water is admitted to a vessel in which it operates a piston or distends a diaphragm, whereby, through a ratchet and pawl mechanism, a cylinder containing carbide is dropped into a generating tank containing water. The gas evolved passes into the gasholder, and through the rise of the bell causes the flow of water to be cut off, and that which has operated the piston to be discharged into the generating tank.—J. A. B.

Acetylene Gas; Means for Generating ——, and
Lighting by Means of such Gas. G. W. Joh
London. From La Compagnie Française de l'Acet
Dissous, Paris. Eng. Pat. 7859, April 27, 1900.

A receiver containing carbide has walls consisting
tially of felt or other capillary substance, through
water gains access to the carbide when the recei
immersed in water in an outer vessel. The gas ev
passes through a drying chamber direct to the bur
burners of the twin-jet type. In order to arrange a n
of these burners in close juxtaposition for search-li
similar uses, they are set obliquely to the base plate or
so that the flames are at an angle of about 45° to it
and parallel to one another.—J. A. B.

Acetylene Gas Generators or the like. J. H. Ro
Birmingham. Eng. Pat. 9537, May 24, 1900.

Measuring spouts attached to the outlet of a
containing carbide by means of a swivel joint, are ac
according to the movements of a bell gasholder, so
measured quantity of carbide is discharged into wat
generating chamber as required. A distributing
inclined plane, immersed in oil floating on top of the
is used to prevent escape of gas through the direct
of the carbide with the water.—J. A. B.

Acetylene Gas; Apparatus for Automatically Gen
——. M. Martin, Saint-Michel de Maurienne,
Eng. Pat. 1283, Jan. 19, 1901.

Carbide is contained in a basket, supported within
sealed chamber attached to the top of a bell float
tank of water. A prolongation of the chamber di
stantly into the water. A pipe, connecting the up
of the chamber with the gas space of the bell, may be
when it is necessary to refill the basket with car
means of a cock a handle of which locks with the li
chamber, so that the latter can be opened only w
cock is closed.—J. A. B.

Acetylene and other Gases; Apparatus for Genera
Burning ——. J. J. Hendler and E. K. Reev
of Kansas City, U.S.A. Eng. Pat. 2914, Feb. 11

A generating chamber, in which carbide res
perforated shelf, is surrounded by a tank containin
with which it is in communication through holes
base. The tank is supplied, through a narrow pipe
nearly to its bottom, with water from a superposed
the upper part of which communicates through a
with the upper part of the tank. The gas evolved
carbide forces water back from the tank to the
through this wide pipe. When equilibrium of p
established, the water required to replace that con
supplied from the reservoir through the narrow
burner is mounted on the top of the generating ch
—J

Acetylene Gas Machines and Regulators. E.
Sacramento, Cal., U.S.A., and G. F. Heusner,
Oregon, U.S.A. Eng. Pat. 4954, March 8, 1901

A generating chamber, containing receptacles fo
carbide and water-distributing troughs, is surmou
tank the bottom of which is connected by a pipe
lower part of the generating chamber, to whi
thereby gains access from the tank. On reaching
of a pipe delivering into one of the distributing tr
water flows into the latter and on to the carbide
gas evolved drives back the water into the tank.
passes through a purifier and regulator of special
tion to the burner. The apparatus is designed
for the supply of locomotive head-lights.—J. A.

Incandescent Lighting; Production of Inflammab
especially Adapted for ——. J. St. C. Legg
Eng. Pat. 8635, May 10, 1900.

The inflammable mixture is produced by passing
pressure through a carburetting mixture co
benzoline or gasoline or other light hydroca

phor in approximately certain proportions, and then ing the mixed air and gas or vapour to impinge on thalene.—R. S.

Incandescence Oil Burners. F. Richter, Vienna. Eng. Pat. 9359, May 21, 1900.

describes a flame-spreader for a circular-wick incan- ence lamp. A perforated cylindrical shell, closed at its r end by a plate and supported by a central rod, is hed at its lower end to an annular metallic disc, of tly conical cross-section, the outer (and higher) edge ich has a downwardly projecting lip a little less in eter than the interior of the outer wick tube. The edge of the annular disc may have a cylindrical , to prevent the flame from entering the head of the der. It is claimed that with this flame-spreader, t combustion is attained, with no formation of soot. —H. B.

descing Media for Incandescence Lighting; Manu- ture of ——. R. A. Nielsen, Copenhagen. Eng. 9785, May 28, 1900.

RENCE is made to Eng. Pat. No. 2672 of 1900 (this al, 1900, 335). As it has been found that in fusing ides in the electric arc, preparatory to drawing them o threads, troubles arise owing to the formation of s and reduction products through the action of the vapour in the arc, the patentee now avoids the application of the arc. This he effects by placing stances under treatment, in crucibles or the like and cing them therein into the electric furnace. From lten mass obtained, threads are to be produced by mechanical means. Incandescing media made uch threads may be provided with a pulverulent of incandescible substances; as, for instance, by ing the medium in a solution of the salts and rds raising the medium to incandescence.—H. B.

Lamps; Incandescent ——. B. M. Drake and Nernst Electric Light, Ltd., Westminster. Eng. 1944, May 30, 1900.

been found that in lamps of the Nernst type, the ontact becomes hotter than the cathode contact, the ding to cause breakage near the anode contact. This n consists in sufficiently dissipating the heat at the by providing the latter with radiating surfaces of forms and dimensions. For example, round the Nernst filament the contact-making wire is wound some of the convolutions being formed with radially- g loops. Each loop is then twisted so as to form a less rigid arm, and the wire coils are coated with (which may have the same composition as that of ent), the radially-arranged arms either being wholly by the coating, or preferably, projecting beyond surface. The contacts at both ends of the filament onstructed in this way.—H. B.

cent Oil and Spirit Lamps. W. P. Thompson, ool. From J. Rubenstein, Berlin. Eng. Pat. , June 19, 1900.

amp described, which is of the circular-wick type, tallic parts which are in contact with the flame are German silver or other poor conductor of heat. , which may consist wholly or partly of asbestos, woven at its upper part, less tightly woven at the art, and loosely woven at the lower part. The nney has the form of two truncated cones, joined ases, an inward "shoulder" being produced, at tion, a short distance above the top of the mantle. r wick tube, which extends above the inner wick its upper edge bent inwards slightly to prevent being raised too far, and is attached to the lamp of a bayonet joint, so that it may be removed to the fixing of a fresh wick in the lamp. By the gallery ring the incandescent lamp may be into an ordinary lamp.—H. B.

Incandescence Oil Lamps. L. Denayrouze, Neuilly, France. Eng. Pat. 11,665, June 27, 1900.

THIS relates to burner fittings, which can be applied to the reservoir of an ordinary oil lamp. A bundle of cotton wicks is bound tightly in a tube of badly-conducting metal, such as German silver, which can be screwed into the top of the lamp reservoir, the lower parts of the wicks being immersed in the oil. At the top of the wicks, where they are tightly bound, is formed a vaporising chamber, having small holes at the top, by which the oil vapour passes into an air-mixing tube, afterwards burning within a mantle as usual. A central heat-conducting rod extends upwards into the region of the flame and downwards through the vaporising chamber and a short distance into the bundle of wicks. The vapour produced by the heat of the rod is prevented by the closely packed wicks from getting down into the reservoir. From the vaporising chamber there is a by-pass pipe, furnished with a cock, leading to the upper part of the reservoir. To extinguish the lamp this cock is opened, when the vapour passes into the reservoir and condenses. To start the lamp, the vaporising chamber is heated in any convenient way.—H. B.

Incandescent Gas-Burners. F. Fuerstenheim, Berlin. Eng. Pat. 6262, March 25, 1901.

WITHIN the mixing tube of a Bunsen burner is fixed a central tube *p*, up which air alone passes, gaining access through the lateral perforations *n*. Gas enters the annular mixing tube through vertical perforations *h* in the head *g*, drawing in air at the inlets *k*. The air issuing from the funnel-shaped top of the tube *p* forces the annular flame against the interior surface of the mantle, and as it is claimed that a much larger area of the mantle than usual is thus rendered incandescent, "mantles of exceptional size may be employed." To prevent the flame firing back, a constriction is made in the mixing tube—such as that shown at *r*, where two opposed metallic rings are inclined towards each other, forming an annular slot. —H. B.

Fig. 1.

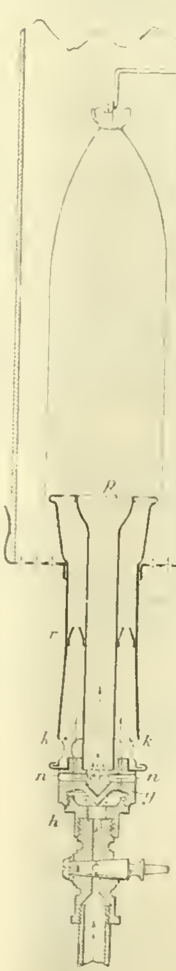
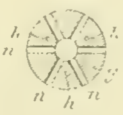


Fig. 2.



Incandescent Bodies for Gas Lighting; Process for Strengthening ——. W. P. Thompson, Liverpool. From A. Wasmuth, Hamburg. Eng. Pat. 2005, Jan. 29, 1901.

The process consists in adding " magnesium sulphate or its constituents " to the solution of salts used in impregnating a purified fabric, more particularly a ramie fabric, in the proportion of about 0·3 to 1 part of magnesium sulphate to 100 parts of the water employed for making the solution. For example, the solution may be composed of: thorium nitrate, 30 parts; cerium nitrate, 0·4—0·5; yttrium nitrate, 0·03—0·05; erbium nitrate, 0·01—0·025; magnesium sulphate, 0·3—0·8; and water, 100 parts.—H.B.

Incandescent Bodies for Gas and other Lighting, Manufacture of ——. K. Schultze, Berlin. Eng. Pat. 5352, March 13, 1901.

Fabrics are to be impregnated with a solution composed of about 0·25 part of uranium nitrate, 0·75 part of erbium nitrate, 250 parts of thorium nitrate, and 500 parts of distilled water, the fabric being burned off afterwards.
—H. B.

Incandescent Gas Lighting. C. G. Richardson, New York. Eng. Pat. 6860, April 2, 1901.

A concentrated solution of celluloid is thoroughly mixed with a solution of suitable incandescence salts, and after evaporation to a pliable mass, the mixture is moulded by pressure into the desired form—preferably that of a hollow perforated cone or mantle. The mantle is then denitrated by means of a suitable reagent, such as ammonium sulphide. Instead of first evaporating the liquid mixture to a pliable mass, it may be " injected under pressure into a mould having the desired configuration. As the liquid hardens in the mould it acquires the desired shape." The mantle is then denitrated.—H. B.

Nernst [Electric] Lamps, and Heaters therefor. A. J. Wurts, H. N. Potter, E. Bennett, and M. C. Beebe, Pittsburgh, U.S.A. Eng. Pat. 11,561, June 26, 1900.

In making electric heaters for Nernst lamp glowers, the heating wire is wound upon a thin, light support, composed preferably of ground talc mixed with a binder, such as gum-tragacanth; the support is bent into suitable shape, and the form is rendered permanent by baking. A suitable shape for the composite insulated heater thus obtained is that of a helix, centrally within which the glower may be arranged. Both heater and glower are fixed, the convolutions of the former interfering to an immaterial extent with the light emitted by the glower. A number of methods of constructing the heaters, arranging them relatively to the glowers, connecting them into the circuits, and fitting them detachably into Nernst electric lamps, are described and claimed.
—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Benzols: Prices, Imports and Exports, Composition, Examination, and Application of ——. F. Frank. Chem. Ind. 1901, **24**, [8], 237—239, and [9], 262—266.

The reduction in the prices of benzol since 1882 is shown in the following table, which also gives the German imports (from England and Belgium) and exports:—

	Marks per 100 kilos.		Marks per 100 kilos.
1882	175—400	1896	50—120
1885	50—90	1897	65
1890	100—125	1898	25
1892	40—60	1899	20
1895	25—60	1900	20

Year.	Imports.	Exports.
	Tons.	Tons.
1891	7,316	516
1892	5,683	916
1895	8,317	1,965
1896	11,305	1,539
1897	10,135	1,270
1898	5,915	1,611
1899	5,291	2,755

At the present time Germany produces upwar 28,000 tons of benzol annually, of which at least 2 tons are consumed in the colour works, the remainder used for the enrichment of gas and other purposes.

The fall in prices was accompanied by the demand purer product, stress being laid on freedom from par light hydrocarbons, carbon bisulphide, and thiophen.

The ordinary method of testing benzols by obs the volume of distillate obtained at certain temperatu no guarantee as to their true character. For ex although the following mixtures fulfil the require of 90 per cent. benzol, *viz.*:—

(1) 82·0 per cent. benzol + 18·0 per cent. tolu
(2) 92·2 per cent. benzol + 7·8 per cent. xylol
(3) 90·0 per cent. benzol + 5·0 per cent. to
5·0 per cent. xylol;
(4) 84·0 per cent. benzol + 13·0 per cent. to
3·0 per cent. xylol;

only the last can be regarded as a typical 90 per benzol. The annexed interpolation curve table by best expresses the variations in such mixtures, and suffi explains itself. See page 567.

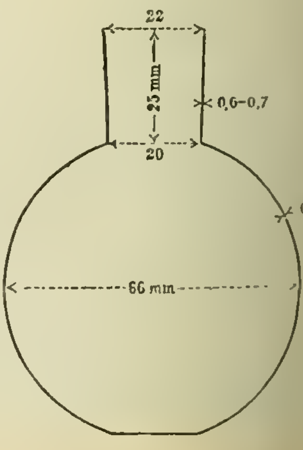
Solvent Naphtha:—90 per cent. at 160° C. strength usually claimed, but it is pointed out that it be better to limit the end-point of the distillation to 1 so as to exclude coumarone and indene, and thereby i both odour and stability to light. Another type of naphtha, consisting chiefly of cumol, and yielding cent. of distillate between 140° and 175° C., is obta washing heavy naphtha with sulphuric acid and di with live steam.

For the proximate composition of commercial be used in colour works, Kraemer and Spilker gi following data:—

——	90 per Cent. Benzol.	50 per Cent. Benzol.	0 p B
	Per Cent.	Per Cent.	P
Water	0·060	..	
Paraffin	0·100	0·25	
Carbon bisulphide	0·686	0·39	
Substances absorbing bromine, including thiophen and the like.	1·202	1·23	
Thiophen *per se*	0·264		
Benzene	80·922	45·37	
Toluene	14·850	40·32	
Xylene	2·180	12·41	

With regard to the examination of benzols, it that, with but few exceptions, the ordinary retort with the thermometer immersed in the liquid, replaced by the following system:—The distilling a globular copper still of 150 c.c. capacity, th being flattened as shown in diagram, Fig. 1. It i

Fig. 1.



ameter and 0·6 to 0·7 mm. thick. The neck is 25 mm. ; 20 mm. wide at the bottom, and 22 mm. wide at the The glass still head (see Fig. 2) is 150 mm. long and 11 mm. wide, with a globular enlargement in the centre, and, 10 mm. above this, a side tube 8 mm. wide, branching off almost at a right angle. The still rests on an asbestos disc with a circular hole 50 mm. in diameter, and is heated by the colourless flame of a Bunsen burner. The burner is surrounded by a metal cylinder with four holes 10 mm. from the top, for the escape of the products of combustion. The Liebig condenser is 800 mm. long, and inclined at such an angle that the outlet is 100 mm. lower than the inlet. The charge is 100 c.c., the rate of distillation 5 c.c. per minute (about 2 drops per second), the operation being finished when 95 per cent. have passed over. The thermometer is made of thin glass about half the thickness of the diameter of the still head, the mercury bulb being fixed in the centre of the globular enlargement. It is graduated to tenths of a degree for pure products, and to half a degree for commercial benzols, and should be tested occasionally against a Government standard. The variations in barometric pressure are allowed for by making the necessary corrections (compare Lenders, Chem. Ind. 1889, 169), or may be disregarded by employing a thermometer with an adjustable scale, and distilling 100 c.c. of pure water through the apparatus, fixing the 100° C. point the moment that 60 c.c. have passed over. The complete apparatus is shown in Fig. 2.

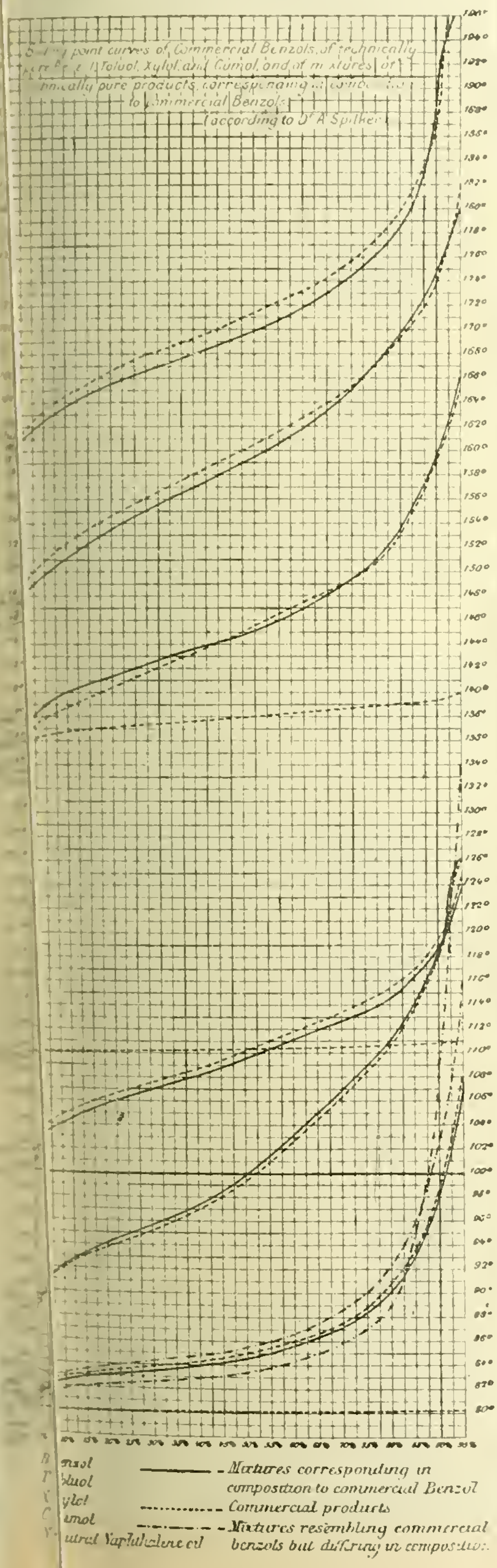
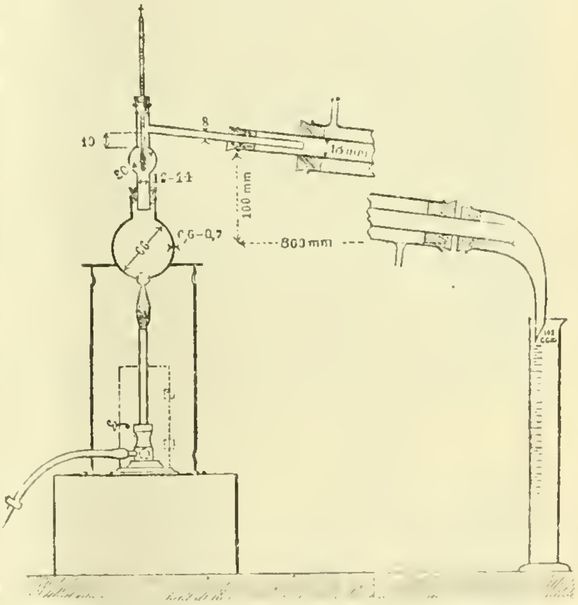


Fig. 2.



The following figures give the average specific gravities of commercial benzols :—

90 per cent. benzol	0·880—0·883
50 per cent. benzol	0·875—0·877
0 per cent. benzol	0·870—0·872
Solvent naphtha, 90 per cent. at 160° C.	0·874—0·880
Solvent naphtha, 90 per cent. at 175° C.	0·890—0·910
Heavy naphtha	0·920—0·945
Pure benzene	0·883—0·885
Toluene	0·870—0·871
Xylene	0·867—0·869

The estimation of carbon bisulphide is effected in the following manner:—50 grms. of benzol are mixed with 50 grms. of a solution of potash (11 grms.) in absolute alcohol (90 c.c.), and kept at the ordinary temperature for a few hours. The mixture is then shaken up with 100 c.c. of water, the aqueous solution is separated from the benzol, and the washing operation repeated three or four times. The potassium xanthate is determined in the washings by acidifying with acetic acid and titrating with a solution of copper sulphate obtained by dissolving 12·475 grms. of the crystallised salt in a litre of water, 1 c.c. = 0·0076 CS_2. The end-reaction is ascertained by the red colour produced when a drop of the liquid, taken out with a glass rod, is brought into contact with a drop of a solution of potassium ferrocyanide on a filter paper. 90 per cent. benzol contains from 0·2 to 1·0 per cent., 50 per cent. benzol up to 0·5 per cent. of carbon bisulphide.

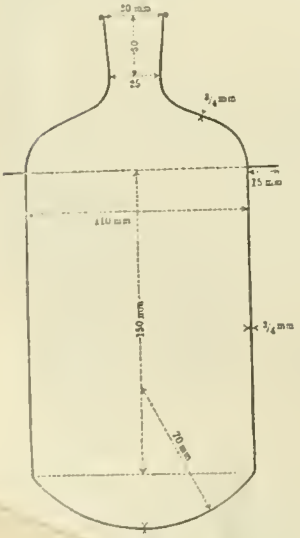
Thiophen can be detected by the indophenine test (blue colour). For its quantitative estimation the method proposed by Denigès is recommended, which depends on the formation of the compound $SO_4(HgO)_2 : Hg.SC_4H_4$, by acting upon thiophen with mercuric sulphate (this Journal, 1896, 746).

For the quantitative estimation of paraffins, 200 grms. of the benzol under examination are thoroughly mixed for 15 mins. in a separating funnel with 500 grms. of fuming sulphuric acid (20 per cent. anhydride), taking care to avoid heating. The mixture is allowed to stand for two hours, the sulphuric acid solution being then drawn off, and the treatment with fuming sulphuric acid repeated a second and third time. The residual paraffins are then separated, whilst that portion dissolved in the acid is recovered by diluting the acid with three volumes of ice water, and distilling the solution in a flask of three litres capacity until, in addition to oil, 50 c.c. of water have passed over. The distillate, after separating the water, is added to the original oil, and the mixture treated several times with fuming sulphuric acid (30 grms.) until its volume ceases to diminish. The quantity of paraffin in 90, 50, and 0 per cent. benzols seldom exceeds 1 per cent., toluol is mostly free from this impurity, whilst xylol frequently contains as much as 3 per cent.

To ascertain the presence of unsaturated compounds, 5 c.c. are shaken vigorously for 5 mins. with 5 c.c. of strong sulphuric acid in a stoppered bottle holding 15 c.c., and the coloration, if any, is compared with a solution of potassium bichromate in sulphuric acid (50 per cent.). The coloration imparted to 90 and 50 benzol should not exceed the colour of a bichromate solution containing at the most 2·5 grms. of $K_2Cr_2O_7$ in 1 litre of sulphuric acid, whilst pure products should remain colourless.

For the purpose of determining the bromine absorption, 5 c.c. of benzol are mixed in a stoppered glass cylinder of 50 c.c. capacity, with 10 c.c. of dilute sulphuric acid (20 per cent.). A decinormal solution of potassium bromide and bromate (9·9167 grms. KBr + 2·7833 grms. $KBrO_3$ per litre, 1 c.c. = 0·008 grm. Br) is then added from a burette until there is at the end of five minutes' continuous shaking a permanent coloration, and the oil gives a blue colour to freshly prepared zinc iodide starch paper. The amount of bromine assimilated by 90 and 50 per cent. benzol is usually 0·6 per cent., and rarely exceeds 1 per cent.

Fig. 3.



The following are the mean flashing points of benzols :—Pure benzol, − 8° C.; 90 per cent. benzol, under − 4° C.; toluol, + 5° C.; xylol, + 21° C.; solvent

160° C.), + 21° C.; solvent naphtha

° C.; and heavy benzol, +

The percentage composition of commercial benzols ascertained by distilling 1 kilo. of the sample in a copp vessel, as shown in Fig. 3, fitted with a Le Bel-Henni dephlegmator 60 cm. in length. The distillate is collec in tared bottles. It is divided into the follow fractions :—

For 90 and 50 per cent. Benzol.

Up to 79° C.	First runnings.
79° to 85°	Benzol.
85° to 105°	Intermediate fract
105° to 115°	Toluol.
Residue	Xylol.

For Toluol.

Up to 109° C.	First runnings.
109° to 110·5°	Toluol.
Residue	Last runnings.

For Pure Benzol.

Up to 79° C.	First runnings.
79° to 81°	Benzol.
Residue	Last runnings.

For Xylol.

Up to 135° C.	First runnings.
135° to 137°	Paraxylol.
137° to 140°	Metaxylol.
140° to 145°	Orthoxylol.
Residue	Last runnings.

Percentage Composition.

—	90 per Cent. Benzol.	50 per C Benz
First runnings	1·0	0·
Benzol	78·8	18·
Intermediate fraction	10·0	47·
Toluol	8·0	23·
Xylol	2·0	10·
Loss by distillation	0·2	0·

Pure Benzol.

First runnings	0·5
Benzol	98·0
Last runnings	1·2
Loss by distillation	0·3

Toluol.

First runnings	0·3
Toluol	97·3
Last runnings	2·2
Loss by distillation	0·2

Xylol.

First runnings	1·3
p-Xylol	15·0
m-Xylol	76·5
o-Xylol	5·0
Last runnings	2·0
Loss by distillation	0·2

— B

Petroleum; Composition of Californian ——. Mahery and E. J. Hudson. Amer. Chem. J. 2 253—284.

The following conclusions are drawn by the autho the results of their investigations :—

The relatively low proportion of distillates below is an essential characteristic of Californian oil. The such crude oils as distil below that temperature co methylenes, similar, as regards specific gravity and point, to those from Russian oils, except in the undecanaphthene (b. pt. = 195° C.), dodecanaphther = 216° C.), and tridecanaphthene (b. pt. = 230°— The aromatic hydrocarbons are present in large than in Russian oil, the benzene homologu abundant, especially in the lighter fractions; the 221°—222° C. from Puente oil contained so much lene as to solidity at 0° C.

Another point of difference is the absence of members of he C_nH_{2n+2} series, as well as the presence of large roportions of oxygen and nitrogen compounds. In some f the high-boiling distillates, *e.g.*, from Summerland oil, ydrocarbons of the C_nH_{2n-2} and C_nH_{2n-4} series were lentified.—C. S.

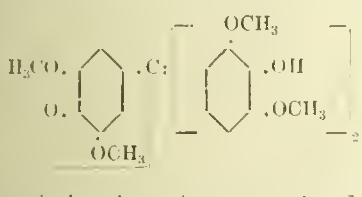
etroleum; Composition of Japanese ——. C. F. Mabery and S. Takano. Amer. Chem. J. 25, [4], 297—307 (See also this Journal, 1900, 1003.)

ne results show that Japanese oil mainly consists of ethylene hydrocarbons, the very heavy oils also probably ntaining hydrocarbons with two or more methylene rings the series C_nH_{2n-2} or C_nH_{2n-4}. Solid paraffins were und in some of the oils (Amaze, Miyagawa, and Hiyama). e proportion of benzene derivatives is smaller than in lifornian oils, and the nitrogen and sulphur compounds esent vary considerably in amount.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

upitton and Pittakall. C. Liebermann. Ber. 34, [6], 1026—1030.

e author, in 1876, separated from wood tar an orange- dyestuff, which he identified as the parent substance of roduct obtained by v. Reichenbach in 1833, termed akal. The latter, on investigation, proved to be a allic salt of an acid dyestuff, to which the name Eupitton given. This product has the formula—



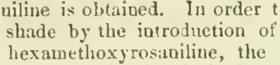
as its constitution shows, is not a mordant dyestuff. same is also true of its sodium salt. Reichenbach's ments as to the dyeing properties of his pittakal appear ive been exaggerated, as the author was only able to in dyeings with difficulty by the use of strong dye-baths. this purpose a solution of Eupitton sodium is preci- ed in the cold with glacial acetic acid, then saturated ammonia, and the fabric (calico or linen) mordanted mordanted, is dyed at the boil. The shade produced is ish violet, approximating to that of Indigo. The dyed stands water and lukewarm soap lye, but acids turn hade yellow; the original bluish-violet colour, however, tored on passing the fabric through lime water.

—T. A. L.

tton Derivatives. C. Liebermann and F. Wiedermann. Ber. 1901, 34, [6], 1031—1040.

determination of the number of methoxyl groups in tton by Zeisel's method gave numbers agreeing with ann's formula, $C_{19}H_{8}(OCH_3)_6O_3$. Moreover, Eupitton salts with mineral acids, and of these, the hydro- de, like that of Aurin, crystallises with alcohol, , however, it loses after standing some considerable in a desiccator, and the salt then has the formula $_3O_9HCl$. When Eupitton (3 grms.) is heated to C. for half an hour with concentrated sulphuric acid c.c.), it loses its methyl groups and is converted into ydroxyaurin, to which the name Eupitton Black, or upitton, has been given. The product, when free acid and before drying, is readily soluble in hot water lcohol to dark brown solutions. It is an excellent ant dyestuff, giving deep blacks fast to soap, and does ppear to be identical with N. Caro's hexahydroxy- (Ber. 25, 2675).

derivative obtained by Hofmann from Eupitton and nia at 160° C., and termed Eupitton triamine or hexa- xyrosaniline, is not a mordant dyestuff, but dyes wool hades, and gives an acetate having a distinct metallic sheen. It is noteworthy that this salt, when repeatedly moistened and evaporated on the water-bath, loses the whole of its acetic acid, leaving the base almost colourless. In determining the number of methyl groups in this product by Zeisel's method, it was observed that the hydriodic acid solution deposited, on cooling, crystals of the de-methylated compound. The hydrochloride of this compound, hexahydroxyleucaniline, has the formula $C_{19}H_{19}N_3O_6 3HCl$. The aqueous solution, after adding a few drops of potash lye, is carefully oxidised by air to a blue dyestuff. After saturating with glacial acetic acid, the mixture is evaporated on the water-bath with the addition of alcohol or acetic acid, when the oxidation is complete. The product dyes wool a fine blue, and is without doubt hexahydroxyrosaniline, from which it follows that the blue colour given by Eupitton triamine on unmordanted animal fibres is not due to methoxyl groups only, but that the presence of six hydroxyls is sufficient to produce a blue dyestuff from Rosaniline. When hexahydroxyleucaniline hydriodide is boiled for 10 minutes with fused sodium acetate and acetic anhydride, it yields ennea-acetylhexahydroxyleucaniline, which crystallises from alcohol in colourless needles melting at 173° C., and having the formula—



$$HC : \left[C_6H_2 \begin{matrix} \diagup (OC_2H_3O)_2 \\ \diagdown NHC_2H_3O \end{matrix} \right]_3$$

This substance is not affected by cold alkali lye, and it is also insoluble in cold fuming hydrochloric acid, but on boiling with this latter, the solution becomes slightly bluish, and a precipitate of the trihydrochloride of hexahydroxyleucaniline is obtained. In order to determine the effect on the shade by the introduction of further methyl groups into hexamethoxyrosaniline, the authors heated Eupitton with methylamine in alcoholic solution to about 160° C. for $2\frac{1}{2}$ hours. A leuco base is formed, which, on oxidation in alcoholic solution in presence of acetic acid with hydrated manganese peroxide (from permanganate by reduction in alkaline carbonate solution), gives most probably hexamethoxydimethyl rosaniline. The deep blue solution dyes wool blue in the cold, but the colour can be stripped by boiling with acetic acid or alcohol. Hofmann stated that Eupitton, when heated with water to 270° C., gave, together with the dimethyl ethers of pyrogallol and methylpyrogallol, a product crystallising in white needles and soluble in alkalis. The authors have identified this as leuco-eupitton, or hexamethoxyleucaurin,—

$$HC : [.C_6H_2(OCH_3)_2OH]_3,$$

and have obtained it by reducing Eupitton with zinc dust and acetic acid. The product is readily soluble in alcohol, and melts at 198° C. It dissolves to a colourless solution in alkali, which, on boiling with strong potash, turns blue. Triacetylleuco-eupitton, $C_{25}H_{25}(C_2H_3O)_3O_9$, obtained in the usual manner by acetylating leuco-eupitton, crystallises from dilute alcohol in colourless needles melting at 236° C., and dissolves in concentrated sulphuric acid with the red colour characteristic of Eupitton.—T. A. L.

Colour Change; Theory of ——. C. Liebermann. Ber. 1901, 34, [6], 1040—1042.

Eupitton triamine, according to Hofmann, is hexamethoxyrosaniline. The entrance of six methoxyl groups has determined a change of colour from red to blue. This might be thought to be due simply to the methyl, which produces a similar change when it replaces the amino hydrogen in Rosaniline, giving rise to violets and blues. But in the present case the change must be attributed to the entire methoxyl, the methyl itself only playing a subordinate part, since hexahydroxyrosaniline is also blue, and here the colour change can only be due to the hydroxyl. Eupitton itself—hexamethoxyaurin—is only a feeble dyestuff, and hardly differs in shade from Aurin. But whereas the alkaline solution of Aurin is red, that of Eupitton is blue, again showing the influence of methoxyl groups. When the methyl is removed from these methoxyl groups, the colour of the sulphuric acid solution changes from magenta to blue; the new compound, the Noreupitton (Eupitton Black) of the preceding abstract, dyes mordants so deeply that its essentially violet colour can only be recognised at the first moment of its application. The effects here attributed to hydroxyl or methoxyl groups, *i.e.*, a deepening of colour and a shifting towards the blue end of the spectrum, can also be obtained in other classes of dyestuffs, such as the hydroxyanthraquinones. In this class, with successive additions of hydroxyl, there is a change of colour from the yellow or orange of hydroxyanthraquinone and of the corresponding dihydroxyanthraquinone having one hydroxyl in each nucleus, through the red and violet of Alizarin and Purpurin to the blue of alkaline solutions of penta- and hexa-hydroxyanthraquinone (Cyanin). The position, however, as well as the number of the hydroxyl groups is important, for the alkaline solutions of Alizarin, Hystazarin, and Quinizarin are bluer than that of Purpurin, whilst in the anthragallols the colour change is towards green instead of blue. On an alumina mordant the changes of colour are from the red of Alizarin and Purpurin through the Bordeaux of Quinizarin to the blue of Cyanin, whilst, on the other hand, with different positions of the hydroxyl groups, the anthragallols and rufigallic acid are brown. In the aurin hydroxycarboxylic acids similar changes from red to brown appear to take place with increasing hydroxyl groups (Ber. **25**, 949), providing that the substances there described were pure.

The two series of colour changes—yellow, orange, red, violet (ponceau), blue, black—and yellow, red, brown, black—which in the foregoing instances mark successive additions of hydroxyl to the molecule, are also well known in the class of azo colours. Here, indeed, there are few examples of an aggregation of hydroxyl groups, but an increase in the number of azo groups or of amino groups has the same effect. Lastly, conjugation with phenol, naphthol, and anthrol respectively (this Journal, 1882, 181 and 226) is marked by a similar colour change, progressing with the increasing number of benzene rings in the molecule. It is remarkable that certain groups, such as sulphuryl, have no influence on colour. Bromine, however, as exemplified in the case of the Eosines, tends to deepen the colour.

It must be remembered that the colours of dyed materials and of solutions are not spectrum colours, and little is known about them spectroscopically; still it is noteworthy that the heaping up of atomic groups only tends to facilitate the passage of rays of shorter wave length.—T. A. L.

Picric Acid; Process for Manufacturing ——. — Wenghöffer. Rev. Prod. Chim. **4**, [3], 35.

A thin paste is made of 100 kilos. of sulphanilic acid and water, this being then mixed with 40 kilos. of sodium nitrite in a dilute solution, and filtered to separate undissolved impurities. The filtrate is treated with 28 kilos. of sulphuric acid, which throws down the diazobenzene sulphonic acid formed. After filtration, the mass is introduced into nitric acid, the concentration of which is such that the liquid has a final density of about 40° B. Heat is applied until nitrogen begins to come off, and when the evolution of gas diminishes, heating is discontinued and the solution is left at rest for about 36 hours, to allow of the separation of the picric acid. The latter is washed and dried, the washing being simpler than in the usual method of manufacture, owing to the nitration being effected in the absence of sulphuric acid.

The method may be modified by stirring the above quantity of sulphanilic acid into a solution of 40 kilos. of sodium nitrite in the same weight of water, the resulting yellow paste being then introduced into such an amount of nitric acid as to obtain 320 kilos. of acid of 40° B.; the final stages are the same as before.

By these methods, 110 kilos. of picric acid can be obtained from 50 kilos. of aniline.—C. S.

Nitrated Azo Dyestuffs; Reduction of ——. A. Rosenstiehl. Comptes Rend. **132**, [16], 985–988.

The author, in conjunction with Noelting, patented, in 1887, a red dyestuff obtained from meta-azoxyorthotoluidine by diazotising and coupling the diazo compound with α-sulpho-α naphthol. The meta-azoxytoluidine was obtained by acting with zinc and caustic soda on meta-nitro-orthotoluidine, but as the nitramine is insoluble in alkali t action was very slow and the yield bad. The author n finds that if the nitramine be diazotised and the di compound then coupled with α-sulpho-α-naphthol, the s stance so formed is soluble in alkali, and may be reduc in alkaline solution by stannous chloride, arsenious ac formaldehyde, or glucose, at 50°—60° C. No change colour occurs during the reduction, but while the nitram derivative dyes wool only, and only in an acid bath, azoxy-amine derivative does not dye wool, but dyes cot in an alkaline bath.

This reaction is general. Metanitramines yield az derivatives of the same colour but different dyeing pow like the "St. Denis Red," which is their type; p nitramines yield azoxy derivatives differing both in col and in dyeing power; orthonitramines give rise b different reaction to colourless compounds which are azo derivatives.

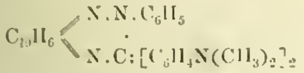
The reduction may be pushed further by raising temperature and increasing the amount of glucose; derivative of the azoxy-amine may then yield the azo-amine, or ultimately the diamine. The author has prepared para-azo-orthotoluidine, from which, by diazoti and treating with sulphonaphthol, he has obtained a stuff giving bluer shades of red than the correspon compound from the azoxy-amine.—J. T. D.

Amino-Azo Compounds. R. Möhlau and M. Heinz
Ber. 1901, **34**, [6], 881—888.

In studying the differences between *o*- and *p*-amin compounds, it is noteworthy that although the l behave in all reactions like primary amines, still in vi the reaction of tetramethyldiaminodiphenylcarbinol *p*-quinonoid compounds (Ber. **31**, 2351, and **32**, 2 this Journal, 1899, 35 and 1010), and especially *p*-hydroxyazo compounds (Ber. **33**, 2858), it appear be of interest to investigate the behaviour of *p*-amin compounds towards this reagent. The authors find the products obtained are not quinone derivatives leucauramines, and in view of their experiments they clude that whereas *p*-amino-azo compounds form le amines within a wide range of temperatures, *o*-ami compounds only form leucauramines at temperatur to 40° C., whilst at higher temperatures (up to 8 Auramines are produced. For the preparation of be azo-phenylleucauramine, equimolecular proportion *p*-amino-azobenzene and tetramethyldiaminodiphe binol are dissolved in 96 per cent. alcohol and coh on the water-bath for about five hours. The conden product crystallised from benzene-petroleum spirit se in brownish-yellow prisms melting at 156·5° C. w 80 per cent. yield. The action of acetic anhydride acetyl-*p*-amino-azobenzene. Dimethylamino - azob does not react with the carbinol, proving that the re occurs with an amino hydrogen. Benzene-azo-α-na leucauramine, obtained in a similar manner, separ yellowish-brown prisms melting at 235° C. When *p*-aminotoluene is dissolved in alcohol, together w equimolecular proportion of tetramethyldiaminodi carbinol, and allowed to stand for about 12 hour occasional agitation, it is converted into the corresp leucauramine, which crystallises from benzene-pet spirit in red needles melting at 174·5° C. It is com decomposed into its components by warming with mineral acids. When boiled for some time in al solution until carbinol can no longer be detected blue colour with acetic acid, the product is convert *p*-toluene-azo-*p*-tolylauramine, which separates in yellow plates melting at 190° C. The same prod be obtained by boiling the components for some alcoholic solution. Benzene-azo-β-naphthylamine condenses with the carbinol in alcoholic solution a perature not exceeding 40° C. The leucauramine s from hot acetone in scarlet needles melting at When boiled with seven times its weight of alcoh completely dissolved, it loses two atoms of hydro forms a dark yellowish-red crystalline powder so most organic solvents and melting at 74° C. T duct is tolerably stable towards somewhat dilute hydro- oric acid, and it is therefore doubtful whether the npound is Benzene-azo-β-naphthyl-auramine—

$$C_6H_5.N_2.C_{10}H_6.N : C[C_6H_4N(CH_3)_2]_2,$$

etramethyldiaminotriphenyldihydronaphtho-α-triazine—



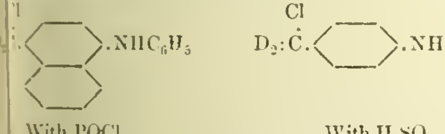
$$C_{10}H_6\left<\begin{array}{l}N.N.C_6H_5\\ \quad\cdot\\ N.C:[C_6H_4N(CH_3)_2]_2\end{array}\right.$$

he same compound can be obtained directly by boiling ther, in alcoholic solution, equimolecular proportions of zene-azo-β-naphthylamine and the carbinol, but the luct cannot be so readily isolated and purified.

—T. A. L.

stituted Aminobenzophenones and Aromatic Amines ι Sulphuric Acid Solution; Reaction between ——. . Lemoult. Comptes Rend. 1901, **132**, [14], 885— 38.

he presence of condensing agents, such as phosphorus chloride, substituted *p*-aminobenzophenones react with molecular proportions of a secondary or tertiary atic amine, forming triphenyl—or diphenylnaphthyl— ane derivatives. If, however, concentrated sulphuric be employed as the condensing agent, only amines of diphenylamine type react. When 100 grms. of pure ıuric acid, 30 grms. of tetramethyl-di-*p*-aminobenzo- one, and 17 grms. of diphenylamine are heated ther at 130°—150° C. for about three hours and the melt ured into ice water, a dyestuff is precipitated having formula of a tetramethylphenylsulphotri-*p*-amino- enylmethane with a 90 per cent. yield. Sulphonation e avoided by moderating the reaction, but condensation only takes place very slowly. No condensation at all rs with secondary or tertiary amines containing only a e aromatic nucleus, whilst, on the other hand, the ving substances do react: methyl-, ethyl-, and benzyl- nylamine, phenyl-*p*- and *o*-tolylamine, but not di-*p*- mine. In the case of the secondary and tertiary thylamines, phenyl-α- and phenyl-β-naphthylamine, l- and methylphenyl β-naphthylamine react, whilst l-α and *p*-tolyl-β-naphthylamine, as well as α-β-di- hylamine, do not. The difference between the dye- formed from phenyl-α-naphthylamine according to ondensing agent employed is illustrated as follows, D represents $(CH_3)_2:N.C_6H_4$—

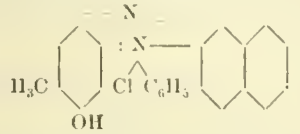


With $POCl_3$ With H_2SO_4

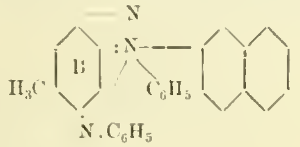
nilar reaction takes place with sulphonated tetra- ldiaminobenzophenone, the dyestuff obtained giving similar shades to those from the unsulphonated et. The general conclusions arrived at as a result se investigations are that substituted *p*-aminobenzo- nes in sulphuric acid solution give dyestuffs with ı aromatic amines which contain at least two aromatic directly attached to nitrogen. One of these must be yl group in which the position para to the nitrogen —T. A. L.

osinduline and Isorosindone Reaction. O. Fischer. Ber. 1901, **34**, [6], 940–949.

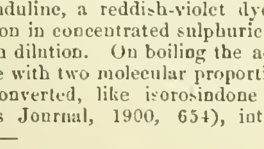
ermining the limits of the reaction between nitroso unds (nitroso aniline, -dimethylaniline, -phenol, -α- ıol, &c.), and β-alkyl- or alphylnaphthylamines, ng in the formation of isorosindulines and isorosin- the author finds that the nitroso-*o*- and *m*-toluidines, as the nitroso-*o*- and -*m*-cresols, readily react with yl- or -phenylnaphthylamine, but homologues of -aniline or nitroso-phenol containing two alkyl , whatever their position, do not form isorosin- Such, for example, are nitroso-*p*-xylenol, -thymol, and -carvacrol. B-*o*-methylisorosindone is obtained from nitroso-*o*-cresol and phenyl-β-naphthylamine according to the method already given for isorosindone (Ber. **29**, 2755; this Journal, 1897, 132). The base crystallises from 70 per cent. alcohol in long reddish-brown metallic needles melting at 258° C., and having the formula—



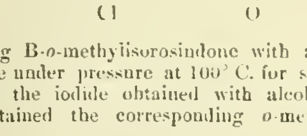
It is only a weak base, and its well-crystallised salts are dissociated by water and alcohol. By the action of phosphorus pentachloride it is converted into B-*o*-methylchlorophenylnaphthophenazonium chloride, in which, like isorosindone chloride, the chlorine atoms are unequally bound, the azonium chlorine being readily replaced in cold aqueous or alcoholic solution by I, Br, or NO_3, &c. On boiling the alcoholic solution of the chloride with two molecular proportions of aniline for several hours under an inverted condenser, it yields B-*o*-methylphenylisorosinduline—



The base separates from benzene in coppery crystals, and dissolves with a blue colour in concentrated sulphuric acid. The homologous B-*o*-methyl-*p*-tolylisorosinduline from the chloride and *p*-toluidine melts at 226° C., and dissolves to a greenish-blue solution in concentrated sulphuric acid. The chloride gives with β-naphthylamine, B-*o*-methyl-β-naphthylisorosinduline, a reddish-violet dyestuff, giving a deep blue solution in concentrated sulphuric acid, becoming reddish-violet on dilution. On boiling the aqueous solution of the dichloride with two molecular proportions of sodium acetate, it is converted, like isorosindone chloride (Ber. **33**, 1485; this Journal, 1900, 654), into B-*o*-methylchlororosindone—



On heating B-*o*-methylisorosindone with an excess of methyl iodide under pressure at 100° C. for several hours, and treating the iodide obtained with alcoholic potash, there is obtained the corresponding *o*-methylmethoxyrosindone—



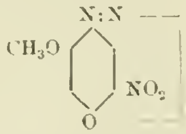
which separates from alcohol in shining brownish-red needles, melting at 288° C. By condensing nitroso-*m*-cresol with phenyl-β-naphthylamine, it is converted into *m*-methylisorosindone, which crystallises from dilute alcohol in golden bronzy needles. The base gives magenta coloured solutions in alcohol, benzene, and chloroform, whilst the salts are readily dissociated by water. It dissolves to a reddish-violet solution in concentrated sulphuric acid, which on dilution becomes brown and then reddish-yellow, depositing on cooling, the sparingly soluble sulphate.

In conclusion, the author characterises some new products. 2-nitroso-1.3.5-xylenol is obtained by known methods from *s*-xylenol, melting at 64° C. It crystallises from dilute alcohol in yellowish prisms, melting at 175° C., and is readily soluble in alcohol, ether, benzene, and ammonia, but almost insoluble in cold water. 6-nitroso-1.2.3-xylenol is obtained from 1.2.3-xylenol. It forms yellowish needles, melting at 166° C., and has a similar solubility to the foregoing. 2-nitroso-1.3.5-ethylxylidine is produced from *s*-xylidine, boiling at 221° C. by heating with ethyl bromide, conversion into the nitrosamine and transformation into the nitroso base, which separates from benzene in steel blue prisms, melting at 138° C.—T. A. L.

Dinitroanisidine and the Constitution of the Resulting Product; Diazotisation of ——. R. Meldola and J. V. Eyre. Proc. Chem. Soc. 17, [238].

A paper just published by Freyss (this Journal 1901, 356), anticipates some conclusions at which the authors have arrived as the outcome of an investigation upon which they have been engaged since last October. They are led, therefore, to place upon record the results of those experiments which appear to give independent support to the conclusions of the author above named. This work is an extension of that already published (Meldola and Wechsler, Trans. Chem. Soc. 1900, **77**, 1172; Proc. 1898, **14**, 226, this Journal, 1898, 1138).

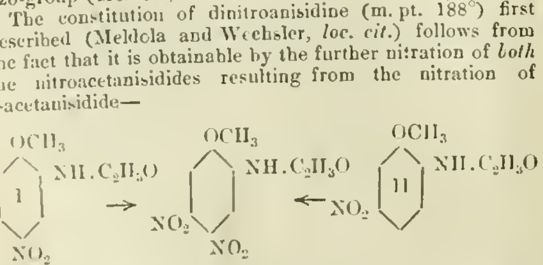
The crystalline diazo-compound, obtained by the action of a nitrite on dinitroanisidine in acetic acid solution, is a diazoxide of the formula—



The proof of this constitution is given by several considerations, some of which appear from the experiments of Freyss, the most cogent, perhaps, being its ready convertibility into nitromethylresorcinol, $C_6H_3.NO_2.OH.OCH_3 = 1:2:1$. The authors find the most convenient method for bringing about this conversion is to dissolve the diazoxide in alcoholic sodium hydroxide. The decomposition takes place at the ordinary temperature, with the evolution of nitrogen and the formation of aldehyde. On diluting the alkaline alcoholic solution with water and acidifying, the nitroresorcinol methyl ether separates in a crystalline form, and is best purified by steam distillation.

The diazoxide is remarkably stable towards acids; it can be boiled with dilute hydrochloric or sulphuric acid and can be crystallised from boiling glacial acetic acid or from acetic anhydride without undergoing decomposition. It is decomposed on boiling with hydriodic acid solution, and the product is iodonitroresorcinol methyl ether (Meldola and Wechsler, *loc. cit.*, 1173), $C_6H_2.OCH_3.OH.NO_2.I = 1:3:4:6$. The azo-β-naphthol derivative described in the former note (*loc. cit.*) has the formula $C_6H_4.NO_2.OCH_3.OH.N_2.C_{10}H_6.OH$. In addition to the properties already assigned to this compound, it may be added that it is distinctly phenolic in character, dissolving in cold aqueous alkali with a dull claret-red colour and being precipitated unchanged by acids. The phenolic character is due to the hydroxyl group in the para position. An examination of the product of the action of ammonium sulphide on the azo-compound has shown that no amino-azo-compound is formed, and this is in accordance with the view that the nitro-group is not in the para-position with respect to the azo-group (Meldola, Trans. Chem Soc., 1883, **43**, 425).

The constitution of dinitroanisidine (m. pt. 188°) first described (Meldola and Wechsler, *loc. cit.*) follows from the fact that it is obtainable by the further nitration of *both* the nitroacetanisidides resulting from the nitration of *o*-acetanisidide—

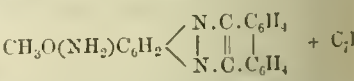


The authors have proved this directly by the nitration of carefully purified specimens of the mononitroacetyl derivatives. No. I. was prepared by the reduction dinitroanisol and acetylation of the nitroanisi (Meldola, Woolcott, and Wray, Trans. Chem. Soc. 18 **69**, 1330). No. II. was prepared from the correspond nitroanisidine, the latter being obtained pure, by a mo cation of the method formerly described (this Journal, 18 1138). The mixture of nitroacetyl derivatives result from the nitration of *o*-acetanisidide is boiled with di alkali till completely hydrolysed. The mixed nitroanisid on being dissolved in hot dilute sulphuric acid deposit, cooling, silvery scales of the sulphate of the *p*-nitro-c pound, $C_6H_3(NO_2)(NH_2)OCH_3 = 1:4:5$, the sulphat the isomeric compound remaining in solution. The cry line sulphate gives pure *p*-nitro-*o*-anisidine on treatn with dilute alkali and crystallisation of the product f hot water. In order to characterise further the nitroanisidines and the dinitroanisidine, the ben derivatives have been prepared: $C_6H_3(NO_2)NH(C_7H$ $OCH_3 = 1:4:5$, white silky needles from alcohol, m 149°—150° C.; $C_6H_3(NO_2)NH(C_7H_5O).OCH_3 = 1:$ slender ochreous needles from alcohol, m. pt. 160°—1 $C_6H_2.(NO_2)_2.NH(C_7H_5O).OCH_3 = 1:2:5:4$, ochr scales from acetic acid, m. pt. 185°—186° C.

The constitution of the *p*-nitro-o-anisidine was prove two methods differing from those adopted by Frey well as by conversion into the *p*-nitro-guaiacol of n 104°. The latter compound, of which the discove assigned to Rupe (Ber. 1897, **30**, 2446), was first desc by one of the authors (Meldola, Proc. Chem. Soc. **12**, p. 125). The *p*-nitro-o-anisidine when diazotise the amino-group replaced by iodine in the usual way, an iodonitroanisol which crystallised in straw-col needles melting at 127°—128°.

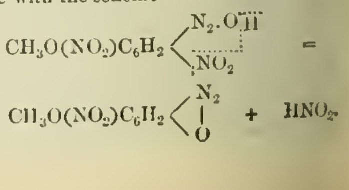
The constitution of the nitroanisidine of Cahours (Me Woolcott, and Wray, *loc. cit.*) was further prove converting it into the corresponding iodonitroanisol replacing the amino-group by iodine by the diazo-me The iodonitroanisol, $C_6H_3(NO_2)I.OCH_3 = 1:3:4$, at 95°—96° and is identical with that described by Rev (Ber. 1896, **29**, 998; this Journal, 1896, 534).

Experiments were in progress to obtain direct evi of the constitution of the dinitroanisidine at the ti appearance of the paper by Freyss. The triamino obtained by reducing the dinitroanisidine with ti hydrochloric acid forms a crystalline hydrochloride, is very unstable, passing readily into a deep violet col matter on exposure to the air. The dinitroacetan does not give an anhydro-base on reduction, an obser which is in harmony with the view that the acet group is not in the ortho-position with respect to a group. On the other hand, that the triamino contains two amino-groups in the ortho-position is p by the formation of an azine with phenanthrenequ On heating together equimolecular weights of the tr and the quinone in glacial acetic acid, the aminoa gradually formed, and on adding hydrochloric ac hydrochloride is completely thrown out on coolin dull red precipitate. The free base is an ochreous which dissolves in alcohol with a magnificent fluorescence. It does not readily crystallise, but se from boiling toluene in the form of brown nodules a melting point of about 237° C., but softening bel temperature. The base thus obtained contains one m of toluene and has the formula—



$$CH_3O(NH_2)C_6H_2\left\langle\begin{matrix}N.C.C_6H_4\\ |\quad\;\;\|\quad\;\;|\\ N.C.C_6H_4\end{matrix}\right. + C_7H$$

The result of this investigation thus confirms the sion that on diazotising 3:4-dinitro-*o*-anisidine i acid, it is the 4-nitro-group which is eliminated, pro accordance with the scheme—



$$CH_3O(NO_2)C_6H_2\left\langle\begin{matrix}N_2.O\;H\\ \vdots\\ NO_2\end{matrix}\right. = CH_3O(NO_2)C_6H_2\left\langle\begin{matrix}N_2\\ |\\ O\end{matrix}\right. + HNO_2.$$

Detection of Dyestuffs ; Application to Indophenols. C. Camichel and P. Bayrac.

See under XXIII., *page* 621.

PATENTS.

ck *Disazo Dyestuffs ; Manufacture of* ——. C. D. Abel, London. From The Actien-Gesellschaft für Anilin Fabrikation, Berlin. Eng. Pat. 10,844, June 14, 1900.

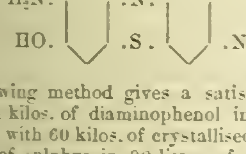
s specification is supplementary to Eng. Pats. 24,527 of 7, 2360 and 6583 of 1899 (this Journal, 1898, 916 ; 1900, and 238), which relate to the manufacture of black disazo stuffs by combining the diazo compounds of *p*-amino- henylamine sulphonic acids, *p*-aminophenyl-β-naphthyl- e sulphonic acids or *p*-aminodiphenylamine carboxylic ls or their homologues or substitution products with hthylamine, diazotising the products so obtained, combining them with suitable dyestuff components. patentees now find that dyestuffs of a similar character obtained by using as first components, sulphonic acids -aminodiphenylamine which contain both a hydroxyl a carboxyl group. These products are formed by the on of *p*-nitrochlorobenzene o-sulphonic acid on *p*-amino- ylic acid or on *p*-aminocresotic acid, and subsequent ction of the nitro-products obtained. Since the new ucts contain hydroxyl and carboxyl groups they are ble for dyeing on chromium mordants. The process loyed is analogous to that described in Eng. Pat. 24,527 1897 (*loc. cit.*). The dyestuffs give directly violet- k shades, and on chrome mordanted fibres produce a black.—T. A. L.

hurised Leuco-Compound ; Manufacture of a ——. D. Abel, London. From the Actien Gesellschaft für nilin Fabrikation, Berlin. Eng. Pat. 10,843, June 14, 00.

RDING to Ger. Pat. 103,301, leuco-thionoline is pro- l by the action of sulphur on mixtures of equimolecular rt ons of certain disubstitution products of benzene. patentees now find that another sulphurised leuco- ct, containing two more amino groups than the above ound, can be obtained by the action of sulphur and m sulphide on diaminophenol—

$$OH : NH_2 : NH_2 = 1 : 2 : 4.$$

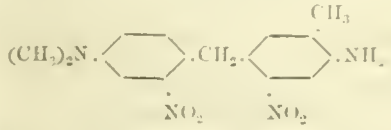
e new product has the formula—



the following method gives a satisfactory yield. A on of 124 kilos. of diaminophenol in 750 litres of hot is mixed with 60 kilos. of crystallised sodium sulphide 2 kilos. of sulphur in 90 litres of water, the whole boiled under a reflux condenser for some time, when noleucothionoline separates in shining leaflets and is d off. The new product forms shining yellowish ts, scarcely soluble in water, alcohol, ether, or benzene, y soluble in dilute acids, caustic alkalis, and sodium ide solution. It is converted by the action of oxidising into the corresponding thionoline which combines cids and alkalis to form violet and blue coloured salts tively.—T. A. L.

ring Matters [*Yellow*] *of the Acridine Series ; nufacture or Production of New* ——. H. E. Newton, don. From The Farbenfabriken vorm. F. Bayer and Elberfeld, Germany. Eng. Pat. 11,035, June 18, 0.

METRICALLY dialkylated or trialkylated derivatives ra-aminodiphenylmethane or their homologues, ob- by nitrating and reducing the corresponding unsym- ally dialkylated or trialkylated *p*-diaminodiphenyl- ne bases, or their homologues, are heated with agents e of removing ammonia, and are then oxidised to the new dyestuffs. For example, 24 kilos. of dimethyldiaminophenyl-*o*-tolylmethane (Ger. Pat. 107,718) dissolved in 200 kilos. of sulphuric acid (66° B.) are nitrated below 5° C. with a mixture of 21·5 kilos. of nitric acid (40° B.) and 50 kilos. of sulphuric acid monohydrate. The melt is poured into water and neutralised with sodium carbonate when dinitrodimethyldiaminophenyl-*o*-tolylmethane—



separates in brick-red crystals. The product, after recrystallisation from acetone, forms red leaflets melting at 160° C. In order to reduce it, it is dissolved in 5 times its weight of hydrochloric acid (36·5 per cent.) and treated in the cold with twice its weight of zinc dust. After filtering from excess of the latter, the diamino product is precipitated by caustic soda lye. On recrystallisation from chloroform, it yields colourless leaflets melting at 177° C. In order to obtain a dyestuff, 1 kilo. of the product so formed is mixed with 10 kilos. of sulphuric acid (20 per cent.) and boiled for seven hours, in a lead-lined vessel. The resulting solution is mixed with about 1·25 kilos. of calcined sodium carbonate, and oxidised with the necessary quantity of ferric chloride, after adding salt and zinc chloride. The dyestuff so produced forms a reddish-brown resinous mass, which soon solidifies to a red crystalline product, easily soluble in cold water, to an orange-yellow solution. It dyes leather level yellow shades.—T. A. L.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Oxycelluloses ; Researches on ——. A. Nastukoff. Ber. 1901, **34**, [5], 719—723.

The author has oxidised Swedish filter paper with (1) chloride of lime solution as in previous experiments (Ber. 1900, **33**, 2237, this Journal, 1900, 733) ; (2) permanganate solution followed after 36 hours by the introduction of sulphur dioxide gas, and finally the addition of weak and lukewarm sulphuric acid. The products in both cases appeared to be α-oxycelluloses. By heating these on the water-bath with 10 volumes of sulphuric acid solution (5 per cent.), washing, and again heating with a like amount of sodium carbonate solution (10 per cent.), a new class of oxycelluloses, characterised by solubility in water, were obtained in 60—80 per cent. yield. The oxycellulose resulting from the action of chloride of lime required to be heated with acid for three hours ; that from the permanganate oxidation for only one hour. A small quantity of sugar was formed during this acid hydrolysis and a larger quantity if the time of heating was extended ; it gave a hydrazone, possibly mannose-hydrazone. The alkaline hydrolysis need be continued for only 10—30 minutes at a temperature of 70°—100° C. For the new soluble oxycelluloses the author proposes the name γ-celluloses as he considers them to be different to the class already distinguished by the prefix β- (Cross and Bevan, J. Chem. Soc. 1883, 22. See also this Journal, 1884, 206 *et seq.*).

Their properties are briefly as follows :—The aqueous solution when dilute is opalescent or milky, and yellow in transmitted light, is quite filterable and does not alter on standing or when heated. Stronger solutions (5—10 per cent.) resemble glycerin or viscose, and when dried in a desiccator or over a water-bath deposit silky transparent scales or plates. The addition of various metallic salts, of acids or alcohol, produces precipitation. When precipitated by an acid, the solubility gradually diminishes as the substance dries, but is restored by the action of warm sodium carbonate solution. If washed with almost any dilute acid, the oxycellulose becomes insoluble once more, and this cycle may be repeated as desired. Drying at 110° C. does not however destroy the solubility.

γ-Oxycellulose reduces Fehling's solution when heated and forms a yellow hydrazone which is insoluble if prepared from the insoluble oxycellulose, but like it, becomes soluble by the action of alkali; also its solutions are yellow, opalescent, and deposit lustrous gold-coloured scales. Iodine produces no coloration; the pentosan reaction does not take place: and the ash has an alkaline reaction.

γ-Oxycellulose, in its soluble form, would appear to be the sodium salt of a soluble acid which, when dried, becomes an insoluble anhydride or lactone.—R. L. J.

PATENTS.

Fatty Matters from Wool, Sheepskins, and other Textile Fibres; Process and Apparatus for Extracting ——. C. D. Abel. Eng. Pat. 2360, 1900.

See under XII., *page* 591.

Mercerizing of Yarn; Machines for Use in ——. F. Shuman. Philadelphia, U.S.A. Eng. Pat. 3568. Feb. 19, 1901.

A MACHINE, chiefly applicable to the mercerising of loose yarn. The latter is taken up on a moving frame composed of two endless chains which travel through the mercerising fluid. By means of cam discs the yarn is stretched during mercerization and washing.

(See also this Journal, 1898, 149, 240, 345, 452, 573, 756, 840, and 1141; 1899, 36, 136, 267, 49, 680, 911, and 1122; 1900, 43, 144, 240, 821, and 1011.)—C. M.

Textile Fabrics and the like, Non-Inflammable and Waterproof; Process and Composition for Rendering ——. C. Baswitz, Berlin Eng. Pat. 8267, May 4, 1900.

THE following composition, namely:—34 parts of "amphibolin, a fire-resisting natural earth found near Baden," 39 parts of size or other gelatinous material, 2 parts of chrome alum, 2 parts of ammonium sulphate and 53 parts of water, is thoroughly mixed and then applied to the fabric by a brush, or priming machine. After each coat the fabric is exposed to light. The number of coats vary with the purpose for which the fabric is wanted.—C. M.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, AND BLEACHING.

Fog in Dye- and Bleach-Works; Prevention of ——. F. Milius. Färber Zeit. 1901, **12**, 117—118.

IN order to prevent the condensation of steam in a dyehouse, the air must be changed 8—10 times hourly, and the air which is blown in should be heated 22—30° C. above its original temperature. Air heated, for example, from − 15° C. to + 15° C. is capable of taking up 11·42 grms. of water vapour per cubic metre, and the author describes a dyehouse of 2,630 cb. m. into which 26,300 cb. m. of air thus warmed are introduced hourly. To heat this air through 30° C. there are required 236,700 cal., or allowing 200,000 cal., for machines, walls, roof, etc., a total of 436,700 cal. In the works described, this heat is provided by the waste flue gases which are drawn off at the foot of the chimney into a heating apparatus consisting of a series of copper pipes, where they give up a portion of their heat to cold air blown in from outside. This air, when warmed, passes to the dyehouse, entering it by a number of openings about 2½ metres above the floor.

The temperature of the flue gases is 225° C. at their entrance into the copper pipes. The boiler fires burn 800 kilos. of coal per hour, which, at N.T.P., will give 16,800 cb. m. of gas, or at 225° C., 30,408 cb. m. In the pipes the temperature of the gases is lowered to 100° C. and 1,178,310 cal. are thus provided hourly, a far greater amount of heat than is required as shown above, and the cost of working is practically nothing. If the heat were supplied by direct steam at, say 75 lb. pressure, about 775 kilos. of steam would be required hourly. For the production of this heat there would be used 103 kilos. of coal at a cost per day of 10 hours of 23·7 marks (23*s*. 6*d*.).

The arrangement is thus very cheap, and it works satisfactorily. The workmen are not exposed to draughts, owing to the height of the inlets above the floor. The admission of this large volume of air at a comparatively high temperature keeps the air always far above the dew point, and it ca therefore undergo a considerable degree of cooling witho the deposition of water. Outlets should be provided in th roof to the extent of 40 sq. cm. for every 25 sq. m. of floo —R. B. B.

Dyeing; Effect of Temperature in ——. R. B. Brow J. Soc. Dyers and Col. 1901, **17**, [4], 92—99.

IT may be stated broadly that wool requires a high temperature in mordanting and dyeing than cotton; whi silk occupies an intermediate place in this respect (see th Journal, 1901, 226).

The basic dyestuffs should never be dyed at the bo This is true not only for wool, to which fibre they are seldo applied, but also for tannin-mordanted cotton. The te perature in dyeing with basic dyestuffs should not exce 80° C., and even at this temperature some of them beco pale and dull. Thus Chrysoïdine, which at 60° C. yield bright orange, at 80° C. dyes only a dull orange yellow. Wi Auramine, the difference is still more marked, this dyes being decomposed on boiling, as is also Turquoise Bl When it is absolutely necessary to apply the basic dyestu at the boil, as in straw dyeing, such colours as these m be strictly avoided. Other colours, again, can be boiled a short time, but will not withstand prolonged boiling. instance of this class is Brilliant Benzo Green B, wh dyes a bluish-green after half an hour's boiling, but continuation of the boiling turns to a dull red or brown, finally to a grey colour. The Sulphocyanine group of d stuffs, it is stated, suffers decomposition in the same way

In some instances it is necessary to dye at a low tempe ture in order not to injure the material which is being dy This is the case with leather. If ordinary "vegetal tanned" leather is steeped in a solution heated to ab 50° C., it is practically reduced to the condition of again, and on drying it shrinks and becomes extrem brittle. Such leather is therefore dyed at a temperat not exceeding 45° C., and a considerable amount of stuff as a consequence is usually left in the dyeb Dyestuffs, *e.g.*, those of the Alizarin group, which not dissolved at this temperature, cannot be emplo "Chrome" leather, on the other hand, can be dyed at or 90° C., or even at 100° C., without injury, so that dyestuffs available in the dyeing of this are much m numerous. With sheepskins, the wool does not become d at a low temperature, and the leather would be destr at a high temperature. The difficulty is met by chlorina the wool, which may then be dyed full and even col at a temperature of 45° C., without injury to the skin.

The property of chlorinated wool may be applie another way. Woollen materials are printed with bleac powder and then dyed at a low temperature, the e being produced of a dark pattern on a paler ground.

In the dyeing of artificial silks made from nitrocellu the fibre is greatly weakened by treatment with hot tions. It is, therefore, necessary to dye in a lukew bath, for which purpose the basic dyestuffs are the suitable. The so-called Vanduara silk (this Journal, 1 16) is dyed prior to the spinning process, owing to tendering action of water upon it.

In the manufacture of straw hats an artificial subst for straw is frequently plaited together with the na product. This material, which is known as satin-s or satin-chip, is employed on account of its high l It is made from fine threads of natural or artificial or sometimes of hemp or cotton, placed side by side caused to adhere together in the form of a band, by pasted over with a solution of gum or gelatin. It is as a rule, dyed after manufacture, as the gelati immersion in water, is dissolved, and the plait then to pieces. It may, however, by dyed, after being subj to the action of formaldehyde vapour to render the g insoluble. The "chip" (shavings of willow wood), which the satin-straw is usually plaited, is dyed at 70° C. by certain basic dyestuffs, like the satin-straw i

A wide diversity of behaviour in dyeing wool and unions is met with in the direct cotton dyestuffs. So these, *e.g.*, the Sulphone group, in a boiling bath, dy wool only, and merely tint the cotton; others, *e.g.*

ikado dyestuffs, act in the opposite way. It is therefore ssible by mixing dyestuffs of opposite tendencies to oduce "shot" effects in a single boiling bath, but the ades are not remarkable for brilliancy or purity of tone. e method might be used in dyeing "solid" shades, by ixing two dyestuffs of similar colour but opposite pro- rties, but this is seldom done, since there are now a rge number of direct dyestuffs which yield "solid" colours a single dyebath.

To produce "shot" effects, it is sometimes desirable to e the cotton in the cold with a direct dyestuff, after the ol has been dyed with an acid dyestuff. The following estuffs have been selected as giving full shades upon ton in the cold, while leaving the wool but little affected: amine Rose B extra, Chloramine Orange, the Mikado anges and Yellows, Direct Yellow R (Bayer), Diamine st Yellow C, Columbia Green, Chicago Blue 4 B, lumbia Black B, Diamine Black R M W, Diamine lling Black B, Direct Grey B (S.C.I. Basle), Teluylene wn R, Cotton Dark Brown B M, Congo Brown R, izocyanine 3 B. Certain of the Blacks are now employed lace of tannic acid and iron salts in the so-called "burling" process for unions.

'he Janus colours are applied in the dyeing of cotton wool unions in an acid bath. Some of them, *e.g*, Janus ret Red, give "solid" colours at the boil; others, *e.g.*, us Yellow G, at 80°—90° C., while Janus Red B does at 60° C. The makers recommend, instead of dyeing w the boil, first to boil the dyebath to cause the wool ke up colour, and then to cool down the bath in order ye the cotton.

i dyeing the unions of cotton and silk, the direct on dyestuffs are chiefly employed. The temperatures hich the two fibres are dyed alike, varies with the dye- ', but it is frequently about 80° C. Many of the direct stuffs are, however, quite unsuitable for the purpose. h Geranine G the two fibres are similarly dyed up to a perature of 60° C.; beyond that, to 80 C., the silk is deeply dyed, while the cotton is less deeply dyed as emperature is increased. The same dyestuff at 80° C. wool and cotton alike. Direct Yellow G (Kalle) at all eratures dyes cotton more strongly than it does the al fibres. Diamine Green B is an example of a dye- which is suited for dying tissues composed of silk, , and cotton, as at 80° C. it gives "solid" colours on is of all these fibres.—E. B.

P ssium *Permanganate in Dyeing; Application of —— or Manganese Brown*]. M. G. Saget. Monit. Scient. , May 1901, 319—320.

ssium permanganate may be employed in cotton g for the production of pale brown or drab shades. xidising action is made use of to destroy a colour ly on the fabric with the production of manganese ide in the interior of the fibre. Metallic tannates the most suitable preliminary colours, and the final of shade will vary according to the amount of tannin ; excess of permanganate is therefore not to be feared. plying the permanganate any rise of temperature must oided or uneven dyeing results; reduction takes place rapidly even in the cold. The grey obtained with and iron is a useful starting point for brownish drab e) shades. The cotton is padded in chestnut extract, n, etc., and subsequently in pyrolignite of iron; after hours' exposure to air it is washed and passed through dilute solution of the permanganate; at the end of nutes the grey has completely disappeared and given to the required drab. The iron may be replaced by metals, *e.g.*, Pb, Cu, Cr, Al, Mn, and the colours of oxides are added to that of the manganese brown. cetates of the metals are to be preferred to any other Calcium plumbite fixed on the fibre also reduces nganate with production of a reddish-brown, a mixture peroxides of lead and manganese.

shades of this kind produced with permanganate are ast to the action of chlorine, but boiling soap im- hes the colour and it fades very rapidly in sunlight, our being restored by chlorine. The fastness to light ased by an after treatment with sodium carbonate at 60° C., which does not influence the shade. The same improvement is effected by a treatment with bleaching powder solution at ½° B. in the cold, followed by a thorough rinsing.

Steaming makes the colour much paler, and acids destroy it, even when very dilute; it is also discharged by bisulphite of soda and by other mineral and organic reducing agents.

On oil-prepared cotton the shades are much faster, especially if the goods are soaped at 60° C. after the permanganate bath: the colour then resists the action of light and steaming and is fairly fast to soap. The cotton may either be previously prepared with oil or the oil may be added to the tannin bath rendered alkaline with ammonia. The goods in this case must be dried before applying the metallic salt. The shade is greyer than on goods which have not been oiled. A drab dyed on cotton which has not been oil-prepared is made faster to acids and soap, but not to light, by padding in acetate of alumina and then drying and steaming without pressure; the resulting shade is also yellower and brighter in tone.

Peroxide of manganese fixed on the fibre in this way can act as a mordant for various colouring matters and also as an oxidising agent for certain aromatic amines.—R. B. B.

Dyeing Wool Black by means of Nitrosulphide of Iron.

M. Prud'homme. Monit. Scient. 1901, 251—252.

The nitrosulphides of iron discovered by Z. Roussin in 1860 are prepared by adding gradually a solution of 350 grms. of ferrous sulphate in 2 litres of water to a solution of 210 grms. of potassium nitrite and 150 grms. of sodium sulphide also in two litres of water. After some minutes' boiling, the liquid is filtered; on cooling, the filtrate deposits black crystals of a composition corresponding to the formula $Fe_3S_5K_2(NO)_4$. These compounds have been studied by O. Pawell, who recommends for their production the addition of 40 grms. of sodium sulphide dissolved in 300 grms. of water to a boiling solution of 40 grms. of potassium nitrite in 600 grms. of water. Into this mixture is poured with continual stirring a solution of 70 grms. of ferrous sulphate in 300 grms. of water. The formula of the black crystals so obtained after suitable purification would be $Fe_7S_5K_2(NO)_{12}$.

The solution of nitrosulphide of iron prepared by either of the above methods possesses the property of dyeing unmordanted wool from a neutral bath, giving a black with a brownish reflection. If the wool is previously mordanted with iron, or still better with copper, the black is somewhat less brownish. The potassium nitrite in the above recipes can be replaced with an equivalent quantity of sodium nitrite.

The author has found that the preparation of a solution for dyeing is best effected by dissolving 14 grms. of ferrous sulphate in 150 grms. of boiling water, and pouring the solution with constant stirring into a mixture of the requisite amounts of nitrite and sulphide of sodium dissolved in 200 grms. of water. The liquid is boiled for several minutes and filtered, the residue being washed with hot water until the filtrate amounts to 500 c.c. This filtrate, diluted with water, forms the dyebath without any addition, and the solution made from 14 grms. of ferrous sulphate is sufficient to dye 25 grms. of wool.

The wool at first acquires a yellowish-brown colour, and only becomes black after dyeing for ¾—1 hour at 90°—95° C. The bath is perfectly exhausted, and since it was found to contain sodium nitrite the author diminished the quantity of this substance in Pawell's recipe, which is better than that of Roussin. The proportions finally adopted were $FeSO_4$, 14 parts; Na_2S, 8 parts; and $NaNO_2$, 5 parts.

The black obtained by the use of this mixture is very brownish when viewed "overhand," and to remedy this defect the wool may be previously dyed with logwood or indigo, or with a green, blue, or violet coal-tar dyestuff. A still more satisfactory black is produced by first dyeing the wool Prussian blue with 10 per cent. of potassium ferricyanide and 10 per cent. of sulphuric acid for ¾ hour at 95° C., washing well, and re-dyeing with nitrosulphide of iron. After dyeing the Prussian blue, the shade becomes deeper and more violet if the wool be passed through water containing 10 grms. of ammonia per litre.

The colour resists the action of dilute acid and of SO_2, and the fastness to alkalis is also good. In boiling water it bleeds a little, giving a brown tinge to the water, and it rubs off a little when wet, producing a pale blue stain which is due to the Prussian blue. The fastness to light is satisfactory. The cost of the materials used for dyeing this black amounts to about 2*d*. per pound of wool dyed.

—R. B. B.

Sulphur Colours; Employment in Dyeing and Printing of a New Class of ——. A. G. Green. J. Soc. Dyers and Col. 1901, **17**, [4], 89—91.

The dyestuffs in question are known in commerce as *Clayton Fast Blacks* (Eng. Pat. 21,832 of 1898, 5,039 and 18,658 of 1899; this Journal, 1899, 909; 1900, 141 and 816). The commercial preparations are the undiluted dyestuffs, free from all inorganic sulphur compounds. They are black powders, which are quite insoluble in water, but dissolve freely in aqueous solutions of sodium sulphide or of sodium sulphite; some also dissolve in caustic alkalis.

Their application in dyeing is based upon their becoming reduced to leuco compounds, which are absorbed by the cotton fibre, and re-oxidised and fixed upon this in an insoluble form. In the case of most of the "sulphide" colours, this reduction is commonly effected by means of sodium sulphide, which is either present in the dyestuff itself, or is added for the purpose to the dyebath. The same method can be employed with the new dyestuffs, but it is not recommended owing to (*a*) the tendency under certain conditions, at present not clearly ascertained, of the tissues so dyed becoming "tender," more particularly after they have been stored for some time, or when undergoing subsequent steaming or hot pressing (see this Journal, 1901, 439); (*b*) the liability to give uneven dyeings through precipitation of insoluble colour on the surface of the fibre, necessitating, in consequence, great care to avoid exposure to air during dyeing; (c) the necessity for excluding all copper or brass parts (steam pipes, rollers, &c.), from the dye-vessels; (*d*) the unpleasant odour arising from the waste liquors when run into the drains.

With the new dyestuffs these difficulties have been overcome in the following way (Eng. Pat. 15,413 of 1900):—The dyestuffs are dissolved by boiling in a concentrated solution of neutral sodium sulphite, with which they form easily soluble sulphite compounds (probably salts of thiosulphonic acids). The latter are stable compounds of little colour, and devoid of dyeing power, but by reducing agents they are readily converted into leuco compounds (probably sulphhydryl derivatives), which are possessed of dyeing properties. Dyeing occurs with these as they are oxidised in the air, the sodium sulphite present combining with that portion of the re-formed dyestuff which has not been fixed upon the fibre, and thus holding it in solution for later use and preventing uneven dyeing. The reduction is effected preferably by glucose and an alkali, which are added in portions during the dyeing in amount sufficient to maintain the dyestuff in a satisfactorily reduced condition. After dyeing, the cotton materials are thoroughly washed, and the dye is then fixed by metallic salts, preferably copper sulphate and an alkali bichromate, the latter treatment being necessary when absolute fastness to soap is required.

This process has given good results with mercerised tissues, which can be dyed upon the ordinary jigger without any special precautions, such as keeping the tissue below the surface of the liquor, &c. All that is necessary is that a squeezing roller shall be attached to the machine.

The colour obtained, for instance, from Clayton Fast Black M, compares well in depth and fastness with Aniline Black, over which it has the advantage of not greening and of not weakening the fibre, while it is easier to produce. Moreover, in the case of mercerised cotton it does not diminish the gloss.

In calico printing, the dyestuffs are applied, either in the insoluble form or as sodium sulphite compounds, in conjunction with a thickening agent and caustic soda (Applic. for Eng. Pat. 17,193 of 1900). A suitable printing mixture is prepared from 100—200 parts of Clayton Fast Black B P, paste, 10 parts of starch, 170—70 parts of water, and 220 parts of caustic soda-lye at 70° Tw. (making in all 500 parts). The tissues printed with this are steam without pressure for $\frac{1}{4}$—1 hour. By preparing the tiss with a 5 per cent. solution of glucose, the duration of t steaming operation may be shortened to 3—10 minut After steaming, the tissue is well washed to remove cau soda, and, if a high degree of fastness be required, it passed through a boiling bath containing 6 parts of cop sulphate, 6 parts of acetic acid, and 2 parts of sodi bichromate per 1000 parts of water. As no spe reducing agent is necessary in the printing process, it considered probable that under the influence of steam caustic soda, the cotton fibre itself fulfils this function. addition of glucose to the printing mixture has no effect.

By employing Clayton Fast Brown P in the ab manner, dark brown prints are obtained.—E. B.

White and Coloured Resists for Paranitraniline Re Textile Colorist, 1901, 77.

The following mixtures are printed upon cotton tiss prepared as usual with sodium β-naphtholate. After b dried, the tissues are passed through a solution of diazot paranitraniline, and are then rinsed and soaped, or other treated as described below.

The *white resist* mixture is composed of 1 kilo. of t per cent. solution of caustic soda, and 160 grms. of Bri gum solution (65 : 100), or of 1 litre of caustic s solution (5 : 4), and $\frac{1}{4}$ litre of dextrin solution (65 : 10

The *blue resist* consists of 1 kilo. of one of the al mixtures, to which are added 150 grms. of caustic s $\frac{1}{2}$ litre of Indigo paste (20 per cent.), 40 grms. of glyc 300 grms. of glucose, and 40 c.c. of water. This is pri and steamed for about a minute with wet steam, be developing the Red, the tissue being afterwards so washed, soaped, washed and dried.

1 kilo. of the white resist, along with 250 grms. of nitrate, 100 grms. of glycerin, and 100 c.c. of water, f the *yellow resist*. After the development of the red, w is effected with the addition of 30 grms. of chalk to the of diazotised paranitraniline solution, the yellow is "rai in a 5 per cent. solution of sodium bichromate, and tissue is rinsed and dried.

A *blue resist* may also be obtained from a mixtu 1,200 grms. of the white resist, 900 grms. of a solutio 500 grms. of potassium ferrocyanide in 1 kilo. of the resist, and a solution at 50° B. of 375 grms. of "nitra iron" and 375 grms. of glycerin. The tissues printed this are passed successively through baths of chalk dilute (5 per cent.) sulphuric acid and water, after through the diazotised paranitraniline bath.—E. B.

White Discharge Effect on a Blue Ground; Prod of —— [in Calico Printing], by Means of Di Blue. H. Scherdel. Färber Zeit. 1901, **12**, [8], 119.

Safranine-azo-β-naphthol dyed on tannin-mord cotton has proved a useful Indigo substitute, and i under the names Indoïn, Diazine Blue B, Naphthi Indene Blue, &c. In calico printing it is less satisfa since it cannot be discharged to a perfect white, but M Kalle and Co. have recently introduced a dyestuff class, Diazine Blue A E, which is well suited for th duction of white patterns on a blue ground. The is equal to Indigo in fastness to light and washin superior to it in fastness to rubbing. It has the de dyeing the unmordanted cotton to a slight extent, b tint can be removed by chlorine, and the following is recommended:—The goods are padded with a solution containing 20—30 grms. per litre and fixed usual manner with an antimony salt. They are printed with an alkaline discharge consisting of soda and dextrin, and made so thin that it only just r from running. After printing, the material is dried, steamed, aged in the open width, washed, washed with bran, and rinsed in warm water. For 2 per cent. of dyestuff is required. The solution dyestuff is acidified with acetic acid and divided in portions. The dyebath is made up with one porti 1—2 per cent. of alum; the temperature is raised to

en the remainder of the dyestuff is added, and the
ting continued to 80° C., the whole dyeing operation
upying $1\frac{1}{3}$ hours, after which the goods are washed,
ped, and dried. Dyeing is followed by one or, if neces-
y, two passages through a bath made by diluting 100 litres
bleaching powder solution at 7° B. with 500 litres of
er. The goods pass through this bath at the rate of
pieces in an hour, and are then led through squeezing
ers to a drying cylinder. After the chlorine bath, the
appears fuller, brighter, and a shade redder than
ore.—R. B. B.

PATENTS.

rs for Bleaching Textile Fabrics. C. Rigamonti and
. Fagliani, Milan, Italy. Eng. Pat. 228, Jan. 3, 1901.

s kier consists of a casing made of boiler plate; from
end a trunk projects, and inside the casing is a ⋃-shaped
e. Means are described by which endless aprons
end the trunk and are then piled up in the ⋃-shaped
e, finally leaving it and returning to the entrance of
trunk. The feeding of the aprons and fabrics is separate
independent. Arrangements are also described whereby
⋃-shaped frame may be kept automatically rocking if
ed: there is also a valve at the top of the trunk for
ing off the impure liquor.—C. M.

ng or Drying Yarns; Machines for ——. W. P.
ompson, Liverpool. From G. Mallinson, Carolina,
S.A. Eng. Pat. 12,020, July 3, 1900.

machine is an improvement on that described in U.S.
at No. 620,470, Feb. 28, 1899, and consists of a frame
ted on a shaft, which is journalled into a vat. On the
of this frame are mounted, slides, each pair rigidly
ected together and slotted for the attachment of the

vices are described whereby the yarn, during the
on of the frame in the dye-bath, is moved in every
and stretched or slackened as may be desired.—C. M.

*ne Black; Process for Dyeing Wool or other Animal
re with ——.* G. Bethmann, Leipsic, Germany. Eng.
. 21,236, Nov. 23, 1900.

tous processes devised for dyeing Aniline Black on
have been based on the principle that the chief
le to success is the reducing action of the fibre. An
y important obstacle, however, is the alkaline re-
of wool, and to remove this the wool is treated
a dilute acid before padding with the Aniline Black
re. The material is boiled for about one hour in
acid, *e.g.*, HCl or H_2SO_4, under an additional
re of 20 lb. per sq. in., or it may be subjected to the
of an acid vapour.

padding mixture should contain somewhat more than
ual quantity of sodium chlorate or similar oxidising
nce, so that, after squeezing or wringing, the wool
ill retain about 3 per cent. of chlorate. The colour
loped by steaming or ageing, and the material then
l with a bichromate as usual.

alternative process consists in saturating the wool
ilute acid and then adding an alkali chlorate, or
d may be wholly or partially added to the padding
e.—R. B. B.

g Yarns, and Apparatus therefor. R. F. Schule,
heim, Germany. Eng. Pat. 12,976, July 18, 1900.

bottom of the dye-vessel is arranged a heating pipe,
ting surface of which must amount to about six or
mes the area of the bottom of the vessel. The dyeing
s placed in the vessel, but only up to about one-
f the height of the goods, which may be in the form
ks, cops, or warps. By means of steam passed
the heating pipe, the liquor is made to lather so
foams vigorously and forms small bubbles, in which
n it is capable of permeating the goods right through
e dyeing liquor. The goods are exposed for about
rs to the lather in this vessel, and are then dried
sual manner by centrifugal action.

To ensure even dyeing, the frames or rollers which carry the cops, warps, &c., can be subjected to a continuous to-and-fro or revolving motion.—R. B. B.

Dyeing and Printing [with Sulphide Dyestuffs]. C. D. Abel, London. From The Actien Gesellschaft für Anilin Fabrikation, Berlin. Eng. Pat. 11,042, June 18, 1900.

Instead of using sodium sulphide the dyestuffs are dissolved in caustic soda, with the addition of glucose, lactic acid, milk sugar, or dextrin. The injurious action of sodium sulphide on the hands of the workmen, and on metal dye-vessels or printing apparatus when working with the sulphide dyestuffs, is thus entirely avoided. An addition to the dyebath of normal sodium sulphite is, in most cases, of great advantage.—R. B. B.

Colour-Printing of Textile Fabrics. C. H. Hope, Providence, Rhode Island, U.S.A. Eng. Pat. 10,709, June 12, 1900.

On a piece of cloth having a glossy calendered surface are printed lines of a different colour from that of the cloth, and sufficiently fine and near to each other to simulate the threads of the fabric. The pigment or colouring matter of the printed lines is retained above the glossy surface of the fabric, so that the effect of a changeable colour will be produced when the cloth is viewed at different angles of light and shade. The coloured lines may also be combined with a figured design for the production of a changeable ornamental fabric.—R. B. B.

Printing of Indigo, or Indigo and other Colouring Matters. G. W. Johnson, London. From Kalle and Co., Biebrich-on-Rhine, Germany. Eng. Pat. 9587, May 24, 1900.

In the usual (Schlieper-Baum) process for printing Indigo, if the steaming be too prolonged, by even a few seconds, the colour is rendered quite useless. This objection to the process is removed if the cotton fabric, after being prepared with glucose, be printed with the strongly alkaline Indigo printing colour, dried in the absence of air, and then steamed with dry steam, at a temperature not below 106° C. This temperature varies from 106°—116°, according to the intensity of the blue. In this case no ill-effect results from prolonged steaming, but the time should not be less than 10 minutes. Since the steaming period is not limited, it is possible to combine the Indigo with steam colours, *e.g.*, Alizarin Red, Gallocyanine, Safranine, &c.

Except with very strong printing colours, it is advantageous to replace a portion of the thickening material by Turkey red oil, which prevents the colour from penetrating too far into the fabric and produces more intense and brighter shades.—R. B. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphur Trioxide. R. Schenck. Annalen, **316**, [1], 1--17.

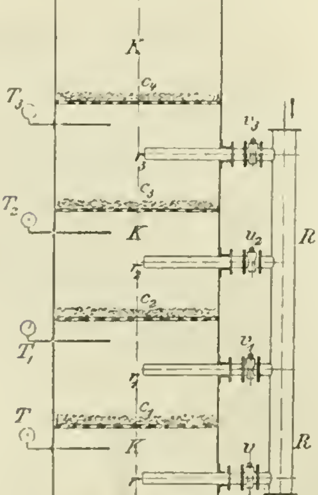
The existence of two forms of sulphur trioxide, the ordinary or asbestos-like form, which vaporises without melting, and the colourless prismatic crystals, which melt at 15°—18° C., has long been known. Weber showed that the latter form was produced when moisture was most carefully excluded, and regarded its conversion into the ordinary form as occurring only in presence of moisture (some of Weber's specimens are still, after many years, unconverted, and on cooling yield only the colourless crystals); hence, he looked on the ordinary form as a hydrate. The author has repeated Weber's experiments, and finds that though the conversion of the colourless into the ordinary form is connected with the presence of moisture (or of monohydrate), yet it occurs in the presence of an amount of moisture so small that one cannot look upon it as forming a hydrate, and must regard its action as catalytic. There remains the possibility of polymerism, as explaining the relationship of the two forms.

The author has investigated the subject, and as a result of molecular weight determinations and also determinations of the coefficient of expansion of the liquid under different conditions, he concludes that liquid sulphur trioxide is to be looked on as a mixture, in or tending towards equilibrium, of simple and polymeric trioxide. At a high temperature the simple form exists alone, but if the liquid be cooled, formation of the polymer sets in and goes on till a state of equilibrium between the two forms is reached. If even traces of monohydrate be present, the rate of conversion is comparatively rapid; but if there be none, the rate, even at low temperatures, may be almost immeasurably slow, so that, as in the case of Weber's specimens, years may elapse without any notable amount of the polymer having been formed.

Or it may be looked on as a solution of the polymer in the simple liquid, and at any temperature there will be two possible limits; the limit of equilibrium between the two forms, mentioned above, and the limit of saturation of the simple liquid solvent and the polymeric solute. At a high temperature, probably, the concentration of the polymer in saturated solution is greater than its equilibrium-concentration, and consequently an unlimited amount of the solid polymer can be dissolved, for before saturation is reached it is converted into more of the solvent; while at a low temperature, the saturation-concentration is lower than the equilibrium concentration, and as the amount of the polymer formed, oversteps the saturation concentration it separates in the solid form, so that ultimately the whole is converted into the solid polymer. Between these two temperatures must be one at which these concentrations will be identical—at which, therefore, there is equilibrium between the solid polymer and the liquid; above this the solid polymer will ultimately be completely liquefied; and below it the liquid will ultimately be completely converted into the solid polymer. This temperature (if the ordinary asbestos-like form be the polymer) according to the experiments of Schultz-Sellack, seems to be about 25°—27° C. If the specimen be carefully freed from the catalytic agent, so that the rate of conversion on cooling of the simple form into the polymer be immeasurably slow, then saturation of the solution with the polymer can never occur, and on cooling the solvent sufficiently—the transparent, prismatic form—separates out.—J. T. D.

Sulphur Trioxide; Production of ——. Ger. Pat. 119,505, Jan. 3, 1899. Meister, Lucius und Brüning, Höchst-a/M. Zeits. angew. Chem. 1901, **16**, [18], 445.

In the contact-space K, of the apparatus shown, the contact-substance (c, c_1, c_2, c_3, and c_4) lies on the perforated stages. The main supply of warmed sulphur dioxide and air enters at E, but subsidiary supplies, not warmed, en by the pipes r, r_1, r_2, r_3. These supplies are so regula by the valves v, v_1, v_2, and v_3, that the mixture reach any stage (of gas heated by the reaction at the stage bel and of cold gas introduced) has approximately the te perature of the original gas at E. This is indicated by pyrometers or thermometers T, T_1, T_2, T_3. The gas lea the uppermost stage, and A, hot enough to raise the entering at E to the requisite temperature. Dissociat of sulphur trioxide through excessive rise of temperat is avoided by this arrangement.—J. T. D.



Monopersulphuric Acid (Caro's Acid). A. Baeyer V. Villiger. Ber. 1901, **34**, [6], 853—862. (See this Journal, 1900, 172, 278, 777.)

Caro's acid ($HO.SO_2.O.O.SO_2.OH$) is obtained (1) treating a persulphate with strong sulphuric acid (Z. angew. Chem. 1898, 845); (2) by the electrolysis tolerably concentrated sulphuric acid (Ger. Pat. 110, 1898, of the B.A.S.F.); (3) by the action of strong phuric acid on hydrogen peroxide (this Journal, 1 278). In the third process much hydrogen pero escapes reaction; it has not, therefore, been further stu In the first two methods, persulphuric acid is the sta point; it is formed at the anode as the primary pro of the electrolysis of moderately strong sulphuric aci the union of two HSO_4 ions. The non-formation of hy gen peroxide at the anode, although a derivative of produced, is explained by the relative stability of hydr peroxide and persulphuric acid towards oxidising ag the former is at once oxidised by the liberated ox whilst the latter is remarkably stable towards oxid agents.

The primary product of the electrolysis, persulp acid, in contact with sulphuric acid, is hydrolysed, prod Caro's acid and sulphuric acid, $(OH)(SO_2).O.O.(SO_2)($ $+ H_2O = (OH).SO_2.O.OH + (OH)_2SO_2$, the Caro's finally, by further hydrolysis, giving sulphuric acid hydrogen peroxide.

In the presence of persulphuric acid and monopersulp acid (Caro's acid), hydrogen peroxide may be estimat means of permanganate in the ordinary manner, sufficient degree of dilution. Monopersulphuric acid ates iodine from an acidified solution of potassium i much more rapidly than persulphuric acid; thus, in tit with thiosulphate, a colourless solution is obtained, wh a short time again becomes blue; this further reaction to the persulphuric acid, and is complete in 12—24 in the estimations the result of a blank experimen deducted. This method gives sufficiently accurate minations of the monopersulphuric and persulphuric a

Monopersulphuric Acid.—The acid could not be is in the free state or as a salt. A solution was obtain triturating 10 grms. of potassium persulphate with 20 of strong sulphuric acid, allowing to stand for one pouring on ice, precipitating sulphuric acid with a s of monobarium phosphate (baryta at once decomposes acid), filtering, and subjecting to a current of air in until the smell of ozone and bleaching powder had disap The solution (1·5 litre) was very stable; it deposite traces of barium sulphate on standing for months; hy peroxide was absent. About 16 per cent. of un persulphuric acid was still present. The product action of strong sulphuric acid on potassium pers has the same composition as Traube's electrolysed su acid.

Persulphuric Acid was obtained by exact preci of a solution of barium persulphate with dilute su acid. On standing, the acid gradually changes to su acid and Caro's acid. The decomposition is almost c in eight days: hydrogen peroxide is not formed.

In the presence of sulphuric acid of 8 per cent. st Caro's acid is as stable as in the presence of pho acid; after seven days, hydrogen peroxide could be by means of titanic sulphuric acid. Persulphuric converted into Caro's acid almost completely in a f by 40 per cent. sulphuric acid; hydrogen peroxide is The electrolysis of sulphuric acid of different concen was studied, using platinum electrodes and a current

.2·5 ampères. Persulphuric acid is the first product, is converted into monopersulphuric acid during the olysis of acid of 55 per cent. strength; with acid of r cent. strength the conversion into monopersulphuric only takes place to a small extent during the electro- With 20 per cent. acid the formation of the per-acids place only to a limited extent.

substance with an odour resembling bleaching powder. ced by Caro's acid on standing, may be S_2O_8, which lso be the substance obtained by the action of the electric discharge on a mixture of sulphur dioxide and n.—A. C. W.

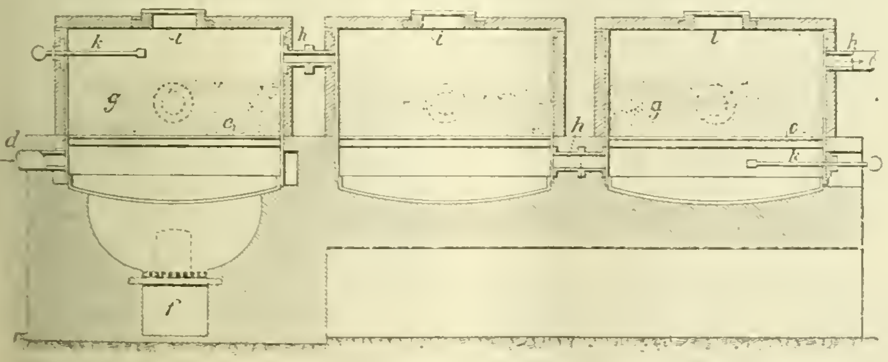
um Ferricyanide; Action of Hydrofluosilicic Acid ——. J. Matschek. Chem. Zeit. 1901, 25, [31], –328.

HYDROSILICIC acid acts upon potassium ferrocyanide ournal, 1901, 363). The action upon potassium ferri- e is to produce a blue precipitate, which was shown ormed in the absence of air. The smallest quantity cyanide which can yield the reaction is 0·002514 this amount, when dissolved in 2 c.c., gives a greenish- loration after shaking with 50 c.c. of hydrofluosilicic c.c. = 0·584 grm. of H_2SiF_6), whilst 0·0013 grm. of um ferrocyanide in 50 c.c. gives the same depth of with 0·6 c.c. of hydrofluosilicic acid. The precipi- shown to contain iron and cyanogen in the propor- quired by Prussian blue, $[Fe(CN)_6]_3Fe_4$; it contains Prussian blue. The quantities of the reagents enter- the reaction agree with the equation $7[Fe_2(CN)_6 \cdot$ $+ 21H_2SiF_6 + 3H_2O = 21K_2SiF_6 + 2Fe_4[Fe(CN)_6]_3$ $N + 3O$.—A. C. W.

ric Acid; Determination of Water or of Sulphur xide in Concentrated Fuming ——. H. Rabe.

See under XXIII., *page* 619.

Fig. 2.



id in Alkali Nitrates; Detection and Determination of ——. E. P. Perman.

See under XXIII., *page* 619.

Production of ——, *from Ferrous Chloride by Electrolysis.* Roubertie and Pepin.

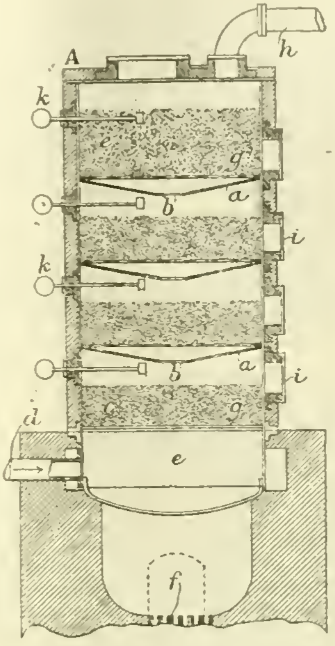
See under XI. A., *page* 588.

PATENTS.

cid; Apparatus for Making ——, *by Catalysis.* esellschaft für Zink-Industrie vormals W. d Max Schroeder, both of Neumühl-Ham- nany. Eng. Pat. 17,034, Sept. 25, 1900.

ct apparatus shown in Fig. 1, the sulphurous reheating in any suitable apparatus to 260°— s in a steady stream through the nipple *d* into *e*, set over a fireplace, for maintaining the if necessary; the gases then ascend through l plate *c* into the contact mass *g*, above which mixed, as the only exit is through the central aperture *b* in the curved partition plate *a*. In like manner the gases pass through each of the superposed chambers, having exit at *h*, whence they are led to the absorbing apparatus for the SO_3 formed. The pyrometers *k* indicate the temperature. It is stated that, "in using the above-described partitions, the gases have to find their way from time to time through comparatively narrow openings, and in doing so they thoroughly mix together, even in contact vessels of very large diameter."

Fig. 1.



For working on a large scale, the apparatus shown in Fig. 2 is preferred, in which the chambers are arranged horizontally, the gases entering at the nipple *d*, and, after traversing the contact mass, pass through the exit *h* into the next chamber, where they descend through the contact mass, and find exit in the bottom compartment into the base of the following chamber, and so on. The contact mass may be that described in Eng. Pat. 25,158, 1898 (this Journal, 1899, 584), in which a platinum salt is dried with a water-soluble salt, such as magnesium sulphate, or a soluble phosphate.—E. S.

Gas Liquors; Treatment of ——. H. Koppers, Carnap, near Essen-Ruhr, Germany. Eng. Pat. 6272, March 25 1901.

THE claims are: "(1) A method for reducing the amount of noxious waste liquors in the treatment of ammoniacal water, characterised by drawing off a quantity of the ammoniacal liquor, after the separation of the free ammonia and before the separation of the combined ammonia, from the purifying apparatus, and using it instead of fresh water for the ammonia washers"; and "(2) In the treatment of ammoniacal liquors described, supplying the lime necessary for the separation of the combined ammonia to the purifying apparatus," not as milk of lime, "but as marshy lime in a pulpy condition."—E. S.

Cryolite; Process of Treating ——. C. A. Doremus, New York, U.S.A. Eng. Pat. 18,969, Oct. 23, 1900.

CRYOLITE is heated in an iron retort, through which steam is passed, to obtain hydrofluoric acid and a residue of sodium aluminate, or sodium fluoride and alumina, or a mixture of these. Or steam is caused to impinge on cryolite fused on the hearth of a reverberatory furnace; as HF escapes, the mass stiffens, "through the production of aluminate, or of sodium fluoride and alumina, or a mixture of these," which may be further treated with heat and steam, or with products of combustion containing steam. Another process, intended to obtain an aluminate with much alumina, consists in heating cryolite, mixed with alumina or bauxite, in "a mechanical furnace by a fuel consisting of or containing hydrogen." This process may be modified by making up briquettes of cryolite and bauxite, and heating them, with or without steam passing, with the fuel described. A fifth process consists in melting cryolite in a muffle furnace, suitably lined, and passing steam as long as the mass remains molten. In all these processes the temperature is kept below a "white heat."
—E. S.

Nickel Salt, and Process of Making Same. H. A. Frasch, Hamilton, Canada. Eng. Pat. 281, Jan. 4, 1901.

SOLUTION of a nickel salt, such as the sulphate or chloride, is treated with ammonia in excess, and sodium chloride is added as long as a nickel-ammonium salt separates. In the case of a solution containing, besides nickel chloride, other chlorides, as of iron, copper, and cobalt, the iron is removed by oxidation and precipitation by calcium carbonate, and the solution is then saturated with ammonia; on addition of sodium chloride (or potassium chloride), nickel-ammonium chloride separates, and may be filtered off, washed with a saturated solution of sodium chloride containing ammonia, and dried. The salt is stated to have the formula "$Ni(NH_4)_2Cl_2 + 4NH_3$, or $NiCl_2 + 6NH_3$," and is described as "forming a crystalline mass of violet to purple colour, very hygroscopic, freely soluble in water with a blue colour, emitting a strong odour of ammonia, and, upon boiling, giving off two-thirds of its ammonia contents." "It differs from the normal nickel-ammonium chloride or sulphate in the excess of ammonia it contains, there being about six equivalents of ammonia to every one of nickel."
—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Glasses; Phosphatic ——. F. Cedivoda. Chem. Zeit. 25, [33], 347—350.

THE author summarises the results of his researches as follows:—When glasses composed of the metaphosphates of calcium and sodium are fused together, true double compounds are formed, as in the case of silicates, of greater resistance than is possessed by the component glasses,—the resistance increasing with the acid ratio, though it is in all cases inferior to that of the corresponding silicate glasses. In the case of silicate glasses, the principal constituents removed by the action of water are alkalis, whereas the phosphate glasses also yield up a considerable amount of phosphoric acid to this solvent. Again, other conditions being equal, the phosphate glasses are more powerfully affected by acids than are the silicate glasses; they are also more readily fusible than the latter, their fusibility increasing with the acid ratio. The fact that phosphate glasses can be fused in a porcelain crucible without appreciably attacking the latter, is regarded as a proof that these glasses are soluble with difficulty in silicate glasses.—C. S.

The Ceramic Stoneware of the Sèvres Porcelain Works. G. Vogt. La Céramique, 3, [133], 127—131.

THE manufacture of ceramic stoneware at the Sèvres works was introduced for the purpose of supplying this material for structural purposes at the Paris Exhibition. The body was composed of the following ingredients, the figures representing the proportions before and after elimination of moisture and combined water in the kiln

Clay from St. Amand-en-Puisaye (Nièvre)	56	50
Clay from Randonnal (Orne)	27	25
Sand from Decize (Nièvre)	26	25
Totals	109	100

the chemical composition, after firing, being: silica, alumina, 21; alkalis, 3 per cent.

The firing temperature employed was that of the fu heat of Seger cone No. 9, *i.e.*, 1,270° C. The colour of ware is yellow when fired in an oxidising atmosphere, pale bluish-grey in a reducing atmosphere. The bo of very fine grain, is easily moulded or thrown on wheel, and can probably be shaped by means of the mechanical appliances. Care is necessary to dry the p slowly, to prevent cracking or deformation; and advisable, in the case of large pieces, to add to the 20—25 per cent. of powdered stoneware shards. The d of shrinkage is such that pieces intended to measure when baked must be 1·125 m. in the fresh state. body can be worked up in conjunction with the porcelain" body prepared at Sèvres.

Glazing.—The new stoneware can be glazed with added in the kiln, in the proportion of 200—800 grm 1 cb. m. of kiln capacity, or by the glazes described be

Glazes: Colourless Glaze.—Pyrenees felspar, parts; Nemours quartzose sand, 27·2; dry argilla kaolin, 13·0; Bougival chalk, 17·7 parts. The f contains: silica, 65·45; alumina and ferric oxide, and potash, 11 per cent., whilst the sand is nearly silica, and the kaolin is an almost pure hydrated alum silicate.

Coloured Glazes.—These are prepared by simple m without previous fusion, and are laid on the unbaked with the brush after stirring up in water thickened wit tragacanth. The following recipes are given:—

Uranium Yellow.—Uranium oxide, 5·0 parts; 17·7; Pyrenean felspar, 42·1; Nemours sand, 29· kaolin, 8·5 parts.

Brown-Yellow.—Pure red ferric oxide, 5·0 parts; 13·0; felspar, 45·0; quartzose sand, 28·5; dry 11·0 parts.

Chrome-Green.—Green chromium oxide, 1·0 part; 17·7; felspar, 42·1; sand, 28·0; kaolin, 11·3 parts

Copper-Green.—Cupric oxide, 4·0 parts; chalk, felspar, 42·1; sand, 27·2; dry kaolin, 13·0 parts.

Cobalt Blue.—Cobalt oxide, 3·0 parts; chalk, felspar, 42·1; sand, 27·2; dry kaolin, 13·0 parts.

Manganese Violet-Brown.—Brown manganese oxi parts; chalk, 13·0; felspar, 45·0; sand, 28·5; dry 11·0 parts.

Nickel Red-Brown.—Nickel carbonate, 3·0 parts; 15·3; felspar, 42·1; sand, 27·2; dry kaolin, 13·0

Flesh Tint.—Equal parts of the foregoing mangan colourless glazes.

Violet-Grey.—Nickel glaze, 10 parts; cobalt g colourless glaze, 87 parts.

Bluish-Green.—Chrome glaze, 30 parts; cobalt g colourless glaze, 67 parts.

Golden-Brown.—Equal parts of manganese a glazes.

Reds.—Chrome pink being found unsuitable for th shades of red for frieze of the Palais des Beaux- following underglaze masses were prepared:—

——	Pale Red.
Randonnai clay	57
Decize sand	41
Ferruginous sand from Thiviers	5
Pegmatite	5

The shade was modified, when required, to o covering with yellow glaze, or to violet by the ai glaze. An oxidising atmosphere is necessary in these coloured glazes, to maintain their purity of t

Semi-opaque Glazes: Colourless.—Pegmatite, 30 parts; ure kaolin, 40; Nemours sand, 28·5; chalk, 20 parts.

Ivory Yellow.—Pegmatite, 35·7 parts; kaolin, 13·7; emours sand, 13·6; chalk, 15·9; natural rutile, 9·6 rts.

Yellow.—Pegmatite, 53 parts; kaolin, 14; sand, 14·1; alk, 25·5; rutile, 9·6; colcothar, 2·4 parts.

Reddish-Yellow.—Same as above, but with 4·8 parts of lcothar.

Violet (Yellow Tinge).—Pegmatite, 33·6 parts; kaolin, 9; sand, 47; chalk, 15; rutile, 6·6; colcothar, 6 parts.

Crystalline Yellow-Brown.—Same as above, except that proportions of rutile and colcothar are each increased to 5 parts.

rystalline Golden-Brown.—Pegmatite, 53 parts; kaolin, ; sand, 14·1; chalk, 25·5; rutile, 22; colcothar, 17·5 s.

rystalline Dark Green.—Pegmatite, 30·85; kaolin, 35; sand, 36; chalk, 28; rutile, 18; cobalt oxide, 12 parts.

reenish Blue-Grey.—Pegmatite, 53 parts; kaolin, 14·1; l, 14; chalk, 25·5; rutile, 12; cobalt oxide, 1·2 parts.

ed.—A frit is made of: Pegmatite, 108 parts; sand, ; zinc oxide, 15·5; barium carbonate, 36; fused borax, dry sodium carbonate, 16·5 parts; and this is incorted with 2 per cent. of copper oxalate and 1 per cent. lcined tin oxide.

is glaze must be fired in a reducing atmosphere, since oxidising fire it turns green; the reduction, however, ld not be prolonged beyond the point of incipient n, or the ware will become black.

ystalline Glazes.—Like the above red, these glazes first be fritted, the following fluxes being prepared in to permit the proportions of potash and zinc oxide to odified so as to furnish the best results in different :—

——	Flux 1.	Flux 2.
tassium carbonate	138	69
ide	162	202·5
ose sand	360	350

proportions found to give the best results at Sèvres No. 1, 85 parts; No. 2, 15 parts. The glaze must lied to biscuit ware, and laid on thick enough for an to run down the ware in the firing. An oxidising here and a temperature of 1,270° C. are necessary; w cooling facilitates the production of good crystals.

w.—The above proportions of fluxes are mixed with No. 3) of: dry potassium carbonate, 138 parts; de, 162; sand, 300; rutile, 82 parts.

her variety of *colourless glaze*—so far as the crystals cerned—is obtained by replacing the rutile in frit y pure titanic acid.—C. S.

PATENTS.

Annealing Furnaces. F. T. Brearley, St Helens, Lancs. Eng. Pat. 7854, April 27, 1900.

ealing chambers and one annealing kiln or "leer" ged together in the shape of a Y, and, if desired, ng openings can be arranged in such a position same turntable feeds both of the annealing chamcasting tables in such event being situated radially rd to the turntable.—C. S.

ng the Surfaces of Refractory Materials; Appar ——. S. S. Bromhead, London. From C. H. an, New Jersey, U.S.A. Eng. Pat. 5204, March 1.

ratus consists of an electrical heater of large area, and of means for presenting the material elled in a plane parallel and in close proximity er, so that the entire surface of the material will simultaneously, immediately, and uniformly, a able shield being interposed between the heater aterial in order to protect the enamel from ion by contact with emanations from the heater.
—C. S.

Muffle Kilns or Ovens [Ceramic or Enamelled Ware]; Continuous Gas ——. H. H. Lake, London. From M. Souvero and Co., Turin. Eng. Pat. 6921, April 12, 1900.

The kiln is of annular shape and the goods to be baked are conveyed by means of a support extending right through the kiln. Gas is generated by the distillation of coal in an adjoining hearth, and is ignited in presence of air, heated by the waste heat of the same hearth, the resulting flame being directed through arches and lateral passages about the central chamber, thus baking the goods without being brought into contact therewith. The kiln is combined with a cooling chamber, an open charging and discharging aperture being situated between the two.—C. S.

Porcelain and the like; Fusing ——. G. Ott, Paris. Eng. Pat. 14,286, Aug. 9, 1900.

The burner claimed, consists of an internal pipe, through which gas is discharged under pressure, and of an external pipe supplying oxygen, the resulting flame generating a sufficiently high temperature to fuse pure porcelain in a platinum mould.—C. S.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Portland Cement from Blast Furnace Slag. C. Steffens. Stahl u. Eisen, **20**, 1170 (Zeits. angew. Chem. **14**, 472).

Experience shows this process to be simple, cheap, and regular. The yields of rotary furnaces are specially satisfactory. The raw material is wet granulated slag (not powder) and hard limestone; these are dried, intimately mixed, and finely ground. The slag, mixed with the requisite amount of small limestone, is brought into a calcining furnace heated by the waste gases of the rotary furnace. The slag is dried and is pulverised by the limestone during the rotation of the furnace, whilst the limestone is partly calcined and rendered brittle so as to be easily powdered. From the calcining furnace it passes into a mill, whence the finely ground substance goes direct into the rotary furnace. This acts quietly and regularly, and needs very little looking after. It will yield on an average 150 casks per day. The whole of the fuel needed, amounts to 18 or 20 per cent. of the slag burnt.—J. T. D.

Portland Cement and Sulpho-Aluminate of Calcium; Action of Sea Water on ——. O. Rebuffat. Gaz. Chim. Ital. **31**, [1], 55; Chem. Centr. 1901, **1**, [17], 927.

The author has made an investigation as to the action of magnesium salts, sodium chloride, and sea water on sulpho-aluminates, aluminates, and silicates of calcium. He concludes from his results, that in the case of cements immersed in sea water, the formation of sulpho-aluminates is, at the most, transient, and can only take place to a small extent, and therefore, contrary to the view of Le Chatelier, sulpho-aluminates can scarcely have any influence on the stability of cements. It is pointed out, however, that in considering the question of the stability of cements, it has been quite overlooked, that aluminates as well as sulpho aluminates are strongly attacked by sodium chloride. 200 c.c. of a 30 per cent. solution of sodium chloride, when left in contact with 1 grm. of calcium sulpho-aluminate, contained even after 12 hours, small quantities of alumina and large quantities of SO_3 and CaO. Calcium aluminates are attacked in a similar manner by 30 per cent. sodium chloride solution, lime and aluminium passing into solution.
—A. S.

Wood with Tar-Oils; Economical Saturation of ——. F. Seidenschnur. Zeits. angew. Chem. **14**, 437—441.

An ordinary sleeper, 2·7 m. by 0·26 m. by 0·16 m., needs 35 to 40 kilos. of creosote to saturate it thoroughly. To lessen the cost of this, attempts have been made to dilute the creosote, and to introduce it into the wood in solution in a volatile solvent, the solvent being afterwards removed by heat; but in all these attempts the loss of solvent has been so great that no saving of cost has been effected. The author has succeeded, however, by emulsifying the oil, and introducing the dilute emulsion; the emulsion is made with a resin-soap, as follows:—*Creosote rid of phenolic constituents*; 22·5 kilos. of resin and 3 kilos. of caustic soda (98 per cent.) are dissolved in water, heated by steam, and diluted to 150 litres. To this 450 kilos. of creosote (washed free from phenols with NaOH) are added, the whole thoroughly agitated, and water added till the required percentage of creosote is reached (say 15 per cent.). The emulsion holds for a very long time. Even after a week the oil will have only settled out as a creamy layer, which is readily mixed again by mere shaking. The drops are very minute and penetrate wood with ease: by a water pump vacuum of 40 mm., there was driven through a piece of beech, 12 cm. in diameter and 15 cm. long, in half an hour, 350 c.c. of the emulsion, containing at entry 15, at exit 11 per cent. of creosote. *Creosote containing Phenols*; to emulsify this, much larger quantities of resin-soap are needed, and the resulting emulsion is not so permanent, so that on all grounds the substance free from phenols is to be preferred. The author's experiments seem to show that the permanence of the emulsion depends on the smallness of the globules of oil; but it is also improved if they contain minute quantities of substances which, like free resin, are absolutely insoluble in water, and increase the surface-repulsion between oil and water, while it is lessened if they contain constituents soluble in water.

To ascertain how far the creosote penetrates the wood when used in this way, pine sleepers were impregnated with a 15 per cent. emulsion, prepared as above described. They were steamed for half an hour at a pressure of $1\frac{1}{2}$ atmospheres, exhausted for half an hour at a pressure of 690 mm., and submitted for half an hour to a pressure of 7 atmospheres. A sleeper, weighing originally 68·6 kilos., took up 36·5 kilos. of emulsion, or 5·5 kilos. of creosote. A diagram is given showing the distribution of the oil, the figures being percentages of creosote reckoned on the dry wood. A second diagram gives the result of similarly impregnating beech sleepers with 30 per cent. emulsion, when sleepers of 80 kilos. weight absorbed 31 kilos. of emulsion, or 9·3 kilos. of oil.—J. T. D.

PATENTS.

Tiles, Roofings, Linings, and the like; An Improved Composition or Material more especially intended for Use in the Manufacture of ——. P. Sohège, Paris. Eng. Pat. 10,865, June 14, 1900.

The composition claimed consists of ground tan, hemp waste, fine sand, or powdered pumice, and sizing materials, such as gelatin, resin soap, &c.—J. W. H.

Marble, Imitation; Manufacture of ——. J. Tuckwell, Glasgow. Eng. Pat. 15,830, Sept. 6, 1900.

Keene's marble cement, white silver sand, and ground alum, are mixed in certain proportions with water and allowed to set; the block obtained is stove-enamelled, polished with rottenstone and water, varnished, grained, and again stoved, and finally polished with a composition of beeswax, turpentine, and precipitated chalk.—J. W. H.

Insulating and Packing Material; New or Improved ——, *and a Method of Manufacturing the same.* M. Raphael and L. Elias, Breslau. Eng. Pat. 16,010, Sept. 8, 1900.

Small plates of mica are made to adhere by means of moistened asbestos; subsequent pressure and drying complete the preparation of the material.—J. W. H.

Iron Constructions; Process of and Compositions for Protecting ——, *from Incandescence in case of Fire.* I. Koslowsky, Mulhouse, Alsace, Germany. Eng. Pat. 6241, March 25, 1901.

The elements of iron constructions are brushed over with a solution of $2\frac{1}{2}$ parts of borax, 3 parts of alum, $2\frac{1}{2}$ parts each of sodium tungstate and ammonium sulphate, 3 parts of magnesium sulphate, and 2 parts of ferrous sulphate, in 100 parts of water. Then a thick paste is repeatedly applied, obtained by mixing 15 parts of the described solution with 50 parts of sodium silicate, 30 parts asbestos, 10 to 20 parts of wood ash, and 15 to 25 p of chalk. Adhesion can be secured by embedding metallic tissue in the protective coating.—E. S.

Lime, Slaked; Production of ——. H. H. Lake, Lond From D. Wachtel and Co., Berlin. Eng. Pat. 1 Jan. 22, 1901.

Slaked lime paste is mixed with dry calcium hydrate submitted to the action of high pressure steam; per slaking is claimed.—J. W. H.

Cement, Lime, and the like; Kilns for ——. H. Schr Bonn, Germany. Eng. Pat. 12,803, July 16, 1900.

The slurry is fed into a rotating cylinder, in which dried by the heated gaseous products from a chamber, which it subsequently enters, and in which the burni completed.—J. W. H.

Cement and similar Materials; Manufacture of —— *Apparatus therefor.* G. Warren, Ilford, Essex. Pat. 6409, May 7, 1900.

The liquid sludge, from which the cement is made, i into moulds to form cakes, small coal being add desirable; these cakes are burnt in a special kiln.
—J. W.

Cement Substance for Ship Building Purposes. Thompson, Liverpool. From A. Johannsen, Flen Germany. Eng. Pat. 8987, May 15, 1900.

The composition claimed consists of a mixture of Po cement and powdered coke, with the addition of lime and sawdust to lighten the mass.—J. W. H.

Cement out of Cement Slush; Manufacture of Blocks of ——. S. S. Bromhead, London. Fr Möller and P. Pfeiffer, Berlin. Eng. Pat. 3282, F 1901.

Small blocks of dried cement are made by any process, and these by repeated dipping in the slu drying increase in size by layers until large enou use.—J. W. H.

Cement; Apparatus for Calcining ——. R. B. L and H. S. Spackman, Philadelphia, U.S.A. En 5346, March 13, 1901.

The calcination of the cement is carried out with p fuel, which is blown into the kiln by a current previously heated by employing it to cool hot clinke
—J.

Stone, Artificial; Manufacture of ——, *and A therefor.* W. Dünkelberg. Eng. Pat. 20,639,

See under I., page 562.

X.—METALLURGY.

Calcium Carbide; Reducing Power of ——. F. gen. Zeits. für Elektrochem. 1901, 7, [41], 5 [42], 557—568; and [43], 573—580.

Neumann (this Journal, 1901, 46) has stated reduction of metallic oxides by calcium carbide ta according to the general equation—

$$3M'_2O + CaC_2 = CaO + 3M'_2 + 2CO,$$

where M′ is a monovalent metal, the general eq mixed oxides and chlorides being—

$$2M'_2O + 2M'Cl + CaC_2 = 3M'_2 + CaCl_2 +$$

According to the author (this Journal, 1901, 12 evolved during the reaction is carbon dioxide carbon monoxide. The general equations repre reduction of metals by calcium carbide should th

$$5M'_2O + CaC_2 = CaO + 5M'_2 + 2CO_2\ \text{a}$$
$$2M'Cl + 4M'_2O + CaC_2 = 5M'_2 + CaCl_2 +$$

Further detailed experiments on the reduction of lead ɔnd copper confirm these equations and have also led the uthor to the conclusion that they take place in two stages. The general equation representing the reduction of PbO ɑkes place in two stages, as follows :—

$$\text{(i) } PbO + CaC_2 = Pb + CaO + 2C.$$
$$\text{(ii) } 4PbO + 2C = 4Pb + 2CO_2,$$

bilst the reduction of mixed PbO and $PbCl_2$ is represented ɪus—

$$\text{(i) } PbCl_2 + CaC_2 = Pb + CaCl_2 + 2C$$
$$\text{(ii) } 4PbO + 2C = 4Pb + 2CO_2.$$

Details of experiments on the reduction of other metals e also given.

The author has arrived at the following conclusions :— lcium carbide is a very powerful reducing agent, and is en capable of decomposing compounds of the alkali etals. Chlorides are much more easily reduced than ides. With most chlorides, when once the reaction is rted at a point, it usually proceeds throughout the entire ss, and very often with explosive violence. For the uction of oxides, on the other hand, external heat must nerally be applied. Bismuth oxide is an exception to s rule, as is also copper oxide when a large excess of bide is employed. The easy inflammability of the xture is characteristic of the reduction of chlorides, the plication of an ignited match being often sufficient. Even en no very great amount of heat is liberated the re-on can be easily started. Specially satisfactory results obtained by the simultaneous reduction of mixed oride and oxide.

Ioissan has shown that molten carbide acts on the les of carbide-forming metals yielding metallic carbides. en, however, the reduction takes place at a lower perature, as above, the metal obtained is free or ost free from carbide. At intermediate temperatures amount of carbon in the reduced metal would increase l the temperature is sufficiently high, as in Moissan's riments, for the formation of carbide, when carbide e would be produced. As a rule, however, reduction neans of calcium carbide yields purer metals than if eduction was effected by carbon alone, since the reaction s place at a lower temperature.

hen the carbide is employed in the proper proportion, traces of calcium are present in the reduced metal. sing a large excess of carbide however, calcium alloys e obtained. A copper alloy contained over 1 per cent. lcium.

lcium carbide can be utilised in the laboratory for us reducing purposes, but its application on a technical would be conditional upon the yield of metal. In the of oxides this yield depends on whether the oxide is reduced by carbon or not. Both the calcium and rbon of the carbide act as reducing agents, the former the more powerful, as is indicated by the differentia-f the general equation into two stages. The greater ifficulty of the reduction of the oxide by carbon, the ill the carbon assist in the reduction, that is to say, carbide will be required for the reduction, which will ake place chiefly at the expense of the calcium. This the case, free carbon is liberated and the larger the ity of carbon thus set free the greater is the difficulty ting or of obtaining a regulus.

ording to Neumann's equation, 342 kilos. of carbide quired per ton of copper reduced, whilst, according to thor, only 202 kilos. are necessary. This more nearly with Frölich's estimation of one-tenth to one-quarter on of carbide per ton of copper. In any case, the ion of copper by carbide is scarcely likely to become ical process. Carbide may, however, become useful preparation of other metals in the pure condition, as r the reduction of nickel oxide or bismuth oxy-e.

rovements might be effected in the case of oxides, reduced by carbon, by adding a certain amount of arbon to the mixture. Again, if the oxides are to reduce by carbon, *i.e.*, if the reduction takes hiefly at the expense of the calcium, a saving might be effected by the addition of aluminium to increase the reducing power of the carbide, and to decrease the quantity of carbon.

The application of carbide for the production of alloys appears to offer better prospects. By proper choice of chloride and oxide, it is possible to simultaneously reduce metals, the separate reduction of which offers great difficulties. Alloys which are not easily prepared by fusing the constituents, owing to differences in the melting points or to oxidation, can thus be obtained.

Carbide may also become useful in refining metals. The process of reduction by means of carbide is not without hope if it be applied in its proper place. This consists not in attempting to replace existing processes of reduction, but rather in applying it in cases where existing methods are either useless or only give unsatisfactory results.—J. S.

Steel Production in Basic Siemens-Martin Furnaces. K. Poech. (From T. Turner.) Chem. Zeit. Rep., 1901, **25**, [36], 143.

Turner points out that, even in the West of Scotland, where the best "acid" steel is produced, the basic process is of importance in consequence of the increasing difficulty in procuring pure ores. To produce a steel of crucible steel quality, white or half hæmatite pig-iron is treated in the basic Siemens-Martin furnace, and then recarburised by spiegel or by means of the Darby process; it is then finally run through the acid furnace or converter. In English practice, the basic Siemens-Martin furnace carries a charge of 30—40 tons; it has a belt of (neutral) chrome ore between the acid walls and the basic hearth, which is of dolomite mixed with tar. About 70—80 per cent. of pig-iron and 30—20 per cent. of scrap iron are employed. To produce 1 ton of ingot, there would be used 0·675 ton of basic and 0·075 ton of gray pig-iron, and 0·338 ton scrap (making 1·088 ton in all) with 0·175 ton of ore, 0·2 ton of limestone, 0·025 ton of lime, 0·0022 ton of spiegeleisen, and 0·0022 ton of ferro-manganese. The phosphorus in the finished product averages less than 0·05—0·06 per cent.—W. G. M.

Steel; State of Combination of Iron with the Rare Elements in ——. Carnot and Goutal. Oesterr. Zeits. Berg-u. Hüttenw. **49**, 162. Chem. Zeit. Rep. **25**, [14], 127.

In blast-furnace ferrochrome, chromium occurs as the compound, $3Cr_3C_2.Fe_3C$. Tungsten occurs in tungsten steel as Fe_3W, or as $Fe_3C.WC$., according as the steel is poor or rich in carbon. Similarly, molybdenum occurs as Fe_2Mo_3, or as $Fe_3C.Mo_2C$. The electric conductivity indicates that these compounds are not in solution in the steel. Copper and nickel, on the other hand, seem to exist in the state of solution in or mixture with the steel, not as compounds with iron.—J. T. D.

Steel or Iron; Influence of Tin on the Quality of ——. Stahl u. Eisen, **21**, 330. Chem. Zeit. Rep. **25**, [14] 125.

Samples of iron containing from 0·1 to 0·63 per cent. of tin were prepared and tested. All the samples forged well, though somewhat hard; on rolling, those containing more tin split more readily at the edges; they welded well, with the exception of that with 0·63 per cent. of tin; they bent satisfactorily, both hot and cold. The tin was irregularly distributed in the ingots.

Crucible steel was also prepared containing 0·23, 0·50, 0·68, and 1·62 per cent. of tin. All samples forged well, the last being somewhat red-short; none of them would weld. The breaking stress was 72·3—73·9 kilos. per sq. mm.—J. T. D.

Tin; Influence of ——, on the Quality of Iron and Steel. A. Zagger. Chem. Zeit. Rep. 1901, **25**, [16], 143.

Observations upon the product of a basic Siemens-Martin furnace, in which tin was accidentally present, showed that a metal containing 0·55 per cent. Sn, 0·015 per cent. Sb, 0·03 per cent. As, and 0·182 per cent. Cu, rolled quite satisfactorily to plates; on further rolling to sheet, however, cracks began to develop at the edges of the sheet, but they could not, as it was proved, be attributed to red-shortness. Bars rolled from the ingot-iron folded completely over under the cold bending test, and showed a tensile strength of 40 kilos. with an extension of 31—34 per cent. Hence it appears to be proved that the presence of 0·55 per cent. of tin does not affect malleability, tenacity, or extensibility; the welding qualities at most are impaired.—W. G. M.

Mercury and its Production. A. Weiskopf. Zeits. angew. Chem. **14**, [18], 429—437, and [19], 465—469. (See also Trade Report, page 610.)

The extraction of mercury is carried out in three stages: (1) Roasting the ore. (2) Condensation of the vapours. (3) Working up of the condensed products. These are prefaced by a sorting of the ore, according to its richness in mercury and the size of the pieces.

Roasting.—Modern furnaces have entirely superseded the well-known "Aludels." In some of these furnaces the ore and fuel are in direct contact; in others the furnace gases play on the ore, and the evolved vapours pass off with them. The former yield a less diluted vapour, and hence there is better condensation. Fig. 1 shows the construction of the Nowak furnace. In this, alternate layers of fuel (charcoal) and coarse ore, each piece measuring from 40—90 mm in diameter, are worked. In 24 hours, in three shifts of eight hours each, 12—14 tons are roasted, 1·5 cb. m. of fuel being required. Ten ovens employ, on an eight hours' shift, 14 men—eight to feed the furnace and six to carry the ore. The second type of furnace includes two kinds. (*a*.) That shown in the figure (Fig. 2), is a reverberatory furnace, on the hearth of which the ore is spread. It is cased in steel, and stands on a tray of steel plate, so that any accidental loss of mercury is avoided. Finely divid ore can be worked in it. In 24 hours 7·2 tons can roasted, 3 cb. m. of beechwood branches or billets bei used. For an eight hours' shift three men are needed—o at the furnace, two for the carriage of the ore. The wc is very heavy and disagreeable, and this form of furnac being superseded by another kind. This (*b*) is somew similar to the Gerstenhöfer pyrites burner, in which the o fed in at the top, gradually slides down over a series of stag and reaches the bottom freed from mercury. These furna are made in two sizes, the larger dealing in 24 hours w 30—40 tons of ore, consuming 9 cb. m. of wood, and need three shifts of nine men each; the corresponding figu for the smaller are seven tons, 8 cb. m., and two men. these furnaces are worked from outside, and a fan bey the condensing apparatus produces sufficient diminutio internal pressure to prevent any escape of fumes. yield of the furnaces and the labour needed vary with nature of the ore; the cinnabar ores are more easily d with than fahlerz. While the former yield a value residue, the latter yield one from which copper, silver, iron are extracted (*e.g.*, 11·72 per cent. copper, 0·04 sil 42·92 iron).

Fig. 1.

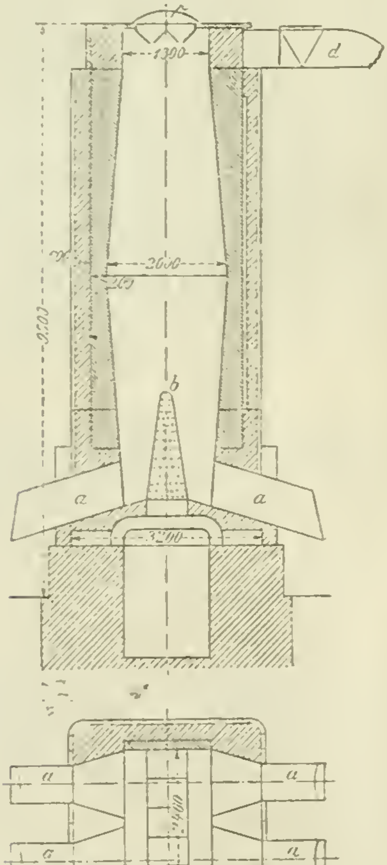
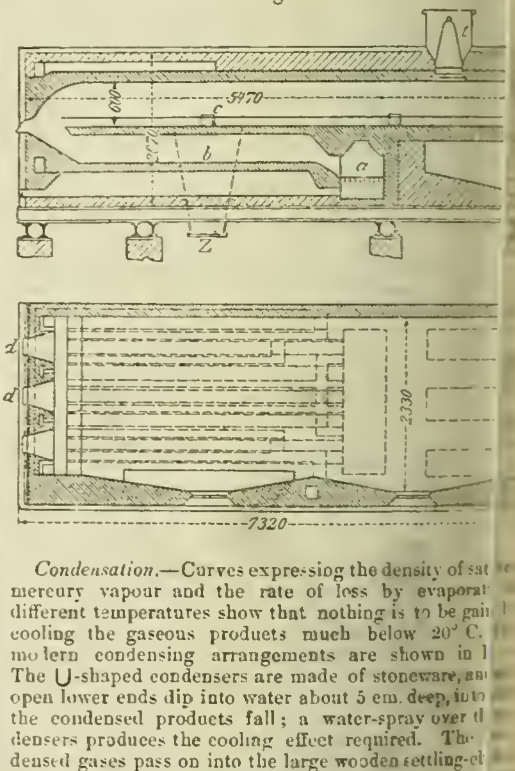


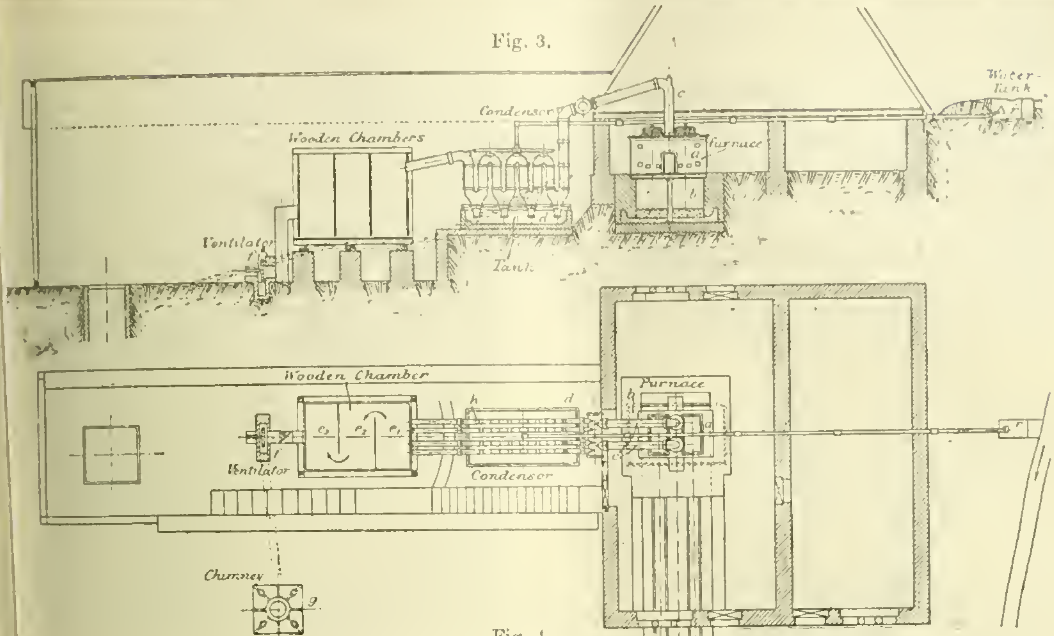
Fig. 2.



Condensation.—Curves expressing the density of sat mercury vapour and the rate of loss by evaporat different temperatures show that nothing is to be gai cooling the gaseous products much below 20° C. modern condensing arrangements are shown in The U-shaped condensers are made of stoneware, an open lower ends dip into water about 5 cm. deep, into the condensed products fall; a water-spray over t densers produces the cooling effect required. The densed gases pass on into the large wooden settling-c (15,000 cb. m.), during their long and slow p through which a further amount of deposition takes then they pass through the fan *f* into the chimney-s Even here a small amount of mercury is deposited.

Working-up of the "Stupp."—The deposited n "Stupp," contains from 70 to 80 per cent. of m chiefly as metal, partly as chloride or sulphide, with and sulphates of calcium, magnesium, and iron, the case of fahlerz) oxides of arsenic and antimony mixed with quicklime, partly to absorb superfluous m partly to saponify resinous and tarry matters, neutralise acids. Then it goes into a "Stupp mill," in Fig. 4, where it is squeezed between the knives on the rotating iron cross and those carried by the fixed to the bottom of the vessel. The mercury sink to the bottom, falls through the holes (10 mm. dia which must be kept clear, and collects in the v indicated. The residue in the mill still contains and is usually added to the ores to go through the

Fig. 3.


Water-Tank
Condensor
c
Wooden Chambers
Furnace
a
b
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Tank
Wooden Chamber
Furnace
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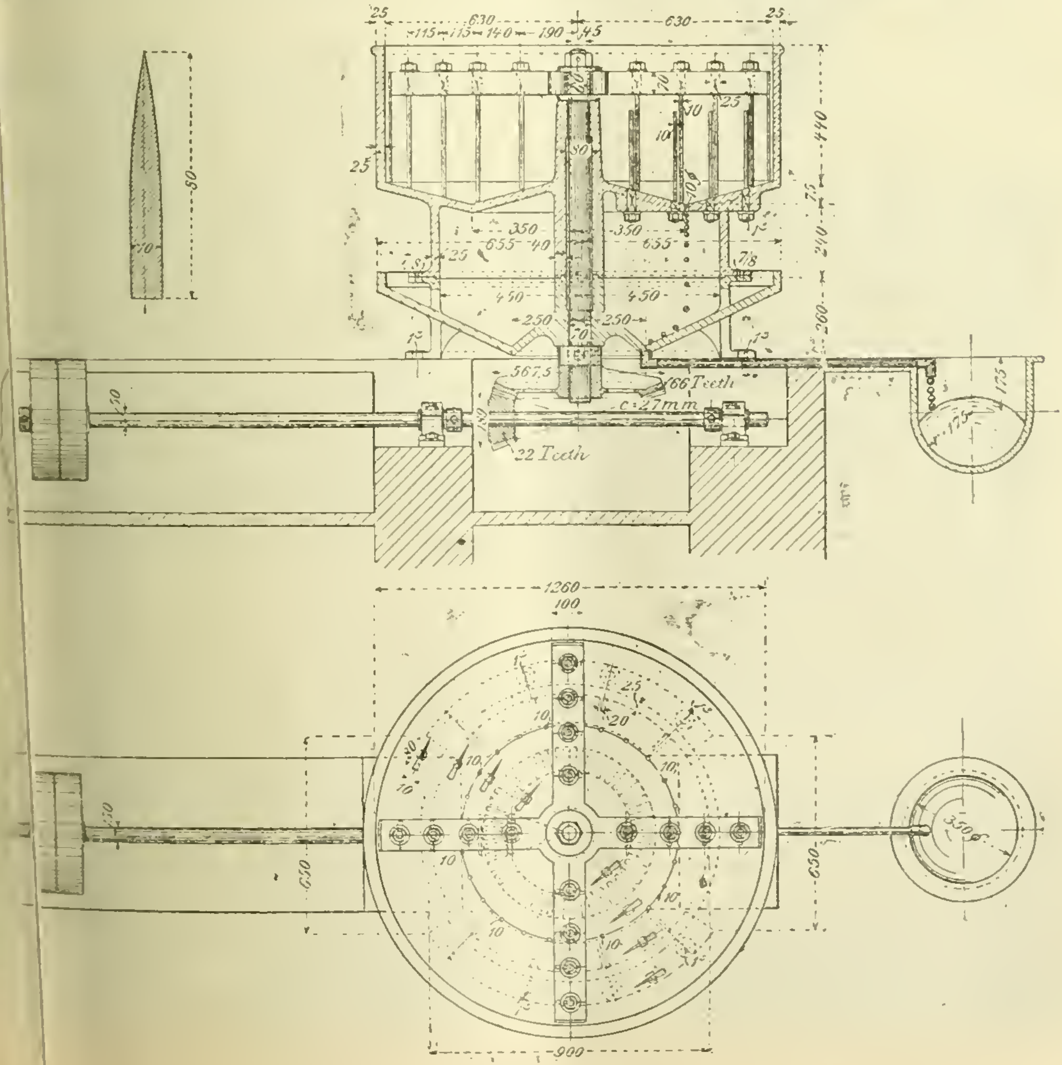
Ventilator
Condensor
Chimney
g

Fig. 4.


25
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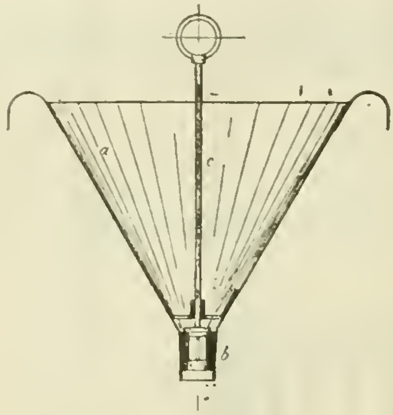
655
240
25
7/8
450
450
250
250
260
70
567.5
66 Teeth
c=27mm
22 Teeth
30
175
175
1260
100
25
20
10
30
650
650
350
900

again. The collected mercury is commercially pure; it only needs mechanical cleaning, which is effected by dipping into it the funnel *a*, Fig. 5, keeping the valve *b*, closed by pressure on the rod.

On letting go the rod *c*, the mercury-pressure opens the valve *b*, and the funnel is filled with clean mercury from the interior of the mass. When the funnel is lifted out the valve automatically closes, and is opened by pressure on the rod after the funnel has been placed in the mouth of one of the iron bottles in which the mercury is sold and transported.

The protection of the workers is an important factor in the conduct of the mercury industry. All is done that can be done by insisting on change of clothing, by the provision of baths, lard, mouth-washes of potassium chlorate, &c., to prevent absorption of the metal; but as the air near the furnaces and stupp mill contains from 0·004 grm. to 0·008 grm. per litre of mercury vapour, and as a workman may thus inhale 0·4 grm. of mercury in a working day, these precautions are not always sufficient. When symptoms of mercurial poisoning show themselves, the workmen should be at once removed, and after recovery should be employed in some other industry, as they become more liable to a recurrence of the symptoms if they return to the mercurial atmosphere and surroundings.

Fig. 5.



The losses of mercury in the process occur from: (1) that remaining in the roasted ore; (2) that carried off in soluble form in the condensed water; (3) that carried off mechanically in the condensed water as finely-divided metal; (4) that escaping uncondensed into the atmosphere; (5) that lost during the various manipulations of the stupp and the metal. These losses were in former times enormous; amounted often to 80 per cent. of the total metal; now, with improved methods and appliances, they may be put at 10 per cent. in the aggregate.

Analytical Determination.—The percentage of mercury in the ores is determined by Eschka's method, which consists in mixing a sample (1—10 grms. according to the expected richness) intimately with iron filings in a porcelain crucible, covering the mixture with a layer of iron filings, and bending over the crucible a gold cover cooled on the outside. The crucible is heated for five minutes in a Bunsen flame, allowed to cool, the cover washed with alcohol and ether, dried at 40° C., and its increase of weight determined. In fluids, mercury is determined by precipitating with hydrogen sulphide, washing and drying the precipitate, and then determining the mercury in it by Eschka's method as above.

The author mentions two other processes of mercury-extraction. The first has only historical interest. The second method is possibly one for the future. Attempts to electrolyse a solution of cinnabar in alkali sulphide are being made, and may possibly be developed into a method applicable to the ordinary ores.—J. T. D.

Copper and its Alloys; Refining ——. Chem. Zeit. 1901, **25**, [15], 136.

A MEANS, frequently employed for the removal of abso gases and cuprous oxide from copper, is the addition of readily oxidisable metal magnesium. At a large fou in Germany this is introduced into the melted copper be pouring, by binding it on the end of a copper rod with and stirring the melt The pieces of magnesium ma wrapped in thin copper sheet to prevent loss by was oxidation. The violent boiling which occurs on the i duction of the magnesium greatly assists the eliminatio the impurities. The manipulation, however, requires siderable experience and is attended with some da owing to the liability of the magnesium to catch fire a surface or be thrown out of the crucible. The alumi and magnesium factory at Hemelingen has recently i duced a copper-magnesium alloy, the use of surmounts all the difficulties experienced in the process. The alloy consists of equal proportions of c and magnesium and is prepared from pure metals; easily powdered and has a specific gravity of 2·97 melts at 450° C. There is not the slightest danger of and the alloy acts more rapidly on the impurities c copper than magnesium alone. About 50 grms. of per 100 kilos. of copper are usually sufficient, b addition of 100 grms. and upwards has an extr favourable effect upon the density and strength c copper. The mixture is also applicable for the refin copper alloys of all kinds and the presence of up to cent. of magnesium in the castings endows them valuable properties.—J. F. B.

Alloys containing Copper; Gradual Alteration of when left in Contact with the Air and with Chlorides. Berthelot. Ann. Chim. Phys. 22 457—460. Chem. Centr. 1901, **1**, [18], 994.

In an earlier article (Ann. Chim. Phys. **4**, [9], 55 author has shown how antique objects containing undergo gradual alteration in the earth, and especial the copper, in presence of small quantities of chloride, is slowly converted into cuprous oxide. has been observed that many antique utensils consi pletely of cuprous oxide, whilst still maintaining thei or shapes. The author discusses the question as to such objects were manufactured of cuprous ox whether, as he believes, they originally consisted of of which the other constituents (Sn, Zn or Pb) disap in consequence of oxidation processes and forma basic salts, whilst the copper remained behind in the cuprous oxide. For the confirmation of this hypoth author studied the behaviour of copper alloys, wh mitted to the simultaneous action of air and sodium solution. Strips of brass were kept for two ye dilute solution of sodium chloride in a loosely clos After this time, the brass was partly converted i cuprous oxide. At the same time, atacamite was whilst the other metals of the alloy were found in s

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Tellurium; Preparation of Large Quantities E. Matthey. Proc. Roy. Soc. 1901, **68**, [444], 16

In the course of several years' work on the extr bismuth from its ores, and the refining of the crude (see this Journal, 1891, 369; and 1893, 159), th obtained large quantities of alkaline residues co tellurium. He has now been able to treat these resi extract from them a substantial amount, 26 kilos., of tellurium. The alkaline residues obtained in refi crude telluric bismuth were steeped in hot water, the acidified with hydrochloric acid, and the tellurium tated with sodium sulphite. The precipitate consis mixture of bismuth and tellurium, the latter form 47·5 per cent. of the whole. The crude metal was in nitric acid, and again treated in the same wa metallic tellurium obtained by this second treatmen composition:—Tellurium, 97·00; bismuth, 2·15 0·65; iron, 0·10 per cent.

The metal, when broken, exhibits a crystalline fi needle-like structure and of bright metallic lustre.

t readily tarnish in the air at the ordinary temperature. slowly cooled, it shows a crystalline form very much embling that of bismuth. Its specific gravity is 6·27, as inst 6·23, the density of uncompressed tellurium found Spring. The melting point, as determined with the Chatelier pyrometer, was 450° C., or 5° lower than that en by Carnelly and Williams. A sample of chemically e tellurium prepared by the author also melted at 450° C. electrical resistance of tellurium is about 800 times that copper, but is largely dependent on the crystalline dition, a rod cast and cooled quickly having a lower stance than one that has been cooled slowly. In ing small rods of tellurium, of, say, ⅜ in. diameter, there uch contraction, and partial separation takes place even r some hours. The thermo-electric power of tellurium ears to be great. The 57½ lb. (26 kilos.) of tellurium ared by the author were derived from 187,019 lb. of e bismuth, which resulted from the treatment of 168 lb. of mineral.—A. S.

)re Sampler; The Calkins Umpire ——. Eng. and Mining J. 1901, 71, [17], 534.

See under XXIII., *page* 617.

hur; Determination of ——, in Wrought Iron and Steel. G. Auchy.

See under XXIII., *page* 620.

dium in [Iron] Slags and Cinders; Determination of ——. C. H. Joüet.

See under XXIII., *page* 620.

Bismuth in Ores; Determination of ——. A. W. Warwick and T. D. Kyle.

See under XXIII., *page* 620.

Sodium; Use of ——, in Blowpipe Analysis. C. L. Parsons.

See under XXIII., *page* 618.

PATENTS.

Improved Method of Treating ——. M. Seligsohn, enver, U.S.A. Eng. Pat. 23,660, Dec. 27, 1900.

EWHAT similar procedure to that patented by B. F. (Amer. Pat. 590,739 of 1897) is protected. Air d with "chemicals" is injected into the wet pulp, in ide the mortar of a stamp battery, on an inclined unated plate, in a Huntington mill, or otherwise, with ject of altering the physical conditions of the particles reatment, and of thus facilitating amalgamation whilst ting sickening or flouring. The "chemicals" may be e or bromine (or both) with or without ammoniated he air charged with these gases is forced beneath el of the "wet ore pulp."—W. G. M.

d Metallurgical Products; Crushing and Lixiviat- ——. E. C. H. Pape and W. S. Henneberg, Ham- Germany. Eng. Pat. 3044, Feb. 12, 1901.

process the minimum of lixiviating solution for an be employed. The stamps or other crushing ma- are covered with a certain head of water, and of the fine particles being carried through screens a (and consequently an excess) of water, the whole material in the crushing mortar is kept agitated, as g, and the finely crushed ore is allowed to overflow. means the milling water leaving the mortar with the amount to as little as one-third of the weight of The crushing arrangement may be stamps or balls levice, the movement of these being sufficient to necessary jigging motion. Centrifugal action in an n may also give the required overflow of fine ore he upper edge. The lixiviating liquid may be used ing, or it may be mixed with the overflow pulp in barrels outside.—W. G. M.

Furnaces for Smelting and Dephosphorising Iron and other Ores. E. T. Zohrab, Thurso, Caithness. Eng. Pat. 11,085, June 19, 1900.

To obviate the use of hot blast, two belts of tuyères are used in a blast furnace, one in the usual position, just above the hearth, the other about the melting zone (a little above the boshes). Into the upper belt, peat gas produced from charring-ovens (such as those specified in Eng. Pat. 26,191 of 1896) is introduced, and into the lower belt, peat-gas, blown through an injector in such a way that it carries air with it. The upper tuyères may also be so arranged that they can be served with peat-gas and air when necessary. The fuel used in the furnace is preferably condensed peat or peat charcoal.—W. G. M.

Crucibles, more particularly Designed for Use in Connection with the Treatment of Ores. A. A. Crosby, Chicago, U.S.A. Eng. Pat. 2677, Feb. 7, 1901.

An iron crucible is used, with means for introducing a supply of hydrocarbon fuel into the midst of the contents of the crucible, with the aid of a reservoir of liquid hydrocarbon and a system of coils of piping.—W. G. M.

Steel; Manufacture of Open Hearth ——. T. N. Muller, Saltburn-by-the-Sea, Yorkshire. Eng. Pat. 21,416, Nov. 27, 1900.

This patent covers the use of magnetic iron sand, or finely-crushed magnetic iron ore, or a mixture of the two, alone or mixed with other oxides and oxidised compounds, or basic material, in the Talbot or Bertrand-Thiel, or other open-hearth furnaces into which fluid pig-iron may be poured or admitted for the purpose of making steel or ingot-iron.—W. G. M.

Metals and their Compounds; Converter Treatment of ——, and Apparatus for that Purpose. A. Reynolds, Sheffield. Eng. Pat. 5877, March 20, 1901.

A converter with two hollow trunnions is used, through one of which air may be passed and through the other reducing gas, each supply being controlled by a check-valve. The pipes conveying the gases from the trunnions may deliver separately into a pocket at one side of the converter, or may conduct them to tuyères placed at opposite sides of a converter of ordinary (side-blowing) construction. In blowing a charge of copper matte, the sulphide is melted in a cupola and charged as usual into the converter, where it is blown with air for a time. The converter is then turned down and the slag run off, after which reducing gas is blown through to effect deoxidation and to cool the highly heated charge. The gas is then stopped and air is again blown through, the oxidation and reduction being alternated until purification is complete. In treating iron, the metal is first decarburised by air and then deoxidised and recarburised to any desired extent by a blast of gas or vapour containing carbon.—W. G. M.

Coating or Overlaying with Gold, Silver, and other Metals. F. W. Howorth, London. From C. O. Harz and H. von Miller, München, Germany. Eng. Pat. 8363, May 5, 1900.

Animal membranes, freed from grease, are painted with a solution of gelatin containing salts of chromic acid (chrome gelatin) and the desired metal, in leaf or foil, is applied thereon. The chrome gelatin is then hardened by the action of light on the untreated side of the membrane.
—R. L. J.

Aluminium; Uniting ——, to Aluminium or other Metals. J. Y. Johnson, London. Eng. Pat. 6735, April 10, 1900.

The aluminium surfaces to be united are cleansed well, and are then heated by means of a blast until they reach the exact temperature at which the metal softens sufficiently to enable a weld to be made with the hammer, and before oxide forms on the surfaces sufficiently to prevent welding. The critical moment is ascertained by slight hammering, and the temperature (which varies with the thicknesses of the pieces under treatment) must not be greatly overstepped, or the aluminium will become brittle and may fall to a powder. At the right moment the weld is effected by working under the hammer.—W. G. M.

Titanic Oxide; Process and Method for Producing Concentrates containing High Percentages of ——. A. J. Rossi, New York; J. MacNaughton, Tahawus; New York State; and W. D. Edmonds, New York, U.S.A. Eng. Pat. 3582, Feb. 19, 1901.

In order to obtain from such material as titaniferous iron ore, a pure titanium compound, practically free from silica and other acids, suitable for the manufacture of ferro-titanium and the like, the iron ore is mixed with sufficient lime, or other suitable earthy base, to form titanate, and with sufficient carbon to reduce the oxide of iron and silica present; the mixture is then heated (preferably electrically) to 1,700° C. In this way a ferro-silicon is produced, and a slag of calcium titanate almost, or quite, free from silicon, sulphur, and phosphorus. The temperature must not greatly exceed 1,700° C., or titanic oxide will also be reduced.—W. G. M.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Chlorine; Production of ——, *from Ferrous Chloride by Electrolysis.* Roubertie and Pepin. Rev. Prod. Chim. **4**, [4], 51.

The operation is conducted in a wooden vessel containing a carbon anode and an iron cathode, the ferrous chloride solution being maintained in a highly concentrated state by an excess of the solid salt placed in a special compartment and kept in contact with the solution. A 4 to 5 volt current is employed, the ampèrage amounting to 600 ampères (maximum) per sq. m. of cathode surface. The chlorine liberated at the cathode is collected in a closed chamber enclosing this part of the apparatus, and is removed, through a conduit, for storage or further treatment. No secondary reaction occurs. With a consumption of 110 h.p. the apparatus will extract the chlorine from 1 ton of ferrous chloride in 24 hours.—C. S.

Anodes for Electrolytic Alkali Cells. A. T. Weightman. Eng. and Mining J., Aug. 4, 1900. (See also this Journal, 1899, 583.)

The author states that the anodes now employed in most electrolytic alkali works are "graphitized carbons" manufactured according to the process patented by Acheson (see this Journal, 1900, 450). He considers that the influence of current density and of temperature upon the life of carbon anodes is not sufficiently recognised. Samples of various carbons may be compared, as to durability, by submitting them to the action of 10 per cent. sulphuric acid for 10 hours, and determining the loss in weight.

A new form of platinum anode which is claimed to be highly efficient, and to cost only about 75 cents, has been devised by Le Sueur, and is in use at Rumford Falls. Short lengths of platinum wire are bunched together in glass tubes, and electrical connection is obtained by pouring in a small quantity of mercury.—A. S.

Pyrogenetic Reactions with the Aid of the Electric Current. W. Löb. Ber. **34**, [6], 915—918.

The electric arc (110 volts, about 10 ampères) was passed between carbon poles in a liquid or its vapour, the containing vessel being furnished with a reflux condenser and a gas-collecting apparatus. The experiments (still in a preliminary stage) have shown that the results are practically the same whether with continuous or alternating current, and whether the liquid or its vapour be used. *Water* yielded a gas containing hydrogen, 50; carbon monoxide, 40; carbon dioxide, 7; unsaturated hydrocarbons, 0·8; saturated hydrocarbons, 2 per cent. *Methyl alcohol* yielded formic acid, and a gas containing methane, 39; hydrogen, 45 per cent.; and small proportions of both oxides of carbon and of acetylene; no formaldehyde. *Glacial acetic acid* yielded carbon monoxide, 35; dioxide, 15·5; saturated and unsaturated hydrocarbons, 12 and 7 per cent. respectively. *Benzene.*—Chars, tu brown, evolves gas containing 86—90 per cent. of hydrog and traces of hydrocarbons. The behaviour of naphthal is similar.

Instead of the electric arc a spiral of electrically hea iron wire was used, at a cherry-red heat; the yields h depended on the duration of the heating. *Methyl alco* gave formic acid, a little trioxymethylene, and gas—hyd gen, 72; carbon monoxide, 20; methane, 6·5 (as agai 39 with the arc), and traces of carbon dioxide. *Benz* evolved very little gas; in the liquid were found diphe and another hydrocarbon, apparently diphenylbenz *Aniline* becomes dark, giving off ammonia and a littl some other gas; diphenylamine and carbazole were fo in the liquid. *Nitrobenzene* darkened very much, gave much nitric oxide, and a solid substance was formed, yet identified.—J. T. D.

Cadmium; New Use for ——. Eng. and Mining J. 19 **71**, [18], 554.

The Edison storage battery (see this Journal, 1901, 2 which comprises cadmium-copper couples in an electr consisting of a 10 per cent. solution of caustic sod claimed to be less expensive, lighter, and more com than an ordinary lead storage battery. The new batter is stated, can be discharged to zero voltage, whilst it deteriorates very slowly, if at all.—A. S.

Monopersulphuric Acid (Caro's Acid). A. Baeyer a V. Villiger.

See under VII., *page* 578.

PATENTS.

Electric Furnaces of Great Power. [*Cooling by* W *Circulation.*] O. Imray, London. From F. M Rome, Italy. Eng. Pat. 10,580, June 9, 1900.

The electrode is supported by one or more yokes of su form, firmly held in a cross-head by bolts and hea which the surface of contact with the electrode is fixe a metal tube, through which and an inner tube a con circulation of water cools the supports of the elect the contact of the conductors to the electrodes effected by bolts and nuts. Various arrangement described for leading the current to the walls of the fu by metal conductors or yokes, or walls of a casing, groups of tubes, all cooled by water circulation. The contents of the furnace are discharged through one or slits formed between the walls of a metal casing cool water circulation.—G. H. R.

Accumulators; Electric [*High Voltage*] *and* [*Bi Electrodes therefor.* A. Tribelhorn, Olten, Switze Eng. Pat. 11,260, June 21, 1900.

In a high-voltage accumulator with double electrodes out rigid or solid core-plates, the neutral layer electrodes may be either (*a*) "impregnated by mea substance rendering it impervious and not participa the electro-chemical process, and opposing the pas the ions from the positive to the negative side, for ex a solution of caoutchouc, solution compound, asph lodion, amber," &c.; or (*b*) it may be provided diaphragm, or membrane of caoutchouc, which fo elastic partition, which opposes the passage of th from the positive to the negative side, and does not the compensating action of the two halves of the material during its expansion and contraction. Th is contained in frames of which the opposite si provided in a longitudinal direction with recesses be larger as they extend from the edges to the middl side, and assisting to secure during the expansion positive half the retention of the negative active in the frame, and prevent absolutely the escape active material, the faces being covered with bands o which electrically connect the two halves of the ele and increase the solidity of the frame. The doub trodes, preferably conical in form, are surrounded b of caoutchouc, and mounted in a trough contracted the bottom, or electrodes of type (*a*) may be a ically without special supports in receptacles where form partitions. The double electrodes comprise ers of fabric or material formed, for example, by ds of glass, which do not participate in the electrolysis, extend horizontally and transversely through the elec- es at suitable intervals" to prevent their sinking. The tance which renders the neutral layer impervious also as an agglutinant between the parts of the double rode, and agglomerates all the parts by means of ontal layers of fabric, "a covering of bands or strips ad, for example, being applied between the double rodes and the walls of the receptacle, and serving to ect electrically the two halves of the electrodes."

—G. H. R.

ge [*Alkaline-Zincate*] *Batteries.* T. A. Edison, Orange, U.S.A. Eng. Pat. 2490, Feb. 5, 1901.

closed receptacle for containing the active elements pressure is formed of sheet metal, iron nickel-plated, to be unaffected by electrolytic action in an alkaline and has numerous small openings in it made by dis- g the metal so that the burr surrounding each opening roject inwardly, thereby increasing the area of contact active material which is held in position by a separate g device. Oxides of nickel or cobalt mixed with te form one of the active elements in an alkaline lyte, and the oxidisable pole is composed of finely l metallic iron mixed with graphite, an oxide of iron employed of such hydration as will allow of its being l electrolytically to the metallic state.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

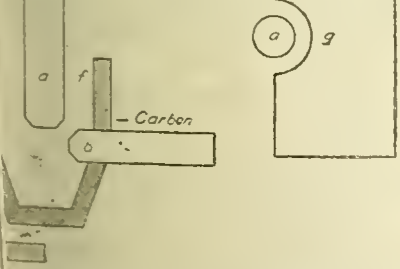
ny; *Electrolytic Deposition of* ——. A. Hollard. r. électr. 1901, **26**, 165—166. Through Zeits. für rochem. 1901, **7**, [41], 551—552.

thor considers the disposition of the Classen cathode cause of the redissolving of antimony by polysul- since the dense polysulphide settles down on it. n be prevented by placing the cathode in another . A further disadvantage of the sodium hydrosul- ethod lies in the fact that the solution dissolves to the extent of 3 or 4 mgrm. per 100 c.c.) which is posited along with the antimony. The author nds a solution of 13 grm. of potassium cyanide and f concentrated sodium hydrosulphide in 220 c.c. of From this solution copper is not deposited owing to ionic concentration and to the fact that it exists the form of a complex ion.

er to determine antimony in commercial tin he a solution of 3 volumes of NaHS (sp. gr. 1·22) and of 20 per cent. potassium cyanide, the current used 5 ampères.—J. S.

ide in the Electric Furnace ——. L. P. Hamil- E. F. Smith. J. Amer. Chem. Soc. 1901, **23**, t—155.

nace used by the authors is shown in the ying figure :—



rbon *a*, was 2 c.m. in diameter, and the 1·5 c.m. A No. 1 Dixon graphite crucible *c*, with an interior diameter of 5 c.m. and a depth of 7 c.m., was placed in a second graphite crucible *d*, with a diameter of 10 c.m. The space between the crucibles was filled with magnesia, whilst two carbon plates, 1·5 c.m. thick, of which *g* represents one, served as a cover. The carbon was inserted at about 3 c.m. from the bottom of the crucible which was lined with magnesia, so that the products should be free from carbon.

The material was introduced into *c* to about the level of the carbon *b*, and the arc between the poles started by means of a thin carbon pencil. The crucible was then partially covered by *g*, and the remainder of the substance introduced little by little, until 150 to 200 grms. in all had been added. The current was continued for some time, the total duration amounting to 10 to 15 minutes. The strength of the current was 145 to 160 A., and from 25 to 70 V.

Alloy of Copper, Tungsten, Iron, and Gangue.—This was obtained by fusing together commercial copper and a tungsten matte. It was lighter in colour but harder than copper, and was found to be the hardest of the copper alloys. Its specific gravity was 7·98, and its chemical composition :—copper, 66·88; tungsten, 23·03; iron, 5·71; and gangue, 5·04 per cent.

Titanium, Copper, Silicon, and Carbon.—This was not so hard as the preceding alloy. Its specific gravity was 7·616, and its composition :—copper, 90·98; titanium, 3·12; silicon, 3·51; and carbon, 2·08 per cent. It resembled brass in appearance. It was prepared by reducing rutile with carbon, and fusing the product with copper.

Columbite reduced with carbon and fused with copper, gave an alloy resembling copper. Its specific gravity was 8·38.

Copper and Molybdenum Matte.—The alloy was greyish-red in colour, and much harder than copper. Its specific gravity was 7·934, and its composition :—copper, 78·53; molybdenum, 8·53; iron, 2·71; carbon, 2·42; and gangue, 8·02 per cent.

Copper and Chromium.—On fusing chromium oxide and metallic copper in a carbon crucible, a greyish-red alloy with a specific gravity of 8·3146 was obtained. In hardness this came next to the tungsten and molybdenum alloys. Its composition was :—copper, 88·18; chromium, 3·22; iron, 1·35; carbon, 2·38; and gangue 4·13 per cent.

Copper, Aluminium, and Tungsten Matte.—A tungsten matte fused with equal parts of copper and aluminium, gave a yellow alloy with the following composition :—copper 34·11; aluminium, 24·89; tungsten, 32·67; iron, 2·12; and gangue, 6·56 per cent.

Iron, Titanium, and Tungsten.—10 grms. of iron were fused with the same quantity of titanium matte and of tungsten, 6 to 8 grms. of ferric oxide being added during the fusion. The alloy was steel-grey in colour, and had a specific gravity of 6·707, and the following composition :—iron, 82·15; titanium, 7·28; tungsten, 1·66; gangue, 6·63; and carbon, 2·30 per cent.

Iron, Chromium, and Titanium.—This alloy was made in the same way as the last one. It was steel-grey in colour, and had a distinct fracture and a specific gravity of 6·464. Its composition was :—iron, 76·41; chromium, 16·29; titanium, 2·47; silicon, 2·39; and carbon, 3·14 per cent. By largely increasing the proportion of chromium, an alloy with the following composition was obtained :—iron, 53·03; chromium, 40·37; titanium, 2·65; and gangue, 4·33 per cent.

Columbium, Tantalum, and Iron.—A brittle steel-grey alloy was obtained by reducing columbite with carbon, and fusing the product with iron in excess. Its composition was :—columbium, 59·76; tantalum, 18·77; iron, 15·73; gangue, 5·12; and tungsten, 0·63 per cent.

Columbium, Tantalum, Titanium, and Iron.—This was a hard grey alloy with the following composition :—iron, 80·03; columbium, 10·15; tantalum, 2·91; titanium, 3·18; carbon, 1·99; and silicon, 2·14 per cent.

—C. A. M.

PATENT.

Electrolytical Apparatus [Stripping Tin from Scrap Metal]. J. Matthews, Kings Heath; and W. Davies, Selly Park. Eng. Pat. 21,533, Nov. 28, 1900.

An outer tank or vat contains an inner one formed of a number of perforated blocks or slabs of insulating material supported by curved pieces of angle iron and metal uprights of girder ┬ or other section. On this is mounted a revolving drum, having a number of radiating arms or rods passing through and supporting an outer circular face of insulating material. Instead of using the tank as a medium for the returned current, cathodes may be employed fitting into cells or holders provided with a well or pocket at the base to catch any granulated tin that may fall from the cathodes.—G. H. R.

XII.—FATS, OILS, AND SOAP.

Lard Oil. M. Dayk. Bull. Assoc. Belge des Chim. **15**, (1), 18—19.

The author examined a sample of lard oil and obtained the following values:—Incipient solidification point, about 10° C.; sp. gr. at 14° C., 0·916; at 100° C., 0·8626; butyro-refractometer index (Zeiss), 52° at 40° C.; critical temperature in open tube, 75° C.; sulphuric acid thermal reaction, 47°; iodine value, 73; saponification value, 193; percentage of non volatile fatty acids, 97·4 per cent.; volatile acids, 0. The fatty acids are solid and hard at the ordinary temperature, melting at 35°, and solidifying at 31°; the specific gravity is 0·885 and the butyro-refractom index 41° (at 40° C.). Under the action of nitrous vap the oil solidifies in a short time, forming a faintly-gree cake.—C. S.

Oils; Determination of the Heat of Combustion of — as an Analytical Factor. H. C. Sherman and J. F. S J. Amer. Chem. Soc. 1901, **23**, [3], 164—172.

Apparatus and Method.—A bomb-calorimeter of Atwater Blakeslee type was used by the authors for t determinations, and its hydrothermal equivalent found by calculation from the weights and specific heats of component materials; (2) from five combustions of sugar assumed to liberate 3,959 calories per grm.; and by combustions with benzoic acid. To reduce the re obtained to constant pressure it is necessary to add ($\frac{1}{2}p$ $\frac{\mathrm{T}}{\mathrm{M}}$ calories per grm. where p represents the numb atoms of hydrogen, q the number of atoms of oxygen i molecule, M the molecular weight of the substance, a the absolute temperature of the calorimeter.

The following corrections were thus found to be requ —For American petroleums, 22 cals.; sperm oil, 18 castor oil and rosin oil, 14 cals.; and all oils cons essentially of non-hydroxylated glycerides, 15 cals.

Ignition of the Oil.—A small quantity of fibrous as was used as an absorbent, and this was placed i platinum crucible and ignited directly by the electr fused iron wire.

The chief results obtained are given in the foll table:—

Oil.	Specific Gravity at 15°·5 C.	Iodine Value.	Free Acid as Oleic Acid.	Heat of Combustion, per	
				Constant Volume.	Cons Pres
			Per Cent.	Calories.	Calc
Raw linseed I. (1900), fresh	0·934	182·4	4·30	9,364	9.
„ II. (1898)	0·938	175·9	1·22	9,379	9,
„ III. old	0·947	156·7	5·30	9,215	9,
Boiled linseed	0·953	150·7	7·49	8,810	8,
Poppy seed	0·926	129·6	2·66	9,382	9.
Maize I. (1900)	0·924	120·3	3·32	9,413	9,
„ II. (1898)	0·926	120·7	2·56	9,436	9,
„ III. crude	0·926	122·4	1·68	9,419	9,
Cotton seed I. yellow	0·920	102·5	0·20	9,398	9.
„ II. „	0·924	106·4	0·32	9,401	9.
„ III. white	0·923	105·5	0·03	9,390	9
„ IV. crude	0·927	103·2	2·28	9,397	9
„ VII. old	0·944	93·7	2·03	9,168	9
Sesamé	0·924	105·3	1·65	9,395	9
Rapeseed	0·922	107·4	0·82	9,489	9
Castor	0·967	84·1	0·26	8,863	8
Earth nut	0·917	105·9	0·16	9,412	9
Almond	0·919	98·1	5·13	9,454	9
Olive	0·917	85·1	2·51	9,457	
Menhaden (refined)	0·935	..	0·36	9,360	
Codliver, fresh	0·927	165·6	0·56	9,437	
„ old	0·938	137·3	1·50	9,277	
Whale	0·924	126·6	0·60	9,473	
Lard I. (1900)	0·917	74·3	0·74	9,151	
Sperm	0·885	78·7	0·78	9,946	
Rosin	0·989	76·9	14·40	10,145	1
Lubricating petroleum I.	0·881	..	..	10,797	1
„ „ II.	0·897	..	..	10,753	1
„ „ III.	0·905	..	..	10,689	1

From these results it appears that sperm, rosin, and mineral oils yield higher calorific results than fatty oils, and that the results given by non-drying glycerides are slightly greater than those from drying oils. Castor oil and boiled linseed oil show very low heats of combustion, as is also the case with old oils. The variations in the heats of combustion stand in closer relationship to the specific gravity than to the iodine absorption or acidity. For oils of the same kind the product of the heat of combustion multiplied by the specific gravity is practically a constant unaffected by age or exposure. This product is slightly higher for drying oils than for non-drying oils. In the case of the ordinary oils examined, it was found to range from 8·80 for the raw linseed oil II., to 8·63 for the earth-nut oil. The values for castor and boiled linseed oils were somewhat lower, whilst in the case of sperm oil and mineral and rosin oils they were higher.

The heat of combustion divided by the specifi yielded a result ranging from 10·0 to 10·3 f unoxidised fatty oils, 11·2 for sperm oil, and 11·8 for the mineral oils.—C. A. M.

Oils; Bromine and Iodine Values of ——. H. and Lily Logan. J. Amer. Chem. Soc. 1901, 156—159.

The authors have made a comparative determinat bromine and iodine values of various oils. The value was determined by McIlhiney's method (thi 1900, 176), with the exception that 30 minu allowed before titration. In determining the iod Hübl's method was used, the flasks being ke dark for 24 hours before the titration. In eac amount of substitution was determined, as in M bromine method.

he results thus obtained are shown in the subjoined e, in which the oils are grouped according to the easing divergence between the bromine and iodine res. As regards the oils in the first class, it makes but little difference whichever value be determined. In the case of rape oil there appears to be more substitution with iodine than with bromine, possibly owing to the longer time of action of the former.

Oil.	Iodine Value (Hübl).	Iodine Value Calculated from Bromine.	Difference of Averages.	Difference of Nearest Figures.
Olive	79·70— 80·40	80·31	0·26	0·09
tton-seed	97·50	97·41—97·00	0·295	0·09
Poppy seed	127·98—128·55	128·83	0·55	0·28
Linseed	155·12- 155·52	154·80	0·52	0·32
weet almond	90·53— 89·84	90·20— 89·64	1·08	0·33
Earth nut	100·71—100·76	101·26	0·523	0·50
Whale	128·00	127·45—127·38	0·585	0·50
ard	76·99— 77·36	76·03— 75·88	1·22	0·96
Sperm	79·95— 79·76	82·39— 82·08	2·422	2·13
Rape	103·69 —103·37	99·03— 98·55	4·60	4·17
astor	86·32— 87·15	78·74— 78·71	8·01	7·58
ie l	93·31— 93·99	103·09—103·74	9·765	9·10
od liver	122·09—122·79	132·86—132·18	10·08	9·39
Menhaden	176·05—175·65	186·94—186·86	10·825	10·36
osin	59·67— 58·95	10·60— 10·26	48·845	48·35

e authors suggest that the ratio between the two s might serve as an indication of, *e.g.*, the presence nhaden oil in linseed oil.

the 15 oils only six gave any marked degree of tution. The values obtained with these are given in llowing table :—

Oil.	Total Bromine Absorption.	Addition Figure.	Substitution Figure.
r	85·16— 84·67	84·52 — 84·09	0·63— 0·58
erage	84·91	84·305	0·605
den	120·10—120·30	118·88—118·93	1·22— 1·27
erage	120·15	118·905	1·245
lmond	59·54— 59·15	57·38— 57·02	2·16— 2·13
erage	59·345	57·20	2·145
..	54·61— 54·56	52·41— 52·21	2·20— 2·34
erage	54·585	52·31	2·27
	52·63— 52·80	50·09— 50·07	2·53— 2·73
erage	52·71	50·08	2·63
	108·67—109·23	6·74— 6·47	101·93—102·76
rage	108·90	6·605	102·345

this Journal, 1900, 213.)—C. A. M.

Extraction Apparatus ; New ——. W. Jerwitz.

See under XXIII., *page* 618.

PATENTS.

Matters from Wool, Sheep-Skins, and other Textile s ; Process and Apparatus for Extracting. C. D. . London. From Délainage Verviétois et Cie., upré-Verviers, Belgium. Eng. Pat. 2360, Feb. 6,

aterial to be extracted is treated with carbon tetra- under water, or in closed chambers, the solution l, and the solvent evaporated. Claim is also made ferent modifications of apparatus in which the is either made to circulate through stationary tetrachloride, or the solvent through the material, mbination of both methods is employed. In all ses the solvent is protected from evaporation by vered with water.—C. A. M.

ed Oil and other Sweet Oils ; Method of Puri- ——. F. Linde, Dortmund, Germany. Eng. 3,201, July 21, 1900.

s mixed with milk (10 to 15 per cent.), heated to ature exceeding 100° C., and filtered. The residue sed for fodder.—C. A. M.

Manufacture of ——. T. Parziale, Alexandria, Egypt. Eng. Pat. 10,912, June 15, 1900.

ton-seed oil is treated with flour and caustic soda in specified proportions, and the resulting soap ted with any other substances desired.—C. A. M.

Rosin Soap ; Process of and Apparatus for Producing ——. C. L. Culmann, Hamburg, Germany. Eng. Pat. 16,989, Sept. 24, 1900.

Claim is made for the manufacture of a rosin soap having an acid reaction and containing free carbonic acid. The soap mixture is heated in an open vessel at a relatively low temperature (say 75°—80° C.), whilst made to circulate through the carbonic acid, which it thus absorbs.

The apparatus claimed for this process consists of a steam-jacketted boiler, containing a pair of concentric bells communicating with one another at their closed ends. The contents of the boiler are forced up into the inner bell by means of a vertical screw or conveyor, and passing laterally into the exterior bell fall back into the boiler. Separate claims are made for different parts and modifications of this apparatus.—C. A. M.

Liquids, Frothing —— ; Processes for Boiling, and Apparatus therefor. M. Erfurt, Straupitz, near Hirschberg, Silesia, Germany. Eng. Pat. 5817, March 19, 1901.

The process claimed, which is specially intended for use in the manufacture of rosin soap, consists in conducting the froth through a "scumming chamber," where it loses the gas it contains whilst the liquid falls back into the boiler. Separate claims are made for cooling the scumming chamber, and for the condensation of the escaping steam or vapour.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

PATENTS.

White Lead ; New Process and Method for Producing ——. E. R. Blundstone, London. Eng. Pat. 8820, May 12, 1900.

Litharge is dissolved in lactic acid or in a solution of lead lactate until the liquid is strongly alkaline to litmus. Carbon dioxide is then led through the solution until the reaction is nearly neutral. The precipitated white lead is separated and washed ; the filtrate is treated with litharge again. A denser product can be obtained by precipitating under pressure. The process may be worked in the cold.

—F. H. L.

Pigments or Paints ; Manufacture of ——. F. A. Hyndman and W. B. Banyard, London. Eng. Pat. 9282, May 19, 1900.

The inventors claim that by mixing 85 parts of pigment or paint with 15 of methylated spirit they produce paints of greater brilliancy and permanence than heretofore possible.

—F. H. L.

Zinc Sulphide Suitable for Pigments, Manufacture of ——: and of Sulphocyanides as a By-product. E. Beringer, Charlottenburg, Berlin. Eng. Pat. 11,108, June 19 1900.

Into an enamelled digestor an ammoniacal solution of zinc is introduced, compounded from zinc sulphate, 230 lb.; water, about 90 galls.: ammonia (sp. gr. 0·91), about 230 lb. About 60 lb. of carbon bisulphide are added, the vessel is closed, the temperature rapidly raised to 100° C. with constant agitation, until the pressure rises to 60 lb. After four hours the pressure begins to fall; in 10 hours it will have sunk to about 22 lb., and the operation is finished. The zinc sulphide is collected, washed, dried, and ground; it is in a very finely divided state, and is suitable to be used as a pigment. The ammonia is converted into ammonium thiocyanate; any excess is recovered by treatment with quicklime.

The inventor refers to Ger. Pat. 97,820, in which, however, the zinc sulphide only appeared as a by-product in the manufacture of guanidine salts, and "of no commercial importance."—F. H. L.

(C.)—INDIA-RUBBER, &c.

Caoutchouc; Columbian ——. G. Springer. Gummi-Zeit. 1901, **15**, [29], 479.

The term "Columbian Caoutchouc" comprises several kinds of rubber obtained from the juice of the *Hevea* and *Castilloa*, but which vary considerably as to geographical origin and market value. The following may be distinguished:—"Virgin Columbia" (loss on washing, 15—20 per cent.), of good quality, rather like Para, and sold as such; "Carthagena" (Essequibo) (loss on washing, 25—60 per cent.), of medium value, consisting of black-coloured strings squeezed together into balls, of unpleasant odour, brownish-black when freshly cut, and often loaded with sand; "Gayaquil," recognised as black laminated pieces, very impure and of low value; "Colon" and "Panama," both sold in long strings and of medium value.

Twenty years ago "Columbian scraps" were for some time sold in London in considerable quantity, and were preferred to the genuine virgin Columbia. This rubber was derived from the *Sapium biglandulosum*, a forest-tree common at that time in Central and South America, the juice of which easily coagulates on the incisions and only requires to be scraped off. Subsequently this tree has been almost entirely destroyed, and its product no longer appears in the market.—R. L. J.

India-rubber; The Colouring of——. O. Markfeldt, Gummi-Zeit. **15**, 224.

The dyeing of india-rubber throughout its mass must be effected before vulcanisation. The dyes, or pigments employed for this purpose, must therefore be such as are capable of withstanding a temperature of 140° C., and not chemically acted upon by sulphur at that temperature. For the latter reason lead pigments cannot be used, and the same may be said of pigments containing iron, tin, mercury, and copper.

The dyeing of india-rubber with inorganic pigments is carried out by mixing them, together with the sulphur, with the india-rubber until a sufficiently homogeneous mixture has been obtained. Attempts have not been wanting to dye india-rubber by methods similar to those employed for the dyeing of textile materials.

The dyeing of india-rubber with aqueous solutions of the aniline dyestuffs has not proved successful, besides, such colours would considerably suffer in the subsequent operations. Hence only pigments are employed at present for the dyeing of india-rubber in the mass, zinc white, lithophone, antimony and vermillion being the most important.

The dyeing of india-rubber with solutions of the aniline dyestuffs, for which quite a number of patents have been taken, is altogether unsatisfactory, the shades being dull and very unstable. The results obtained with solutions of aniline dyestuffs in alcohol were perhaps better, but only moderately satisfactory. Much better effects have been recently obtained with solutions of certain aniline dye preparations in benzene, or carbon bisulphide, especially for the dyeing of thin, transparent articles, such as toy ballo Cerasin Red, Red G, Orange, Dark Yellow and Soudan give particularly good results as regards permanency brilliancy, but the shades assume brightness only w these articles are fully distended, the undistended arti appearing dull.—C. O. W.

Para Rubber Mixings. G. Springer. Gummi-Zeit. [20], 327.

Para mixings are, strictly speaking, mixings consi of pure Para rubber and sulphur. At present, howe all mixings of any kind of india-rubber and sulphur described by the above term. All these float upon w and are further characterised by their peculiar grey co All high and medium grades of rubber may be used Para-mixings provided the percentage of ash they yiel incineration does not exceed 0·6 per cent. and provi further that they can be vulcanised with a moderate portion of sulphur. Also the colour of the india-ru after vulcanisation is a guide as to suitability of particular brand of india-rubber for the above pur No rubber exhibiting after vulcanisation a dark brow black colour should be used. Particularly some of the African brands are objectionable in this respect. (care should be employed in the washing of the rubbe Para mixings and it is advisable to continue the pr until the water is quite free from turbidity. In mixin dry india rubber with the sulphur only small batches time should be taken into operation as the time req for the mixing of large batches is apt to injure the qu of the mixing. Nor should mixings, especially containing substitutes, be allowed to lie unvulcanise any considerable length of time. Best qualities co rarely more than 20 per cent. of Para, about the quantity of Negro head, and about 30 per cent. of one of the better African qualities. Reduction of the pe tage of Para above given is not advisable, the prefe alternative being to reduce the quality of the other ru used. Besides india-rubber probably all Para mi contain at present substitute to the amount of about l cent. Second grade Para mixings contain only 10 per of Para or less, the amount of Negro head is reduc 5 per cent, the amount of substitute raised to 12 per the rest consisting of sulphur and lower-class ru For still lower qualities no Para is used at all, nor as any Negro head, only rubbers of third quality employed with up to 15 per cent. of substitute "floating" qualities of recovered rubber. The perce of sulphur used in these mixings varies considerably 4·5 to 8·5 per cent., according to the vulcanising conc observed. The quality of the sulphur employed, a its uniform distribution in the mixing, are poin great importance. Flowers of sulphur are very reliable, precipitated sulphur, in spite of its high is much to be preferred. The vulcanisation tempe should not exceed 146° C., and must be controll means of suitably placed thermometers. Revulcan of undervulcanised goods is generally unsatisfactor has invariably a deteriorating influence upon their q It is customary to subject these goods to a treatmen a dilute solution of caustic soda in order, as it is sta remove the free sulphur. Analysis of the goods and after this treatment shows, however, that n action takes place. The action of the alkaline l strictly confined to the surface, and is merely that of solution. Indeed, soap solutions are at present use good results for this final treatment.—C. O. W.

India-Rubber and Sulphur. G. Springer. Gumm **15**, [18], 294.

Vulcanised india rubber, when examined under the scope, is found to contain throughout its mass well de crystals of free sulphur. No sulphur crystals occur the "flowers of sulphur", these crystals, in the opinion, can only have been formed by the sulphur into solution in the india-rubber. The writer conten in the process of masticating the india-rubber betw rollers liquid hydrocarbons are formed, which are of dissolving the amorphous sulphur, depositing it ou in the crystalline form.

)n heating a mixture of para-rubber and sulphur under microscope the sulphur melts and gradually disappears. sequently small bubbles of a clear yellow colour form, ch become opaque after a few hours and from which a s of fine sulphur crystals penetrates into the india- ber. On continued heating, the colour of the india- ber darkens considerably, but remains transparent, and ne heating be continued long enough all free sulphur permanently disappear.—C. O. W.

dia-Rubber Waste. G. Springer. Gummi-Zeit. 15, [21], 346.

employment of old india-rubber scrap, or waste, has med considerable dimensions since more or less satis- ry processes have been devised for converting this e into a form in which it readily lends itself to re- poration with rubber mixings. The india-rubber waste w collected and sorted according to its quality, in a matic manner. The best waste consists of articles in nanufacture of which only rubber and sulphur have used; this quality is therefore known as "best floating ." The lower qualities consist, of course, of more or less ly compounded goods. In one class are grouped the gs of waterproof cloth, bed sheeting, and the like, the r of which can here covered by special processes now sively carried out. "Hard rubber waste" is at present sought after. When reduced to the state of an pable powder it can be added to hard rubber mixings. converting soft waste into a product suitable for re- uction into rubber mixings, the first operation consists eing it from adhering dirt. It is then ground, and out 20 hours boiled with caustic soda at a pressure of This removes the free sulphur. In spite of in- able attempts, no process is known for the removal combined sulphur. After treatment with caustic soda, iste is washed and dried in vacuo. The dry mass is nixed with from 5 to 10 per cent. of benzene, or l oil, and heated for a few hours under hydraulic e, by means of 60 lb. steam. The product thus d is rolled into slabs, and is then ready for use in mixings.—C. O. W.

sia; The Employment of ——, in India-Rubber. G. Springer. Gummi-Zeit. 15, [17], 281.

nployment of magnesia in conjunction with india- is not very extensive, its basic character making it rather as a substitute for lime than for general use ing material. Lime is very generally considered a le addition to rubber mixings as a means of sing any free acids present, and as an adjunct to ation. But various investigations have shown that lition of lime is conducive to the evolution of etted hydrogen, and there is besides the drawback being a heavy and more or less gritty powder, to distribute evenly throughout the mixing. In e respects magnesia, which forms an extremely l impalpable powder, is much to be preferred. More nt perhaps is the employment of magnesia in place h chalk to counteract the stickiness of unvulcanised ber. French chalk acts perfectly satisfactorily purpose in the cold, but is not capable of preventing when the india-rubber comes into contact with hot In this case dusting the surfaces with magnesia ghly effective, and this substance is therefore much the manufacture of rubber shoes and goloshes. m carbonate is capable of much more general on. It is employed not so much as a pigment ng material of special value. It has been found substitution of magnesium carbonate for chalk g") in "steam goods" tends to prolong the life rticles.—C. O. W.

PATENT.

Cables, Conductors, or Wires; Method of and al for Covering [with India-Rubber] —— with ing Material. G. E. Heyl-Dia, Manchester. Eng. ,217, June 20, 1900.

ct of this invention is to cover cables with pure vulcanised rubber in one operation. Pure (*i.e.* non vulcanised) and vulcanised rubber are each calendered separately into sheets; then one of each, or several of each arranged alternately, is passed together between warm rollers so as to make them adhere, yielding a composite sheet with pure rubber on one side and vulcanised rubber on the other. The whole is then cut into strips and applied to the cable by means of grooved pressure rollers, or in any other fashion, the pure rubber being next the conductor. Any rubber substitute capable of being vulcanised may be employed instead of the vulcanised rubber. The final heating to complete vulcanisation is preferably not carried out until the material has been applied to the conductor.

Eng. Pats. 8289 and 8290, 1900, are referred to.—F. H. L.

XIV.—TANNING, LEATHER, GLUE, SIZE.

Sheep Skins with Wool on; Tanning ——. Leather Manufacturer, 1901, 12, [3], 49–50.

The skins after being thoroughly soaked in cold water and fleshed, are stretched on a table flesh side down, and the wool thoroughly washed with a strong solution of soap, to which has been added some sodium carbonate ("soda"), until the wool is perfectly free from grease, when it is thoroughly rinsed with warm water. The goods are now tawed by immersion in a solution of alum and salt for two or three days, the strength of the liquor being increased each day. A stock solution of alum and salt is made by dissolving 15 kilos. of alum and 9 kilos. of salt in 250 litres of water; for the bath, 25 kilos. of this solution are taken for each 375 litres of water used, and 5 kilos. of solution are added for each lot of skins treated.

After tawing, the goods are laid over a beam and allowed to drip until sufficiently dry, when they are brushed over lightly on the flesh side with the fat liquor made of three parts of dissolved soap and 15 parts of bone grease; if the skins are to be dyed, this operation must follow the dyeing.

The goods may be dyed with aniline dyestuffs, from 6 to 12 skins being operated upon at one time in a tub, keeping the goods in constant motion; when sufficiently dyed, the goods are rinsed in water containing a few drops of sulphuric acid. A seal brown may be dyed by alternately passing the skins through a Gambier solution and a solution of potassium bichromate "of 7° strength"; if desired white, the skins are bleached with sulphur dioxide gas.
—M. C. L.

Glacé Leather from Intestines. Leather Manufacturer 1901, 12, [3], 53.

This is a process of producing glacé leather from the outer membrane of the intestines of animals, especially from the coecum or blind gut of cattle. The membrane may be tawed in a mixture of 500 grms. of wheat flour, 125 grms. of alum, 65 grms. of common salt, six egg yolks, and 2½ litres of water, for 2½ hours; the quantity being sufficient for 100 membranes. After removal from the tawing mixture, the goods are hung up to dry and when only slightly moist are worked over on the flesh side with a semi-circular blunt iron and are then dried, moistened, and worked for a second time with the iron tool.

A second method consists in treating the washed membranes with a 1 per cent. solution of hydrochloric acid until they are well plumped, when they are rinsed in a solution of soap and transferred to a solution of 40 grms. of alum and 40 grms. of salt, dissolved in 2 litres of water. The goods are transferred after a few hours soaking to a 3 per cent. solution of chromic acid which is gradually increased to 6 per cent. strength; the above quantitie being sufficient for 1,000 grms. of membranes. After absorbing sufficient chromic acid, they are placed in a mixture of ½ litre of egg yolk and 2 litres of water per 100 membranes, and left until the egg is well taken up; they are now stretched, dried, and glazed. If desired, zinc sulphate may be substituted for the chromic acid.

The membranes may also be tanned with ordinary vegetable tanning materials after being well cleansed in a sodium carbonate solution. They are afterwards subjected to the action of one part of hydrogen peroxide solution dissolved in 10 parts of water and then washed. After tanning, the goods may be "nourished" with yolk of egg, and finished.—M. C. L.

Beam-House [Tanning] Experiment. Hide and Leather. 1901, **21**, [15], 28—29.

This experiment was made with the view of ascertaining what relation the amount of hide which enters the tanning liquor bears to that of the hide as bought. In carrying out the experiment no attempt was made at economic or improved methods, the hides being simply treated in the usual manner. Nine hides as nearly as possible alike in weight, spread, and texture, were divided into three packs and marked; No. 1 weighing 205 lb., No. 2 weighing 210 lb., and No. 3 weighing 197 lb. The total weight, 612 lb., of the wet hides consisted of 391·68 lb. of dry hide and 220·32 lb. of water. The soaking extended over a period of 72 hours, fresh water being used each 24 hours, the hides being drawn, put on a grating and drained, until all dripping had ceased, the drainage being conducted back to the soaking vat, the water well stirred and measured, and a large sample taken for the determination of the residue which it contained. This process was repeated on all of the three days during the soaking, and the results obtained were, 1st day, dry residue 118·324 lb. or 30·21 per cent.; 2nd day, dry residue 25·690 lb. or 6·56 per cent.; 3rd day, dry residue 5·280 lb. or 1·35 per cent.; thus showing a total loss of 149·294 lb. or 38·12 per cent.

On examination, it was found that the residue obtained on the first day was principally composed of manure, salt, and earthy matter; on the second day the insoluble and soluble matter were equally divided, whilst on the third day the residue was almost entirely soluble. After two days' soaking the hides were worked over on the beam and the fluid, dirt, &c. drained back into the vat and included in the residue from the second day's soaking; the shreds of flesh and fatty matter were carefully collected and dried, and on weighing gave 6·23 lb. or 1·59 per cent. A bacteriological examination of the soak water showed that seven different kinds of bacteria were present during all three days; two of these varieties were found capable of liquefying gelatin and exerted a destructive action on hide substance.

Liming.—Pure fresh lime was used, the amount varying for each pack; the goods were limed for five days, being drawn every 24 hours and allowed to drain into their respective vats; the quantity of water used in each case was 350 gallons. Pack No. 1 was placed in vat No. 1 which contained 51 lb. of lime, pack No. 2 into vat No. 2 containing 71 lb. of lime, and pack No. 3 into vat No. 3 containing 134 lb. of lime; a fresh quantity of lime was added each day so that when the liming was completed, the quantity equalled 50 per cent. of the original amount used; vat No. 1 containing 76·5 lb. of lime, vat No. 2, 105·5 lb. of lime, and vat No. 3, 201 lb. of lime. After completing the liming, the hides were drawn and drained thoroughly, the drainings being conducted back into the vats. An examination of the limes showed that in vat No. 1, pack No. 1, the loss in weight was 5·79 lb. or 4·4 per cent.; vat No. 2, pack No. 2, the loss was 5·16 lb. or 3·84 per cent.; vat No. 3, pack No. 3, 16·78 lb. or 13·31 per cent.

It will be seen that the minimum loss is in the lime of medium strength; however, when the hides came to be unhaired, it was found that pack No. 1 had not been sufficiently limed. Pack No. 2 was considered satisfactory, the hair being easily removed. Putrefactive germs were found in great numbers in vat. No. 1, whilst in vat No. 2, the number was somewhat diminished, especially after the third day; in vat No. 3 they were at no time so plentiful as in the others.

After liming, the hides were placed in a vat of water at a temperature of 85° F., and allowed to remain over night; the loss in hide substance during this operation being found to be 1·44 lb., or 0·37 per cent. They were then unhaired by hand, and the amount of hair removed was found after washing and drying, to weigh 28·04 lb., or 7·16 per cent. When unhaired, the hides were fleshed by hand, using the German spring flesher, and the fleshings washed and dried, when they were found to weigh 15·7 lb. or 4·01 per ce The goods were now left over night in water at 60 F.; t were then stoned and worked out, and left for five hours running water, when they were drained for 45 minut weighed, and samples taken for analysis. The net wei of the nine hides ready to tan was 654·84 lb., being 7 cent. in excess of the original green salted weight; t contained 73·84 per cent. of water, and 1·8 per cent lime, which, on deduction, leaves 164·27 lb., or 24·36 cent. of the weight of hide purchased, for tanning.

—	Per Cent.	Poun
Total green salted hide used for experiment..	..	612
Water in green salted hide	36·00	220
Total dry green salted hide..................	..	391
Loss in soaking	39·71	155
„ liming pack No. 1	4·4	5
„ „ No. 2	3·84	5
„ „ No 3........................	13·31	16
„ water before unhairing................	0·37	1
„ unhairing	7·16	28
„ fleshing................................	4·01	15
Total Loss	..	228
Total hide ready to tan as shown by experiment.	..	163
Total hide ready to tan by actual weight before going to liquors.	..	164
Difference unaccounted for, 0·26 per cent. of dry hide.	..	1

The following will illustrate the true value of the we and percentages in the foregoing:—

	Per Cent. Wat
Total dry green salted hide	36·00
After soaking..................................	39·71
„ liming..................................	43·55
„ unhairing..............................	51·08
„ fleshing	55·09

—M. C.

Leather; "Spueing" of ——. Eitner. Der Gerb through Leather Trades' Rev. **34**, [786], 275.

"SPUEING," or gumming, is the term used to den resinous exudation in which an oily substance colle patches upon the surface of the leather, and whe process is prolonged, finally covers it with a thick vi coat, which, as time goes on, becomes thicker and sticky. This gummy or resinous exudation consists hydroxyfatty and polyhydroxyfatty acids of the fis formed by the oxidation of the fatty acids of th The oxidation is not always effected by the oxygen air, but appears to depend upon other causes, becau spueing in its worst form generally occurs in the warel in the interior of bundles of skins, to which only a small quantity of air can gain access.

It has been found by experience that all fish oils ha an equal power of becoming oxidised. Some variet fish oil are known to be characterised by this propert high degree, such as shark oil, herring oil, and Ja fish oil, whilst in others it would appear to depend up mode of manufacture, and upon the age of the oil. a low specific gravity may be said to oxidise more than those of a high specific gravity. Several ca spueing have been investigated, and their cause att to the practice of converting lighter kinds of fish more viscous and heavier kinds by the addition of percentage of wool fat or paraffin wax; also to the u substance sold as oxidised fish oil. Oxidised oils ar likely to spue than those which are not oxidised, whi perhaps be explained by the fact that more hydro acids are formed, which under favourable circumstan converted into polyhydroxyfatty acids, of which the tion in great part consists. As many kinds of dégras commerce consist to a greater or less extent of oxidi oil, it is very evident that leather stuffed with dég artificial substitute for pure moëllon, may also be to the evil of spueing.—J. G. P.

ather; Marbled ——. Hide and Leather, March 28, 1901.

…cess recently patented by George Collin, of Berlin,
…marbling or decorating leather by means of aniline dye-
…s, is carried out by moistening the surface of the
…ed leather with water, the excess moisture being
…ved by rubbing with a dry cloth and those parts of the
…er which are to appear bright are dotted, sprinkled or
…ted with a solution made by dissolving 80 grms. of
…h alum or 40 grms. of stannous chloride in 1 litre of
…; the surface of the leather is allowed to dry, when
… covered for a few minutes with a dilute alkaline
…on of soda or potash (about 10° Tw.), the surplus
…ne solution being removed by rubbing; the alum or
…ous chloride solution is now again applied on the parts
…d bright and the leather dried. The leather is now
…d with a solution of the selected aniline colour when
… be found that the places mordanted with the alum
…solution will not take the dye and therefore remain
…, by which means it is claimed, an effective marbling
…duced. When using the acid dyestuffs, only the
…ous chloride mordant must be employed in order to
… good results.—M. C. L.

er; Manufacture of Patent Chrome Goat and Calf
… . Shoe and Leather Reporter. Feb. 28, 1901, 39.

…*king Goat Skins.*—The dry goat skins are placed in
…water for from four to five days, adding, if necessary,
…f borax to each 1,000 galls. of water; after which
…re drummed with warm borax solution for about
…utes, afterwards being drummed in two changes of
…ater for periods of 20 minutes.

…*ing Calf Skins.*—Calf skins are soaked in clean
… two days being sufficient for fresh skins; salted
…equire from three to four days.

…*ng.*—After soaking, the goods are weighed before
… 1,200 goat skins or 500 calf skins are usually
…ogether in a vat. Five to seven days liming is
…ly given, experience having shown that skins
…d for chrome leather should not be limed too long;
… is slaked in the vat with an old lime liquor, together
… per cent. of "red arsenic," calculated on the weight
…dry skins; after slaking, the vat is filled with water,
…ed" well, and the goods thrown in; the limes are
…ened, and the goods hauled daily; when sufficiently
…e goods are ready to be unhaired. After unhairing
…hing, the former operation being performed either by
… or hand as desired, the skins are well washed in
…mill with cold water for 10 minutes, when they are
… to drain and are ready to be bated.

…*ng.*—The skins are bated in paddle wheels at a
…ture of 75° F. for about 2½ hours, using new
… When sufficiently bated the skins are placed in
…f warm water in order to open the grain and to
…of the removal of any remaining dirt in the slating
…a, which follows next. After slating the skins
…y machine or hand, they are paddled in a warm
…lution, using 4 lb. of borax to the pack of goods,
… to remove whatever lime may be left in the skin,
…ch they are drained and weighed.

…*ng.*—The goods are now pickled by drumming
…lution made by dissolving 10 lb. of common
…5 galls. of water for every 100 lb. pelt weight
… for 20 minutes, when a quantity equal to 2 per
… hydrochloric acid, previously diluted with hot
… added, and the drumming continued for another
…tes. The object of pickling the skins is to
…m open and plump, and to prevent them from
… on the grain. The goods are now drummed for
…tes in a solution made by dissolving 2 lb. of
…a bichromate in 12 galls. of water for every 100 lb.
… a temperature of 70° F., when 4 lb. of potassium
…te and 2½ lb. of common salt dissolved in 15 galls.
… are added and the drum revolved for a further
… four hours or until the goods are coloured yellow
…he thickest parts, when they are taken out of the
…own over "horses," and left overnight covered with
…n order to keep off the light; next morning they
…k out by machine and are prepared for the reduction bath by dipping in a weak solution of sodium thiosulphate and acid, using 3½ per cent. of sodium thiosulphate and 180 per cent. of the weight of the skins, of water. The skins are dipped well in this solution and thrown over a "horse," when they are ready for the reduction bath.

The reducing is done in the paddle, using 10 per cent. of thiosulphate of soda, and 5 per cent. of hydrochloric acid. The sodium thiosulphate after dissolving, is added together with sufficient water to the paddle, the acid is then added, the paddle set in motion and the goods thrown in as quickly as possible. The goods are paddled until no yellow colour is apparent, it being advisable to begin the reduction early in the morning and to paddle the skins all day; they are then left in the paddle overnight and run for one hour next day, when they are removed and paddled all day in running cold water, afterwards they are horsed up and left covered with sacks overnight, when they are ready for machine shaving. The goods are now drummed in a solution of borax for 20 minutes, using 10 lb. of borax dissolved in sufficient warm water, and are afterwards washed for 20 minutes in cold running water in the wash-wheel; three pints of sulphuric acid diluted with three pails of water is thrown into the wash wheel, with the plugs out, the goods are revolved two or three times, and are then washed for about 30 minutes in running water, when they are allowed to drain off.

The skins are now drummed for 30 minutes in a solution made by dissolving 3 oz. of Methyl Violet and 2 oz. of Nigrosine, in 30 galls. of warm logwood infusion at a temperature of 100° F. when a fat liquor, made by dissolving 10 lb. of a suitable soap in 15 galls. of boiling water to which 2 galls. of best fish oil, emulsified by boiling with a solution of 2 oz. of borax in water is added; sufficient cold water is now added to make up the solution to 45 galls., 10 lb. of egg yolk are added and the whole thoroughly mixed. The fat liquor is added to the drum at a temperature of 95° F. and the drumming continued 20 minutes, when part of the solution is run off and the following mixture added:—A mixture of 8 lb. of ferrous sulphate dissolved in sufficient water and 25 galls. of logwood infusion in which has been dissolved 5 lb. of gum arabic, is diluted to 2½° Tw. 2½ pailsful of this mixture are entered in the drum, which is revolved for two minutes, when the mixture is run off, the skins washed for five minutes in cold running water and then allowed to drain over horses for four hours, after which they are set out on the grain by machine, being afterwards given a light coat of a solution composed of two parts of glycerin and one part of water, on the grain side, and a slight coat of oil, preferably sperm or cod oil.

The goods are now tacked upon frames or boards, and dried, and then laid in piles till they are wanted for finishing. When required, the goods are staked, after damping in wet sawdust, for four or five hours, then fluffed on the flesh side, and the grain cleaned by brushing by hand, any grease being removed by rubbing a little "benzine" on the grain.

The goods are now fastened to frames, by means of string attached at distances of about 1 ft. all round the skin, and the first coat of varnish is applied; this varnish, or "daub" consists of 15 galls. of linseed oil heated up to 570° F. for eight or ten hours, allowed to cool to 400° F. The mixture is afterwards allowed to stand overnight, when it is again heated up to 600° F., and should then have acquired the consistency of a jelly; ¼ lb. of burnt umber, 4 lb. of litharge, and 1 oz. of sulphuric acid are now added, the mixture cooled down to a moderately warm temperature, 15 galls. of "benzine" added and the whole stirred. 10 galls. of benzine are now further added and the mixture again stirred; the quicker the benzine is added—the composition being stirred, the better. Two coats of this mixture are given to the grain surface of the skins, using a wooden slicker and working the mixture thoroughly into the leather, and drying thoroughly before applying the second coat. The skins are then dried in an oven for about 12 hours at a temperature of 120° F., rubbed over on the grain with a piece of pumice stone, in order to obtain a smooth surface and are given a coat of varnish. This varnish is made by boiling 20 galls. of raw linseed oil for eight to ten hours at a temperature of 550° F. to 580° F., adding 5 lb. of Chinese blue after the oil has been boiling for two hours. The varnish is, after sufficient boiling, cooled, and 3 lb. to 4 lb. of lampblack, previously mixed with a little turpentine, are added, and the mixture diluted with benzine until it flows freely. This mixture is placed on the leather with a brush, and the skins dried for 12 hours in the oven at a temperature of 160° F., or until thoroughly dry, when the goods are again pumiced and a finishing varnish is applied; this is made by boiling 20 galls. of linseed oil until it is of the same consistency as the varnish just described; 5 lb. of Chinese blue are added after two hours' boiling, the composition being kept for 10 hours at a temperature of 650° F., 2 oz. of sulphuric acid being added during the operation; the varnish is cooled down overnight, and is ready to use when cool enough to bear the hand in it; the skins receive two coats of this varnish, applied with a brush, the goods being dried between the coats, and pumiced with a very fine pumice stone; the finishing coat is allowed to dry for two days in the oven; when dry, the goods are exposed to the sunshine for one day, and are then ready for market.

—M. C. L.

Picric Acid; Tanning with ——. F. Watenburger. Leather Manufacturer, 1901, **12**, [3], 54.

After tanning with a picric acid solution, the goods are allowed to drain, and are then transferred to a tanning extract solution of about 1° strength for about 12 hours, when they are removed, washed, partially dried, and fat-liquored, and are then dried and finished in the usual manner. It is claimed that the vegetable tanning material fixes the picric acid in the leather in an insoluble form which will not "rub off."—M. C. L.

Hide-Powder; Report on the Effect of Moisture and Time on the Quality of ——. A. Turnbull. Paper read before the Paris Conference of the I.A.L.T.C., 1900. Leather Trades' Rev. **34**, [786], 279.

In order to find out the effect of different amounts moisture in hide-powder with regard to its keeping p perties for purposes of analysis, a quantity of hide-pow was obtained and divided into four portions :—

Lot 1.—This portion was allowed to absorb moist until it increased 2 per cent. in weight, and was then s divided into five portions, which were placed in w stoppered glass bottles, and the latter sealed with paraf and marked, respectively, "Lot 1*a*," "Lot 1*b*," "Lot "Lot 1*d*," "Lot 1*e*."

Lot 2.—This portion of the original hide-powder jus received was, as in the case of Lot 1, sealed up in bottles, and labelled "Lot 2*a*, *b*, *c*, *d*, *e*."

Lot 3.—This portion was dried by means of a curre warm air until it had lost 2 per cent. in weight, and then subdivided as before, and the separate bottles mark respectively, "Lot 3*a*, *b*, *c*, *d*, *e*."

Lot 4.—The final portion was dried at 50° C. to const weight, and was then apportioned in sealed bottles as bef and labelled "Lot 4*a*, *b*, *c*, *d*, *e*." The estimation moisture gave the following results :—

——	(*a.*) January 23, 1900.	(*b.*) April 23, 190
	Per Cent.	Per Cent.
Lot 1	17·3	17·5
" 2	15·5	15·3
" 3	12·9	13·3
" 4	9·8	9·5

For the object of testing these samples, an oak extract was used, each analysis being conducted on ex the same lines. The following tables express the re obtained:—

Hide-powder: Oakwood Extract.

——	Lot 1. 17·3 moist.		Lot 2.—15·5 moist.		Lot 3.—12·9 moist.		Lot 4.—9·8 moist.	
	January.	April.	January.	April.	January.	April.	January.	Apr
Tannins	26·4	26·5	26·4	26·4	26·4	26·7	26·3	26·
Non-tannins	13·6	13·7	13·6	13·8	13·6	13·5	13·7	13·
Insoluble	0·4	0·4	0·4	0·4	0·4	0·4	0·4	0·
Water	59·6	59·4	39·6	59·4	59·6	59·4	59·6	59·

Hide-powder: Solid Quebracho Extract.

——	Lot 1.—17·3 moist.		Lot 2.—15·5 moist.		Lot 3.—12·9 moist.		Lot 4.—9·8 moist	
	March.	June.	March.	June.	March.	June.	March.	J
Tannins	58·3	57·9	58·8	58·6	58·3	58·4	58·5	58
Non-tannins	11·2	11·6	10·7	10·9	11·8	11·1	11·0	11
Insoluble	12·1	12·0	12·1	12·0	12·1	12·0	12·1	12
Water	18·4	18·5	18·4	18·5	18·4	18·5	18·4	18

A blank test with water was made on the hide-powder, with the following results :—

Soluble in Water.

——	April.	June.	April.	June.	April.	June.	April.	J
25 of first 30 c.c.	0·0113	0·0186	0·0154	0·0205	0·0196	0·0184	0·0209	0·
25 of second 30 c.c.	0·0050	0·0030	0·0031	0·0022	0·0015	..	0·0010	0
25 of third 30 c.c.	0·0027	0·0028	0·0016	..	0·0016	0·0008	0·0008	0

It will be observed that the amount soluble in the first 30 c.c. is greater in June than in April, whereas in the succeeding 60 c.c. which would affect an analysis, the water-soluble portion in the first 30 c.c. increases, and in the succeeding 60 c.c. slightly decreases.—J. G. P.

Lactic Acid in the Tanning Industry. Leather Tr Rev. **34**, [786], 278.

Lactic acid is used successfully for de-liming hid skins. Half a kilo. of lactic acid is mixed with 100 of water. The skins are thrown into the bath, and a soak about a quarter of an hour, and then stirred for 15 20 minutes, and the process repeated. If used simply a de-liming agent, the bath should be kept at a tempera- re of from 33° to 38° C., but if for swelling stock, the mperature must not be above 16 C.—J. G. P.

nnin Estimation; Comparison of Volumetric Methods with the Results of the "Hide Powder" Method. A. Turnbull.

See under XXIII., *page* 623.

PATENTS.

ather, Artificial; Manufacture of ——. C. Buer, Imrie, and Co., London. From L. Gevaert-Naert, Bevere Audenarde, Belgium. Eng. Pat. 17,253, Sept. 28, 1900.

leather-like substance is obtained by impregnating ssed, undressed, or felted fabrics with cellulose xanthate solution, and then fixing the cellulose by means of steam other recognised agents for decomposing this compound. llulose, dissolved in zinc chloride or in cuprammonium oride may also be used. A second treatment with solu- s of india-rubber or gutta-percha, dammar or other ns follows, and is effected either *in vacuo* or at the inary pressure. Either process may be omitted or eated as often as desired, the final product being rolled inished in various ways.—R. L. J.

eïn Glue; Composition of ——. R. W. James, London. rom W. A. Hall, New York. Eng. Pat. 6815, April 1, 901.

HERTO, although caseïn has been frequently used in e of glue, it has been found more suitable for sizing poses than for joiners' work, as its compositions did not etrate properly into the materials to which they were lied. According to the present process it is possible to pare a caseïn glue free from this defect; it is strong, tically water-resisting, and particularly adapted for fix- veneers or for boat building. The new caseïn glue is e by mixing dry caseïn (preferably rennet-precipitated), 60 parts; sodium phosphate, about 20 parts; sodium hite, about 10 parts; and dry lime, either slaked or aked, 20 to 30 parts. This material dissolves in hot cold" water as ordinary animal glue does.—F. H. L.

XV.—MANURES, Etc.

itrification; The Organisms of ——. A. Stutzer. Centralbl. Bakt. 1901, [2], 7, 168.

organism which produces nitrates was obtained from en soil, and cultivated in a solution containing sodium te (2), potassium biphosphate ("superphosphate") PO_4,H_2O (1), magnesium sulphate (0·3), sodium ide (0·5), and potassium carbonate (0·5 grm. per . The cultivation is kept for some weeks, further nts of nitrite being added as required, after which itrate organism is isolated on plates of agar. In a more weeks, when there is no longer any nitrite ion, the smallest colonies are selected. The organism t coloured by aniline dyestuffs in aqueous solutions; ol-magenta is very suitable. The organism does not se ammonia, but just manages to live when nitrogen pplied in the form of nitrate. The usual organic nts are, as a rule, either poisonous, or hinder the tion of nitrites; some, as for instance mannitol, ndifferent. The reaction of the nutritive matter, the n dioxide, and the temperature are of importance. one variety of the nitro-microbe seems to exist.

cultivating the nitrous organism, ammonium mag- m phosphate was employed instead of a soluble onium salt. The best dye for the nitrous organism is l-magenta. The organism behaves towards organic nts similarly to the nitric organism. Several ies seem to exist, differing both morphologically and ologically.—N. H. J. M.

"Alinit." Biedermann's Centralbl. 1901, **30**, [4], 240—243.

ACCORDING to Stutzer and Hartleb, Stoklasa, and Lauck, Caron's "alinit" bacillus belongs to the group of hay bacilli; Stoklasa maintains that the microbe is *Bac. megatherium*, whilst Lauck believes it to be *Bac. subtilis*. Stutzer and Hartleb state, that it closely resembles *Bac. megatherium* and *B. mycoïdes*. Gerlach and Lüders have recently examined pure cultivations from alinit, and find that the bacillus behaves similarly to *Bac. subtilis*.

In 1898 and 1899, Gerlach made some vegetation experiments, in which alinit was employed both alone and in conjunction with glucose, straw, and glycerin. Inoculation was, in each case, without effect. Similar results have been obtained by Gyárfás (Wiener Landw. Zeit. 1900, **50**, 476); the simultaneous application of alinit and bone-meal also gave negative results.

—N. H. J. M.

XVI.—SUGAR, STARCH, GUM, Etc.

Glucose and Galactose; New Derivatives of ——. W. Koenigs and E. Knorr.

See under XXIV., *page* 626.

Sugars; Influence of Salts on the Rotatory Power of ——. J. de Kowalski and P. Tomartschenks.

See under XXIII., *page* 623.

Gum Arabic; Valuation of ——. O. Fromm.

See under XXIII., *page* 624.

Griess' γ-Diamidobenzoic Acid: A Reagent with its Compounds for Identifying Sugars, &c. B. Schilling.

See under XXIII., *page* 621.

Starch in Potatoes; Baumart and Bode's Method of Determining ——. P. Behrend and H. Wolfs.

See under XXIII., *page* 623.

PATENTS.

Steam or Vapour of any desired Pressure from Liquids Heated under Pressure but not Boiling; Process and Apparatus for Producing ——, *and the Application of the Process for Concentration of the Liquids.* C. Steffen. Eng. Pat. 12,805, 1900.

See under I., *page* 562.

Molasses Fodder; Apparatus for Making ——. R. Schrader. Eng. Pat. 3590, 1901.

See under XVIII. A., *page* 601.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeast; Antiseptic and Aseptic Action of Various Substances upon ——. Wehmer. Zeits. f. Spiritusind. 1901, **24**, [14], 137—138; [15], 147; and [16], 158—159.

THE effective dose of an antiseptic or germicidal agent varies within wide limits, even with one and the same micro-organism, depending, apart from concentration of the poison, on other factors which are often not sufficiently taken into account, such as vitality of the organism; conditions of nutrition and reproduction in respect to nature and reaction of the culture medium; temperature, age of the cultivation, time during which the reagent is allowed to act, number of cells employed in seeding, &c. Especially in the case of yeast is the available information vague and discordant; and in the present communication the author has collected and reviews some of the published investigations concerning the action of antiseptics on yeast, with the object of obtaining a comprehensive and comparative view of the effect of a series of substances, from a quantitative standpoint. The values in the following table may be regarded as *approximately* accurate under *average* conditions. By "inhibitive value" is meant the maximum dilution at which a given reagent completely suspends the functions (reproductive and fermentative) of yeast, without, of necessity, killing the cells.

Substance.	Inhibitive Value (*a*) for Reproduction.	Inhibitive Value (*b*) for Fermentation.	Lethal Dose.
Alcohol	10—20	5—10	.. ..
Citric acid	under 100	under 7	.. ..
Malic acid	"	"	.. ..
Lactic acid	50 (?)	12—15	.. ..
Sodium chloride	10 (?)	10 (?)	.. ..
Succinic acid	under 100	11	.. ..
Tartaric acid	"	12	.. ..
Arsenious acid (alkaline salt).	over 130	10	1 per cent. within 20 days.
Acetic acid	..	70—140	..
Propionic acid	..	"	..
Butyric acid	over 200	"	½ to 1 per cent. within 50 days.
Formic acid	..	250	..
Chloroform	..	100	1 per cent. = 0 (?).
Salicylic acid	1,000	400	0·2 per cent. within 30 days.
Benzoic acid	"	400	0·2 per cent. within 30 days.
Oxalic acid	..	300—400	..
Formaldehyde	over 1,000	400 and over.	½ per cent. within 3—6 days.
Sulphurous acid	over 1,000 (?)	1,000 (?)	0·1 5 per cent. within 15 minutes.
Mercuric chloride	"	"	0·1 per cent. within 3 days.

—H. T. P.

Yeast Cells and Yeast Enzymes; Comparative Resistance towards Injurious Agents of ——. Th. Bokorny. Chem. Zeit. 1901, **25**, [34], 365—366.

Oxalic Acid is very injurious to vegetable protoplasm. Yeast cells are killed by a 0·1 per cent. solution in four days; the yeast enzymes are fairly resistant, the zymase is not destroyed in five days by a 0·1 per cent. solution.

Acetic Acid.—The resistance of wine yeasts towards acetic acid was studied by Lafar. Bokorny finds that the zymase is destroyed by 0·2 per cent., but not by 0·1 per cent., in 24 hours. A 1 per cent. solution has no effect upon invertase, but is somewhat injurious to maltase.

Sulphuric Acid.—After 16 hours' exposure to 0·5 per cent. sulphuric acid, the yeast cells are killed, but not the mould yeasts, a 0·1 per cent. solution is not fatal; the yeast enzymes are more resistant to the mineral acids than the cells.

Caustic Soda.—The yeast cells are more sensitive to soda than the enzymes. Yeast is killed by 16 hours' exposure to a 0·5 per cent. solution, but survives treatment with a 0·1 per cent. solution. Invertase is not permanently destroyed by a 0·5 per cent. solution after four days, and maltase survives an exposure of 24 hours; both enzymes are destroyed by 1 per cent. caustic soda. Zymase is not destroyed by 0·5 per cent. soda in 24 hours.

Formaldehyde.—A 0·1 per cent. solution kills yeast in 16 hours, the zymase is also destroyed. The maltase is considerably injured by a 0·1 per cent. solution in 24 hours, and destroyed by 1 per cent. Invertase is not destroyed by a 5 per cent. solution in 24 hours; at this concentration yeast is killed in half an hour.

Mercuric Chloride in 0·02 per cent. solution is fatal to yeast in 24 hours, the zymase is also destroyed, as well as the maltase; the invertase is destroyed by a 0·5 per cent. solution.

Phenol.—Solutions of 1 per cent. and 0·1 per cent. kill the yeast cells in 24 hours, the former also destroys the zymase, but the latter does not; the same is also true for the maltase. Invertase will resist a 1 per cent. solution of phenol for 24 hours.

Thymol in saturated solution (0·1 per cent.) kills yeast in 16 hours, as also does a saturated solution of turpentine (0·001 per cent.). Zymase seems to be just as sensitive as yeast cells to these antiseptics, maltase is not much m resistant, but the invertase is scarcely affected.

Alcohol.—Yeast will resist 10 per cent. alcohol for m than a month; it is killed after three months in 30 cent. alcohol. Even absolute alcohol does not dest zymase in eight days, exposure to 10 per cent. alcohol a month weakens it. Maltase is more sensitive tows alcohol than zymase, 10 per cent. destroys it in a few da invertase resists absolute alcohol for a long time.

For demonstrating the activity of the enzymes a from the life of the cells, a 0·5 per cent. solution of cau soda and a 0·1 per cent. oxalic acid are convenient zymase (in addition to the antiseptics recommended Buchner); for invertase, any of the above solutions applicable, whilst for maltase, a 0·5 per cent. solutio oxalic acid would appear to be most suitable.—J. F. B.

Zymase. E. Buchner. Woch. für Brau. 1901, **18**, 197—201.

Continuing his reply to the paper on zymase by Macfa Morris, and Rowland (this Journal, 1900, 1127), the a deals separately with each of the main contentions of t authors, and, in the light of the additional experim evidence now to hand, he sees no reason to modify an his previous conclusions, and adheres to his opinion the inconclusiveness of the English experiments (this Jou 1901, 55). The author has worked throughout with I and Munich bottom fermentation yeasts, but does not t it likely that the fundamental differences found ar plained by any specific difference in the English top fer tation yeast. The present experiments prove tha quantity of gas evolved from the expressed juice incr with increase in the quantity of sugar added, and that concentrations of sugar do not yield better results stronger solutions. Further, it is shown that the ad of toluene as an antiseptic up to 1 per cent. has pract no retarding action, whilst thymol causes consid retardation at this concentration. With regard t "auto-fermentation" of the expressed extract, the r of the author distinctly contradict those of the E chemists. The author generally allows that the gas e by auto fermentation may be 10 per cent. of that ob by the fermentation of sugar; the highest quantity ob was 23 per cent., and this was demonstrably due t presence of glycogen. For the purpose of studyin effect of dilution, which was the most important e educed in support of the view of the English chem to the protoplasmic nature of the cell-juice, Buchner three series of experiments. The cell-juice, containing was diluted with a 40 per cent. sugar solution in one with a 10 per cent. sugar solution in the second, an water in the third; the first method being the l Buchner's opinion, and the other two being comp with the English experiments. At dilutions with volumes the first series showed no decrease in the q of gas, the second showed a distinct increase, owing fact that the undiluted extract could have fermente than the 10 per cent. of sugar added, and the third showed a slight decrease (20—25 per cent.) owing solubility of the gas. With regard to the proper carbon dioxide to alcohol formed, the author shows t is very near the theoretical in the case of the active with which he was dealing. He agrees that the consumed is greater in quantity than the prod fermentation, and suggests the possibility of the p of a synthesising enzyme.

The author is inclined to doubt the desirability important modifications which the English chemis introduced in the method of preparing the juice.—J.

Catalase [Tobacco Fermentation, Curing, &c.] Enzyme in Cured Tobacco and of General Occ O. Loew. U.S. Dept. of Agric., Report No. 68, 1

In the course of his studies on tobacco fermenta author encountered two kinds of oxidising enzym dase proper and peroxydase (see this Journal, 189 compare also Grüss, this Journal, 1899, 1012). now discovered the universal occurrence of another ich gives none of the guaiacum reactions of the oxydases l to which he gives the name of "catalase" from its cific property of liberating oxygen from hydrogen oxide. It was shown (*loc. cit.*) that the processes of ing and sweating of tobacco are accompanied by a truction of the enzymes of the leaves; the oxydase and oxydase generally survive the curing process, the former these finally disappears in the sweating, leaving the re resistant peroxydase; this latter may persist for two rs longer, and then only the catalase survives.

n spite of difficulties arising from its universal occurrence iving tissues, the author has been able to prove that lase is distinct from all the known enzymes, none which, when pure, have the power of "catalysing" rogen peroxide. Catalase occurs in two forms, α-cata-, which is insoluble in water, and which appears to be mpound of the soluble catalase with a nucleo-proteid, β-catalase, which is soluble, and is of an albumose ure. α-Catalase is converted into the soluble β-catalase er the influence of very dilute alkaline media at erately high temperatures, as for instance in the ating process of tobacco manufacture, α-catalase is ble in dilute alkalis (0·2 per cent. NaOH), and is recipitated by acetic acid. α-Catalase is best prepared cured or sweated tobacco by washing out the soluble mes with water, and subsequently extracting with e a kali; the extraction, however, is not very efficient. difficult to remove all the peroxydase if green leaves nployed. β-Catalase is prepared by exhausting sweated eco, free from peroxydase, with water and salting out enzyme with ammonium sulphate. Since the total ytic power of tobacco increases during the sweating ss, the existence of a zymogen may be inferred. ogen peroxide has a destructive action upon catalase the volume of gas liberated decreases somewhat ly. The catalases resist the effects of time for al years, they are destroyed by heating at a tem ure of 71°—75° C. in water, but withstand higher eratures in the dry state. The quantity of oxygen oped from hydrogen peroxide by catalase is increased itation. The presence of neutral salts as a rule has fect upon the activity, but the presence of nitrates ls it. The presence of dilute acids retards the action, dilute alkalis favour it; more than 0·5 per cent. of rapidly destroys the activity of catalase. Mercuric de (0·1 per cent. solution) is most injurious. β-Catas soluble to a considerable extent in 50 per cent. l; absolute alcohol does not injure catalase in the ud boiling alcohol does not destroy it immediately. water and dilute hydrocyanic acid attack β-catalase, ve comparatively little effect upon α-catalase. Formde and free nitrous acid are most injurious.

No living plant or vegetable organ is free from catalase, although the relative proportions of the α and β forms vary considerably. In an elaborate series of tables the author shows the quantity of oxygen evolved from hydrogen peroxide by various leaves, seeds, and fruits under comparative conditions. β-Catalase is generally absent from green leaves, but is often predominant in seeds.

The flesh of fruit of an acid nature is poor in catalase, though slightly better results are obtained after neutralisation. Fatty seeds generally contain more catalase than starchy seeds. In the case of barley the total catalase is considerably increased after germination. The amount of catalase secreted by fungi is very considerable; there is also a large quantity in yeast and bacteria; the α catalase is in greater proportion than the β. Catalase is also of general occurrence in the animal kingdom. The author discusses the question whether catalase is to be regarded as an oxidising enzyme and concludes that it may be classed as such, although several of the oxidising reactions, notably the guaiacum reaction, are absent. A characteristic oxidation brought about by catalase is the formation of quinone from hydroquinone. He then deals with the physiological importance of catalase. Its function must be to destroy hydrogen peroxide, but the formation of this body in the respiratory processes of living cells has not yet been proved; any explanation must account for the universal distribution of the enzyme. The recent researches of Bamberger and of Engler on the rendering active of oxygen in processes of autoxidation, make it very probable that hydrogen peroxide may be produced during respiration, and, since this body is a powerful protoplasmic poison, the presence of catalase would protect the tissues from destruction. The utility of catalase in the case of anaërobes like yeast, is still less clear, but it may have the effect of facilitating the breaking up of the sugar.—J. F. B.

Raisin Wines; Composition and Examination of ——. Aug. Schneegans. Archiv. der Pharm. **239**, 91—95.

The author has examined a number of raisin wines, made from different fruits, such as currants and sultana raisins. The wines were clear, and varied in tint from light yellow to pink. They had a pleasant taste but no bouquet. This is due to the previous drying of the fruit, which upon fermentation will not then yield the higher alcohols and acids which produce the bouquet by esterification. These wines are of much more value from a medicinal point of view than has hitherto been supposed, and, according to the author, should be recommended in preference to the heavier wines. In the following table, numbers 1 to 5, are wines from different varieties of currants, and 6 and 7 are from mixed currants and sultana raisins, while 8 is from sultana raisins alone.

100 *c.c. of Wine at* 15° *C. contain, in Grms.*

Alcohol.		Extractive.	Inorganic Matter.	Free Acids.	Volatile Acids.	Non-Volatile Acids.	Free Tartaric Acid.	Tartaric Acid.	Glycerin.	Phosphoric Acid.	Sulphuric Acid.	Prepared from
By Weight. Per Cent.	By Volume. Per Cent.											
5·89	7·42	2·21	0·247	0·64	0·12	0·49	..	0·42	0·70	0·019	0·020	Currants.
6·73	8·48	2·35	0·216	0·78	0·09	0·67	..	0·49	0·73	0·021	0·021	,,
7·60	9·57	2·52	0·272	0·71	0·12	0·56	..	0·39	0·74	0·023	0·027	,,
8·84	11·14	2·98	0·242	0·64	0·10	0·51	..	0·17	0·78	0·027	0·024	,,
11·42	14·39	3·18	0·234	0·71	0·14	0·53	0·03	0·22	0·86	0·014	0·022	,,
6·59	8·31	1·91	0·218	0·52	0·11	0·38	..	0·22	0·50	0·023	0·013	Currants and sultanas.
6·79	8·56	2·30	0·274	0·63	0·15	0·44	0·01	0·22	0·65	0·036	0·017	Currants and sultanas.
6·59	8·31	2·55	0·304	0·58	0·12	0·43	..	0·07	0·57	0·033	0·019	Sultanas.

2 contained: Chlorine, 0·005; lime, 0·014; and 0·002 per cent.

proportion of alcohol to glycerin varied between 53 and 100:11·88, and averaged 100:9·33. The ion of the extract to ash varied between 100:7·35 0:12·92, and averaged 100:10·21. Free tartaric found in small quantities in two of the wines.

—J. O. B.

Sparkling Wines; Secondary Fermentation of ——. E. Manceau. Comptes Rend. **132**, [16], 1003—1006.

The sparkling wines of Champagne are made by bottling a mixture of old and new wines from the vats, containing so much sugar as will yield, by fermentation in the bottles, carbon dioxide in amount producing a pressure of 4 or 5 atmospheres at 0° C. For this purpose, different wines need different amounts of sugar, and the explanation of this, hitherto received, rests on the supposition that different wines dissolve very different amounts of carbon dioxide. The author's experiments, still in progress, have shown that this is not the case, but that many factors determine the result. 1. The amount of yeast at the time of bottling has but little influence, but its nature and origin influence the extent of the fermentation very considerably. 2. The fermentation as a rule goes farther at 20° than at 10° C. 3. The residue of unfermented sugar is greater in a more alcoholic wine; while in wines containing about 6 grms. of glycerin per litre, the addition of more glycerin diminishes the residual sugar.

The nature and amount of the gases dissolved in the wine at the time of bottling, and the proportions of phosphoric acid, nitrogenous substances, and other constituents, all appear to influence the resulting fermentation. The author's further experiments will be directed towards elucidating their separate effects.—J. T. D.

Yeast; Nutrition of ——. Part III. A. L. Stern. Proc. Chem. Soc. 1901, **17**, [238], 126.

The author has determined the effect of varying the concentration of the sugar, the temperature of fermentation, the amount of seed-yeast, and the time, on the nutrition of yeast.

The experiments were made in exactly the same manner as those previously described (Trans. 1899, **75**, 202); this Journal, 1899, 933; the sugar used was dextrose, the nitrogenous nutriment, asparagine; and the inorganic nutriment, potassium phosphate, magnesium sulphate and calcium sulphate; and the yeast a pure culture from a Burton pitching yeast.

The conclusions drawn are:—

(1.) Any increase of nitrogenous or inorganic nutriment beyond a definite limit will not increase either the amount of nitrogen assimilated by the yeast, or the weight of the yeast. This limit is but little greater than the largest amount which the yeast is able to assimilate under the conditions of the experiment.

(2.) Any increase of the sugar is accompanied by an increase of the weight of nitrogen assimilated and of the weight of the yeast. This increase goes on up to the strongest concentrations which can be completely fermented. The rate of increase is greatest at the lowest concentrations, and falls off gradually as the concentration rises.

(3.) Temperatures between 12° and 25° C. have but little influence on the weight of nitrogen assimilated and the weight of the yeast crop. At higher temperatures reproduction is weakened.

(4.) The weight of the nitrogen assimilated and of the yeast crop is composed of two quantities: the weight of the seeding *plus* a quantity dependent on the composition of the solution.

(5.) The growth of the yeast is, during a portion of the fermentation, proportional to the amount of sugar fermented, and proceeds as long as any sugar remains unfermented.

From a consideration of these deductions, and of the work of others, the author concludes that there is an essential difference between the functions of the inorganic and nitrogenous nutriment on the one hand, and of the sugar on the other; that the former supply only material to the yeast, whilst the latter supplies both material and energy. Whether fermentation is caused by an enzyme or not, the author does not yet consider definitely determined; whilst there is certain amount of evidence to support this supposition, there is none to negative it.

PATENTS.

Yeast and Alcohol from Molasses or Sugar Juices without Addition of Cereals and without Lactic Acidity; Process for Obtaining German ——. F. R. Bramsch. Teplitz, Bohemia. Eng. Pat. 8306, May 4, 1900.

Material rich in nitrogen, such as linseed meal, is first heated with an acid (*e.g.*, hydrochloric acid) for about three hours, and then subjected to a suitable pressure, and boiled at that for about two hours longer. The liquid is drawn off, neutralised, and filtered, and the filtrate is decolorised by treatment with bone black. The preliminary open boiling causes complete softening and better extr tion of the nitrogenous matter. The decolorised extra with about 20 per cent. dissolved solids, is added to t purified molasses or saccharine juices before fermentatio

—J. F. B

Fermenting; Apparatus for ——; Collecting the C given off during the Process of Fermentation and aft wards Using the Same to Re-Carbonate Ales, Sug Beer and other Beverages. J. House, Cardiff, E. W. Lancaster, London. Eng. Pat. 8125, May 2, 19

The inventors claim "a closed fermenting vat, divided i two chambers by means of a horizontal partition, the up and lower chambers communicating with each other means of a vertical yeast pipe and a vertical wort pipe, vat being also fitted with a suitable attemperator coil an hop extractor, consisting of a close coil of D-shaped pi or of two concentric cones having a spiral water between them, an opening at the bottom of the vat to ad sterilised air, and outlets for the air, yeast, and gas gi off during fermentation." A cooler or refrigerato claimed, consisting of a vertical cylinder having a stac tubes therein, through which the liquid to be cooled passes cooling agent circulating outside the tubes. A carbon and filters for fermented liquids are also specified.

—J. F.

Fermented Beverages and the like; Process for alcoholising ——, and Apparatus therefor. A. Mi Stuttgart, Germany. Eng. Pat. 22,592, Dec. 11, 190

A de-alcoholised beverage, charged with carbon dio is made from beer or other fermented liquor, wit deterioration of taste or colour, by conveying the bev into a vacuum pan, and, after the air has been expelle a neutral gas, such as carbon dioxide, boiling it at a low perature, the gas being conducted through it until it is from alcohol, after which the de-alcoholised extracted tion is charged with carbon dioxide gas, air being exclu

—J. F.

Crude Spirit; Purification of ——. W. P. Thom London. From J. H. Lavollay and G. Bourgoin, Eng. Pat. 9210, May 18, 1900.

The process claimed consists in treating the crude s with an insoluble manganate of an alkaline earth. calcium manganate, in the presence of an electric cu The impurities are oxidised by the manganate unde influence of the current, whilst the aldehydes are re to alcohol by the electrolytic hydrogen. The proc carried out in any ordinary electrolyser without partitions; the electrodes may be of zinc, and the is passed for 10—20 minutes with constant agitation.

—J. F

XVIII.—FOODS; SANITATION; WATE PURIFICATION, & DISINFECTANTS

(*A.*)—FOODS.

Honey; Artificially Coloured ——. A. Bömer. Untersuch. Nahr. Genussm. 1901, **4**, [8]. 364—3

Attention is drawn, in this paper, to the fact that and, more especially, adulterated honey, is son artificially dyed. The added colouring matter n detected by the usual tests, and by dyeing wool fibr the aqueous extract of the honey.—W. P. S.

PATENTS.

Flour of Cereals, Pulse, and their Derivatives; Desi and Sterilisation of ——. E. C. A. Fleurent, Eng. Pat. 11,502, June 25, 1900.

The process claimed consists in first partially or desiccating the flour by evaporation under reduced at a temperature of about 45° C. The dry flour sterilised by heating to 80°—120° C. The object desiccation is to prevent the coagulation of the glu the discoloration of the flour during sterilisation.

—W. S

k; Process for Rendering Digestible Cow's and *oat's Milk.* O. Imray, London. From Farbwerke ormals Meister, Lucius und Brüning, Hoechst a/Main, ermany. Eng. Pat. 12,231, July 6, 1900.

casein in the milk is first coagulated by the addition nnet, and then broken up into fine flakes by shaking, ing, or otherwise mechanically agitating, the object being revent the formation of large clots of casein.—W. P. S.

asses Fodder; Apparatus for Making ——. R. chrader, Hamburg. Eng. Pat. 3590, Feb. 19, 1901.

is apparatus, which is depicted in Fig. 1, the feeding e molasses and the solid materials into the mixing er is effected by means of rotating drums *f* and *g* 1), fitted with chambers separated by wedge-shaped ons. The drums are arranged above the mixing er, and are enclosed in casings attached to the storage vessels *a* and *c* in such a way that the latter are kept separated from the feed vessels until the contents of the previous chamber of the rotating drum have been discharged. The proportions between the molasses and the absorbent substances may be varied by the insertion of boxes *n* and *o* (Fig. 2), of a suitable and size, into the chambers of either of the feed The molasses pan is provided with a coil *b* for the molasses if necessary. The general arrange- the apparatus will be seen from the figures.

—T. H. P.

Fig. 1.

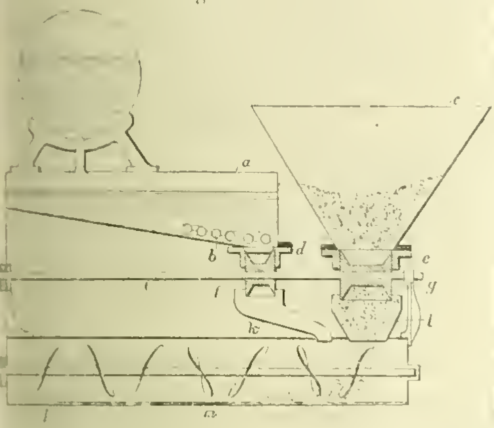
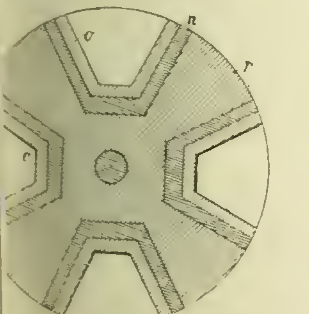


Fig. 2.



's Milk; A Substitute for ——. J. Meyenberg, Washington, U.S.A. Eng. Pat. 3750, Feb. 21,

cess described in this specification is as follows:— ilk is aërated to remove disagreeable flavours, and through clean gravel. From one half of this and filtered milk the cream is removed, and from -milk the casein is removed. The whey and cream ained are added to the other half of the original gether with the requisite amount of sugar. The is then heated to boiling point in a closed vessel, ed under reduced pressure to the required con- and canned.—W. P. S.

Preserving Organic Bodies and Substances; Method and Apparatus for ——. A. Mészáros, Székesfejérvár, Hungary. Eng. Pat. 6371, March 26, 1901.

The materials, such as meat, fruit, eggs, vegetables, corpses, &c., to be preserved are submitted, in closed receptacles, to the influence of the dry products of distillation of garlic or onions, which are previously passed through salt water and alcohol. The apparatus for carrying out the process is also claimed.—W. P. S.

(*B.*)—SANITATION; WATER PURIFICATION.

Drinking Water; Sterilisation of ——. A. Bergé. Mém. de la Soc. des Ing. Civ. de France, 1900, 601. Proc. Inst. Civil Eng. **143**, [1], 37—38.

The author recommends the use of perchloric acid for the sterilisation of drinking water. A concentrated solution of perchloric acid is prepared by acting on potassium perchlorate with sulphuric acid (58° B.), and passing the gas evolved into water, by means of a current of air at constant pressure. One mgrm. of perchloric acid is sufficient to sterilise 1 litre of water, and the operation can be performed on any scale with equal facility. The French Board of Public Health has adopted the conclusions of various scientific authorities in support of the efficiency and innocuous character of the method. The process is being used, at the present time, at Lectoure (Gers, France) and at Ostend, whilst at Brussels, sewage water containing 1,000,000 bacteria per c.c. (16,000,000 per cub. in.) has been wholly cleared of germs by treatment with perchloric acid. The cost of the reagent should not exceed 0·26 centime per cub. metre (10*s.* per 1,000,000 galls.) of the water to be sterilised, even with bad water, whilst the charges for maintenance and redemption of plant would be extremely low.—A. S.

Waters; Determination of Nitrates in ——, *by Stannous Chloride.* H. Henriot.

See under XXIII., *page* 619.

PATENTS.

Filtering Media. C. Sharples, Stockport, Cheshire. Eng. Pat. 7383, April 21, 1900.

Fibrous material, made up in the form of brushes, is used for the filtration of sewage effluent.—L. A.

Sewage and Sewage Effluents; Method of Treating —— R. H. Reeves, London. Eng. Pat. 9819, May 29, 1900.

The sewage, before entering the precipitation tank, is mixed only with the chemicals required for deodorisation, the precipitant is sprayed on to the surface of the sewage in the tank, the effluent is then drawn off by a pump or other device and forced through a jet or nozzle, which converts it into fine spray or mist, and in this condition it falls on to a filter bed, or into a plain tank, according to the degree of purity required.—L. A.

Greasy Water; Purification of ——. E. G. Weddell, Tipton Green, Staffordshire. Eng. Pat. 7240, April 19, 1900.

The greasy water first passes into a tank or chamber in which it is mixed with lime-water, and filtered to separate the precipitated calcium soaps. It then passes through a series of chambers, in which the excess of lime is removed, either by injecting fuel gas and filtering, or by mixing with hard water containing bicarbonates and filtering.—L. A.

Water; Apparatus for Softening and Purifying ——. W. Pemberton, Newcastle-on-Tyne. Eng. Pat. 7397, April 21, 1900.

The apparatus comprises one or more tanks supplied with a suitable reagent, such as lime, a filtering chamber, preferably arranged under the tanks, and a valve mechanism controlling the supply to the filtering chamber of water from the main pipe mixed with a suitable proportion of water containing the reagent. The tanks are supplied through branches from the main pipe, and the water containing the reagent is delivered from them through controlling cocks. This water and the water direct from the main pipe pass through separate valves into a mixing funnel, from which the mixed liquids pass through a pipe to the bottom of the filtering chamber. The two supply valves are operated automatically by a single lever connected to a float in the filtering chamber. The mixing funnel is provided with a perforated removable plate, which has depending tubular projections surrounding the perforations, for the purpose of better mixing the liquids.—R. A.

Water: Apparatus for Purifying and Softening ——. E. Froitzheim and M. M. Schumacher, both of Cologne, Germany. Eng. Pat. 1830, Jan. 26, 1901.

The water to be treated is fed into a pivoted two-chambered bucket, which as one chamber becomes filled, tilts and empties that chamber and brings the other chamber into position to be filled. The movement of the bucket acts automatically, through a pawl and ratchet mechanism, on a bucket conveyor, which raises proportionate quantities of a chemical solution (such as soda) from a reservoir and discharges it into the settling and filtering tank. The water, before entering this tank, may be heated by exhaust steam, &c. The tank is divided by a forked partition into three compartments, forming respectively the mixing, settling, and filtering chambers. Live steam, preferably mixed with air, may be supplied to the mixing chamber, to facilitate the mixing of the chemical solution with, and its action on, the water. From the mixing chamber the liquid descends to the settling chamber, and from the latter it rises to the filtering chamber, the settling chamber being provided with a cock for drawing off the deposited impurities. In the filtering chamber, a series of detachable filters are employed, each consisting of a perforated cylinder with a removable cover at one end, a perforated pipe, and means for connecting it to a common outlet pipe, the space between the cylinder and the perforated pipe being filled with a filtering material.—R. A.

Water and Aqueous Solutions; Processes of Eliminating Iron from ——. B. Teufer, Leipsic, Germany. Eng. Pat. 6121, March 23, 1901.

Hydrated ferric oxide, preferably freshly precipitated, is agitated with ferruginous water to remove the iron. The liquid may be filtered, or separated from the precipitate by decantation. The process is stated to be also applicable in removing iron from solutions of salts, such as "ferruginous solution of potash."—E. S.

XIX.—PAPER, PASTEBOARD, Etc.

Paper Sizing; Chemistry of ——. P. Friedlaender and H. Seidel. Mitth. tech. Gewerbe-Museums in Wien. 1901, **11**, 65—73.

The object of paper sizing is the diminution of the capillarity of the paper by cementing together the single fibres. After remarking that gelatin sizing is only used now for the best qualities of papers, the authors proceed to deal with the principles of the ordinary rosin sizing, which is almost universally employed. The raw materials are rosin, caustic soda or carbonate, aluminium sulphate, and starch. Rosin is a more or less variable mixture, containing abietic, sylvic, dextro- and lævo-pimaric acids; it becomes semi-fluid under boiling water and melts at about 135 C. The only factor which concerns the paper-maker is the saponification number (mgrms. of KHO required per 1 grm.) This varies with the different samples and is determined by boiling for half-an-hour with semi-normal alcoholic potash. The saponification number being known, it is an easy matter to prepare rosin soaps containing any desired percentage of free rosin. Neutral rosin soaps, fully saponified, dissolve to a clear solution in water, whilst, on the other hand, free rosin cannot be emulsified with pure water; the rosin size or "milk" is therefore a uniform and finely-divided emulsion of free rosin in a solution of neutral rosin soap. The proportion of free rosin employed varies greatly, according to requirements, but less than 25 per cent. of free rosin never employed. The author gives the following exam of the preparation of a rosin size:—300 kilos. of rosin a melted at 150°—160 C., 30 kilos. of caustic soda dissol in 15—20 times the weight of water are then added stirred up. The mixture is allowed to remain for 11 da and a dark liquid which separates at the surface is dra off. The soap is dissolved in 50 times its weight of water with the addition of 33 per cent. of starch. The is added to the beater and a 5 per cent. solution of calci sulphate of alumina is added to acid reaction. There been considerable discussion as to the nature of the prec tate produced. Wurster argues that it consists of a mixt of free rosin and alumina, because it is largely solubl ether. But, on the other hand, it has been shown that resinates of copper, silver, and zinc are also solubl alcohol and ether, and that the precipitate thrown dow alum is more finely divided and melts at a higher temp ture than the free resin precipitated by acid. The aut have made comparative precipitations with alum and and corroborate this latter point; they also show that precipitate is almost completely soluble in ether-alcohol that the filtered solution leaves an ash consisting of alum hence there is no doubt that the cementing precipitate resinate of aluminium.

In the second part of the paper the authors descril detail the standard methods for the analysis of rosin soap sizes, and for the determination of free and combined r The examination of glue sizes and of Mitscher "Gerbleim," which is a mixture of caustic soda, glue, and sulphite wood liquors, is also dealt with.—J. F. B.

Cellulith. G. Springer. Gummi-Zeit. **15**, [20], 32

Brunswig's cellulith is produced by grinding wool p a paper "beater" until an apparently homogeneous free from every trace of wood fibre, is obtained. pulp is then drained of the bulk of its moisture by all it to run into a vat provided with a bottom of m gauze, and is subsequently dried, either in the air rooms at a temperature of 40° C. The product th contracts very greatly, and forms, finally, solid mas the hardness of horn, which are sold under the na cellulith. Its specific gravity is about 1·5, it is n flammable, can be worked with tools like wood or and is very resistant to oils, fats, alcohol, and petr It is used as a substitute for horn, ebonite, buffin polishing wheels.—C. O. W.

"*Celluvert.*" G. Springer. Gummi Zeit. **15**, [20],

Celluvert consists of hydrocellulose charged wit chloride. In 1878 it was first used in America manufacture of waterproof cardboard. It is obtain parchmentising paper by means of zinc chloride and a number of the sheets so treated by pressing. recently it has been displaced in the market by " nised fibre." It used to be sold in hard, but so pliable, slabs, either red or black in colour. It resis action of hot and cold water, also of fats and oils. to be employed in place of leather, india-rubber, metal, horn, and celluloid.—C. O. W.

PATENTS.

Peat Fibre for Use in the Manufacture of Paper o Pulp; Process for the Production of Purifi Bleached ——. Jensen and Son, London. M. Krause, Berlin. Eng. Pat. 6831, April 11, 19

Peat is sludged in a hopper with water that h aërated and rendered alkaline (*e.g.*, by passage ove ot coke and lime) and allowed to stand for two longer, when the following changes are stated t Humic and other acids are neutralised, organ pounds of iron, &c. are rapidly oxidised, and put bacteria promote an alkaline bleach. After drai mass is cut up finely and evenly in a mincer at into paper stock, with or without additional tr Designs for a suitable plant are attached to the spe

—R

lp Fibres from the Waste Waters of Paper Manu-ictories; Apparatus for Separating ——. W. P. 'hompson, London. From E. Füllner, Warmbrunn, ilesia, Germany. Eng. Pat. 7842, April 27, 1900.

s device consists of a collector in the form of a per, having radially-arranged flanges or wings on the side which strengthen the hopper and at the same time, means of an outer ring of closing partitions or walls, le preferably of removable boards, form a number of osition cells round the foot of the hopper, into which fibres deposited from the waste liquor on the floor of hopper are directed at will, according to their quality colour. The waste liquor, with fibre in suspension, is into the hopper from a bell-shaped mouthpiece ate half-way down the hopper, and with a coarse sieve e in its neck; the fibres sink to the floor and pass, by pipes, to the cells, whilst the waste liquor wells up overflows at the mouth of the hopper.—R. L. J.

er; Manufacture of ——. Johnsons and Willcox, ondon. From G. J. Wildridge, Airdrie, N.B. Eng. it. 9517, May 24, 1900.

layers of pulp, one of the composition for blotting r and the other for sized paper, are caused to adhere ich other in the moist condition by pressure only, no or adhesive being used. One side of the composite so obtained is perfectly absorbent, the other may be ed or written upon, and does not fray or break up as iary blotting paper does by the friction of the hand.
—R. L. J.

r temporarily Transparent; Process for and means Rendering Non-transparent or Opaque ——. Chees-ough Royston, Liverpool. From L. H. A. von Giese, edenhofen, Germany. Eng. Pat. 630, Jan. 10, 1901.

nake ordinary paper transparent for a time, so that igs, &c., may be made in any desired portion, the is painted with a volatile liquid, such as benzene, methylated spirit, chloroform, or a solution of hor (3 parts) in benzene (7 parts), all of which orate without injury to the surface.

device suitable for the purpose consists of a small lic drum with a flat tongue like extension. A cotton is rolled up inside and just emerges from the chisel- aperture of the tongue. The drum is filled with the through an air-tight cap at one end, and the saturated end then stroked over the paper where desired. An ived form of the apparatus has a spring slide which over the end of the tongue to prevent evaporation e liquid when not in use. The process and the device aimed.—R. L. J.

us Compositions; Manufacture of ——. H. H. Lake, idon. From The National Package Co., Glen Falls, v York State, U.S.A. Eng. Pat. 4125, Feb. 26, 1901.

omposition is prepared by mixing together in equal a fibrous material such as waste paper, corn stalks, ie, &c., or, if a more or less fireproof substance is ed, asbestos or mica, plaster of Paris, and rosin. The t is submitted to hydraulic pressure at a temperature nt to melt the rosin, whereby a hard and tough al is formed, which can be used for constructing s or kegs that have to be exposed to hot water or Pigments may be incorporated into the composition, y be dusted on to the dies of the press; and the d article can be made at one operation by suitable ement of the hydraulic press.—F. H. L.

uloid-like Substance; Method of Producing ——. . Zühl, Berlin. Eng. Pat. 4326, Feb. 28, 1901.

lic acid and phthalonic acid ($HO_2C.C_6H_4.CO.CO_2H$), eir anhydrides and esters, easily dissolve nitro-cellulose, g a celluloid-like substance. For instance, 100 kilos. o-cellulose are mixed with a solution of 50 kilos. of c acid or anhydride, and treated in the usual manner manufacture of celluloid. The claim suggests that mphor usually employed may also be one of the ients.—T. A. L.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Acids; Action of ——, upon the Carbonates of the Alkaline Earths in the Presence of Alcohol. C. Vallée. Bull. Soc. Chim. 1901, **25**, [8], 393—395.

Pelouze found that acetic acid does not act upon carbonates in the presence of absolute alcohol. The author has now found that (1) acetone and methyl alcohol also prevent the action of acetic acid upon calcium carbonate. (2) The action of sulphuric acid in the presence of alcohol (10 c.c. of normal acid diluted to 100 c.c. with absolute alcohol) on excess of calcium carbonate is very slow, but is complete (in four months). The velocity of reaction increases with decrease in the strength of the alcohol, and the velocity decreases regularly as the reaction proceeds. Barium and strontium carbonates behave similarly. An increase in the quantity of acid, the strength of the alcohol remaining the same, accelerates the reaction. (3) Acetic acid (10 c.c. of normal acid diluted with absolute alcohol to 100 c.c.) does act upon calcium carbonate; the reaction is extremely slow (half complete in 3½ months). The velocity decreases regularly as the reaction proceeds, and increases with decrease in the alcoholic strength. (4) Nitric acid, similarly diluted with alcohol, in the presence of strontium nitrate, is at once neutralised by strontium carbonate. With barium nitrate and carbonate several hours are required.—A. C. W.

Basic Bismuth Salicylate. C. Martinotti and L. Cornelio. Boll. Chim. Farm. **40**, 141—148; Chem. Centr. 1901, **1**, [17], 966.

Commercial preparations of bismuth salicylate differ considerably in composition, the proportion of salicylic acid varying between 5 and 67 per cent. and that of bismuth oxide between 37 and 79 per cent., and it has, consequently, not been deemed possible to attribute a definite chemical composition to these preparations. From the results of an investigation as to the constitution of normal and basic salicylates, and the behaviour of bismuth salicylates towards water, acids, &c., the authors conclude that commercial bismuth salicylates contain, mostly, only bismuth salicylate of the formula—

$$C_6H_4(OH)(COOBiO) \text{ or } C_6H_4(OH)[COOBi(OH)_2].$$

For the preparation of bismuth salicylate, the authors use a method based on the following reaction:—

$$3C_6H_4(OH)(COONa) + 2Bi(NO_3)_3.5H_2O =$$
$$2C_6H_4(OH)(COOBiO) + 3NaNO_3 + 3HNO_3 +$$
$$8H_2O + C_6H_4(OH)(COOH).$$

A solution of 1 kilo. of sodium salicylate in 10 kilos. of water at 50° C., is treated with 2 kilos. of normal bismuth nitrate moistened with about one-tenth of its weight of water, the mixture well shaken, diluted with about 25 litres of water at 50° C., agitated for 10 minutes, filtered, and the precipitate washed with 50—60 litres of water at 50° C., centrifugalised, and dried at 60° C. Bismuth salicylate prepared in this manner forms a light, amorphous, white, faintly acid powder, which, when freed from nitric acid, other salts, and as far as possible from free salicylic acid, should yield, on analysis, at least 60 per cent. of Bi_2O_3. Like other basic bismuth salts, the salicylate readily undergoes alteration by washing with water.—A. S.

Bismuth; Basic Nitrates of ——. F. B. Allan. Amer. Chem. J. **25**, [4], 307—315.

When poured into water at ordinary temperature, nitric acid solutions of bismuth furnish only $BiONO_3 + H_2O$, if the precipitate be quickly filtered off, the concentration of the acid being high at the point of contact, whilst the reaction on subsequent contact with the weaker acid is too slow to effect any change in a short time. At 21° C. the salt $Bi_{12}O_{13}(NO_3)_{10} + 9H_2O$ is in equilibrium with nitric acid solutions from 0·03 to 0·32 normal, and the salt $BiONO_3$ with solutions from 0·425 to 0·72 normal. At 50° C. the salt $Bi_4O_5(NO_3)_2 + H_2O$ is in equilibrium with the acid solutions from 0.057 to 0·285 normal, and the salt $Bi_{12}O_{13}(NO_3)_{10} + 9H_2O$ with solutions from 0·285 to 0·466 normal. At 75° C. the salt $Bi_4O_5(NO_3)_2 + H_2O$ is in equilibrium with the acid solutions from 0·109 to 0·314 normal. No basic nitrate between $Bi_4O_5(NO_3)_2 + H_2O$ and $Bi_{12}O_{13}(NO_3)_{10} + 9H_2O$ exists at 50°.

The many basic nitrates that have been described are accounted for by the slowness of the reaction, or a concentration of the mother liquor at which a monovariant system was possible. It is also found that some time elapses before the commencement of a reaction between the higher basic nitrates and water containing nitric acid.—C. S.

Mercury Salicylate ; Determination of Mercury in ——.

F. Rupp. Archiv der Pharm. **239**, 111—118.

MERCURY salicylate is one of the recent additions included in the new *Pharmacopœia Germonica* (Editio IV.). The author criticises the method given for determining the mercury, and points out that varying results are obtained according to the length of time and temperature at which the H_2S is passed in. He advises instead a method which he claims to give consistent results and to be at the same time very simple. 0·3 grm. of the salicylate is rubbed down with a little water and 25 c.c. of N/10 iodine solution is run in. After standing for an hour in a well-stoppered flask, the excess of iodine is determined by titration with thiosulphate. Several determinations required 16·5—16·8 c.c. of N/10 iodine; practically no variation being noticed whether the action was allowed to continue for one hour or fifteen. Theoretically 0·3 grm. of the salicylate should require 17·85 c.c. of N/10 iodine solution; the low results obtained are due to the fact that mercuric salicylate reacts with haloid salts to form a double compound, but as the error due to this is a constant, the results are quite reliable.

—J. O B.

Methyl Alcohol ; Pure ——. — Rotten. Rev. Prod. Chim. **3**, [23], 357.

METHYL alcohol may be entirely freed from acetone by exposing the nearly boiling liquid to the action of a current of chlorine gas, which is inert towards the alcohol but converts acetone into mono- or di-chloro compounds, which are afterwards separated by fractional distillation, the alcohol being finally freed from chlorine by the aid of lime.—C. S.

Formaldehyde. C. Harries. Ber. 1901, **34**, [4], 635—637.

KEKULÉ found (Ber. **25**, 2435) that when the vapour evolved on heating solid paraformaldehyde was condensed by means of solid carbon dioxide and ether, a liquid monomolecular formaldehyde was obtained. The same substance is produced in almost quantitative yield if liquid air be used as the refrigerant. The paraformaldehyde is heated in a hard-glass test tube (a combustion tube in a furnace for larger quantities), from which the vapours are conducted by means of a wide tube into a U-tube, blown out at the bend, the lower half of which is placed in a dish containing about 300 grms. of liquid air. The paraformaldedyde is heated from the front backwards; the vapours condense to a white crystalline mass, which melts, on warming, to a turbid liquid. The turbidity is easily removed by filtering through a small folded filter. In attempts to dry the formaldehyde vapours by means of calcium chloride, the gas was partly absorbed and partly polymerised. In the receiver a little liquid collected, which soon polymerised; the vapours of the polymer detonated when it was heated in a test tube. The same explosive property was observed in a preparation of paraformaldehyde obtained from Kahlbaum several years previously; obviously it could not be used in the preparation of the liquid formaldehyde. Phosphorus pentoxide acts on the gas, causing the formation of carbon, perhaps according to the equation, $CH_2O + P_2O_5 = C + 2HPO_3$. The melting point of the solid mono-molecular formaldehyde was determined, by means of a toluene thermometer, to be about 92° C. The mono-molecular aldehyde in ethereal solution unites with aceto-acetic ester at —50° C., forming an oily compound, without separation of water. This substance cannot be distilled undecomposed; it is violently decomposed by caustic soda; on heating, it yields formaldehyde, water and high-boiling compounds.—A. C. W.

Heptane from Coniferous Trees. W. C. Blasdale. Amer. Chem. Soc. 1901, **23**, [3], 162—164.

T. E. THORPE (J. Chem. Soc. **35**, 297) found an insec
cide sold as "Abietine" to consist of nearly pure norm
heptane. This substance had previously been stated
Wenzell (Amer. J. Pharm. 4th Ser. **2**, 97) to be obtain
by distilling an exudation of *Pinus Sabiniana.* The
facts have led the author to examine the exudations fr
different species of conifers.

1. *Pinus Jeffreyi.*—The fresh material from recently
trees was a clear white fluid, which rapidly became thi
on standing, and lost its pleasant orange-like odour.
distillation it yielded about 3 per cent. of a mobile colo
less liquid, which on purification distilled mainly betw
96° and 98° C.

2. and 3. *Pinus Sabiniana.*—The exudations clos
resembled that of *P. Jeffreyi* but were more viscous. T
yielded about 16 per cent. of a mobile distillate.

4. *P. Murryana.*—The material was a light yellow se
solid substance with an odour of turpentine. On distillat
it yielded a liquid with a terpene odour, most of wh
boiled at 153°—160° C., though part boiled as high
180° C. The fraction boiling at 158°—160° C. was emplo
for a series of determinations.

5. *Abies concolor var. Lowiana.*—This exudation clos
resembled Canada balsam. It yielded 20 per cent. o
terpene-like liquid distilling, in the main, between 155
160° C.

6. *Pseudotsuga taxifolia.* — The hardened exuda
yielded about 9 per cent. of a terpene-like liquid, most
which distilled between 157° and 160° C., and the remai
between 160° and 165° C.

From the characteristics of these different distillates,
author concludes that *P. Jeffreyi* and *P. Sabiniana* y
normal heptane, whilst the other species mentioned y
terpenes resembling those obtained from other conife
trees.—C. A. M.

Methylheptenone ; New Synthesis of ——. W. Ipati Ber. 1901, **34**, [4], 594—596.

THE constitution of methylheptenone—

$$(CH_3)_2:C:CH.CH_2.CH_2.CO.CH_3,$$

has been ascertained by Barbier and Bouveault an
Tiemann and Semmler (Ber. **28**, 2128). Barbier
Bouveault obtained an unsaturated ketone by the acti
sodium acetylacetone on dimethyltrimethylene bro
$(CH_3)_2.CBr.CH_2.CH_2Br$, from which caustic soda sepa
methylheptenone in small quantity (Comptes Rend. 2
1243). The author has studied the action of sodium a
acetic ester upon the dibromides $C_nH_{2n}Br_2$; acids
closed chains are formed only when the bromine ato
united to primary carbon atoms or to a primary a
secondary. By the action of sodium aceto-acetic
upon the above dimethyl-trimethylene bromide, dim
allylaceto-acetic ester is formed; it boils at 120—1
under 11—12 mm. pressure. A second unexamined pr
boiled at 145°—150° C. When heated with baryta or
alcoholic potash, this ester produces a ketone identical
respects with natural methylheptenone.—A. C. W.

Camphor ; New Method of Manufacturing ——. Ampère Electrochemical Co. Rev. Prod. Chim. **4**, [3

THE process is based on the reaction of oil of turpent
oxalic acid, or some other body capable of yieldi
COOH, so as to form esters, which are then oxidi
camphor.

For this purpose five parts by weight of oil of turp
free from water, are heated to a temperature below the
point, *e g.*, 120°—130° C., along with one part of anh
oxalic acid. The reaction produces a mixture of b
its oxalic and formic esters, camphor, and polymer
products, in which the borneol esters are decompo
the action of caustic alkali (lime), leaving a mixt
borneol, camphor, and impurities. The latter ar
eliminated by distillation, and the borneol is oxidi
camphor by a mixture of potassium bichromat
sulphuric acid.—C. S.

traptene or Lemon Camphor. E. Theulier. Bull. Soc. Chim. 1901, 25, [8], 465—468.

UANTITY of 2,500 grms. of lemon oil, when concentrated *acuo* until the terpenes were completely removed, gave grms. of a very deep yellow substance, which, on ing, formed a semi-fluid mass containing crystals. The talline portion was separated by filtering; it then formed axy mass. The portion insoluble in hot alcohol was posed of salts of potassium and iron, probably citrates. alcoholic solution of the citraptene contained two subces, melting at about 76° and 145° C., the former is ent only in traces, and always separates from alcoholic ion in the amorphous form, the latter crystallises in l prismatic needles.—A. C. W.

dragora Root; Bases of ——. H. Thoms and M. Wentzel. Ber. 1901, 34, [6], 1023—1026.

SCAMINE has previously been found amongst the contained in the mandragora root (this Journal, 1898,). The aurichloride of another alkaloid melted at C. This base was now isolated in the following er:—The roots were exhausted with alcohol cong tartaric acid and water, the extract concentrated *in* , and extracted with petroleum spirit and ether. s then exactly neutralised with hydrochloric acid, n bicarbonate added, and the solution extracted ether. After two repetitions of this process, a base btained, the hydrobromide of which was identical with alt of Schmidt's scopolamine in composition and l rotation. A third base, belonging to the piperidine is also present.—A. C. W.

oids; Micro-chemical Investigation of ——. E. zzi-Escot. Comptes Rend. 132, [15], 920—921.

author has examined the crystalline structure, chemically, of the picrates of strychnine, cocaine, e, atropine, morphine, codeine, and quinine. Of strychnine is the only one, the picrate of which is in st characteristic.—J. T. D.

na Alkaloids; Perbromides of ——. A. Christen. J. prakt. Chem. 1901, 63, [6, 7, 8], 313—351.

E, cinchonine, and cinchonidine, when dissolved in romic and acetic acids, and treated with bromine, e crystalline perbromides of the formula, $AlkBr_2.Br_2$. The bases contained in the perbromides are -addition compounds of the alkaloids; they have the ition, $C_{20}H_{24}Br_2N_2O_2$ (quinine), and $C_{19}H_{22}Br_2N_2O$ nine and cinchonidine).

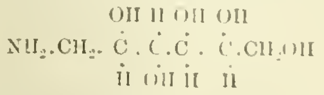
ibromo-derivative of cinchonidine is unknown; it's base (Annalen, 172, 103) is a perbromide of nula, $C_{19}H_{22}Br_2N_2O.Br_2$.

salts of the bases contained in the perbromides are from 1 mol. of base and 2 equivalents of acid. One the acid is more loosely combined than the other, so olution of the salt in 50 per cent. alcohol liberates rom a solution of potassium iodide and iodate.—

—A. C. W.

ne; New Base derived from Glucose. L. Mae and E. Roux. Comptes Rend. 132, [16], 980—

cing glucosoxime by sodium amalgam, the base e, $CH_2OH.(CHOH)_4.CH_2NH_2$, is obtained. After and recrystallising the oxalate and decomposing it , the base forms a confusedly crystalline mass, at 127°—128° C., very soluble in water, slightly in lævo-rotatory, not reducing Fehling's solution. Its at once sugary and caustic, it absorbs carbon and exhibits all the characters of a powerful base. *xalate* crystallises readily from alcohol in hexagons, 180 C., at a somewhat higher temperature gives off d forms a slightly yellow mass, of the composition $(C\,H_{14}O_5)_2$. Other salts have not yet been isolated ll-defined condition. The free base precipitates salts like ammonia; it redissolves in excess the tes formed with ferric, cupric, and mercuric salts. iodoform with tincture of iodine. Its action on nitrous acid is yet obscure; but it behaves towards ethyl oxalate, benzaldehyde, acetylacetone, and potassium cyanate, as a primary amine. Its constitution is, according to the author's notation, amino- 1 hexanepentol $\frac{2.4.5}{3}6$.



$$\begin{array}{lccccl} & OH & H & OH & OH & \\ NH_2.CH_2. & \dot{C} & .\dot{C} & .\dot{C} & .\dot{C} & .CH_2OH \\ & H & OH & H & H & \end{array}$$

It is perhaps identical with the compound found by Fischer among the products of reduction of glucosehydrazone.—J. T. D.

Theobromine; Properties of ——. Th. Paul. Archiv der Pharm. 239, 81—90.

THEOBROMINE crystallised from aqueous solutions may be dried without loss at a temperature of 50 C. The base is not hygroscopic. The solubility in water at 18° C. is 1 : 3232. It is slightly more soluble in dilute hydrochloric acid, but not so much so as is required by theory for an undissociated hydrochloride. It is more soluble in caustic soda solution, showing that its characters are more of an acid than of a basic nature. Theobromine possesses much weaker basic properties than betaine, but on the other hand its acid characters are more marked.—J. O. B.

Anæsthetic [Ethyl-o-Anisidine Formate]; New ——. C. Goldschmidt. Chem. Zeit. 1901, 25, [31], 329.

THE author had previously announced the anæsthetic properties of methenyl-*o*-anisidine, obtained by the action of orthoformic ester on *o*-anisidine (Chem. Zeit. 1898, 22, 1033). Methenyl-*o*-anisidine appears, however, to change into ethyl-*o*-anisidine formate, which is a strong local anæsthetic; it was obtained by Claisen's method (Annalen, 287, 360). By long boiling of *o*-anisidine with orthoformic ester, ethyl-*o*-anisidine formate is obtained; the methenyl-*o*-anisidine, when once isolated, is stable, and distils unchanged at 253° C. The guaiacol sulphonic acid salt of methenyl-*o*-anisidine is obtained by dissolving its constituents in alcohol and precipitating by ether; it is very soluble in water and has anæsthetic action.—A. C. W.

Jamaica Dogwood; Constituents of ——. F. C. Freer and A. M. Clover. Amer. Chem. J. 1901, 25, [5], 390—413.

THE active principle of the bark of the root of Jamaica dogwood (*Piscidia erythrina*) has been stated by Hart (Amer. Chem. J. 5, 9) to be a resinoid called *piscidine*, crystallising from alcohol in colourless prisms, melting at 192° C. This so-called piscidine really consists of a mixture of two distinct compounds, melting at 216° C. and 201° C. respectively, and it is stated that a pharmacological investigation by Cushny has shown that there is no foundation for the assumption that this mixture constitutes the active principle of the bark.

The authors have made a detailed investigation as to the constituents of Jamaica dogwood, and, by means of a series of extracts of the powdered bark of the root, have isolated the following substances:—*Piscidic acid*, $C_{11}H_{12}O_7$, m. pt. 185° C.; a compound, $C_{23}H_{20}O_7$, m. pt. 201° C.; a compound $C_{22}H_{18}O_6$, m. pt. 216° C.; a substance melting at 50°—80° C.; a compound, $C_{25}H_{22}O_7$ (?), m. pt. 159° C.; and a compound, $C_{20}H_{22}O_7$, m. pt. 150°—155 C.

Piscidic acid, obtained from the aqueous extract, was isolated by means of its lead salt, and was purified by repeated crystallisation from methylpropylketone. It is a dibasic acid, $C_9H_8O(OH)_2(CO_2H)_2$, extremely soluble in water, slightly so in ether, and insoluble in chloroform, benzene, and petroleum spirit (ligroin). It resembles, in its properties, mucic and saccharic acid, is decomposed on heating, giving an odour of caramel; and is instantly oxidised by permanganate of potash, forming potassium carbonate, oxalate, and, apparently, formate. The ethyl ester, $C_9H_{10}O_3.CO_2H:CO_2C_2H_5$, m. pt. 207° C.; anilide, $C_9H_{10}O_3(CO.NH.C_6H_5)_2$, m. pt. 196° C.; acetyl derivative of ethyl ester, $C_9H_8O(C_2H_3O_2)_2.CO_2H.CO_2C_2H_5$, m. pt. 149° C.; and bromine derivative, $C_{11}H_{12}O_2Br_2$ (?), m. pt. 234° C., were prepared.

The compound, $C_{23}H_{20}O_7$, crystallises from alcohol in highly refractive rectangular prisms, is very soluble in chloroform, moderately soluble in benzene and acetic acid, sparingly soluble in alcohol, and insoluble in ether, petroleum spirit (ligroin), and alkalis. It contains two methoxy groups, and by the action of methyl alcoholic potash, yields two compounds, one, $C_{22}H_{20}O_8$, melting at 159 C., and the other, $C_{22}H_{20}O_7$, melting at 136° C.

The compound, $C_{22}H_{18}O_6$, crystallises from alcohol in fine yellow needles soluble in benzene and chloroform, sparingly soluble in ether and alcohol, and insoluble in ligroin, water, and alkalis. It contains two methoxy groups.

The substance melting at 50°—80° C., could not be obtained in a pure state, and the quantity was too small to admit of analysis. It is probably a glucoside; when heated with slightly acidified alcohol, it deposits crystals of the compound $C_{22}H_{18}O_6$, melting at 216° C., whilst the mother liquor readily reduces Febling's solation.

The compound ($C_{25}H_{22}O_7$?), melting at 159° C., could not be obtained in a perfectly pare state; it yielded colourless crystals from alcohol, soluble in chloroform and benzene, sparingly soluble in ether and ligroin, and insoluble in aqueous acid or alkaline solution.

The compound, $C_{20}H_{22}O_7$, separated from 70 per cent. alcohol in small, needle-shaped, colourless crystals, melting with decomposition at 150°—155° C., very soluble in ether and methyl alcohol, moderately soluble in acetone, sparingly soluble in ether, chloroform, benzene, and hot water, and insoluble in ligroin. It dissolves in hot alkalis with a red colour. The compound reduces Fehling's solution and ammoniacal silver nitrate, and gives a green coloration with ferric chloride. A diacetyl derivative, $C_{24}H_{26}O_9$, melting at 183° C., was prepared. When heated with slightly acidified alcohol, it yielded a compound, $C_{18}H_{16}O_6$, melting at 275° C.; and by heating with caustic potash and methyl iodide, a compound, $C_{20}H_{20}O_6$ (?), melting at 141° C.—A. S.

Balsam of Peru. Chem. and Druggist, 1901, **58**, [1108], 638—642.

P. Preuss describes the method of cultivating the "balsam-tree" and the preparation of the balsam (see this Journal, 1901, 150). H. Thoms and C. Mannich give the results of the analysis of four samples:—(1) Peru balsam as exported from San Julian; (2) "rag balsam" (balsamo de trapo); (3) "bark balsam" (balsamo de cascara); and (4) balsam made from bark brought from Central America by P. Preuss and extracted with ether (yield, 18·5 per cent.).

——	1.	2.	3.	4.
Specific gravity at 15° C.	1·404	1·408	1·612	..
Cinnamein, per cent.....	64·6	65·8	51·4	37·4
" ester number	260·6	260·6	250·0	..
Resin, per cent.	18·2	17·3	28·7	26·5

—A. S.

Oil of Rue. Thoms. Pharm. Zeit. **46**, 110. Pharm. J. 1901, **66**, [1608], 485.

The author finds that the oil of rue from *Ruta graveolens*, L., is free from terpenes, but contains about 5 per cent. of normal methylheptylketone; its chief constituent is normal methylnonylketone. The author also detected free fatty acids and a phenol, but could not confirm the presence of laurinaldehyde and the compound, $C_{12}H_{14}O$, reported by Williams.—A. S.

Calamus Oil; The Constituents of ——. H. Thoms and R. Beckstroem. Ber. 1901, **34**, [6], 1021—1023.

A fraction of calamus oil boiling between 272° and 340° C. was saponified and fractionated *in vacuo*. From the highest fraction a crystalline substance, $C_{15}H_{26}O_2$, melting at 166°—167·5° C., separated. From the mother liquor of this compound, asarone, $C_{12}H_{16}O_3$, was isolated. The original oil contained free fatty acids and eugenol.

A colourless oil, of very pleasant odour, was obtained by shaking the calamus oil fraction with sodium bisulphite solution, and decomposing the compound with sodium carbonate. On standing, the odour was lost and crystals separat which were found to be asaryl aldehyde; the oxu $C_{10}H_{13}O_4N$, melted at 137° C.—A. C. W.

Saffron; Estimation of Red Sanders Wood in ——. Beythien. Zeits. Untersuch. Nahr. Genussm. 1901, [8], 368—369.

The author finds that a determination of the amount crude fibre in samples of saffron affords a good indicat of the amount of adulteration should the same be mi with sanders wood. The latter contains from 62·12 62·93 per cent. of crude fibre, whilst the quantity saffron varies from 4·54 to 5·47 per cent. "Bastu saffron contains from 11·87 to 12·53 per cent. of cr fibre. A sample of saffron, which contained 20·33 cent. of crude fibre, was, from the above figures, calcul to be adulterated with 26·6 per cent. of sanders w and this conclusion agreed favourably with a microsc examination of the sample.

In estimating the crude fibre in saffron, the latter sho be first boiled with water until freed from colouring ma as boiling with acid precipitates a large quantity of croc which blocks the filter.—W. P. S.

Licari canali (Bois de rose femelle); Essential Oil of - E. Theulier. Bull. Soc. Chim. 1901, **25**, [8], 468—

The essential oil of the *bois de rose femelle* is someti confounded with oil of linaloë (this Journal, 1896, 919) is therefore called oil of linaloë of Guiana. The esse constituent of both oils is linalool; the odour of the form however, much finer than that of oil of linaloë. The de of the essential oil of *bois de rose femelle* is 0·873 14·5° C., and its optical rotation −15° 20′ to −13; corresponding values for Mexican oil of linaloë are 0 and −7° 33′.

The wood, which is also known as *licari cana* imported into France from Guiana in the form of logs, —1·30 m. in length, and varying in diameter from th small branches up to 1 m. or even more. The ru greyish-maroon-coloured bark is devoid of oil. The is of a bright golden-yellow colour, with reddish-y veins. The density of the wood at 15° C. is 0·6789; much less hard than sandal wood. Unhealthy trees duce inferior oil. A tree of medium age produce largest yield of oil, the upper portion of the trunk an large branches producing more than the other por The heart of a log gives a larger yield than the portion.

The ground or chipped wood is distilled with steam residue is used as fuel or packing. The yield of ess oil varies from 1 to 1·6 per cent., the mean being 1·4 per cent. After rectification the oil is colourless; its is soft and agreeable, with a characteristic piquanc is very persistent.

On fractionation the principal portion of the oil di 194°—200° C.; this fraction was identified with *l*-li By fractionating 10 kilos. of oil it was proved to l from methylheptenone and other substances boiling 192° C. Geraniol and other compounds boiling 210° C. are also absent. The quantity of sapo matter was about 0·3 per cent. The oil is thus entirely composed of *l*-linalool. It is soluble in of alcohol of 70°. It is principally employed for per soaps, for which its neutral character is an advantage

—A. C

Anthranilic Acid; Derivatives of ——. H. Mel J. prakt. Chem. 1901, **63**, [6, 7, 8], 241—312.

The author summarises his conclusions as follows:-

Methyl anthranilate (2 mols.) condenses with for acetic aldehyde (1 mol.), without the presence of a form methylene or ethylidene diamine derivatives, th hydrogen of which cannot be replaced by acid The methylene diamine is transformed by acids derivative of diaminodiphenylmethane, whilst the eth diamine is decomposed. Different products are o from methyl anthranilate and aldehydes in acid so acetaldehyde is polymerised to aldol, which then with 2 mols. of the ester.

iazotised methyl anthranilate unites with primary ies to form diazo-amino compounds, which are fairly le and crystallise well. Methyl anthranilate does not with diazo compounds in dilute acetic acid solution.

nthranilic acid readily unites with diazo salts to form able diazo-amino compounds, the stability of which is ased by the presence of negative groups in the tised amine and decreased by alkyl groups.

ter treatment with nitrous acid, anthranilic acid does unite in dilute acetic acid solution with primary amines rm diazo-amino compounds; the condensation, how- takes place in pyridine solution.

Foluene diazochloride and *m*-xylene diazochloride do nite with anthranilic acid, apparently because in one a methyl and in the other a carboxyl group would into the *o*-position with regard to the anticipated -amino group.

zo-aminobenzene-*o*-carboxylic ester, its homologues substitution products, on boiling with dilute alcohol, methyl alcohol and derivatives of phen-*β*-triazone. ing formation is facilitated by the presence of negative s in the nucleus of the amine united to the diazoben- -carboxylic ester, but is hindered by the presence yl groups. The same triazones are obtained by ising *o*-aminobenzanilide and its homologues.

heating with alcoholic alkalis, the triazones are posed with formation of the corresponding diazo- benzene-*o*-carboxylic acids. The latter are also ed by the saponification of their esters. The com- s obtained are identical with those produced by ising the amine, united in the above case with the ised methyl anthranilate, and combining with nilic acid. This is another case of the identity of zo-amino compounds obtained from $XN_2Cl + YNH_2$ $N_2Cl + XNH_2$.

mple apparatus (see page 623) was employed for timation of the diazo-nitrogen in both crude and l diazo-amino compounds.—A. C. W.

ium; Essence of Cannes ——. Jeancard and Satie. Bull. Soc. Chim. 1901, **25**, [9], 516—519.

thors have previously shown (this Journal, 1900, 2, that the determination of physical and chemical ts serves in a measure to distinguish between ferent geranium essences. In the present paper resent in tabular form a series of experiments on mples taken weekly, during the season, showing ekly minimum, medium, and maximum specific rotation, solubility in 70 per cent. alcohol, surface specific viscosity, alcohols, saponification numbers cold, and true ethers. During these experiments dues from the determination of the saponification s and those from the alcohol determinations were d and examined. That which came from the nation of the saponification number in the cold is l" "geranium"; that from the saponification hot is "saponified" "geranium"; that from the ation of alcohol geranium "acetyl"; the charac- of these are tabulated.

ning that neither in saponification hot or cold, or cetylation are there found resins or polymerides, owing conclusions are drawn from the tabulated :—

eutralisation diminishes specific gravity, rotation, ace tension, whilst increasing the solubility.

Acetylation increases specific gravity and surface whilst diminishing specific viscosity and solubility.

aponification increases viscosity and solubility.

sation increases the solubility in 70 per cent. alcohol. xplains why Cannes geranium is a little more han other essences. Cannes geranium contains acid. The authors find that the free acids are in the wood 3 per cent., leaves 54 per cent., and per cent.—C. T. T.

Oils; Surface Tension and Viscosity of —— rd and Satie. Bull. Soc. Chim. 1901, **25**, [9], 23.

's method for determining surface tension of as follows:—A 5 c.c. pipette provided with a capillary orifice, is calibrated to 100 drops of distilled water at 15° C. If this pipette be filled with a liquor of surface tension F, specific gravity D, and gives *n* drops at 15° C., then $\frac{F}{f} = \frac{100}{n}D$, *f* being the surface tension of distilled water at 15° C. If the value *n* is known to be between 110° and 300°, a correction is made—

$$N = n - [0{\cdot}002\ (n - 100) + 0{\cdot}00036\ (n - 100)^2].$$

The authors have determined the surface tensions and viscosities of a number of essential oils, and give the results in a series of tables, in which the oils are grouped, according to the classification of Charabot, Dupont and Pillet, as:—Alcohols and alcoholic esters (*e.g.*, benzyl acetate), Aldehydes (*e.g.*, benzaldehyde, Phenols (*e.g.*, eugenol), Ketones, Hydrocarbons, &c. From their average results they draw the following conclusions.—

Alcohols.—First, essences of which the principal constituent is geraniol, free or combined; average surface tension is higher than that of essences of which the principal constituent is linalool. *Secondly*, specific viscosity of an ester is less than that of the corresponding alcohol. *Thirdly*, for essences, diminution of specific viscosity corresponds generally to increase of saponification number.

Phenols.—First, for essences containing eugenol; decrease of surface tension corresponds to decrease of phenols. *Secondly*, for essences containing thymol and carvacrol; the non-phenolic portions have a surface tension and viscosity less than that of the phenolic portion.

Aldehydes.—First, the surface tension appears to diminish with content of aldehydes. *Secondly*, the viscosity of aldehydes is generally less than that of the corresponding alcohols.—C. T. T.

Myrcenol and its Constitution. P. Barbier. Comptes Rend. **132**, [17], 1048—1050.

The alcohol ($C_{10}H_{18}O$) was prepared from myrcene by Power and Kleber's method. It is a colourless, oily, fragrant liquid, slowly polymerising and becoming viscous. It boils at 99°—101° C. at 10 mm. pressure; density, 0·9012 at 14·5° C.; refractive index for sodium light 1·47787, hence molecular refraction, 48·35. It must therefore contain two double linkings. It gives with acetic anhydride a monacetyl derivative; and it must be, from its mode of formation, a tertiary alcohol. It is certainly different from licareol. On oxidation with chromic acid it yields acetone, an aldehyde $C_{10}H_{16}O$, similar to limonal, but not identical with it, and levulinic acid. No methylheptenone is formed, but some of the original myrcene is regenerated. On oxidation with permanganate, followed by chromic acid, it gave acetone, and a mixture of levulinic and succinic acids. From this evidence the author deduces the formula $C(CH_3)_2 : CH.CH_2.CH_2.C(CH_3)OH.CH : CH_2$, and hence that of myrcene is—

$$C(CH_3)_2 : CH.CH_2.CH : C(CH_3).CH : CH_2.$$

That a tertiary alcohol should form an aldehyde on oxidation is unusual, but the author explains it by supposing that myrcene is first formed by dehydration of the alcohol, and is then directly oxidised.—J. T. D.

Perfumes; New Method of Improving ——. Lavollay and Dourgoin. Rev. Prod. Chim. **3**, [23], 358.

The method consists in treating essential oils, either singly or mixed, with 20 to 25 grms. per hectolitre of calcium manganate or other manganate, in presence of an electric current of suitable intensity, for example, 3 to 10 ampères per square metre of electrode surface, the operation being in no case prolonged beyond 20 minutes. Under these conditions the manganates are said to act more energetically than ozone, the action being also more easily controlled and cheaper.—C. S.

Piperine Colloid, Form of ——*, with Especial Reference to its Optical Refraction and Dispersion.* H. G. Madan. Proc. Chem. Soc. 1901, **17**, [238], 127.

The author has examined the conditions under which crystalloid piperine is converted into the colloidal allotropic form of the substance. He finds that while crystallised piperine when heated to its melting point, 135° C., solidifies on cooling into a transparent resin-like substance, the latter, when thus prepared, is not permanent, but reverts spontaneously in the course of a few months into the crystalloid form. The same change takes place quickly and completely when the substance is heated to 100° C. If, however, piperine is kept for an hour at a temperature of 180°, the resulting product is much more stable, if not absolutely permanent as a colloid. It does not become crystalline when heated to 100° or above, nor has the lapse of 2½ years had any effect in changing it back into the crystalloid condition.

The results of a determination of the refractive indices of colloid piperine for some of the principal spectrum lines were given, from which it appears that, while its refraction is very high ($\mu_D = 1\cdot684$), its dispersion is quite extraordinary, the visual spectrum being nearly four times as long as that given by a prism of dense flint glass having the same refracting angle. The coefficient of dispersion ($\mu_{H\gamma} - \mu_{H\alpha}$) is 0·142, while that of carbon bisulphide is only 0·057.

Bismuth by Electrolysis; Quantitative Determination of ——. K. Wimmenauer.

See under XXIII., *page* 620.

"Saccharin"; New Reaction for ——. A. Leys.

See under XXIII., *page* 622.

Catalase [*Tobacco Fermentation, Curing, &c.*]; *New Enzyme of General Occurrence.* O. Loew.

See under XVII., *page* 598.

Morphine; Determination of ——, *by means of Potassium Iodate and Arsenious Acid in Alkaline Solution.* C. Reichard. Chem. Zeit. 1901, **25**, 31, 328.

See under XXIII., *page* 624.

Alkaloids; Methods of Exhausting Drugs for Determination of ——. O. Linde.

See under XXIII., *page* 624.

Cloves; Notes on the Approximate Analysis of ——. A. McGill.

See under XXIII., *page* 625.

PATENTS.

Iodine and other Products from Sea Weed; Extraction of ——. J. Thesen, Christiania, Norway. Eng. Pat. 15,233, Jan. 30, 1900. (Under Internat. Convent.)

SEA weed, more or less dried, is heated with dilute (5—20 per cent.) sulphuric acid in open or closed vessels. The iodine present goes into solution, and may be recovered by adding an oxidising agent such as sodium nitrite, and finally separated by distillation or extracted with petroleum, petroleum spirit or other mineral oil. The solution also contains potassium sulphate, which may be crystallised out after removing the iodine. The sea weed residue, after drying forms a pulverulent manure, containing almost all the original nitrogenous constituents of the sea weed.
—T. A. L.

Stannic Acid; Manufacture of —— *by Combustion of Tin Vapour.* C. P. Bary, Paris. Eng. Pat. 9231, May 18, 1900.

METALLIC tin is heated, electrically or otherwise, to a temperature of 1,700° C. out of contact with air. The resulting tin vapour is then burnt in a current of air or oxygen. The stannic oxide thus produced is more homogeneous and in a better state of sub-division for enamelling, &c., than is the ordinary oxide, whilst owing to the absence of metallic tin, it has not the grey tint often observable in the older samples.—W. G. M.

Antiseptic Compounds; Manufacture of ——. A. Zimn maun, London. From The Chemische Fabrik auf Ac vorm. E. Schering, Berlin. Eng. Pat. 10,845, June 1900.

IN Eng. Pat. 8429 of 1893 (this Journal, 1894, 414 process is described for the production of alkaline antise liquids from silver salts and non-toxic organic bases, s as ethylenediamine, and piperazine, &c., such solut having the property of not coagulating albumin. Accor to the present specification, these compounds can be obta in a solid form. For example, the compound from si nitrate and ethylene diamine is obtained by stirring 6 g of powdered silver nitrate into 5 grms. of 90 per ethylene diamine at a temperature below 40°—50° C. clear solution is mixed with 18 grms. of absolute alc and on cooling, the mass solidifies to a crystalline j After filtering, the product is washed with alcohol ether, and dried in the dark over lime. The product the formula $2(H_2N.CH_2.CH_2.NH_2).AgNO_3$, is re soluble in water with a strong alkaline reaction, and at 65° C. Piperazine silver nitrate is obtained by qu mixing 2·5 grms. of silver nitrate in 2·5 c.c. of water 5·1 grms. of piperazinum in 10·1 grms. of absolute alc with constant agitation, when the product separates crystalline form. The specification gives the physical perties and melting points of a number of these substances.—T. A. L.

Saponine from Horse-Chestnuts; Obtaining ——. Weil, Strassburg, Alsace, Germany. Eng. Pat. 7 Feb. 14, 1901.

RIPE horse-chestnuts, after peeling, are ground and at 40°—50° C The oil and resin are removed by e tion with benzine or petroleum spirit, and a subse extraction with 93—96 per cent. alcohol dissolve saponine, which separates on concentration and co The crude product is dissolved in alcohol, treated freshly precipitated hydroxide of lead (from lead and ammonia), and finally precipitated by pourin alcoholic solution into ether. If necessary this proc repeated. After drying, the saponine forms a white p readily soluble in water, giving a strongly frothing so The yield of saponine is about 10 per cent. of the wei the nuts.—T. A. L.

XXI.—PHOTOGRAPHY.

Metol-Developer; Limit of Dilution of ——. E. K Phot. Rundschau, **15**, 91. Chem. Zeit. Rep. 25 128.

METOL can be used in very dilute solution. A sol 0·5 grm. of metol and 5 grms. each of sodium thios and sodium carbonate, in 2 litres of water, forms a de suitable both for instantaneous and for longer e plates. The time required for the development vari two to three hours.—J. T. D.

Potassium Percarbonate; Medium for Destroying sulphate in Photographic Films. E. Valenta. Corr. **38**, 235. Chem. Zeit. Rep. **25**, [14], 128.

"ANTIHYPO," a new preparation, consisting essen potassium percarbonate, for destroying excess o sulphate after fixing and washing, was found by th to effect its object perfectly without injuring the film
—J.

PATENTS.

Photographic Prints; Process for Obtaining —— Abel, London. From The Actien-Ges. für Anili Berlin. Eng. Pat. 12,313, July 7, 1900.

THE processes hitherto employed for producing phot images by means of chromates depend either on tre exposed print with metallic solutions or on using danting properties of the chromium dioxide which i by light to deposit dyes on the paper. Accordi present invention, the oxidising property of the c xide is made use of to convert colourless aromatic comunds into colouring matters of any desired shade. Thus process yields positive pictures. A method has been scribed by Lumière in which manganese salts and idisable bodies are used somewhat similarly, but here the ages were produced by the action of the unchanged romates, and the pictures were negative. The new pros is as follows:—Ordinary unsensitised photographic per is coated with a solution of 16 to 20 grms. of ammou bichromate in 100 c.c. of water, to which, in order to id sinking in of the image, 6 grms. of gelatin or gum y be added. The paper is dried in the dark, and exposed ler a negative for half the time required in the gum cess. The prints are washed quickly with plenty of h water, finally rinsed in a bath of 1 c.c. of sulphuric l in 1 litre of water, and then developed with 1 grm. of henylenediamine, 1 or 2 grms. of sodium bisulphite, and e.c. of water in the cold. The prints are washed first cidulated, afterwards in pure water, and possess a pure c brown colour. Other organic compounds which give racteristic colours are dimethyl-*p*-phenylenediamine, lene-*p*-diamine, 1 : 5 - naphthylenediamine, *p* - aminoaol, methyl-*p*-aminophenol, *o*-*p*-diaminophenol, *β*-triophenol, pyrogallol, 1 : 5 - dihydroxynaphthalene, ainodiphenylamine, *p*-diaminophenylamine, aniline, and thylaniline.—F. H. L.

ographic Reducer; Manufacture of a ——. C. D. bel, London. From The Actien-Ges. für Anilin Fabr., rlin. Eng. Pat. 12,375, July 9, 1900.

well-known photographic reducers, potassium ferriide or potassium ferric oxalate, mixed with sodium ulphate, cannot be kept ready made, but must be ired afresh each time as required. The inventors ome this inconvenience by compounding a mixture of s. of powdered potassium ferric oxalate and 50 kilos. owdered anhydrous sodium thiosulphate. This is nent in the dry state, and for use only has to be ved in water. Potassium ferricyanide cannot be oyed in a similar manner.—F. H. L.

ide Photographic Prints; Treatment of ——, to der them more Permanent, with Range of Colours. I. Smith, London. Eng. Pat. 22,201, Dec. 6, 1900.

rints are treated in a bath of potassium bichromate, ; hydrochloric acid, $\frac{1}{2}$ oz.; water, 20 oz., till they e a creamy colour. They are then well washed and loped with sodium sulphantimoniate, 1 oz.; water, They are next rinsed, and toned with ammonium le, 1 oz.; water, 20 oz. Finally they are washed ed in an alum bath, as is done with "carbons." By ocess an image of silver sulphide in bichromated is obtained, which is said to be permanent; a variety s ranging from red to dark brown may be produced, whole method of working is cheap.—F. H. L.

XII.—EXPLOSIVES, MATCHES, Etc.

ion Catastrophe at the Griesheim-Elektron Chemical Works. Zeits. angew. Chem. **14**, 459—461.

rks lie to the west of Griesheim, between the railway Main. The chief products are mineral acids, soda and carbonate), potash, chromates, bleach, permananiline derivatives, and carbon tetrachloride. There r main divisions: the old acid and soda works, on r bank, adjoining the village of Griesheim; the works, next the soda works; the recent electrolytic urther from the river; and the "Mainthal" works, inland still. Between the last and the aniline works works of Marx and Müller and of Nötzel Istel and h of which suffered in the explosion.

t three in the afternoon of April 25th a small fire l, through the heating of a shaft or bearing, in the cid division of the aniline works. Through int water-pressure at the time, it was not promptly shed; alarm was given, and the buildings were emptied of workpeople. In spite of the efforts of the works brigade and that of Griesheim, the fire spread, and about half-past four there was a severe explosion. Dr. Jacobi and his men after this beat a retreat, when a second much more powerful explosion occurred, which wrecked all around, and broke windows in all the neighbouring villages. Heavy wreckage, some of it burning, was hurled in all directions, so that fires occurred in the other divisions of the works, and in those of neighbouring firms.

Fire brigades from all around were soon on the spot, but the smoky atmosphere, the heaps of *débris*, and the fear of further explosions, greatly hindered their work. Several small explosions did occur, but no further damage was done. None of the boilers exploded, the fires having been all drawn and the steam blown off in time.

Griesheim was emptied, from a fear that the great store of over 100,000 litres of benzene might fire or explode; the wind was unfavourable for this, however, and though the roof had been damaged by the explosion, nothing further happened here.

For 600 metres around, roofs were lifted and walls displaced; a child playing on the river bank was hurled into the river and drowned; people in the neighbourhood were thrown down and often injured; the wall of the building in which Dr. Jacobi and his men had taken refuge was blown down and buried them in its ruins. In all, 24 persons were killed, some are missing, 20 were severely and many others slightly wounded.

Two days after the explosion, work was partially resumed in the "Elektron" and the acid works; but not till the 28th was all danger over in the aniline works and in those of Marx and Müller and of Nötzel Istel and Co.

Picric acid manufacture, it is stated, will not be begun again, even if no Government regulation should be made to prevent it.

It was generally believed, as the result of experiments, that moist picric acid would not explode, but would only burn. The catastrophe at Griesheim shows only too clearly that there are circumstances under which this is not the case. Prompt investigation of these circumstances is demanded.—J. T. D.

Explosives; Manufacture of —— with Solidified Oil. Ger. Pat. 119,593, Jan. 7, 1900. G. Girard, Paris. Zeits. angew. Chem. 1901, **14**, [18], 449.

A potash or soda soap with a vegetable oil or resin oil is dried at 120°—130° C., added to the oil to be solidified, to the extent of 10—15 per cent., the whole well stirred, heated to 150°—170° C. for two or three hours, and filtered if necessary. At the ordinary temperature the product is a plastic solid, but at 80° C. it is liquid, and can be mixed with chlorate, perchlorate, or nitrate, as desired. The oil itself may form the combustible constituent of the explosive, or there may be added, at will, nitro or azo compounds, nitro ethers, or any mixture of them.—J. T. D.

Nitrocellulose; Researches on the Stability of ——. W. Will. Mitth. a. d. Centralstelle f. Wissensch. Techn. Untersuchungen Neu-Babelsberg bei Berlin, 1900, [2], 5—24.

After enumerating and criticising the methods at present employed to determine the stability of nitrocelluloses, the author describes a new method, based on the quantitative estimation of the nitrogen evolved (as oxides) when the guncotton is heated at a definite temperature (135° C.).

The results so obtained are plotted in curves to illustrate the effects produced by various conditions of manufacture, and to show the relationship between this method of examination and the results given by other well-known test methods.

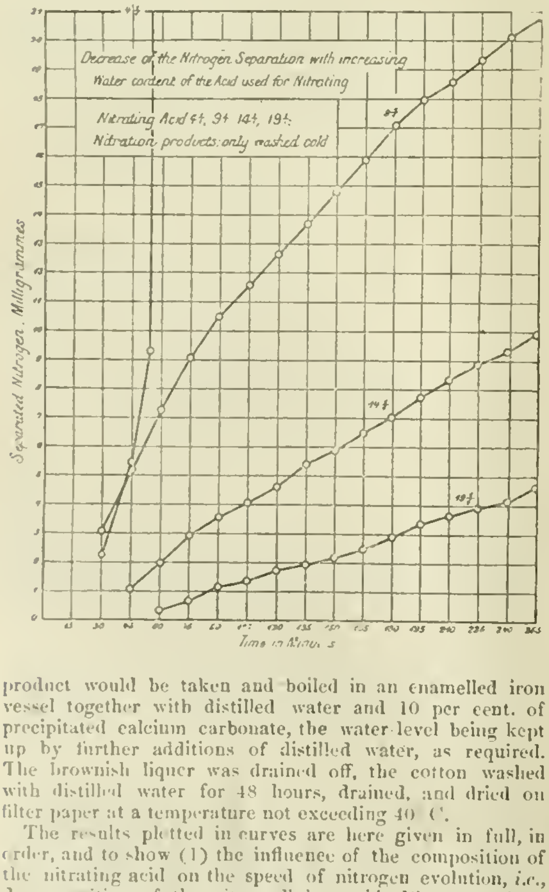
The figure, page 611 (Fig. 1) diagrammatically represents the apparatus employed. The sample of guncotton ($2\frac{1}{2}$ grms.) packed in a glass tube, *a*, 15 mm. wide and 10 cm. high, is heated by the oil-bath, *b*, at a constant temperature, the nitrogen oxides so produced are swept over ignited copper, *d*, where they are reduced, and the nitrogen is retained in the measuring tubes, *g*. Care must be taken that the acid decomposition products do not condense in any portion of the apparatus. The air in the whole apparatus is first displaced by a stream of carbon dioxide issuing from the generator, *f*, through the scrubbers, *e*, and this stream is maintained throughout the experiment, the gas being absorbed at the end of the system by strong soda solution.

To guard against the danger of explosions, which occur repeatedly, the tube *a* and oil-bath *b* are surrounded by a large casing with walls composed of iron plate and strong glass.

As raw materials, an untreated cotton, similar to that commonly employed in the gun-cotton industry, was obtained, the effect of special chemical treatment being not yet sufficiently well known to risk its possible influence in the course of the experiments. The composition of the nitrating acid is indicated in the paper by a compound fraction (see curves at end), in which the unit represents the amount of water present per 100 parts, and the fraction denotes the ratio of H_2SO_4 (numerator) to HNO_3 (denominator) in the remaining portion; thus $4\frac{3}{1}$ is an acid mixture containing 4 per cent. of water, 72 per cent. of sulphuric acid and 24 per cent. of nitric acid, *i.e.*, the ratio of H_2SO_4 to HNO_3, after subtracting the water, is as 3 is to 1.

To nitrate the cotton it was placed in a centrifugal machine at 15° to 20° C. with 50 volumes of the nitrating acid, and stirred after 10 minutes to prevent local heating. After one hour the acid was drained off, the remainder removed by whirling, and the cotton then washed with at least 100 volumes of cold water, which washing was renewed over a period of eight days. It was then cut into lengths about 2 mm. long, washed again for eight days, and finally centrifugalised. As thus prepared, it was used for most of the experimental steps of purification. For example, if boiled nitrocellulose were required, the centrifugalised product would be taken and boiled in an enamelled iron vessel together with distilled water and 10 per cent. of precipitated calcium carbonate, the water-level being kept up by further additions of distilled water, as required. The brownish liquor was drained off, the cotton washed with distilled water for 48 hours, drained, and dried on filter paper at a temperature not exceeding 40° C.

PLATE 1.



The results plotted in curves are here given in full, in order, and to show (1) the influence of the composition of the nitrating acid on the speed of nitrogen evolution, *i.e.*, decomposition of the nitro-cellulose, *vide* Plates 1 and 2; (2) the effect of incomplete purification on speed of decomposition, Plates 3 and 4; (3) the relation betwe quantitative decomposition and the results obtained by usual tests, Plates 5, 6, 7*a*, 7*b*; (4) the effect on the r

PLATE 2.

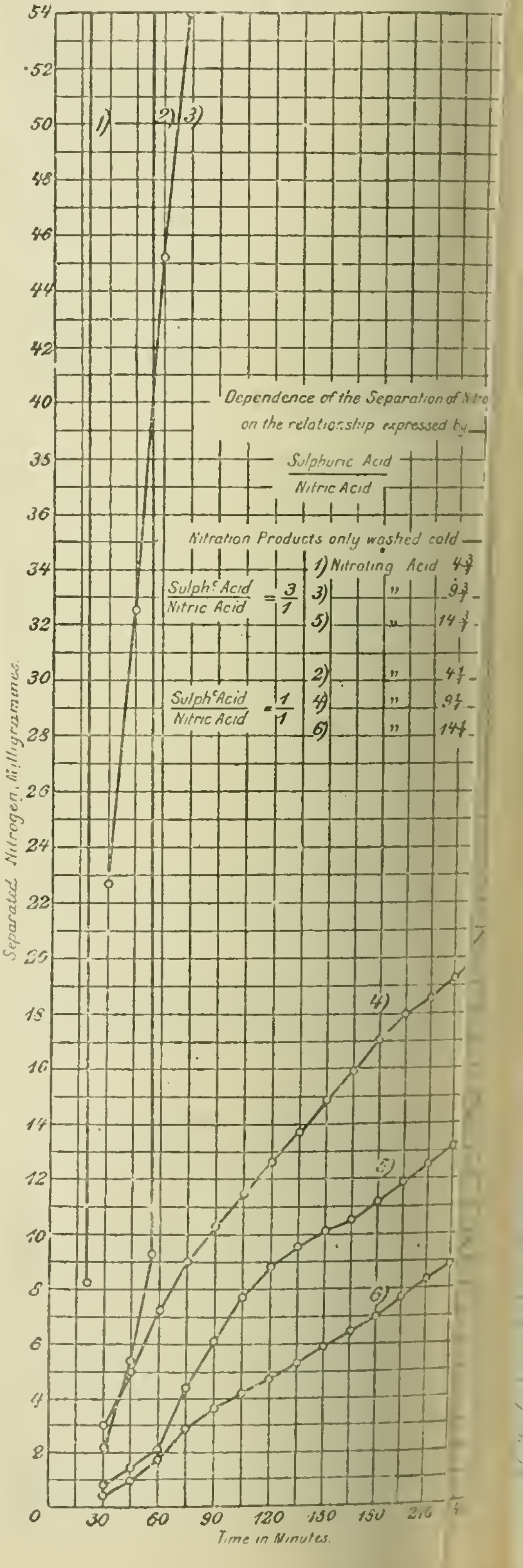


Fig. 1.

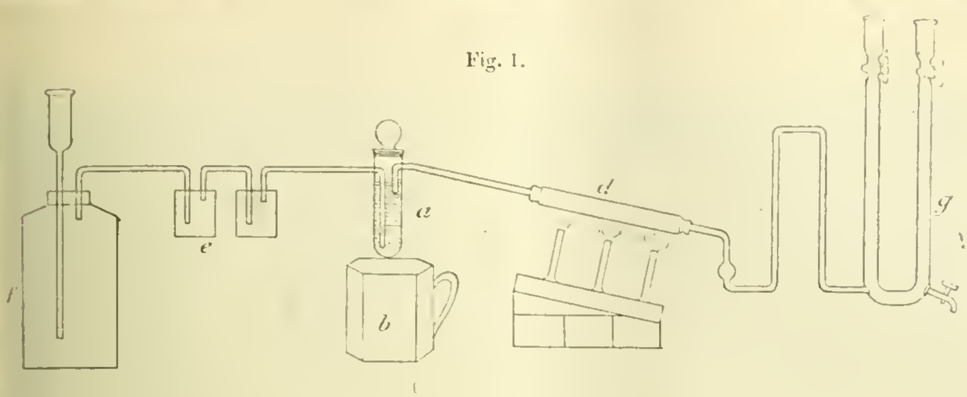


Plate 3.

Decrease of Separation of Nitrogen with increasing duration of boiling.

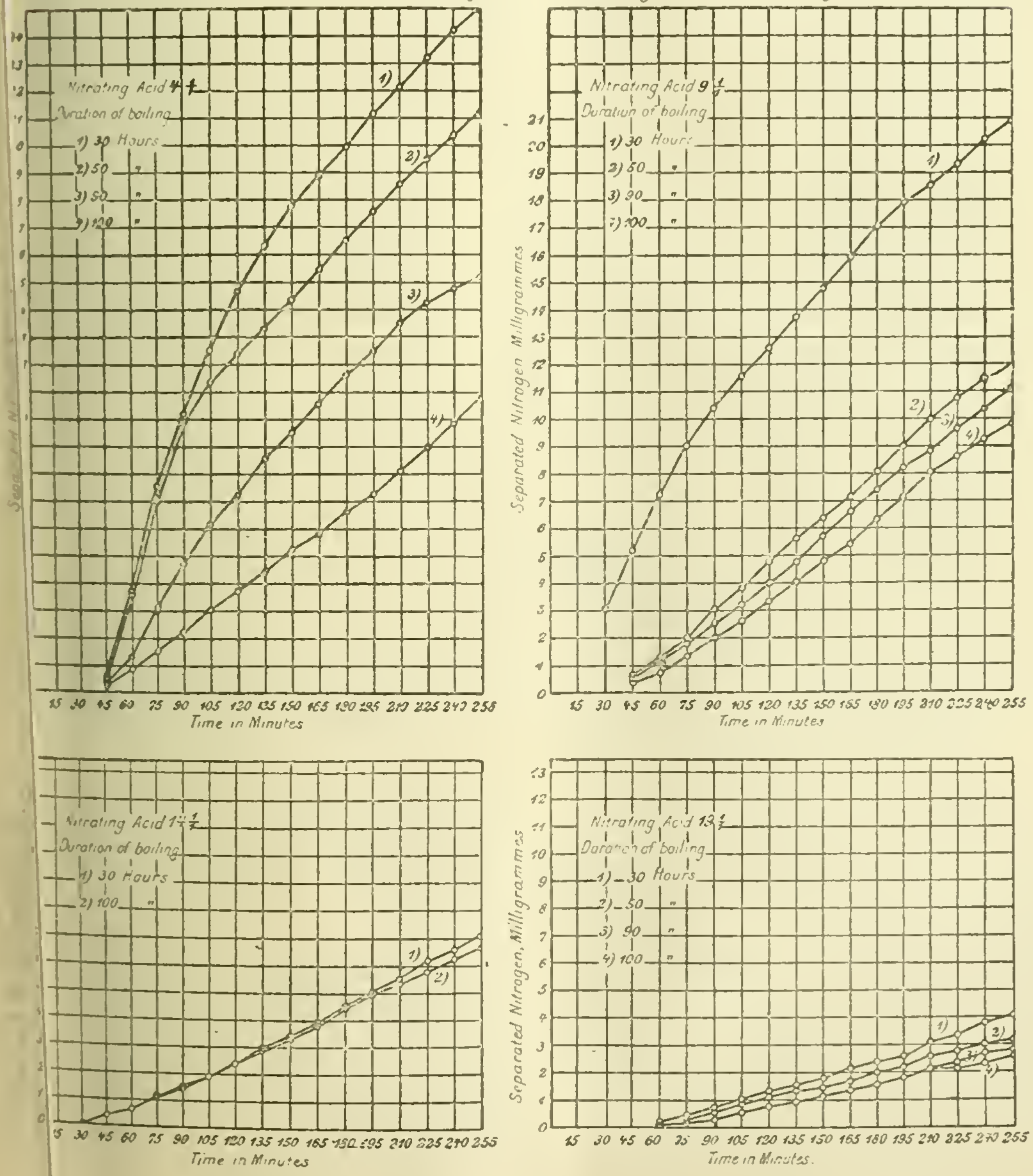


PLATE 4. (For Plate 5, see page 615.)

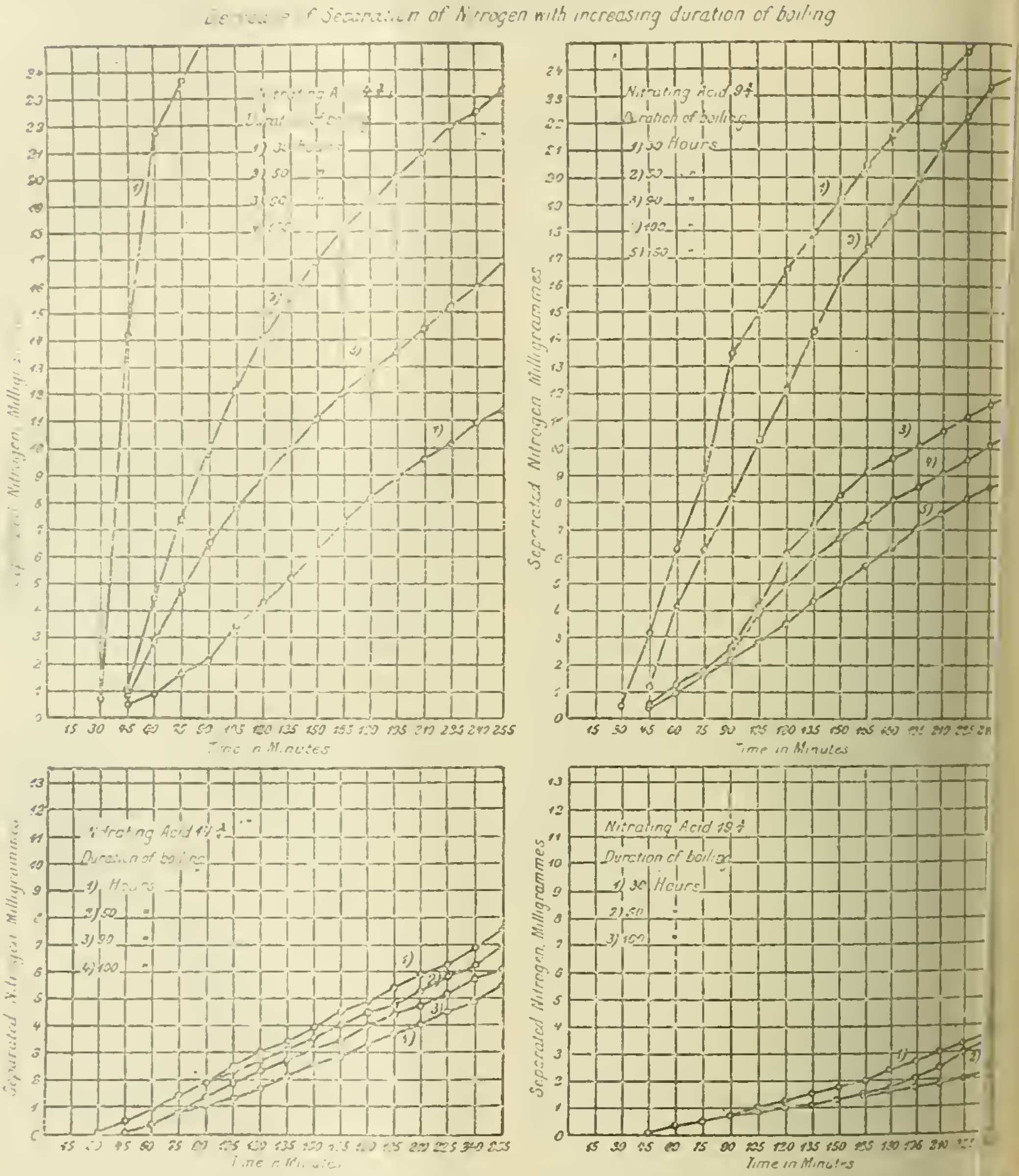
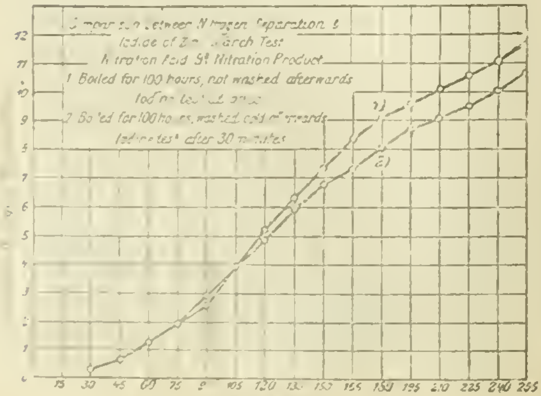


PLATE 6.



of decomposition caused by the use of differ peratures during testing, Plates 8, 9, 10; and regular decomposition of nitrocellulose purified to limiting stage, the existence of which became the course of this work, Plates 11, 12*a*, and 1 chief deductions are summarised under the heads :—

Relation of Stability to Nature of Raw used.—Brunswig has established by other meth the time of appearance of the first traces of products is a function of the nitrating acid. clear that under similar conditions and with s ratios, the speed of decomposition falls accord amount of water used, *i.e.*, as the dilution of th greater. In Plate 1, for example, the nitrating containing 1 per cent. of water, produces a gun- easily explodes, the product of 19¼ acid, b highly stable.

Again, under similar conditions of dilution, th decomposition depends on the relation between

PLATE 7a.

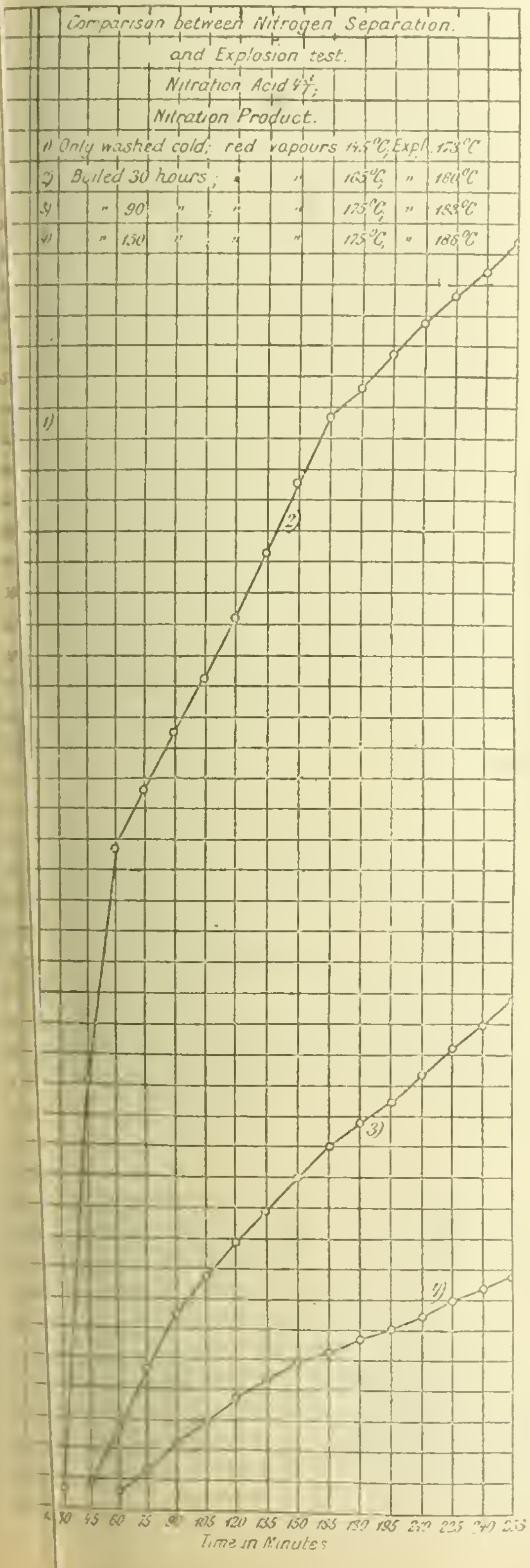


PLATE 7b.

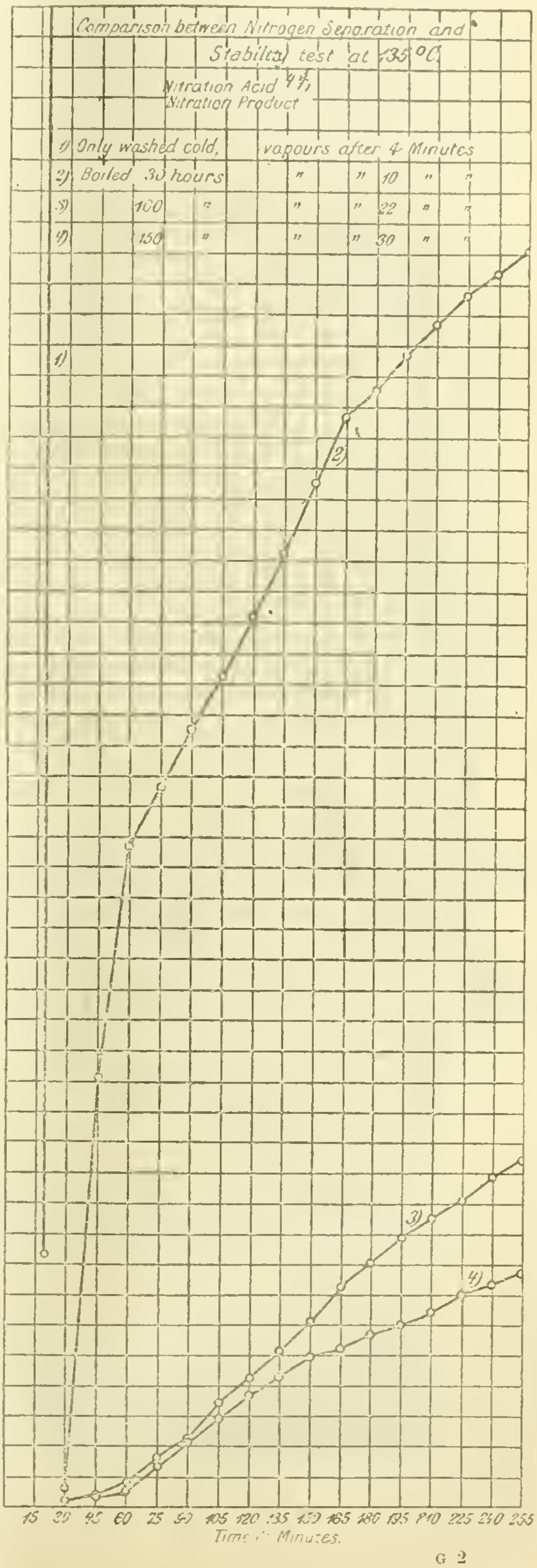
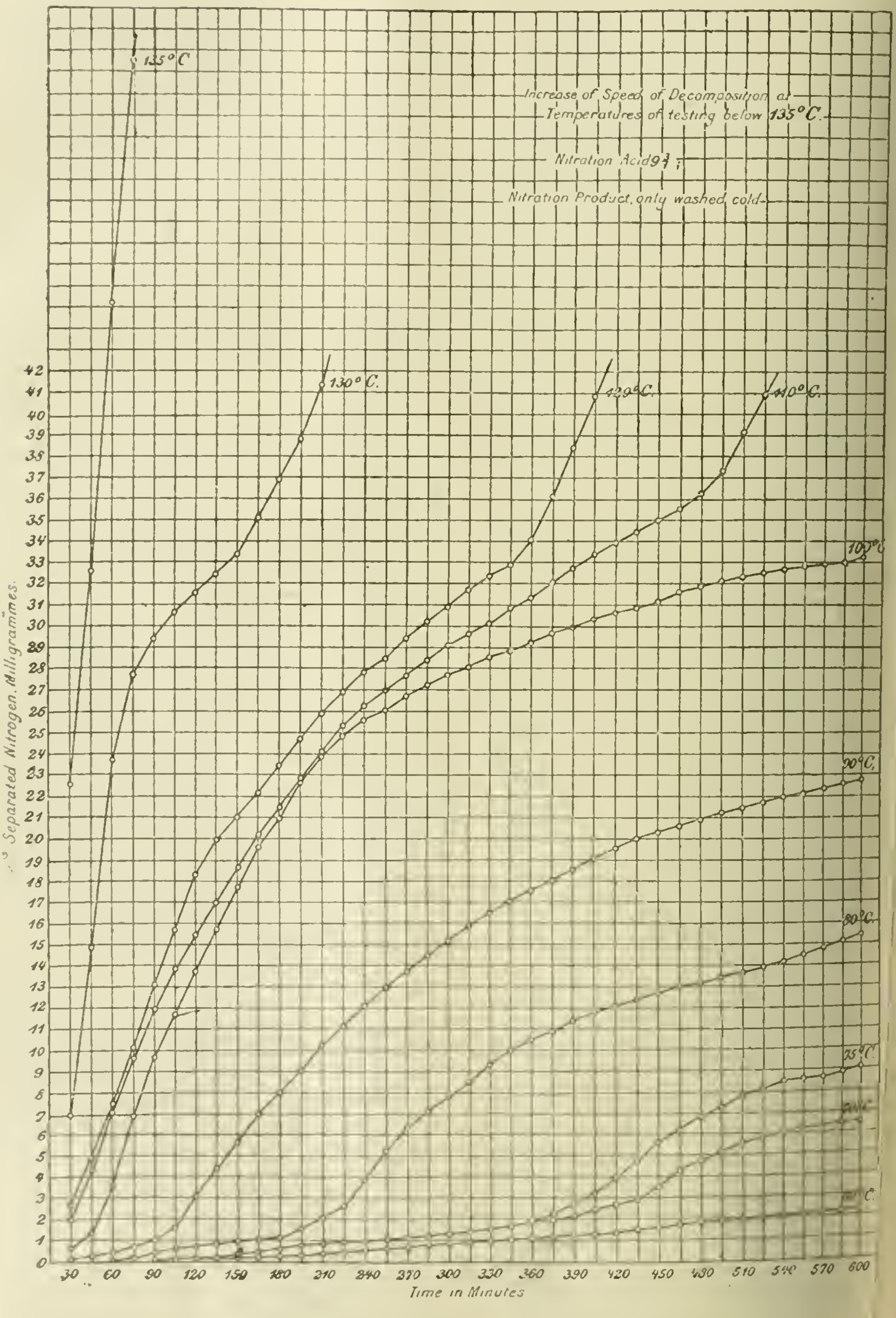


PLATE 8.


135° C
Increase of Speed of Decomposition at Temperatures of testing below 135°C.
Nitration Acid 9¾
Nitration Product, only washed cold.
130° C.
120°C.
110°C.
100°C
90°C,
80°C.
75°C.
70°C
°C.
Separated Nitrogen. Milligrammes.
42
41
40
39
38
37
36
35
34
33
32
31
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29
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27
26
25
24
23
22
21
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14
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12
11
10
9
8
7
6
5
4
3
2
1
0
30
60
90
120
150
180
210
240
270
300
330
360
390
420
450
480
510
540
570
600
Time in Minutes

An increase of H_2SO_4 increases the speed, as is evident from Plate 2, where the steep curves have the acid ratio $\frac{3}{1}$.

Relation between Stability and Mode of Preparation.—Plates 3 and 4 indicate that insufficient washing lowers the stability. These experiments were conducted with boiled gun-cottons, and there appears to be a limit, beyond which boiling does not further increase the stability.

The relation of stability to the degree of comminution of the cotton was also investigated and found to be very slight, contrary to the general view that only finely divided cotton can be efficiently stabilised. Similarly the effect of adding small quantities of mercury or sublimate was found to be slight.

Relation between Stability as judged by the Quantitative Method and other Methods.—No definite relations were established between the speed of decomposition and (1) the actual nitrogen contents; (2) the solubility of the nitrocellulose in ether-alcohol (2 : 1); or (3) its viscosity.

Plate 5 shows that a nitrocellulose, which gives a slow reaction to the zinc-iodide-starch test also decomposes slowly. The iodide test, however, is largely influenced by the presence of impurities, and it may be markedly affected by washing the gun-cotton, whilst the speed of nitrogen evolution, under similar conditions, is not correspondingly altered (compare Plate 6). There is greater harmony between the quantitative method and the ordinary decomposition tests, as Plates 7*a* and 7*b* show clearly.

Results of the Quantitative Method at various Temperatures.—In Plates 8–12 are exhibited the results of varying the temperature of decomposition, in which experiments larger quantities of gun-cotton were employed.

In conclusion, the author considers that the best definition and test of a stable nitrocellulose, is that it should give off at a high temperature equal quantities of nitrogen in equal times. For the purposes of manufacture, it is specially important that the material should be purified to its limit, *i.e.*, the point at which further washing produces no further change in its speed of decomposition measured in the manner described.

PLATE 5.

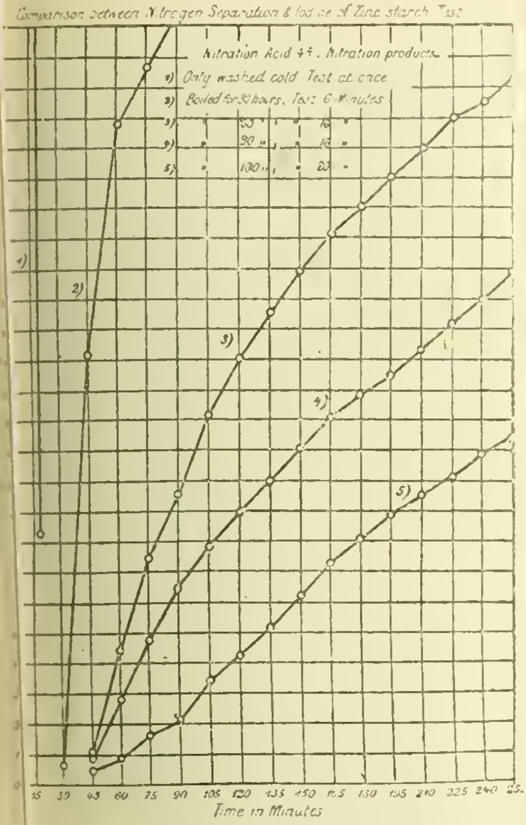


PLATE 9.

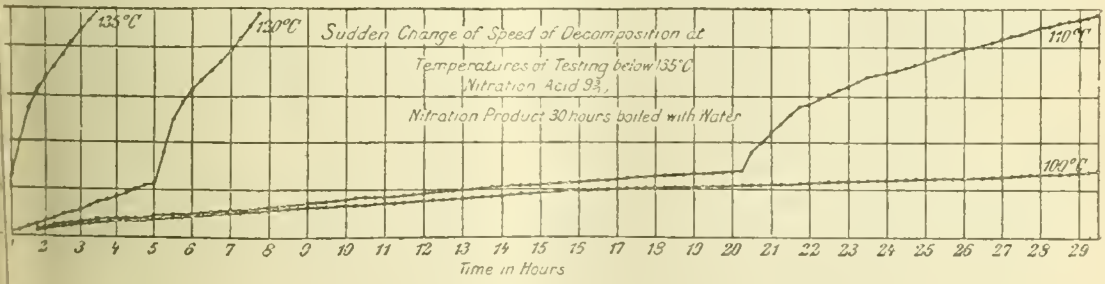


PLATE 10.

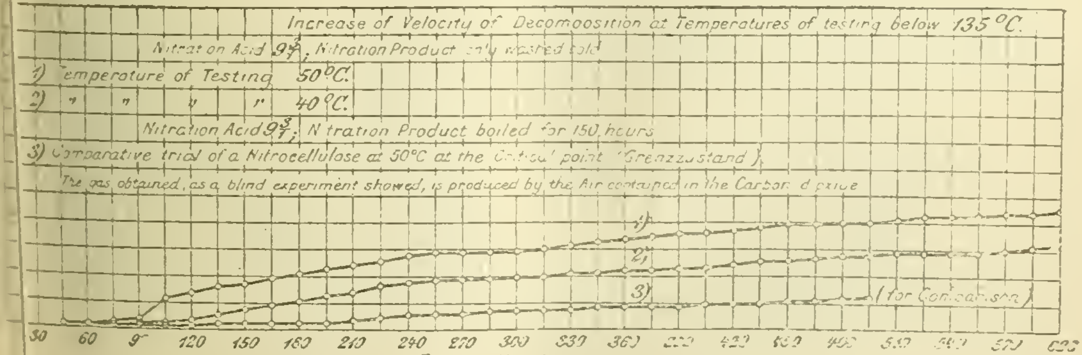


PLATE 12*a*.

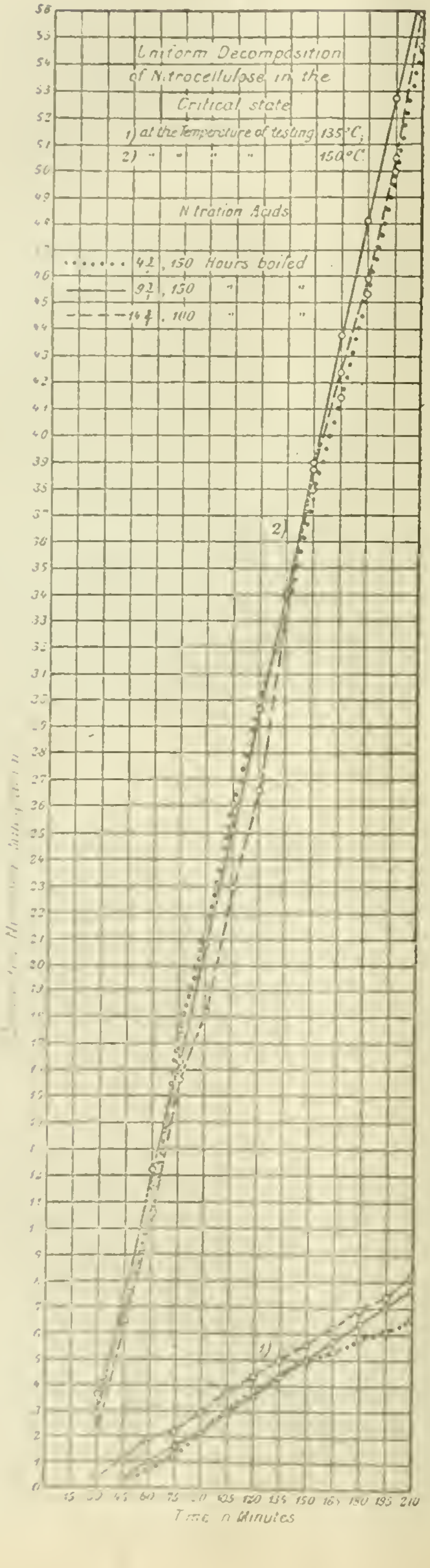


PLATE 12*b*.

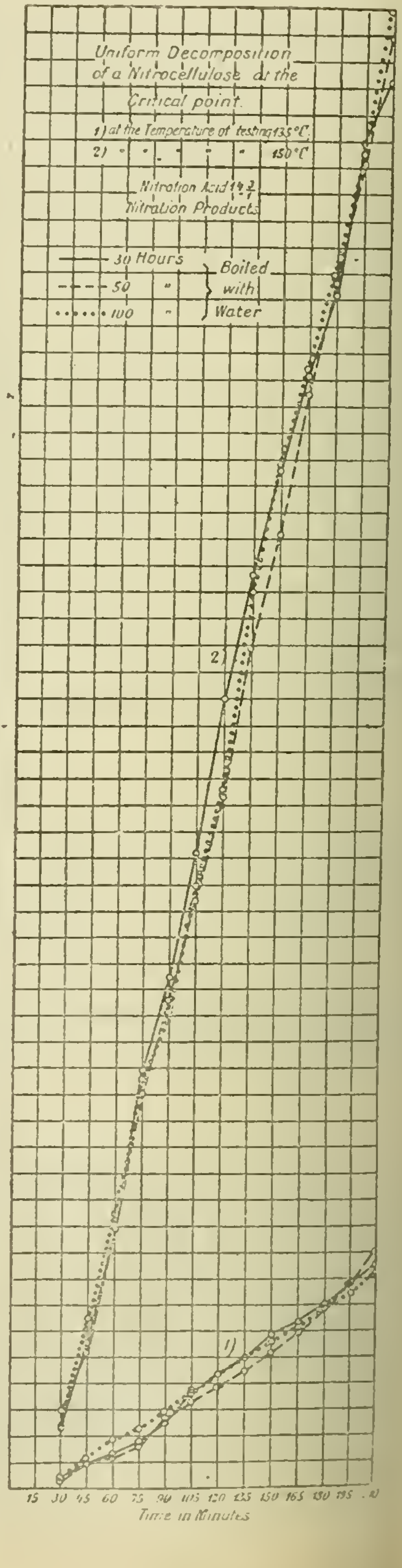
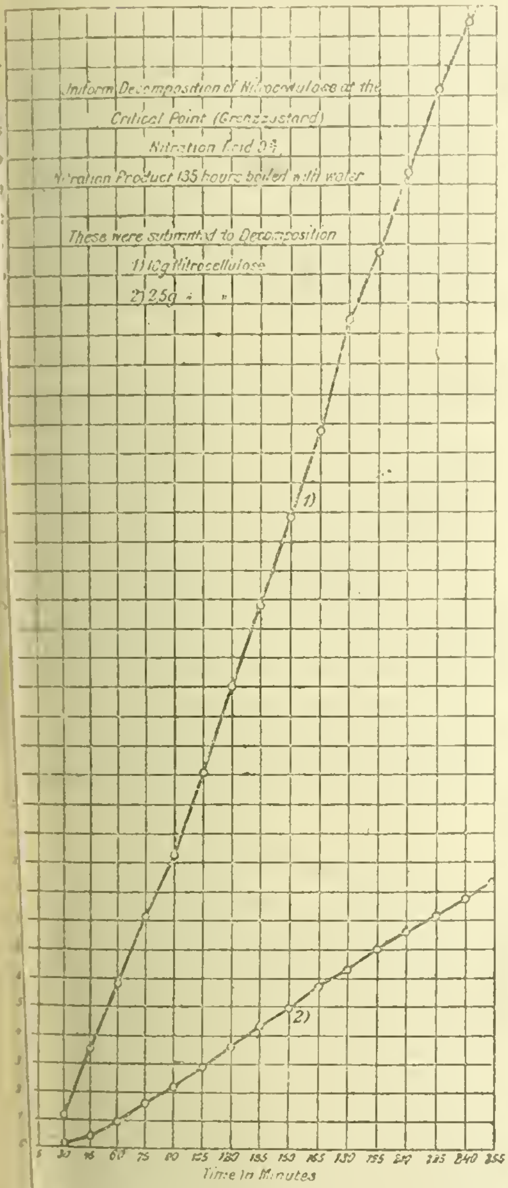


PLATE II.



nfluence of other manufacturing conditions which pair or increase the stability will be considered R. L. J.

rus; Ignition Temperature of——. F. Eydmann, jun. rav. chim. Pays-Bas, 1900, 19, 401, through Chem. Rep. 1901, 25 [15], 129.

stance is placed under water in a test-tube of meter; the test-tube is closed with a cork with es, carrying a thermometer and two tubes, one of aches nearly to the bottom of the tube. The test-ds in a larger vessel, filled with water, which can gradually. During the experiment the water or hosphorus is gently agitated by passing a current r oxygen through the tubes. As soon as the us melts, the thermometer dips into it. According experiments, the ignition point of phosphorus is hether the atmosphere of gas be air, pure oxygen, n diluted with carbon dioxide. The concentration ygen has no effect upon the ignition temperature orus.—J. F. B.

Picric Acid; Process for Manufacturing ——.
Wenghöffer.

See under IV., page 570.

PATENTS.

New Explosives. J. de Macar, Embourg, Belgium. Eng. Pat. 10,456, June 8, 1900.

A SERIES of new explosives is made by mixing lead nitrate with (1) derivatives of phthalic acid; (2) salts of derivatives of phthalic acid; (3) nitro-hydrocarbons such as dinitrobenzene or dinitronaphthalene; (4) azo-derivatives, such as azobenzene, amidoazobenzene, or diamidoazobenzene; (5) the combinations formed between the nitrous derivatives of the hydrocarbons and the azoderivatives; or (6) the nitrocelluloses. Mixtures containing lead nitrate and 17 per cent. of dinitroxylene, 10 of amidoazobenzene and 45 of dinitrocellulose respectively are quoted as examples.
—E. W. W.

Smokeless Explosives or Colloids; Making ——. J. B. Bernadou, Philadelphia, U.S.A. Eng. Pat. 2253, Feb. 1, 1901. Compare Eng. Pat. 11,567, June 26, 1900 (this Journal, 1900, 851).

A COLLOID powder consisting of nitrocellulose insoluble in ether-alcohol and containing a higher percentage of oxygen than that of the pentanitrate, is claimed together with a process for manufacturing it by cooling a mixture of insoluble nitrocellulose and ether to a temperature below that required to freeze a mixture of 95 per cent. (by volume) absolute alcohol and water. At such a temperature the nitrocellulose is dissolved or colloided by the ether, and the residue, after drying, may be used as a smokeless powder or as a cementing agent for binding together other ingredients of such powders. Any ordinary form of closed mechanical mixer fitted with a cooling jacket can be used for gelatinisation and kneading.—E. W. W.

Explosives; Manufacture of ——. J. V. Skoglund, Brooklyn, U.S.A. Eng. Pat. 5231, March 12, 1901.

A METHOD of manufacturing an explosive mixture of salts containing a high percentage of ammonium nitrate, from sodium nitrate and ammonium sulphate. About equal weights of the commercial salts are dissolved in water, the solution cooled, and the crystals of sodium sulphate removed. To the mother liquor a compound such as calcium nitrate which forms an insoluble sulphate is added. After removing the precipitated sulphate, the liquid is evaporated and a residue containing a large proportion of ammonium nitrate obtained.—E. W. W.

Explosive Charges for Guns. R. W. Scott, Philadelphia, U.S.A. Eng. Pat. 5264, March 12, 1901.

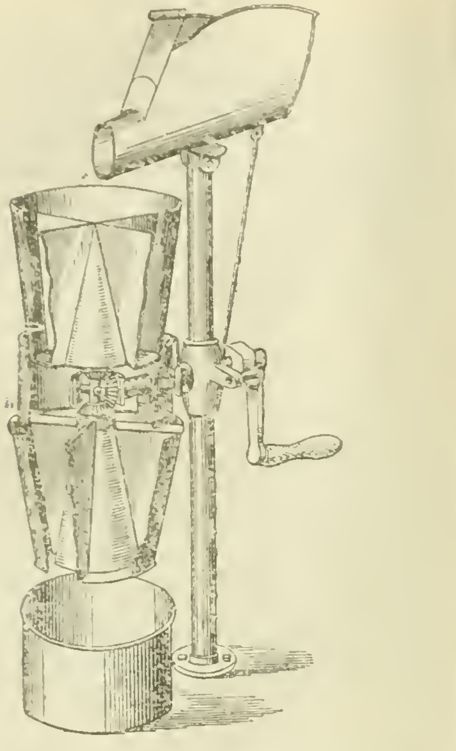
THIS invention relates to a method of retarding the combustion of a gun charge by temporarily protecting a portion of the charge from ignition, by inserting a barrier of combustible material. The latter may be made of a plastic explosive substance moulded into an envelope or sheath, wholly or partly inclosing the charge, or may be used to coat the grains of the charge, or in a variety of other ways, according to the object to be attained. By this means, it is stated, the chamber pressure is greatly reduced, owing to the slowness of ignition, and the strains are distributed throughout the bore of the gun, since the projectile has traversed a portion of the barrel before the rapid combustion of the charge occurs.—E. W. W.

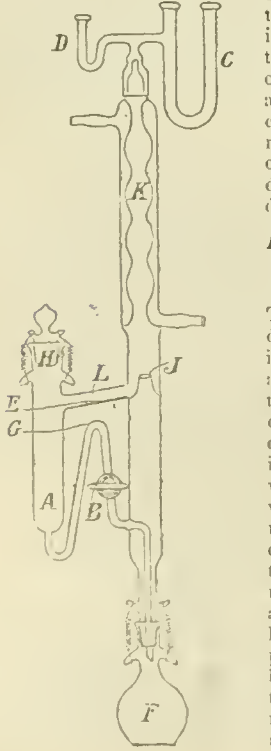
XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Ore Sampler; The Calkins Umpire ——. Eng. and Mining J. 1901, 71, [17], 534.

IN the accompanying figure is shown a sectional view of the "Calkins umpire ore sampler," by means of which, it is claimed that 100 lb. of crushed ore can be reduced to an assay sample in 10 minutes, and smaller quantities of from 1 to 10 lb. can be accurately sampled to 4 oz. in 1 or 2 minutes. The machine is 3 feet 7 ins. high, and weighs 55 lb.; it can be easily and thoroughly cleaned. The upper and lower buckets are revolved in opposite directions by means of gear wheels, and the hopper is continually agitated. Each bucket is divided into four divisions, two being closed and two open; therefore, if 16 lb. of ore be fed into the machine from the hopper, 8 lb. will remain in the upper bucket, 4 lb. in the lower bucket, and 4 lb. or one quarter of the original amount will pass into the receptacle at the bottom. By repeating the operation, the original sample may be reduced to $\frac{1}{16}$, $\frac{1}{64}$, $\frac{1}{256}$, &c., as desired.—A. S.





Fat-Extraction Apparatus. W. Jerwitz. Chem. News, 1901, **83**, [2164], 229.

The author refers to the difficulty, when using ether in a Soxhlet fat-extraction apparatus, of obtaining a tight joint between the condenser and extractor, and he claims that this disadvantage is overcome in the apparatus which he has devised and which is shown in the annexed figure. The two clamps of special construction which are provided for use with the apparatus, give a solid, safe, but not absolutely rigid grip. The stopper H and the connection between the condenser and the flask, F, are secured by means of spiral springs as shown. When using the apparatus, the cartridge containing the material to extracted is placed in A, the stopcock B is closed, and eth poured into A, till it reaches to about E, after which t stopper H is inserted and secured by the springs. T siphon is set working by opening B, and the ether solution of the fat flows into F. The flask, F, is heated a water-bath, in which it is allowed to hang free; it advisable to govern the temperature of the bath by me of a thermo-regulator The ether distils off through J condensed in K, and flows back through L into A. Wh A becomes again filled with ether up to G, the siphon s and the ether flows into F. The process is repeated u extraction is complete, when the stopcock B, is closed, the whole of the ether is distilled off into A. C is a calci chloride tube to prevent entrance of moisture, whilst which contains mercury acts as a safety valve, in the ev of the calcium chloride tube becoming choked.—A. S.

INORGANIC CHEMISTRY.—QUALITATI

Sodium; Use of ——, in Blowpipe Analysis. C. L. Pars J. Amer. Chem. Soc. 1901, **23**, [3], 159—161.

W. Hempel (Zeits. anorg. Chem. **16**, 22), first made of metallic sodium as a reagent in qualitative analysis, was unable to obtain satisfactory results on charcoal. the following method, however, the author readily obt a reduction. A small piece of sodium, 3 or 4 mu diameter, is hammered out flat, and the powdered subst to be reduced kneaded into it with a knife. The ma placed on charcoal and ignited, the reduction b immediately complete. The residue is heated in the b pipe flame, and as the sodium oxide and hydroxide into the charcoal, any fusible metallic particles collec a button.

The reduction takes place with silicates, chlorides bonates, borates, sulphates, &c, as readily as wit oxides themselves, and in the case of minerals, the m gives results nearly as certain as with the pure salts metals.—C. A. M.

Cobalt; Some Reactions of ——. E. Donath. Z anal. Chem. 1901, **40**, [3], 137—141.

If a few drops of a solution of a cobalt salt be add concentrated potash lye (30 per cent. and over), results, especially on heating, a more or less intense solution, although a portion of the cobalt hydrate remains undissolved. The same reaction can be observed by adding a piece of solid caustic alkali to solution of the cobalt salt. The blue solution i obtained on adding any of the cobalt compounds are insoluble in water to the concentrated alkali. B solution of cobaltous hydrate, this blue solution a oxygen from the air, and is decolorised with the forr of a brownish-black deposit on the walls of the test the change may also be effected by oxidation with hy peroxide. The only other metallic oxide yielding solutions with the caustic alkalis is cupric oxid these solutions are permanent in the air. Th solutions of the two metals can be differentiated addition of powdered Rochelle salt. The blue colo to cupric hydrate is not affected, or, if anything, intensified, but the blue solutions of cobaltous hyd either decolorised, or, if concentrated, are change reddish tint. Further, the addition of potassium decolorises the blue solutions of copper instantan whilst the cobalt solutions are changed to a yellow, an intense brown where they come in contact with If complete solution of the cobaltous hydrate be de may be obtained by adding glycerin to the causti employed; the blue solutions so obtained turn to green on oxidation by the air or hydrogen peroxid cobalt in the glycerin-alkali solution is therefo different condition from that in the tartrate-alkali In the author's opinion the solubility of th hydrate in concentrated alkali and the chara behaviour with tartrates are due to differences equilibrium of the ions.—J. F. B.

etallic Sulphides ; Precipitation of ——, by Thiosulphate. E. Donath. Zeits. anal. Chem. 1901, **40**, [3], 141—143.

HE author draws attention to the great utility of sodium hiosulphate in presence of mineral acid for the separation copper as sulphide from cadmium and zinc. It may so be employed in place of sodium carbonate and sulphur r the decomposition of minerals containing arsenic and timony in addition to metals of the copper group. If solution of a cadmium salt be treated with an excess of amonia and then strongly acidified with acetic acid, the dition of powdered thiosulphate to the boiling solution uses the precipitation of the whole of the cadmium mixed th sulphur after half an hour's boiling. With a zinc salt, the other hand, under the same conditions, only a nimum quantity of the zinc is precipitated as sulphide. e separation of cadmium and zinc by this method is not antitative, since cadmium sulphide carries down with it nable quantities of zinc sulphide. Similar relationships st between nickel and cobalt ; under the same treatment, h long continued boiling, nickel is entirely precipitated, cobalt salts in the pure state yield no sulphide. But en nickel salts are mixed with cobalt, manganese, or iron ts, variable quantities of these metals are co-precipitated h the nickel sulphide. The method answers admirably the rapid and easy detection of small quantities of kel in presence of large quantities of cobalt.—J. F. B.

Selenium ; Detection of ——, in Sulphuric Acid. d. Jouve. Bull. Soc. Chim. 1901, **25**, [3], 489—491.

the known methods for the detection of selenium, two are sensitive. Firstly, the codeine test (morphine is lly applicable), which gives an intense blue coloration sulphuric acid solution of selenious acid, sensitiveness 200. Secondly, the method by which sulphur dioxide ssed into the sulphuric acid, diluted with four volumes vater ; warm solutions should be used. The selenious is reduced, selenium being precipitated as the red ification ; maximum sensitiveness 1 in 10,000. Selenic is only influenced with difficulty by sulphurous acid, not at all in the codeine reaction. The author recom- ls as a test (sensibility 1 to 100,000), that crude lene should be passed through the solution under nination, when, if selenium be present, a more or less se red coloration results, due to selenium in suspension. check there are two means :—Firstly, sulphuric acid ining free selenium in suspension, dissolves the latter arming, with a green coloration. Secondly, the red l after the passage of C_2H_2, is diluted, and oxidised with anganate, until there is a permanent rose coloration, s of $KMnO_4$ is destroyed by sodium sulphite in excess, he liquid is warmed. The permanganate changes the ium to selenious acid, then the sodium sulphite brings k to the state of selenium, and, on warming, very light akes of selenium are obtained, which can be collected dentified by the odour evolved on ignition, or by solubility in alkalis, and by suspension in sulphuric and warming, producing the green colour as above. uthor adds that the sensitiveness as regards rapidity duction of red colour is increased if the acetylene n vapour of hydrochloric acid.—C. T. T.

INORGANIC CHEMISTRY.— QUANTITATIVE.

ic Acid ; Determination of Water or of Sulphur ide in Concentrated or Fuming ——. H. Rabe. m. Zeit. **25**, [32], 345—346.

inary concentrated sulphuric acid be added to fuming he latter ceases to fume when the water in the con- ed acid added is exactly equivalent to the sulphur e in the fuming acid.

ay concentrated sulphuric acid, a sample of known sition, approximating to that of the sample to be (say containing 5 per cent. of H_2O) is added from a to 25 c.c. of fuming acid, carefully shaking and out the fumes after each addition, till the point is ched at which no more fuming occurs. The experiment is repeated with the sample of acid to be tested. The percentages of water are inversely as the amounts of the acids used, so that if 24·8 c.c. of the known acid and 30·5 c.c. of the unknown acid were required, the latter contained 24·8 × 5 ÷ 30·5 = 4·07 per cent. of water.

By a precisely similar process, running concentrated acid from a burette successively into equal quantities of a known and an unknown sample of fuming acid, the percentage of SO_3 in the unknown sample can be determined.

The process is easy and rapid, and is not affected by coloration or turbidity of the samples. For works purposes, it is sufficient to compare the volumes run out of the burette, or equal volumes of the fuming acids, as the differences in density are usually small ; but the densities can be determined and calculations by weight made where necessary. Great care must of course be taken to preserve the known standard acids from possible alterations of composition.

—J. T. D.

Nitric Acid in Alkali Nitrates : Detection and Determination of ——. E. P. Perman. Chem. News, 1901, **83**, [2161], 193.

If an alkali nitrate be heated gently with certain sulphates, for instance, with lead sulphate or ordinary alum (anhydrous), the sulphate of the alkali metal is formed, and red fumes of nitrogen peroxide are evolved. In applying the method quantitatively, the alkali nitrate is heated with anhydrous potash alum, at first very gently, and finally to a low red heat for one or two minutes. The residue consists of alkali sulphate, together with alumina and excess of alum, nitrogen peroxide and oxygen having been expelled. The loss in weight may be calculated as N_2O_5.

The author has obtained the following results :—Percentage of NO_3 in KNO_3 :— Found 61·5, 61·2, and 61·3 ; calculated, 61·4.—A. S.

Nitrates in Waters ; Determination of ——, by Stannous Chloride. H. Henriot. Comptes Rend. **132**, [16], 966—968.

The author confirms quantitatively Divers and Haga's statement that stannous chloride in strongly acid solution converts nitric acid into hydroxylamine. He applies this reaction to the determination of nitrates in waters, as follows :—Prepare (1) a standard solution of stannous chloride by dissolving 14 grms. of tin in hydrochloric acid, making up with strong hydrochloric acid to a litre. Preserve this in a flask fitted with a two-holed cork, one tube through which communicates with a carbon dioxide generator, and the other, a siphon tube, communicates, through a rubber tube and pinchcock, with a 10 c.c. pipette or burette, the upper portion of which also communicates with the carbon dioxide generator. Measured quantities of this solution can thus be delivered without access of air. The vessel should be shaken before use, and the first 10 c.c. should be rejected. Prepare (2) a standard iodine solution by dissolving 8 or 9 grms. of iodine and 20 grms. of potassium iodide in a litre of water. Standardise, either by thiosulphate or by solution of potassium nitrate, as below. For analysis, place 50 c.c. of the water in a 125 c.c. flask, and evaporate to dryness on the sand-bath at 110° C. Cool, add 10 c.c. of hydrochloric acid and 10 c.c. of the stannous chloride solution, close with a cork through which passes a glass tube about 10 cm. long, having an equal length of rubber tube on its outer end ; boil vigorously for 10 minutes under a hood. Meanwhile proceed in the same way with a blank experiment. Remove the flask, pinch the rubber tube, connect it with a carbon dioxide generator, and allow to cool ; then add 10 c.c. of water, a few drops of starch paste, and titrate with the iodine. The difference between the sample and the blank represents the stannous chloride oxidised by the nitrates : 14 parts, by weight, of nitrogen are equivalent to 6 × 127 parts of iodine. Experiments with known amounts show always a slight loss of nitrogen, which is, however, negligible for waters containing not more than 1·5 mgrm. of nitric nitrogen per litre. Organic matter does not affect the results, but any iron should be removed by ammonia before evaporating.

—J. T. D.

Sulphur; Determination of ——, in Wrought Iron and Steel. G. Auchy. J. Amer. Chem. Soc. 1901, 23, [3], 147—151.

A SOURCE of error in the analysis of iron and low carbon steel is that sulphur may escape during the solution of the sample in strong nitric acid. Thus, for example, an iron which, when dissolved in *aqua regia* in the ordinary way showed 0·006 per cent. of sulphur, gave 0·012 per cent., when the solution was made very slowly. In evolution methods there is a further source of error due to the escape of part of the sulphur in combination with the carbon. It is shown by a series of comparative results obtained by the *aqua regia* method of slow solution, and the cadmium chloride evolution method, that the latter is sometimes accurate and sometimes not, and that it is therefore not possible to find a universally true correction. The author considers it best to note the greatest error in a series of tests, and to apply one-half of this amount as a correction.

The presence of iron oxide in the barium sulphate is a difficulty in the *aqua regia* method when the precipitation is made from a solution not containing much free acid. Arnold's method of cold precipitation has given low results in the author's hands, whilst Blair's method of having only 5 c.c. of hydrochloric acid in the liquid also gave figures from 0·004 to 0·008 per cent. too low. By having this amount of acid (5 c.c.), boiling for 30 minutes, and allowing the liquid to stand over night, the author found that no iron was precipitated, and that the precipitation was as complete as in Blair's method. In all cases, however, he recommends the addition of at least 0·002 per cent. to the result.

Experiments are described to show that although *aqua regia* is necessary to dissolve high carbon steels, the hydrochloric acid must be sparingly used or the percentage of sulphur will be too low.—C. A. M.

Bismuth in Ores; Determination of ——. A. W. Warwick and T. D. Kyle. Eng. and Mining J. 1901, 71, [15], 459.

THE authors state that the methods given in text-books for the determination of bismuth in ores, are either inaccurate or clumsy and laborious. They propose a modification of the method devised some years back by Pattison Muir, and claim that it is simple, accurate, and rapid (a determination can be completed in 40 minutes). 1 grm. of the finely crushed paste is treated with 5—10 c.c. of concentrated nitric acid, the solution evaporated to dryness, the residue broken up, heated for a short time with 5 c.c. of nitric acid, then 25 c.c. of water added, and the whole rinsed into a beaker, and made up to about 100 c.c. with hot water. 5 grms. of ammonium oxalate or oxalic acid are added, the solution boiled vigorously for a few minutes, and the precipitate washed twice by decantation with boiling water, the washings being passed through a filter. The final wash water should be neutral to litmus, indicating that the bismuth oxalate has been completely converted into basic oxalate. The precipitate on the filter is dissolved in 5 c.c. of hydrochloric acid (1 : 1), and the filter washed twice with water, the liquid in each case being run into the beaker containing the main portion of the precipitate. The precipitate is dissolved by gentle warming, the solution made up to 250 c.c with hot water, then neutralised with ammonia, and the precipitate re-dissolved by the addition of a slight excess of sulphuric acid (1 : 4). The solution is finally titrated at 70°—100° C. with standard permanganate solution. Lead, iron, copper, zinc, arsenic, and tellurium have no influence on the results, which are stated to be accurate within 0·1 per cent.—A. S.

Bismuth by Electrolysis: Quantitative Determination of ——. K. Wimmenauer. Zeits. anorg. Chem. 27, 1—21; Chem. Centr. 1901, 1, [19], 1066.

THE author finds that the methods hitherto proposed for the direct electrolytic determination of bismuth do not give satisfactory results. He proposes the following method:—As anode, a bucket electrode is used with a total surface of about 70 sq. cm. and which is so arranged that it can be rotated by a small water turbine. Quantities of bismutl up to about 0·1 grm. can be separated with sufficien accuracy and certainty, if the solution contain 1—0·5 c.c of concentrated nitric acid per 0·1 grm. of Bi_2O_3, and i electrolysed by a current of at least 0·05 ampère, the elec trolyte being kept in motion. The time occupied is 3— hours; the temperature is raised to 50° C. and maintaine at that point till the electrolysis is finished. The tensio of the current is always 2 volts. The length of time take for complete electrolysis may be reduced by using a highe current strength, say 0·1 ampère, at the beginning, but s soon as the precipitate begins to darken in colour, th current strength must be reduced to 0·05 ampère an maintained thereat till the finish. If the electrolyte is no kept in motion, superoxide is formed. Before cutting o the current, the deposited bismuth is washed with pu water, and rinsed with alcohol and ether.

If bismuth nitrate be the substance under examinatio glycerin may be used with advantage as a solvent; 0·1- 0·3 grm. of bismuth nitrate is dissolved in 2—4 c.c. of liquid consisting of 2 parts of water and 1 part of glyceri the solution is diluted to 150 c.c. and electrolysed in th manner described above.—A. S.

Vanadium in Slags and Cinders; Determination of ——. C. H. Joüet. School of Mines Quarterly, 1901, 22, [2 143.

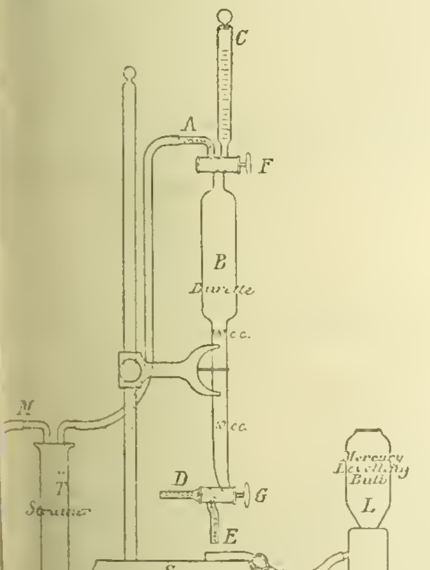
THE author gives a description of Pope's method (Tra Amer. Inst. Mining Eng. 1899, 372). A mixture of grms. of the finely powdered slag, 50 grms. of sodi carbonate, and 6 grms. of sodium nitrate is fused, a sm portion at a time, in a platinum crucible, and the fused m heated for 1 hour to a very high temperature, by two bl lamps. The melt is digested in boiling water, and residue again fused, &c., in order to effect the compl separation of the vanadium. The united aqueous extra are treated with alcohol to reduce the manganese, th almost neutralised with nitric acid, and boiled to ex carbon dioxide. The precipitate of alumina and silica m retain some chromium and vanadium. It is filtered evaporated with sulphuric and hydrofluoric acids, the resi fused with sodium carbonate and the aqueous extract of melt nearly neutralised with nitric acid, boiled for a sh time, and filtered. The filtrate is added to the main c and the whole made slightly acid with nitric acid, t alkaline with a few drops of sodium carbonate, boiled f few minutes and filtered, and the filtrate treated with bari nitrate. The precipitate formed consists of barium vanad and carbonate, together with chromate and phosphate if corresponding elements are present. It is collected o filter paper and the paper, with its contents, digested some time with dilute sulphuric acid. The barium sulph is filtered off, the filtrate concentrated to about 100 then made alkaline with ammonia and heated to induce formation of ammonium metavanadate. The solutio then nearly saturated with solid ammonium chloride, 200 c.c. of a mixture of equal volumes of alcohol and e added, and the whole allowed to stand for several hou a cool place. The ammonium metavanadate which cry lises out, is filtered off, and washed, first with an ammoni solution of ammonium chloride containing some alco and finally with alcohol-ether. The precipitate is d ignited, treated with two or three drops of nitric a again ignited and weighed. In order to obviate any e due to contamination of the precipitate with small amo of phosphorus, chromium, or tungstic acid, the va oxide, V_2O_5, is dissolved in sulphuric acid (1 : 1), the tion diluted and reduced with sulphurous acid. The ex of sulphur dioxide is expelled by boiling in a curre carbon dioxide, and the V_2O_4 re-oxidised by titratio 70°—80° C. with N/100 permanganate.—A. S.

Gold Chloride; New Method of Titrating ——. H. I Chem. Zeit. Rep. 1901, 25, [16], 141. From Mittheil. 1901, 33, 128.

A 1 PER CENT. solution of gold chloride and a 0·1 per aqueous solution of sodium thiosulphate are prep About 3—6 drops of saturated potassium iodide sol hen added to 1 c.c. of the gold chloride, producing ep brown colour, indicating the liberation of iodine. brown colour is then discharged by means of the lard thiosulphate solution, added drop by drop, the ne of the latter required for the purpose being accurately off. The number of c.c. of thiosulphate used multiplied ur gives the titre of tho gold chloride in percentages. der, for example, to decolorise 1 c.c. of the one per gold chloride solution, 10 c.c. of the 0·1 per cent. ou of thiosulphate are used; the titre of the chloride ben be:—10 c.c. × 4 = 40 per cent., *i.e.*, 100 grms. of loride contain 40 grms. of pure gold.—W. G. M.

ogen Sulphide; Determination of ——, in Illuminating s. C. C. Tutwiler. J. Amer. Chem. Soc. 1901, 23, , 173—177.

apparatus shown in the figure was devised by the tor testing the progress of purification in gasworks. ethod employed is based on the well-known reaction, $I_2 = 2HI + S$.



pparatus consists of a burette, in communication 0 c.c. stoppered cylinder, graduated in tenths of n the burette itself there are only two marks, one .c. and the other 50 mm. from the bottom. A tle, containing cotton, is placed between the gas d the burette to arrest tar.

ing a determination, the taps are turned so that communicate with the burette. The gas supply ted with A, or, if it be crude gas, with M. After utes the bottom tap G is turned so as to close the The levelling bulb L is attached to E, with the cautions, the tap G opened, and the mercury the 100 c.c. mark. The lower tap is now closed p one (B to A) momentarily opened to bring the ospheric pressure. The mercury is next with- G, the burette disconnected, and about 5 c.c. of tion drawn in through A. A standard solution is then placed in C, and allowed to enter the op by drop, with a shake after each three or four his is continued until the starch becomes per- blue. The difference between the original quantity solution in the cylinder and the amount used cor- o the hydrogen sulphide in the gas. The strength ine solution should be about 0·0017076 grm. of c.c. One c.c. of this will then be equivalent to of hydrogen sulphide in 100 cb. ft. of gas. ains of H_2S in 100 cb. ft. of gas can be detected of the apparatus.—C. A. M.

ORGANIC CHEMISTRY.—QUALITATIVE.

Dyestuffs; Detection of ——, Application to Indophenols. C. Camichel and P. Bayrac. Comptes Rend. **132**, [14], 1901, 882—885.

THE method employed depends upon the absorption of light by solutions of the indophenols in alcohol, ether, carbon bisulphide, and chloroform. Taking wave lengths as abscissæ and the transmission coefficients as ordinates, the authors obtain parabolic curves convex towards the axis of the abscissæ. The branch of the curve corresponding to the red rays rises more rapidly than that corresponding to the green and blue. The minimum of transparency is given by the lowest point of this curve and has been determined for a number of substances. This value is independent of the concentration for all substances of which the absorption coefficient is proportional to the concentration according to Beer's law, but it varies with the solvent according to a law which is, however, different from that enunciated by Kundt. Two series of indophenols have been investigated, one containing two tertiary nitrogens, as for example $O:C_6H_4:N.C_6H_4.N(CH_3)_2$, the other in which the second tertiary nitrogen is replaced by a primary, $O:C_6H_4:N.C_6H_4.NH_2$. The authors have determined the effect of substituting a primary for a tertiary nitrogen and of substituting certain radicles (CH_3, C_2H_5, $(CH_3)_2:CH$, $CH_3.CH_2.CH_2$) in the *o*- or *m*-position in the original phenol. They arrive at the following conclusions:—1. The replacement of a tertiary by a primary nitrogen whatever the solvent, causes a displacement of the minimum of transparency towards the most refrangible end of the spectrum. 2. An ortho substituent in the phenol from which the indophenol is derived, whatever the solvent, causes a displacement which may exceed the preceding. 3. A meta substituent causes a very slight displacement. 4. The method proposed by the authors is applicable for the detection of dyestuffs of which the absorption coefficients follow Beer's law. In the case of blood it is possible to determine the position of the first black band, the error not exceeding 1/10th of the distance between the two sodium lines. With the help of the first two laws it is possible to determine the formula of a phenol, only a very small quantity being required for the test. It is only necessary to convert the product into an indophenol with a primary or tertiary nitrogen and to examine its alcoholic solution.

—T. A. L.

Griess' γ-Diaminobenzoic Acid; a Reagent, with its Compounds, for Identifying Sugars, &c. B. Schilling Ber. 1901, **34**, [6], 902—907.

ALTHOUGH useful as a reagent for characterising sugars phenylhydrazine does not offer a good means of identifying maltose and isomaltose in the products of the hydrolysis of starch. For this purpose, γ-diaminobenzoic acid [$NH_2:NH_2:CO_2H = 1:2:3$] was suggested by Griess who, in conjunction with Harrow, described condensation products formed by this acid with various sugars. These compounds, which were stated to be well crystallisable, and hence readily purified, have both an acid and a basic character, are optically active in both acid and alkaline solution, and do not reduce Fehling's solution. The author gives a method for preparing the acid, which is, however, attended with considerable difficulty, and has examined the action of it on glucose, maltose, isomaltose, and lactose. With glucose and maltose the results obtained agree with those of Griess and Harrow, but the author regards the condensation products as benzimidazol derivatives, since by the action of potassium permanganate, the sugar residues are split off and benzimidazol carboxylic acids are formed. With isomaltose, no solid product was obtained but the existence in solution of a condensation compound was shown by the action of permanganate. Lactose and γ-diaminobenzoic acid yield a compound forming small pyramidal crystals melting at 206° C.

Against the general applicability of this acid as a reagent for sugars are its difficult preparation as well as the bad yields of the condensation products, which the author finds are not readily purified. It may, however, in particular cases, be made use of, as the melting points of the products are in general more constant than those of the phenyl osazones.—T. H. P.

"Saccharin" (Benzoylsulphonic Imide); New Reaction of ——. A. Leys. Comptes Rend. 132, [17], 1056—1058.

Even very dilute solutions of "saccharin" give, when treated with dilute copper sulphate or ferric chloride and hydrogen peroxide, a violet coloration. To 5 c.c. of a solution of saccharin (say 0·01 per cent.) there are added two drops of ferric chloride solution made by diluting 2 c.c. of solution of density 1·075 to 100 c.c. with water, and 2 c.c. of hydrogen peroxide solution made by diluting 1 c.c. of the 10-volume solution to 200 c.c. with water; the colour developes in 30 or 35 minutes.

Saccharin in Milk.—To 100 c.c. of 10 per cent. solution of potassium bisulphate add 10 c.c. of absolute alcohol, and into 100 c.c. of this liquid pour 50 c.c. of the milk; filter from the precipitated casein and fats, and shake the clear liquid with ether. Separate, evaporate the ethereal solution, and dry at 90° C. Take up the residue with 5 c.c. of boiling water, allow to cool, and taste; if it tastes sweet, examine it for saccharin as above.

Saccharin in Butter.—Dissolve the butter in a mixture of equal volumes of chloroform and absolute alcohol; add twice the volume of water, shake, allow to settle, and separate. The separated chloroform retains the fats; the aqueous-alcoholic solution contains the saccharin. Evaporate the latter, and test as above.—J. T. D.

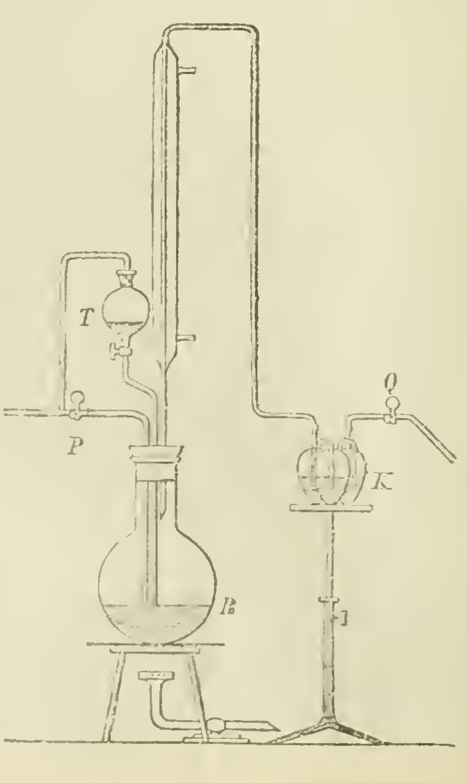
ORGANIC CHEMISTRY.—QUANTITATIVE.

Nitroso Group in Organic Compounds; Determination of ——. R. Clauser. Ber. 1901, 34, [6], 889—895.

The method consists in warming a solution of the nitroso-compound and phenylhydrazine in glacial acetic acid when benzene is formed and nitrogen is given off, two atoms of the latter for each nitroso group, according to the following typical equation,

$$R.NO + C_6H_5NHNH_2 = R.N: + C_5H_6 + H_2O + N_2.$$

The estimation is carried out in the apparatus shown in the figure.



The 300 c.c. flask R is provided with a three-hole c carrying a condenser, tap funnel T, and a tube provided w a stop-cock P, and is connected with a carbon dioxide supply. The tube connected with the top of the tap funne for the purpose of preserving uniformity of pressure. T upper end of the condenser is connected to a Liebig's b apparatus K, containing water, and by means of a three-w tap Q, to a nitrometer tube. In order to make use of apparatus, 0·1 to 0·2 grm. of the nitroso compound dissolved in 20—30 c.c. of glacial acetic acid in the fla After the whole apparatus is filled with carbon dioxide by passing a current through for several hours, a quan of phenylhydrazine (4—5 times the theoretical quanti dissolved in 30—40 c.c. of concentrated acetic acid is into the flask by means of the tap funnel. The curr of carbon dioxide gas is stopped and the flask is ge warmed, when a vigorous evolution of gas takes place, the colour of the solution turns red. The reaction, exc in the case of substances sparingly soluble in acetic aci complete in about 10 minutes. The nitrogen remainin the apparatus is expelled by passing carbon dioxide through for five minutes, until no further increase in volume of the nitrogen takes place. After standing 1 hours, the gas is transferred by means of the three-way Q to a eudiometer. A few drops of benzene are added the nitrogen then is completely saturated with water benzene vapour, when its volume is read off in the u way. If P be the percentage of nitroso groups in substance, V the volume of nitrogen in c.c., w the su the tensions of water and benzene at t° in mm., g, the we of the substance in grammes, b, the barometric height, s weight of 1 c.c. of nitrogen at 0° C., and 760 mm., then

$$P = \frac{3000\, s\, V\, (b - w)}{760 \times 28\, (1 + \alpha t)g}$$

For substances soluble in glacial acetic acid, the me is accurate within 0·5 per cent, but in the case of inso substances in which the reaction proceeds very slow 2 per cent. error has been observed.—T. A. L.

Nitro Group; Applicability of a Volumetric Metho the Determination of the ——. P. Altmann. J. p Chem. 1901, 63, [6, 7, 8], 370—380.

The method is based on the ready and complete redu of the NO_2 group by acid stannous chloride solution. following solutions are used:—(1) Stannous chloride: grms. of tin are dissolved in strong hydrochloric aci solution decanted off, mixed with 50 c.c. of hydroc acid, and made up to 1,000 c.c. The solution of th should not be accelerated by platinum chloride; va results would then be obtained. (2) Rochelle salt: 90 of anhydrous sodium carbonate and 120 grms. of Ro salt dissolved to 1 litre. Also filtered starch sol decinormal iodine solution, and standardised permanga

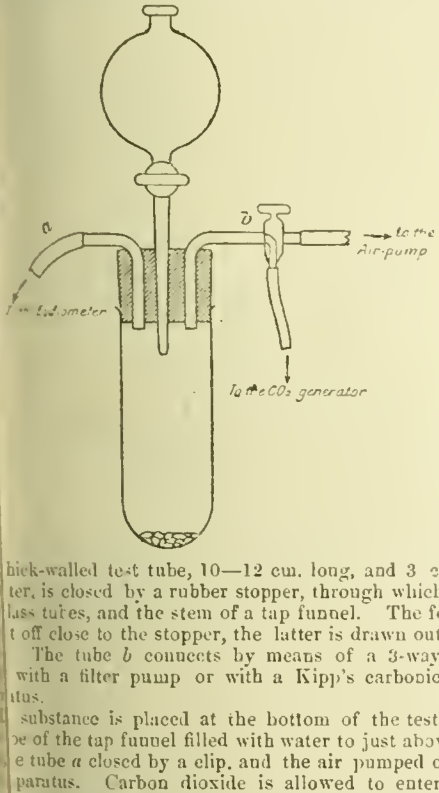
0·2 grm. of the material, chemically pure and car dried, is weighed into a 100 c.c. flask and warmed 10 c.c. of the stannous chloride solution. The solu then quickly cooled and made up to the mark; then are withdrawn, and the Rochelle salt solution added the precipitate just redissolves, water and starch are and the liquid titrated with iodine solution. Good r were obtained with nitrobenzene sulphonates, *m*-nitrob benzoic acid, barium dinitrobenzene sulphonate. A reaction cannot be recognised in the case of nitrop and nitronaphthalene; good results were, however, ob by titrating with permanganate instead of iodin stannous chloride being standardised against the manganate; *o*-nitrophenol, *m*-dinitrobenzene, pot nitrotribromobenzene sulphonate, ammonium nitrodi benzene sulphonate, *m*-nitrobenzene sulphonamide, & favourable results by this method. In the c nitraniline, the reduction must be effected by heat several hours in a closed tube in the water-bath method is not applicable to picric acid, nitronapht and similar compounds, the amines obtained from are oxidised by the permanganate.

In practice, iodine solution is used first; if this d give a sharp end-reaction, permanganate is tried, em Rieth's modification with ferric chloride (Volu

290). If no end-reaction is then obtained, ordinary thods must be employed.—A. C. W.

azo-Nitrogen in Diazo-Amino Compounds; Apparatus for the Determination of ——. H. Mehner. J. prakt. hem. 1901, **63**, [6, 7, 8], 304—307.

LESCHMIDT and Reinders decomposed diazo-amino-zene by boiling with dilute sulphuric acid in a small flask, m which the air had been expelled by carbon dioxide, and lected the nitrogen over caustic soda in a eudiometer r. **29**, 1369). During the long time required to replace air completely by carbon dioxide, diazo-amino comnds are transformed to some extent into amido azo npounds. The author has devised a simple apparatus order to obviate this small error; the substance is not ught into contact with the acid until the evolution of ogen may commence, thus strong hydrochloric acid may sed, and a more rapid reaction obtained. Under these litions amido azo compounds are not produced.



hick-walled test tube, 10—12 cm. long, and 3 cm. in ter, is closed by a rubber stopper, through which pass lass tubes, and the stem of a tap funnel. The former t off close to the stopper, the latter is drawn out to a The tube *b* connects by means of a 3-way cock with a filter pump or with a Kipp's carbonic acid atus.

substance is placed at the bottom of the test-tube, e of the tap funnel filled with water to just above the e tube *a* closed by a clip, and the air pumped out of paratus. Carbon dioxide is allowed to enter, and paratus again evacuated. After repeating this process l times, the air in the rubber tube connecting to the eter is driven out by a rapid current of carbon :. The gas passing through the apparatus should completely soluble in caustic soda. The 3-way tap d, and strong hydrochloric acid admitted from the until the test-tube is filled to the extent of about h. The liquid is now heated to boiling; the evolunitrogen is soon finished, boiled water is then run in he funnel until the apparatus is nearly full. The ices of gas are expelled in a few moments by a of carbon dioxide. It is stated that, with careful g, the accuracy of a Dumas' nitrogen determination ied, or even exceeded. The time required is very -A. C. W.

Estimation; Comparison of Volumetric Methods the Results of the "Hide-Powder" Method. A. bull. Paper read before the Paris Conference of the .T.C. 1900. Leather Trades' Rev. **34**, [786], 279.

llowing experiments were undertaken with the f testing F. Jean's method for the estimation of tannin, to see what relation the results might have with those obtained by the Loewenthal method and the hide-powder method as now used by the I.A.L.T.C. The following table gives the results obtained by analysing a known mixture of gallotannin and gallic acid:—

——	Tannic Acid.	Gallic Acid.
Actual amounts in milligrammes, per c.c.	0·456	0·452
Jean's method, using Jean's separation	0·424	0·485
Loewenthal method, using separation method of—		
Jean..............................	0·527	0·390
Procter..............................	0·457	0·445
Hunt..............................	0·426	0·470

In the subsequent experiments, Jean's method of separation was used with the Jean method of analysis, but with the Loewenthal method, Procter's method of separation was used. The following table gives the results by the three methods:—

——	Jean Method.	Lowenthal Method.	Procter's Hide-powder Method.
Oakwood:—			
A. Gallotannic acid.	12·3	16·6	27·0 tannins.
Gallic acid.......	4·7	2·8	13·0 non-tannins.
B. Gallotannic acid.	10·6	25·5	26·6 tannins.
Gallic acid.......	4·8	2·7	16·0 non-tannins.
C. Gallotannic acid.	15·5	17·3	26·1 tannins.
Gallic acid.......	4·2	2·5	17·2 non-tannins.
Mixed oakwood:—			
D. Gallotannic acid.	17·4	21·2	33·8 tannins.
Gallic acid.......	5·3	3·3	6·7 non-tannins.
Hemlock:—			
Gallotannic acid.	13·0	15·2	28·8 tannins.
Gallic acid.......	1·9	1·2	13·0 non-tannins.
Solid quebracho:—			
Gallotannic acid.	39·3	45·8	58·8 tannins.
Gallic acid.......	2·2	1·8	10·7 non-tannins.

(See also this Journal, 1901, 159).—J. G. P.

Sugars; Influence of Salts on the Rotatory Power of ——. J. de Kowalski and P. Tomartschenko. Arch. Sc. phys. nat. Genève, **11**, [4], 294—299. Chem. Centr. 1901, **1**, [18], 984.

THE authors examined the influence of the chlorides, bromides, and iodides of sodium, potassium, and ammonium, at different concentrations, on the rotatory power of cane sugar, invert sugar, and glucose, in the latter case after the multi-rotation had ceased. The rotation of the cane sugar is lowered, and at equal concentrations the effect is less, the stronger the individual salt becomes dissociated. Also, for each salt the influence is smaller, the stronger it is dissociated at the corresponding dilution. Similar results are obtained with invert sugar and glucose. The lævo-rotation of the invert sugar is increased; the dextro-rotation of the glucose is lowered.—A. S.

Starch in Potatoes; Baumert and Bode's Method of Determining ——. P. Behrend and H. Wolfs. Zeits. angew. Chem. **14**, 461—465.

THE authors' method of determining the starch-content of potatoes, by the specific gravity of the potato, cannot claim scientific accuracy, though it affords good comparative results and is very useful in the rapid valuation of potatoes for the purposes of the distillery. The conversion of the starch into dextrose and determination of the amount of the latter, too, only gives the "starch-value," not the actual starch content, of the tuber.

Baumert and Bode's method (this Journal, 1900, 1152) consists shortly in completely drying the finely divided potato substance, bringing the starch into solution in water under high pressure, filtering, rendering alkaline with soda, and finally precipitating the starch from an aliquot portion, washing and drying the precipitate, and determining its quantity from the loss of weight on burning it off. The authors have subjected the method to a searching investigation, and are completely satisfied with it. They suggest that the asbestos-tubes for the filtration should be not less than 20—22 mm. in internal diameter. The starch should be burnt off in a stream of oxygen; this is much quicker and more convenient than to use air. The author's figures (duplicate analyses of 12 potatoes), show a maximum difference between the duplicates of 0·10 per cent., an average difference of 0·06 per cent. (the figures running from 18·84 to 21·62 per cent.). Moreover, by analysing known mixtures made to imitate the composition of a potato, the authors have shown clearly, in confirmation of Baumert and Bode's statement, that the whole of the starch is precipitated and weighed, and that it is precipitated free from any of the associated substances.

The method is exact, though not rapid. It will be of the greatest value for physiological research and for the purposes of potato culture, as also in the starch industry. It will not probably be very generally used in distillery work, though here the authors have used it for determining starch in the "insoluble residue" of sweet mash, to discover the amount of unaltered starch; for this it is more convenient and more exact than the (yet very good) Maercker diastase method.
—J. T. D.

Gum Arabic; Valuation of ——. O. Fromm. Zeits. anal. Chem. 1901, 40, [3], 143—168.

The first portion of the paper is devoted to the methods employed in the examination of gum. These methods are necessarily entirely empirical, and the results are only comparable among themselves. The observations were carried out on filtered solutions of 1·035 density at 15° C., it being proved that these solutions always contained about 8·5 per cent. of dry substance. The observations include those of colour, tendency to froth, and behaviour towards basic lead acetate and alkaline copper solution. The volume occupied by the swollen insoluble matter when allowed to settle in water was always noted. The viscosity of the solutions was determined by Engler's viscosimeter and referred to water at 20° C. The free acidity was tested by titration with decinormal soda in 50 c.c. of the solution. The acidity of the solutions increases and the viscosity decreases on keeping; standard conditions must therefore be observed. The optical activity, a_D in the 1 dm. tube, is generally between $-2°$ and $-3°$, but abnormal variations between the limits of $-4° 52'$ and $+9° 8'$ are recorded. The variations in optical activity are not due to the presence of sugar. Nearly all the samples were precipitated by basic lead acetate, and very nearly all had a certain variable cupric reducing action. The most important factor in the value of a gum is its adhesive strength. This was determined relatively by soaking sheets of standard unsized paper in the solution, drying off, and determining the increase of weight and increase of tensile strength of the paper. From these a "breaking length" was calculated, indicating the cohesion of the dried gum and its adhesion to the fibres of the paper. The process is somewhat tedious, and a special chamber is required to ensure constant hygrometric conditions in making the tests of tensile strength. The increased elasticity imparted to the paper was also observed and expressed as per cent.

The author draws his conclusions from the results of the examination of several hundred samples. It is never quite safe to substitute the various physical and chemical tests for the more tedious direct test of adhesive power. But in most cases it is found that if the other properties, notably viscosity, acidity, and lævo-rotation are up to the normal average, the adhesive power will also be good. The author gives a definition on his arbitrary scale of the normal values of these factors; variations, whether above or below the normal, generally indicate deficiency in strength. Certainly no safe conclusion can be drawn from viscosity alone, as is sometimes attempted.

The prices of the samples on the whole tended to vary with the adhesive strength, though some were found to be too dear and others cheap: the external appearance, however, also has an influence on the price, which often varies in much wider limits than the relative strength of the gum. The author states that no differences could be detected in the samples of different origin. The author's methods are sufficiently exact to control bulk deliveries against samples. The tests show that gums gradually alter on keepin a fact which is recognised in the trade by the te "ripeness." This alteration on storage is marked by deterioration as regards strength; the viscosity and acid also decrease; the elasticity is not affected. This deterio tion is accompanied by an increase in the quantity gelatinised insoluble matter.—J. F. B.

Alkaloids; Methods of Exhausting Drugs for Determi tion of ——. O. Linde. J. Pharm. Chim. 1901, [8], 374—377.

The author criticises and reviews the methods for alkalo extraction, and divides them into two classes.

A.—Operations requiring no special apparatus.—

1. Extraction by neutral solvents, utilizing cold or water as the solvents. To this class may be added meth where a solution of sodium salicylate is used (see met for opium extraction, German Pharmacopœia, 4th editio

2. Extraction by acid solvents. To this class is ad methods in which very concentrated solutions of chl hydrate are employed (J. Pharm. Chim. 1900. 6, 11, see also this Journal, 1900, 569).

3. Methods of treatment with alkalis and subseq treatment by a neutral solvent. These methods are numerous; as bases there are used, lime, potash, s magnesia, ammonia, oxide of lead, alkali carbonates solvents, ether-chloroform mixtures, alcohol, petrol spirit, benzine, carbon tetrachloride, amyl alcohol, et alcohol.

B.—Operations in which special apparatus is requ divided into two classes:—

1. Methods in which a percolater is required, the sol varying according to the method (acidulated water, alco ether, &c.) These methods generally exhaust the d perfectly, but they are open to objection on account o comparatively large amount of solvent required necessit subsequent evaporation, and thus introducing risk of in or loss in the case of certain alkaloids.

2. Methods in which extraction apparatus is require Soxhlet, Barthel, Tollens). In such methods the pow drug is usually mixed with lime or magnesia and subm to the solvent action of ether-chloroform, &c.; or by m solvents to which ammonia has been added.

The author concludes that methods based on the em ment of extraction apparatus give perfect results; only inconvenience being that the apparatus is usually fragile, but there are certain very simple types (To Barthel); and these do not even require the use of as a condensing agent, they can therefore be ins in any laboratory. The quantity of drug to be taken be equivalent to 0·1 grm. to 0·5 grm. of active pri As a solvent, ether is recommended, as it dissolves all alkaloids, but in certain cases (*e.g.*, nux vomica) c form is preferable.—C. T. T.

Morphine; Determination of ——, *by Means of Pot Iodate and Arsenious Acid in Alkaline So* C. Reichard. Chem. Zeit. 1901, 25, [31], 328—3

In the presence of acids, morphine separates iodin potassium iodate. The iodine is, partially at least, in peculiar state of solution, since the brown col obtained in dilute solutions is made deeper by the of ammonia. Aqueous iodine solutions are at o colorised by morphine salts; on standing, the co solution becomes brown, but the coloration is not r by the addition of excess of morphine. The iodine se on the addition of potassium iodate to morphine so can be completely removed by chloroform and solvents, the residual solution then gives no colorati ammonia. The dark coloration produced by amm not removed by an alkaline arsenite, it is therefore ne to extract the iodine by a solvent and act on the sol the solvent with the arsenite. Chloroform is th suitable solvent, it is used until the last portion i col the iodine solution is shaken with an excess of solution and starch paste, and the excess of titrated by $\frac{1}{100}$ N-iodine solution. Three mole morphine = 1 atom of iodine. The results of the analyses quoted are quite satisfactory.

In regard to the estimation of morphine by means of ver nitrate (this Journal, 1901, 160), it has now been ind that an ammoniacal solution of silver chloride is ich more suitable, especially in the case of morphine drochloride. Very dilute solutions of morphine separate the cold a black powder of silver. The reaction appears be adapted to the estimation of morphine in opium; yish-black silver is separated in a few minutes from y dilute, almost clear, filtrates of opium solutions.

—A. C. W.

ves; Notes on the Approximate Analysis of ——. A. McGill. Analyst, 1901, **26**, [302], 123—126.

s author records analyses of genuine cloves (*Caryo-llus aromaticus*), tabulating his results. Previously orded analyses give water from 2·90 to 16·39 per cent. onig, "Zusammensetzung," &c., 744); the author finds raller range, the extremes being 4·1 and 7·5 per cent. exposing samples of powdered cloves *in vacuo* over huric acid it was found that loss of weight continued to ur for many days, but that the rate decreased very idly after the first period of 24 hours, while the acid tinued to grow deeper in colour till it became quite black o separated carbon; the explanation being that water is given off during the first period, and that loss of ght after this period is essentially due to volatile oil. A ple was found to suffer 11·45 per cent. total loss in 16 s. The same sample lost 3·65 per cent. in 24 hours sulphuric acid at ordinary pressure, and 4·72 per . in 54 hours with only slight discoloration of acid. author recommends that moisture be determined by sure for 24 hours over sulphuric acid under the reduced sure of 60 mm. mercury; total volatile matter by sure in a current of dry air at 98° C. for 24 hours. light increase of volatile matter is observed after ious treatment with petroleum spirit. 2 grms. of the le are allowed to stand at the ordinary temperature, addition of 25 c.c. of ether, until this ether is evapor-then dried in a water oven at 98° C. as described; extractive matter is obtained by Soxhlet extraction to tant weight. The lowest value for the percentage of ile oil found in genuine whole cloves is 12·1 per cent. author concludes that no sample of cloves of good ty should yield less than 14 per cent. of volatile oil assayed as above. If the total volatile matter be mined by treatment with petroleum spirit before drying 0 C., this treatment being repeated, the minimum nt of volatile oil should be 16 per cent.—C. T. T.

V.—SCIENTIFIC & TECHNICAL NOTES.

lium; Action on Selenium of the Radiation of ——. E. Bloch. Comptes Rend. **132**, [15], 914—915.

ENIUM cells, of resistances 30,000 and 654,000 ohms tively, were exposed in the dark to the radiation from ple of radio-active barium carbonate of activity about times as great as that of uranium. The active salt vered by black paper, and was distant everywhere 1 mm. from the selenium cells The resistances of lls were reduced after ten minutes to 29,000 and ohms respectively: an effect equal to that of feeble d light.—J. T. D.

dio-active Lead. K. A. Hofmann and E. Strauss. Ber. 1901, **34**, [6], 907—913

tinuation of their investigations on radio active l separated from pitch-blende, bröggerite, &c. (this l, 1901, 290), the authors have obtained from the oluble portions of the lead chloride prepared from nerals, a compound, which, when converted into e and precipitated as barium sulphate, gives an ent of 85·98. The similarity existing between these unds and those of lead indicates that they correspond valent metal which would hence have the atomic 171·96, and would occupy in the periodic system etween tin and lead. This "radio-lead" sulphate strong action on a photographic plate in the dark and when acted on by cathode rays, it retains this activity for some weeks. On heating to redness for a quarter of an hour the activity suffers only slight diminution. When the sulphate was converted into sulphide by means of ammonium sulphide solution it was found to be quite inactive; a strongly active sulphate converted into sulphide in a Rose crucible by hydrogen sulphide, and then re-converted into sulphate, was found to be active, although to a less marked degree than the original material. By digesting the sulphate with aqueous potassium iodide, a yellow iodide is obtained, which, under the action of the cathode rays, exhibits a green fluorescence and superficial decomposition, but does not affect a photographic plate. The property of being rendered active is hence peculiar to the sulphate, although the sulphide seems to possess it in a latent form. That an intimate connection exists between phosphorescence and radio-activity is shown by heating the sulphate with sulphur, by which means a mixture of sulphate and sulphide is obtained; this mixture is caused to fluoresce and phosphoresce under the action of cathode rays, but it has no action on a photographic plate, whilst on converting the whole mass into sulphate again, a material is obtained which is rendered intensely active by cathode rays. The action of radio-lead sulphate on a photographic plate is exerted through sheets of paper, glass, aluminium, and caoutchouc, the last-named causing a spreading out of the action. The action on the electroscope coincides with that of Becquerel or ultra-violet rays, the sulphate causing the gold leaves to collapse much more quickly than if left to themselves.—T. H. P.

Stannous Chloride; Oxidation of Solutions of ——, *by means of Free Oxygen.* S. W. Young. J. Amer. Chem. Soc. 1901, **23**, [3], 119—147.

IN a former communication (J. Amer. Chem. Soc. **23**, 21,) it was shown that there must be a strict definition of the reagents taking part, before it is possible to determine the constant of velocity or the order of a reaction.

In the reaction between stannous chloride and free oxygen an acceleration occurs, and the author suggests that that this may be due to the hydrochloric acid formed during the reaction retarding the hydrolysis, or possibly to a catalytic action of the products of the reaction. Since the velocity constants for different series of measurements show great variations, he is inclined to attribute the phenomenon to catalytic influences, and in the second part of his paper discusses the detection and qualitative investigation of some of these agents.—C. A. M.

Silver Oxide; Action of Hydrogen Peroxide on ——. Berthelot. Comptes Rend. **132**, [15], 897—904.

IF equivalent quantities of well-cooled dilute solutions of silver nitrate, sodium hydroxide, and hydrogen peroxide be taken, any two of them be mixed, and the third be then rapidly added, the first result is the formation of the black peroxide Ag_2O_2. This almost immediately begins to decompose, and a rapid evolution of oxygen occurs, which practically ceases when an amount equal to the available oxygen of the original hydrogen peroxide has been given off. Part of this arises from the complete dissociation of some of the silver peroxide, according to the equation $Ag_2O_2 = Ag_2 + O_2$; but another portion of the silver peroxide gives off only half this proportion of oxygen, while the resulting monoxide combines with a third portion of the peroxide ($Ag_2O_2 = Ag_2O + O$; $Ag_2O + Ag_2O_2 = Ag_4O_3$) to form an intermediate oxide. A third stage in the reaction consists in the very slow dissociation (hastened by rise of temperature, or by addition of dilute sulphuric acid) of this oxide, according to the equation $Ag_4O_3 = 2\ Ag_2O + O$. Direct experiments have shown that this last evolution of oxygen proceeds from the solid substance, not, as Baeyer has supposed, from a supersaturated solution of the gas in the suspending liquid. When strong solutions of the reacting substances are used, or the temperature is allowed to rise, the reaction approximates more and more closely to the complete dissociation, $Ag_2O_2 = Ag_2 + O_2$.

—J. T. D.

Borides: Production of some New Metallic ——. S. A. Tucker and H. B. Moody. Proc. Chem. Soc. 1901, **17**, [238], 129.

The authors describe the formation and properties of four new borides, those of zirconium, chromium, tungsten, and molybdenum. These compounds were prepared by bringing an intimate mixture of the metal with boron under the influence of a temperature produced by a current of from 200 to 275 amperes and 60 to 75 volts in the electric furnace.

Combination takes place in a few minutes with the formation of compounds which are crystalline, hard, of a high specific gravity, not easily attacked by acids, and having very high melting points. The compounds thus prepared have the following formulæ Zr_3B_4, CrB, WB_2, and Mo_3B_4.

The authors were unable to produce the borides of copper and of bismuth in a like manner, and it seems therefore as if boron had no affinity for the members of the copper group, but that it combines readily with the members of the iron group.

Tobacco Smoke: Chemistry of ——. H. Thoms. Schweiz. Woch. **39**, 27; Pharm. J. 1901, **66**, [1607], 459.

Tobacco smoke was drawn through absorption tubes containing caustic soda, sulphuric acid, &c., and the contents of the tubes subsequently examined. The smoke was found to contain the bases, nicotine, pyridine (from the decomposition of nicotine), and ammonia, carbonic, and butyric acids, (but no hydrocyanic acid), carbon monoxide, and two volatile oils, one of which could be steam-distilled from the tobacco. In 15,000 grms. of tobacco there are 6 grms. of this oil. It is dark coloured and similar to a balsam, the smell resembling that of camomile oil. It boils at 295°—315° C., and contains a phenol. The other oil, which is extremely toxic, is obtained by extracting with ether the sulphuric acid and soda through which the smoke had passed. 20,000 grms. of tobacco yield 75 grms. of the oil; it is dark coloured, has a narcotic odour, boils mainly at 220—230° C., and contains nitrogen and sulphur, and a phenol boiling at 190°—200° C. About 75 per cent. of the nicotine present in the tobacco passes over with the smoke, part being decomposed into pyridine and other bodies.

The ash amounted to 20·09 per cent. of the tobacco burned, and 18·82 per cent. of this ash was carbonaceous. The mineral matter consisted chiefly of the carbonates of calcium and potassium, the phosphates of calcium and magnesium, potassium chloride, silicates and silica.—A. S.

Glucose and Galactose; New Derivatives of ——. W. Koenigs and E. Knorr. Ber. 1901, **34**, [6], 957—981.

By the action of five molecular proportions of acetyl bromide upon glucose, the authors have obtained acetobromglucose, analogous to the acetochlorglucose of Colley. Unlike the chloro-compound, acetobromglucose is readily obtainable in the crystalline form, and its purity is thus ensured. It is dextro-rotatory, melts at 89° C., and reduces Fehling's solution. With silver acetate and glacial acetic acid it yields the pentacetylglucose, melting at 131° C. Solutions of the potassium compounds of phenol and β-naphthol in methyl alcohol yield the corresponding glucosides. The authors noticed the extreme ease with which the bromine is replaced by methoxyl or ethoxyl, by shaking acetobromglucose with the absolute alcohols in presence of silver or barium carbonates or pyridine. Tetracetyl derivatives of the β-alkyl glucosides were thus obtained; these are readily saponified by caustic alkalis in the cold to the β-glucosides. Acetobromglucose therefore belongs to the β-series, and the pentacetyl glucose, melting at 131° C., is the β-isomeride. In no case would any of the α-series of glucosides be detected. Colley's acetonitrose [acetonitroglucose] was prepared by treating acetobromglucose or β-pentacetylglucose with fuming nitric acid in chloroform solution. The nitric group of acetonitrose is just as readily replaceable as the bromine of acetobromglucose, and in exactly similar manner. Since the pentacetylglucose is very easily obtained, it forms the most convenient starting point for the preparation of the β-glucosides. The authors have not succeeded in obtai ing the isomeric α acetonitroglucose. Further, startin from pentacetylgalactose, the authors have prepared acet nitrogalactose, tetracetyl β methylgalactoside, and finall β-methylgalactoside. Attempts to synthesise di-sacchari by means of acetobrom- and acetonitroglucose led to n successful results.—J. F. B.

PATENTS.

Oxidising or Raising Chemical Compounds to a High Oxide; Process for ——. U. Wedge. Bayonne, Ne Jersey, U.S.A. Eng. Pat. 2010, Jan. 29, 1901

The patentee claims the use of ozone or ozonised air f various processes of oxidation.—T. A. L.

Extinguishing Fires in Vessels containing Inflamma Liquids. F. Shuman, Philadelphia, U.S.A. Eng. P 5515, March 15, 1901.

A solution of a carbonate or sulphite—preferably bic bonate of soda—is stored at the bottom of the vessels, where it can be quickly discharged into it, and sulphuric other acid is stored above in a vessel from which it can discharged on the outbreak of fire within the vessel. T carbon dioxide evolved on the contact of the acid with t solution passes to the surface of the oil or other inflamma liquid, and forms a layer thereon which is stated to excl air and thereby extinguish the fire. The discharge of acid may be effected automatically by the burning of a c or connection when fire breaks out on the surface of liquid.—J. A. B.

Research.

Research at the Scientific and Technical Depa ment of the Imperial Institute.

Annual Rept. of Imp. Inst. for 1900.

During the last year a large number of natural produ derived from India and the Colonies, have been submi to scientific investigation with the view of utilising th commercially.

Among the investigations which have been reported to Government of India may be mentioned those on var new fibres, gums, tanning materials, medicinal plants, rubbers.

Reports have also been made to the Indian Govern on certain special questions connected with the produc in India, of tanning extracts from those plants which proved to be suitable for this purpose, and also, through Commercial Intelligence Branch of the Board of Trad connection with the question as to the competition betw natural and artificial indigo and its bearing upon the in industry in India, and the possible improvements which be effected in this industry with the view of increasing production and decreasing the cost of this valuable dye

Reports to the respective Governments have been on coal from Victoria (Australia), clay from British Colu fibres and minerals from British Central Africa, rubber Zululand, the ash of the aloes plant of Natal, mica Canada, and leather from New South Wales.

Investigations have also been conducted with ce medicinal and poisonous plants from Egypt. The Egy Government having had its attention frequently dra the poisonous effects on animals of a small vetch, *arabicus*, abundant on the banks of the Nile, an inve tion was conducted in the Laboratories of the Depar on the nature of the poison, with material collect Egypt by Mr. E. A. Floyer, Member of the Egy Institute and Director of Egyptian Telegraphs. mystery attending the poisonous action of this plant ha completely cleared up. In a preliminary communic to the Royal Society by Professor Dunstan and Mr. (the Salters' Company's "Research Fellow" attach the Institute), it has been shown that at certain sta its growth, this plant, when intimately mixed with develops prussic acid to a considerable extent, accounts for its poisonous effects. They have prove oison originates in a glucoside contained in the plant, iich a full account will be given in a forthcoming .

publication last year of papers in the *Journal of the ical Society*, describing the results of an investigation Government of India of Indian henbane, *Hyoscyamus is*, has led to the examination of the same plant is abundant in Egypt. It has been proved that the ian hyoscyamus is even of more value than the Indian as a source of the pure alkaloid, *hyoscyamine*, which luable medicinal agent. As a consequence of these gations a demand has already sprung up for this mong chemical manufacturers.

h the increased facilities which are being afforded to epartment, it is hoped that its usefulness to the ments of India and the Colonies will be still further ed. It is now in a position to supply scientific and al information in reference to natural products of escription which are likely to be of importance either commercial or scientific standpoint and also to in reference to the establishment or improvement, a or the Colonies, of those industries which involve tions of science.

Société Industrielle de Rouen.

s been decided to organise, in connection with an ion of Arts applied to the Adornment of Tissues ctiles, a congress of Learned, Technical, and Industieties at Rouen on Aug. 19th next.

aunications are invited, and further particulars may ned from the Secretary of the Société Industrielle n.

torian Gold Jubilee Exhibition, Bendigo, 1901—2.

May, 1901.
Exhibition Offices,
Market Square, Bendigo.

ommittee of the Victorian Gold Jubilee Exhibition announce to manufacturers of chemicals, chemical s, and assaying goods, that they have made the arrangements for bringing the manufactures of s in these lines as prominently before the public as —

lel laboratory 25 ft. × 16 ft. is to be provided by igo School of Mines, equipped and stocked under tion of the Lecturer in Chemistry and Assaying at tution.

boratory will be provided with furnaces, apparatus, gs for the carrying on of assaying and chemical .

be situated near to the metallurgical and assaying and will do much to make the court an interesting tive one.

exhibitors so desire it, exhibits such as balances, , crucibles, platinum ware, and other articles g closer examination than can be made in show be removed, at regular times, and in rotation (or quest of visitors), to the laboratory, and there so that they can be carefully examined by and assayers who may be interested in them.

will be taken that the goods are not damaged by andling.

case of furnaces, &c., exhibitors can make nts to have these actually worked in the labo-

ises goods on exhibition in the laboratory will be ly labelled with the name of the manufacturer or. Such labels should be forwarded with the A good supply of circulars and catalogues should rwarded, for distribution from the laboratory, oods are on exhibition there.

mittee feel sure that manufacturers and others ppreciate the advantages that such a method of afford from an advertising point of view.

led description of all exhibits in the way of assaying goods, and chemical apparatus, will be Mr. H. C. Boydell, B.Sc., A.O.U.S.M., (Lecturer ry, Assaying, and Metallurgy, at the Bendigo School of Mines). Mr. Boydell has been connected with mining, metallurgy, and assaying in many parts of Australasia, and will particularly emphasize such articles as are new to Australia.

These descriptions will be published in the Australian, and other mining papers, and also in the papers of mining districts. Sketches of the best and newest appliances will also be given. Exhibitors should forward notes and sketches of such points in their goods as they wish special attention drawn to.

Exhibits will be carried to and from the Exhibition free of charge, on the Government railways, and must reach Bendigo not later than the end of September.

Geo. V. Allen,
General Secretary.

New Books.

The Extra Pharmacopœia. By William Martindale, Late President and Examiner of the Pharmaceutical Society, and W. Wynn Westcott, M.B., &c., H.M's. Coroner for North-East London. 10th Edition. H. K. Lewis, 136, Gower Street, London, W.C. 1901. 10*s*. 6*d*., by post, 10*s*. 9*d*.

This is the 10th edition of the Extra Pharmacopœia, which is of pocket-book size (med. 24 mo.), and contains preface and subject-matter filling 514 pages, also Appendices I., II., and III., 14 pages; and the Index and Posological Table, pages 559—664, and finally the Therapeutic Index of Diseases and Symptoms, pages 665—685.

Merck's Annual Report on the Year 1900. Vol. VIII. (Complete German Edition, Vol. XIII.). March 1901. F. Boehm, 16, Jewry Street, E.C.

A compilation of facts ascertained during 1900, and a description of substances which have, during this period, gained importance in the various branches of medical chemistry. The book (Report) contains 205 pages of subject matter, and ends with a Biographical Index, an Index of Authors, and the General Index of Subjects and Substances. Then follows an index of Diseases, Symptoms and Indications for Treatment, and finally a Tabulated Index of Approximate Prices of the Principal Substances (remedies) specified in the Report.

Recent Parliamentary Publications. Patents, Designs, and Trade Marks. Eighteenth Report of the Comptroller-General. 163. Price 3*d*.

The report of the Comptroller-General of Patents, Designs, and Trade Marks for 1900 shows that the number of applications in respect of patents continues to show a falling off. In 1897, 30,952 were applied for, and these have decreased annually to 23,922 in 1900. The applications for designs amounted to 16,952 last year. The applications for trade marks numbered 7,937 in 1900, but in spite of this general decrease, the total receipts increased from 225,701*l*. to 226,091*l*. The number of applications accompanied by provisional specifications was 18,117, which is 1,912 less than in 1899, while those accompanied by complete specifications were the most numerous ever received in one year. The number of complete specifications filed after provisional ones had been sent in was 7,288 in 1900, and the total number of specifications was 31,210. The applications from England and Wales have decreased from 15,354 in 1899 to 13,775 in 1900, and those from Germany have decreased from 2,921 to 2,631, and for France from 1,031 to 946. The United States, on the other hand, account for 3,189 instead of 3,022 in 1899. The system of deposit accounts for Patent Office publications which was started in June 1900, has met with a favourable reception. Eighty-three accounts with a *minimum* of 2*l*. were opened in that year. Under this system it is no longer necessary to send the deposit of 8*d*. in ordering a given specification. Volumes of collected abridgments relating to certain selected portions of the subject-matter of a few abridgment classes have now been issued and placed in the Patent Office Library. Three further guides to the contents of the library have been published at 6*d*. a number, *viz.*: (1)

key to the classification of French patent specifications; (2) photography; (3) laws of industrial property and copyright.

Practical Dictionary of Electrical Engineering and Chemistry (German, English, and Spanish). Treating especially of Modern Machine Industry, The Foundry and Metallurgy. By Paul Heyne, assisted by Dr. E. Sanchez-Rosal.

In 3 volumes:—I. German—English—Spanish. II. English—Spanish—German. III. Spanish—German—English. Gerhard Kühtmann, Dresden. H. Grevel and Co., London. 1899.

Trade Report.

TARIFF CHANGES AND CUSTOMS REGULATIONS.

Countervailing Duties on Dutch Sugars—Revised Rates in British India.

The Board of Trade have received a copy of a notification (Customs Circular 8, of 1901) issued by the Government of India on 7th May 1901, imposing, with effect from 1st June last, the following revised rates of additional duty on sugars produced in, or exported from, Holland:—

Kinds of Sugar.	Bounties Bestowed.	Additional Duties to be Levied.
		Per Cwt. Rs. a. p.
Raw sugar produced in Holland from beetroots.	1·50 florins per 100 kilos. of hard refined.*	0 15 3
Sugar refined from beetroot raw sugar produced in Holland.	1·72 florins per 100 kilos.	1 1 5
Sugar refined from imported raw sugar.	0·22 florins per 100 kilos. in addition to bounty, if any, allowed on the raw sugar by the country of production.	0 2 3 in addition to the countervailing duty, if any, on the raw sugar.

The former rates were:—

Kinds of Sugar.	Bounties Bestowed.	Additional Duties to be Levied.
		Per Cwt. Rs. a. p.
Raw beet sugar of less than 98 per cent. polarisation.	2·2354 florins per 100 kilos. of hard refined (100 per cent.).*	1 7 0
Raw beet sugars of at least 98 per cent. polarisation.	¾ths of above bounty, or 1·7655 florins per 100 kilos. of hard refined.*	1 2 0
Refined beet-root sugars Refined sugar from materials other than beet-root raw sugar.	0·2946 florins per 100 kilos. of hard refined, in addition to above rate.	0 3 0 in addition to above rate.

* The output of refined sugar from raw is computed by deducting from the polarisation of the raw sugar twice the glucose, four times the ashes, and 1½ per cent. for loss in refining.

Exemption from Duty of Vinegar and Ligneous Acid for Preparation of Amylic Acid in the Netherlands.

A translation has been received at the Board of Trade, through the Foreign Office, of a Dutch Royal Decree, dated the 15th ult., providing for the exemption from excise and import duty, subject to certain restrictions, of vinegar and ligneous acid destined for use in the preparation of amylic acid.

Duty on Glucose and Molasses.

In Committee of Ways and Means of the House of Commons on 11th June, the Chancellor of the Exchequer (Sir M. Hicks-Beach) moved a resolution eff certain changes in the new Customs duties proposed levied on molasses and glucose. On molasses an sugar and sugar extracts which cannot be tested l polariscope, if containing 70 per cent. of sweetening the amended duty will be 2*s.* 9*d.* per cwt.; if cont less than 70 per cent. of sweetening matter and more 50 per cent. the duty will be 2s.; and up to 50 pe the duty will only be 1*s.* The Chancellor's or proposal, as embodied in the Finance Bill, was th these cases there should be a uniform duty of 2*s.* duty upon glucose at present is only 1*s.* 8*d.*, a su on the assumption that glucose contains 40 per ce sweetening matter. But since that calculation was it has been pointed out that solid glucose co considerably more sweetening matter than 40 per and the duty upon it will accordingly be raised to Liquid glucose also has a higher sweetening powe Sir Michael at first supposed, and the duty upon it increased to 2*s.* The duties will operate from 11th when corresponding Excise duties will also be im The Chancellor explained that some of these chang necessary in the interests of the revenue, while oth required in order to put manufacturers in this count footing of equality with foreign producers.

The resolution was agreed to after some dis without a division.

The following is the text of the resolution:—

Resolved—That there shall be charged on and af 11th day of June 1901, the following Customs dutie

Molasses and all sugar and extracts from sugar cannot be tested by the polariscope:—

	Per C *s.*
If containing 70 per cent. or more of sweetening matter	2
If containing less than 70 per cent. and more than 50 per cent. of sweetening matter	2
If containing not more than 50 per cent. of sweetening matter	1
Glucose:—	
Solid	2
Liquid	2

And there shall be charged on and after the sa on glucose Excise duties equivalent to the Custom charged on that article.

Export of Spirituous Preparations.

Chemist and Druggist, June 15, 1901.

The Custom House have issued an order, dated relating to amendments in the Code which gov export of medical tinctures in bond. Paragraphs and 256 have been cancelled and the following pa substituted:—

Paragraph 212.—"Tinctures or medicinal spirit removed under bond to a ship's side, for exportati as ship's stores, in bottle or metal canisters hol quantity, packed in cases each containing not 1 bulk-gallon, and the bottles or canisters mu different sizes; but no consignment of tinctures cinal spirits may consist of less than 2 bul Medicinal spirits, flavouring-essences, and perf may be packed in the same case provided that packed in separate internal compartments or Jars covered with wickerwork and iron drums, eac ing not less than 2 and not more than 10 bulk-gal be exported uncased. 'Free goods' may be pack same case as medicinal spirits, flavouring-es perfumed spirits, provided that they are plac internal package, distinctly marked 'Free Goods, the consignment consists of not less than the quantity of tinctures or medicinal spirits, fl essences, or perfumed spirits, allowed to be ex drawback at one time, exclusive of the 'free good

Paragraph 213.—"Flavouring essences may be under bond to ship's side, for exportation, in metal canisters holding any quantity, packed in containing not less than 1 bulk-gallon, and the canisters may be of different sizes; but no co of flavouring-essences may consist of less than 2 bu overed with wickerwork, and iron drums, each con- not less than 2 and not more than 10 bulk-gallons, exported uncased."

graph 214.—"Perfumed spirits may be removed bond to a ship's side, for exportation, in bottles any quantity, packed in cases each containing not n 1 bulk-gallon, and a single case may be exported. tles in each internal package in a case must be of size and contain spirits of the same strength."

graph 256.—"When tinctures or medicinal spirits, ng-essences, or perfumed spirits, are exported to of Man, and samples of them have been sent to the nent Laboratory for examination, the abstract of ce to pack (Form No. 111–6) is to be sent by the st direct to the Collector of Customs at Douglas. ncipal of the Laboratory will, without delay, send lt of the analysis of the samples to the Collector at on the notice to pack, to guide him in charging lar duty. The Collector will certify on that docu- the receipt of the goods and to the charging of the duty. He will then forward the notice and the to the Collector of the Inland Revenue Collection ich the goods were removed, in order that drawback vances may be paid in the usual way."

UNITED STATES.

(From the Board of Trade Journal.)

Customs Decisions.

co.—So-called "lentisco," being the ground leaves *stacia lentiscus*, or mastic tree, is not sumac, but is n adulterant for sumac, and is a tanning-bearing of less value than sumac. It is dutiable at the cent. per lb. and 10 per cent. *ad valorem* under h 20 of the Tariff.

rial Preparations.—Mercury sulphocyanate, mer- ate, mercurous nitrate cryst., mercury oxycyanide, ury bichloride are dutiable as chemical compounds agraph 3 of the Tariff at the rate of 25 per cent. *m*, and not as medicinal preparations.

ehyde.—Paraldehyde is not dutiable under the of paragraph 2 of the Tariff, which is limited in ation to perfumeries and toilet waters, nor can it be classed under the provisions of paragraph 3 as l compound. It is a "medicinal preparation," and dutiable under the provisions of paragraph 67 as in the preparation of which alcohol has been used.

nd Chloral Hydrate.—In accordance with a notified in August last, and published in the *Trade Journal* for the 6th September, salol and drate, in the preparation of which alcohol is used, rto been admitted at the rate of 25 per cent. *ad* nder paragraph 68 of the Tariff. The question, has again been raised whether these articles should iable under paragraph 67 of the Tariff, and until shall have been re-determined it has been decided and chloral hydrate, as above, are to be dutiable graph 67 at the rate of "55 cents per pound, and less than 25 per cent. *ad valorem.*

CK ON SUGAR, GLUCOSE, SACCHARIN, &c. IN THE UNITED KINGDOM.

Chem. and Druggist, June 8, 1901.

ard of Customs has issued a General Order drawback and export regulations on sugar and ods exported or deposited for use as ships' stores, d to the Isle of Man. The drawback is not cept upon sugar, molasses, glucose, or saccharin, e gone through a process of manufacture in this The amount of drawback which will be paid on ntaining saccharin or glucose is equal to the duty of the quantity of that article which has been e manufacture or preparation. Full details are to set about drawback claims generally, and the required. As regards examinations and sampling, ose manufactured in the United Kingdom and u drums and other large packages, also glucose in a solid form, will be examined to the extent of 2 per cent. of each parcel; one sample of 8 ozs. is to be taken. Saccharin need not be sampled to the extent of more than 1 oz. In the case of liquids of British manufacture containing sugar or saccharin, such as malt extract, ginger-ale, or like preparations, and sweetened waters (whether aërated or not), the schedule should state the number of bottles of each size and variety, the number of gallons of each kind, and the percentage of dutiable article or articles contained in them. When sweetened condensed milk is presented for drawback, the schedule should specify the number of tins of each description in each case, the net weight per tin, the total net weight per case, and the percentage of refined cane-sugar added.

MONOPOLY DUTIES IN SWITZERLAND ON PRODUCTS MANUFACTURED WITH ALCOHOL.

Bd. of Trade J., June 6, 1901.

With reference to the notice which appeared at p. 194 of the *Board of Trade Journal* for the 25th April last, respecting the Swiss Spirit Law of the 29th June 1900, the Board of Trade have now received a copy of the German official *Nachrichten für Handel und Industrie* for the 16th April last, containing a translation of a notice, issued by the Swiss Customs authorities on the 27th March to the effect that the following new monopoly duties are to be leviable under the Law in question on products manufactured with alcohol.

Tariff No.	Article.	Monopoly Rates per 100 Kilos., Gross Weight.
		Frs. Cts.
13	Iodoform (until further notice).......	Exempt.
14	Salol (until further notice)	"
15	Formic ether, chloroform, acetic ether, nitric acid (until further notice).	"
15	Fusel oil (amylic alcohol) (until further notice).	80 00
15	Fruit ethers...........................	As spirits of superior quality, see below, Nos. 461–3.
20, 21	Pharmaceutical preparations, containing alcohol, so far as they are not intended for the manufacture of brandy and liqueurs, per degree and per 100 kilos., gross weight.	1 05
	Extracts and essences containing alcohol, for the toilet, or for the manufacture of distilled spirits, liqueurs, lemonade, &c., such as "*Alcool de menthe*," "*Bittergeist*," essence of cognac, essence of rum, "*Extrait de menthe*," &c.	As spirits of superior quality, see below, Nos. 461–3.
23, 24	Perfumery and cosmetics containing alcohol, per degree and per 100 kilos., gross weight.	1 05
64	Sulphuric ether (until further notice).	Exempt.
106	Spirit-varnishes and polishes manufactured with non-denatured alcohol, per degree and per 100 kilos., gross weight. N.B.—Spirit varnishes and polishes containing 6 per cent. of their weight and over of shellac or other resins will be considered as denatured and exempted from the monopoly tax.	1 05
375, 376	Vinegar (until further notice).........	Exempt.
377	Fruits preserved in alcohol............	As spirits of superior quality, see below, Nos. 461–3.
379, 395	Juice of fruit or berries prepared with alcohol:	
	(*a*) Containing at most 3·5 per cent., by volume, of alcohol:—	
	(1) Consignments of 50 kilos., gross weight, and upwards, per degree and per 100 kilos., gross weight.	0 80
	(2) Consignments under 50 kilos., gross weight, per degree and per 100 kilos., gross weight.	1 00
	(*b*) Containing more than 3·5 per cent., by volume, of alcohol.	As spirits of superior quality, see below, Nos. 461–3.

Monopoly Duties in Switzerland, &c.—*cont.*

Tariff No.	Article.	Monopoly Rates per 100 Kilos., Gross Weight.
		Frs. Cts.
460	Raw spirit, spirit, spirits of wine, and alcohol. N.B.—The importation of raw spirit, spirit, spirits of wine, and alcohol is a monopoly of the State.	Exempt.
460	Anhydrous alcohol:—	
	(*a*) In quantities over 50 kilos., gross weight, and over.	100 00
	(*b*) In quantities less than 50 kilos. .	125 00
175	Transparent glycerine soap (until further notice).	Exempt.

OFFICIAL NOTICES.

Carriage of Collodion Cotton on Board Ship.

The Board of Trade are advised that for the purposes of the Explosive Substances Act, 1875, Collodion Cotton is defined as follows:—

Collodion Cotton consisting of thoroughly purified nitrocotton (*a*) of which not less than 15 per cent. is soluble in ether and alcohol, and (*b*) which contains not more than 12·3 per cent. of nitrogen.

Where this substance is "used or manufactured with a view to produce a practical effect by explosion," it is by Section 3 of that Act an explosive in any form. But in cases where it is not intended to be used by itself as an explosive, it is not regarded as coming within the meaning of the Act when it is

(*a*) in solution in alcohol and ether,

(*b*) wet, or

(*c*) saturated in methylated spirit and contained in air-tight cases.

In such circumstances it will not be considered as "dangerous goods" within the meaning of Section 446 of the Merchant Shipping Act, 1894.

It is however regarded as an explosive when dry.

Courtenay Boyle,
Secretary,
Walter J. Howell,
Assistant Secretary.

I.—GENERAL.

Chemical Industries of Pernambuco, Brazil.

Foreign Office Annual Series, No. 2591.

Match Factory.—A match factory has closed its doors owing to the stamp tax. This tax lays the obligation on the factory to buy and hold a stock of stamps greatly beyond its financial resources. The mere fact of obliging every box of matches to be sealed with this stamp entails greatly increased cost of the article, for there is no machine yet invented for sticking these stamps on the boxes in the way laid down by the Government; consequently it has to be done by hand. The result is that foreign matches can successfully compete with the home-made article.

Sugar Refinery.—The sugar refinery (the largest in Brazil), which was erected in 1894–95, has proved a failure, although the machinery is of the very best make. The system, however, of refining did not prove suitable for the native markets, or perhaps the venture was over-capitalised by the payment of a large sum for the patent, by disasters while building, and by the lack of sufficient working capital, entailing the borrowing of large sums at high interest, or perhaps technical men were not employed as elsewhere to manage and supervise the different processes of refining. The result is a loss of several thousand contos de reis.

Soap Works.—There are several soap works giving good results, turning out coarse yellow soap, but no toilet kinds.

Gunpowder Factory.—A successful result has been obtained by a Swede (Mr. Lundgren) in his gunpowder factory, which he erected himself in 1894.

Distilleries.—Nearly all the local distilleries have
to grief owing to excessive taxation and prohibitive im
Rum is now produced only in the sugar factories i
interior of the State, and at the time of writing is a
on the market.

Cotton-seed Oil Factories.—Cotton-seed oil fact
which were flourishing five or six years ago, are now c
closed or just barely making headway owing to the fa
able tariff granted to the United States on imported oi

Chemical Imports of Canary Islands.

Foreign Office Annual Series, No. 2605.

Candles.—The United Kingdom still sends nearly a
candles consumed; those from Spain and France are
chiefly for ecclesiastical purposes.

Soap.—The United Kingdom keeps her hold o
monopoly of the soap business, and did a much
trade in 1900 than in the previous year.

Starch.—The United Kingdom has entirely cea
ship starch, and the trade has passed into the ha
Belgian manufacturers, who are now appropriating
of the trade that has hitherto gone to Germany.

Drugs.—The Mother Country has beeen pushi
drug branch of her trade at the expense of the
Kingdom and Germany. The imports in 1900
Spain, 44 tons; the United Kingdom, 26 tons (75 t
1899); and Germany, 3 tons (23 tons in 1899).

Beer.—Germany's lighter beers are still preferred
market, and she sends twice the quantity shipped fr
United Kingdom.

Glassware.—Germany has taken the lead again
glassware business, the cheapness of her wares givi
an advantage over her competitors, Spain, the
Kingdom, France, and Belgium. Belgium, which i
beat Germany in the race for first place, lost mo
half her trade in 1900, while German imports we
than double those of the previous year.

Paper.—There was a considerable improvement
trade in 1900, and most of the new business fell
United Kingdom. Germany still keeps the lead.
and Italy send a little, and Belgium has begun to c

Paint and Varnish.—Imports in 1900 were doub
of 1899. The business is almost all in the hand
United Kingdom.

Cement.—The United Kingdom has lost her
the cement branch of the island trade. French s
however, have been making strenuous efforts to
lost ground, and are now doing nearly as much bu
their Belgian competitors, who have been enabled
freights to overcome all opposition from both the
Kingdom and France. There is always a steady
for this article, and price is the only considerat
buyers.

Chemical Manures.—The chemical manure busi
formerly a monopoly of the United Kingdom, and
holds the greater part of this trade, but France, S
Germany have all begun to send shipments to
increasing demand.

Mention should be made of a few specialities
brought to the islands in important quantities,
being the following:—

Powdered Sulphur.—Powdered sulphur, which
in bags from Sicily and Marseilles, and is used
vines.

Chemicals.—Thousands of tons are sold annuall
and white sulphate of ammonia, superphosphate
superphosphate of lime, ground dried blood, nitrat
and raw nitrate of potash. These are used
manufacture of artificial manures.

Chemical Trade of Sivas, Turkey.

Foreign Office Annual Series, No. 2588

The Vice-Consul expresses the belief that a good
agent at Sivas could secure a good deal of busine
articles as chemicals, drugs, stationery, and possib
and soap.

Chemical Imports of Tangier for 1899.

Foreign Office Annual Series, No. 2603.

ndles.—The trade in candles has remained stationary.
United Kingdom retains her hold on the market in this
e, 3,390 cwts. of the total of 3,576 cwts. having been
ied by British manufacturers. Germany supplied a
ases, some of them having probably been stearine
es of Dutch make.

nent.—There still appears to be no sale for British
ind cement in presence of the competition of the
er though inferior foreign cements; thus, out of
barrels imported, only 30 barrels came from the
d Kingdom.

mical and Drugs.—The principal items included
the heading of chemicals and drugs are potash to
e of 1,182*l.* from Germany and Belgium; saltpetre,
also from Germany; and soda, 400*l.*, principally from
ited Kingdom. Saltpetre, being a monopoly, can only
ported on Government account.

'ches.—British matches meet with little sale in this
y, the cheaper French and Italian small wax matches
preferred.

—A good oil crop, and consequent fall in price of
il of local manufacture, accounts for the compara-
mall amount of cotton-seed oil imported this year
l. worth, as compared to 9,040*l.* in the preceding
Linseed oil was imported to the value of 112*l.*, and
orth of olive oil came from Spain.

sh.—About 90 per cent. of the item "chemicals"
tash for soap manufacture. The other articles of
do not call for any particular notice.

—676*l.* worth of indigo and 324*l.* of cochineal are
cipal items under the head of dyes.

Trade of Bordeaux in 1900.

Foreign Office Annual Series, No. 2612.

rts.—The following remarks apply to the exports of
ted Kingdom only, unless specially mentioned as
e:—

oure oils exported were olive oil, 7,742 cwts.
7,340 cwts. in the previous year; ground nut oil,
wts. against 16,811 cwts. in 1899; practically, no
cotton-seed oil went to the United Kingdom last

was a great increase in exports of resin and
e, the forest owners finding prices for these
nore remunerative than those for pit-wood.

chemical products the principal items exported
estnut and other vegetable tannin extracts,
ts. against 83,960 cwts. in 1899; oxide of zinc,
against 772 cwts.; crystallised acetate of copper,
against 496 cwts.; glycerine, 357 cwts. against
s.; raw tartar, 2,516 cwts. against 2,185 cwts.;
tartar, 35,587 cwts. against 37,832 cwts; and
manures, 1,558 cwts. against 146 cwts. in the
year.

ncipal item under perfumery is that of common
cwts. against 433 cwts. in 1899.

ly item of importance under pottery and porcelain
white porcelain, 56,621 cwts. against 43,705 cwts.
vious year. This article comes from the Havilland
t Limoges.

rts. of common paper formed the principal item
heading against 10,955 cwts. in 1899.

he heading of prepared hides the only items of
4,150 cwts. of tanned goat and sheepskins against
.; other, 1,073 cwts. against 133 cwts.; curried
natural colour, 441 cwts. against 274 cwts.: and
red dressed calfskins, 842 cwts. against 2,112 cwts.

ole of the manganese ore went to the United
in addition to which was sent 3,451 tons of iron
ons of copper ore, 776 tons of zinc ore, and
lead.

Imports.—The following remarks apply exclusively to the trade with the United Kingdom, unless otherwise stated:—

The principal items under fish oils were, whale oil, 464 cwts. against 206 cwts.; cod liver oil, 627 cwts. against 639 cwts.; and other oil, 1,150 cwts. against 468 cwts. in the previous year.

Of oil seeds, 647,788 cwts. came from Senegal.

The amount of cotton oil imported was 9,948 cwt. against 9,802 in 1899.

No chemical wood pulp was imported from the United Kingdom in 1900.

There was again a falling-off in coal-tar, but there were 32,420 cwts. of bitumen imported, against 24,530 cwts. in 1899.

The principal items of importation under iron and steel were cast-iron, containing less than 25 per cent. of manganese, 122,192 cwts., against 87,129 cwts., and tinned-plates, 59,540 cwts., against 25,039 cwts. in the previous year.

The principal item imported under copper was under the heading of "pure or alloyed with zinc or tin; of first fusion, cast in lumps, bars, pigs, or slabs," 1,717 cwts., against 3,069 cwts. in 1899.

The lead imported was chiefly in crude lumps or pigs, 10,148 cwts., against 16,391 cwts. in the previous year.

There was a very great falling off in the importation of chemicals, owing principally to the freedom from disease of the vines. The principal items were bicarbonate of soda, 72 cwts. against 921 cwts. in 1899 and 2,768 cwts. in 1898. Sal ammoniac, raw, 5,858 cwts., against 9,924 cwts.; refined, 3,993 cwts., against 1,511 cwts. in 1899; super-phosphate of lime, 2,687 cwts., against 6,304 cwts. in 1899, and 21,253 cwts. in 1898; chemical manure, 112,188 cwts., against 166,910 cwts. in 1899, and 77,867 cwts. in 1898; creosote, 124,079 cwts., against 367,570 cwts., and sulphate of copper, 217,839 cwts., against 229,192 cwts. in the previous year. The falling-off in the importation of creosote is due to the substitution by the railway companies of sulphate of copper as a preservative for railway sleepers and timber generally. Other items imported were caustic soda, 233 cwts., against 198 cwts.; oxide of lead, 177 cwts., against 345 cwts.; carbonate of magnesia, 34 cwts., against 412 cwts.; chloride of lime, 147 cwts., against 269 cwts.; glycerine, 1,170 cwts., against 1,167 cwts.; sulphate of lime, 746 cwts., against 787 cwts. in the previous year.

The quantity of ground oil paint imported fell off to 191 cwts. from 283 cwts. in 1899 and 751 cwts. in 1898. There does not, however, appear to have arisen a competitor outside France, as nearly all the paint imported came from the United Kingdom.

There was an increase in the importation of coloured washes for wall papers, &c., the amount imported being 445 cwts., against 70 cwts. in 1899. The amount of ink for writing or printing imported was 31 cwts., against 20 cwts. in 1899.

There was a falling-off in all toilet soaps, transparent soap figuring for only 12 cwts., against 123 cwts., and other kinds 21 cwts., against 49 cwts. in 1899.

Of condiments were imported 109 cwts. of mustard and 109 cwts. of others, including sauces. The blacking imported amounted to 87 cwts. out of a total of 98 cwts.

The principal articles of pottery imported were common earthenware, 93,855 cwts., against 71,834 cwts.; varnished or enamelled pottery, 503 cwts., against 169 cwts.; fine earthenware, 107 cwts., against 153 cwts.; and porcelain, 109 cwts., against 80 cwts. in the previous year.

The only item of importance under the heading of glass was 5,026 cwts. of empty bottles, against 6,477 cwts. in 1899.

63. The principal kinds of paper imported were fancy paper, 33 cwts.; other writing paper, 2,168 cwts., against 2,142 cwts.; paper-hangings, 351 cwts., against 228 cwts.; and cardboard, 49 cwts., against 212 cwts. in the previous year.

64. The chief items under prepared hides are tanned or dressed goat, sheep, or lamb skins, 173 cwts., against 315 cwts.; other tanned or dressed skins, 183 cwts., against 327 cwts. in the previous year.

Sulphate of Copper.—About 2,000 tons of sulphate of copper remained over from 1899, and 11,186 tons were imported in 1900, so that the consumption reached about 13,000 tons in all. Of these fully 10,000 tons were used against the cryptogamic diseases of the vine, and the remainder for railway sleepers, telegraph poles, &c.

The syndicate founded in 1899 among the most important British manufacturers of sulphate of copper, renewed their agreement for 1900, and on the strength of this, high prices were asked at the beginning: towards May, however, after finding that manufacturers outside the syndicate had been underselling them, they had to lower their prices, and thus rendered trade most unprofitable to dealers and re-sellers in France.

As the vines were healthy and very little troubled by mildew, proprietors applied only very small doses of sulphate of copper, and were thus saved what has been a very heavy annual tax on their resources. The stock remaining at the end of the year was, however, small.

Brimstone.—The importation of brimstone during 1900 amounted to about 3,700 tons, of which about 2,500 tons were transformed into sublimated and ground sulphur for the treatment of vines. A sudden outbreak of oidium in some vine districts towards May and June cleared off the existing stocks, and rendered trade pretty brisk, although prices, which were a little below those of the previous year, kept steady during the whole season.

Creosote.—The French railway companies did not buy any creosote in 1900, using instead sulphate of copper for the preservation of sleepers. Consequently, the speculators, who bought up all available stocks in anticipation of heavy orders from France, were deceived in their calculations, and a very heavy fall in prices was the result. Creosote continues to be used as an insecticide against the vine disease called "cochenille," and seems to give satisfactory results.

Tanning.—During 1900, tanning maintained its activity, and this industry, although in its infancy here, seems to be developing steadily. The continued rise in raw material has not made the task an easy one for the tanner, who, in the face of a very small stock and defective classing, experienced great difficulties in the conduct of his business. Thanks to good work and the continued rise in prices, the production sold well both at home and abroad.

Manure.—During 1900, the total output of manure from Mazamet was 126,676 cwts., valued at about 22,400*l.*

Turpentine.—In 1900 there was a greatly increased production of turpentine, and stocks are large and probably amount to from 24,000 to 30,000 cwts. Prices rose during the first quarter of 1900 to 98 fr. 45 c. (3*l.* 18*s.*) per 2 cwts. in May, and then fell steadily throughout the year, being 83 fr. 50 c. (3*l.* 6*s.* 9*d.*) in December 1900, and in March 1901, only 77 fr. 10 c. (3*l.* 1*s.* 9*d.*) per 2 cwts. f.o.b., subject to a discount of $3\frac{1}{2}$ per cent. Thus the average price for the 12 months was 86 fr. (3*l.* 8*s.* 10*d.*).

Resin and Pitch.—As in the case of turpentine, there was also a great production of resin and pitch, owing to the rise in prices, but in this case the greater part of the stocks were sold, and of resin especially, hardly any remains on hand.

PAUILLAC.

Coke Ovens.—The works of "La Société des Hauts Fourneaux de Pauillac" includes two blast furnaces, which are estimated to consume 90,000 tons of coke per annum. The coke will be produced on the premises by means of 60 Coppée ovens, and it is proposed to employ for this purpose British coal only. The yearly quantity that will be required is estimated at 110,000 tons. It is calculated that each blast furnace will ensure a daily production of 90 tons of pig-iron and 130 tons of other castings. There is a subordinate factory for the extraction of chemical products from coal. This department is expected to yield 3,000 tons of coal tar and 100 tons of sulphate of ammonia per annum.

Chemical Products.—A manufactory of chemical products near Pauillac is among the projects which have so far taken no practical shape. It may here be menti that there is a large demand for sulphur and sulph copper in the Médoc, and on the opposite side of the for the preservation of vines from cryptogamic di There appears to be some opening at Pauillac for P trade in this direction.

BAYONNE.

Chemicals.—The chemical works of St. Gobain, alt not yet completed, have now started working. Durin past year they received from the United Kin principally from Middlesborough, Birkenhead, and pool, 3,310 tons of phosphates, and recently, 2,25 from Coosau River, United States of America.

A German firm is about to construct works at Na Pau, for the extraction of dye from chestnut wood, is very plentiful in this district, and which has up present always been sent to Nantes.

Manganese Ore.—Although small quantities of ganese ore are annually shipped to Belgium and the Kingdom, the shipments have never reached anythi the proportions expected. The mines are at St. and at Aras; the former send their shipments from P in the Gironde, where they have their depôt.

ITALIAN IMPORTS AND EXPORTS IN 1900.

Foreign Office Annual Series, No. 2,616.

Division.—In the official returns the imports and are divided in four large categories in accordance wi nature:—(1) Raw materials for manufacture; (2 materials for manufactures; (3) manufactured (4) articles of food and drink. The Consul has the same system in analysing the importation and tion of the principal goods, distinguishing thos showed an advance from those that underwent a de

Category 1.

Subjoined are the articles that had a larger im into Italy in 1900:—

Articles.	Value.	
	1900.	Incr
	£	
Medicinal herbs	30,920	
Gum and resin	154,825	
Barks and roots for dyeing purposes.	426,635	
Raw hides	1,731,558	
Cement	570,374	
Non-oleaginous seeds	194,371	
Bones	48,640	
Raw india-rubber	265,314	

Over two-thirds of the gum and resin came United States. Cements came principally fro but of late factories have been started in Ital increasing demand. Non-oleaginous seeds co India and Australia. The United Kingdom on the oleaginous kinds to Italy. The United export of raw india-rubber was 6,983 cwts. out of 13,470 cwts.

The following showed a falling off in import .—

Articles.	Value.	
	1900.	De
	£	
Cinchona	8,832	
Indigo	83,152	

e greater part of cinchona bark now comes from nd. Limited requirements for indigo depressed the

e following showed increased export in 1900:—

Articles.	Value.	
	1900.	Increase over 1899.
	£	£
ls........................	139,987	12,995
y........................	62,064	12,894
r........................	1,897,388	158,912

most important article which seems to be reviving he serious depression recorded in 1896 and 1897 hur. The United Kingdom purchased, in 1899, 3 cwt. The largest customers are, however, the States, which bought, in 1900, 3,262,887 cwt.

following showed decreased export in 1900: —

Articles.	Value.	
	1900.	Decrease under 1899.
	£	£
materials	517,839	17,850
l herbs	111,272	15,560
c., for dyeing............	110,672	25,564
s..........................	864,365	23,642
res.......................	6,090,806	2,005,125
....	100,210	16,463
....	25,495	14,087

t one-third of the mineral ores was shipped to the Kingdom (2,225,868 cwts. in 1900). Since 1896, tity to the United Kingdom has fallen by one-half. which bought of Italy, in 1896, 73,165 cwts., d in 1900, 1,098,314 cwts.

Category 2.

llowing imports showed an increase over 1899.

Articles.	Value.	
	1900.	Increase over 1899.
	£	£
other oils (except olive	602,582	202,990
....	136,833	26,151
....	44,473	7,515
....	125,896	5,929
....	91,808	4,718
soda and potash......	241,957	49,878
soda....	943,929	163,390
....	36,173	12,795
....	271,252	32,275
les.......................	599,551	2,174
copper, steel, bronze ingots, &c.	1,876,444	397,478
l..........................	68,306	14,100
l kinds..................	567,464	51,680

oil exports to Italy, such as cod and others, have creased.

portation of acids, potash, and caustic soda, oxides, ates also increased, but there was a decrease in and nitrate of potash. The latter article, which e supplied in quantity by the United Kingdom, very rapidly since 1896, apparently to the of Central and South America and Germany. r part of the sulphate is provided by the United but the United States of America have tried to nce 1896, so that they have almost trebled their ts of this article to Italy.

One good feature, as far as Italian interests are concerned, is the increased importation of the chemical products recorded above. The increase is very marked, and as these products are intimately connected with local industries and manufactories, the improvement is worth noting.

Charcoal and wood pulp are not supplied by us, and tanned hides only for a small value.

A good portion of the iron, copper, &c., returned in the preceding schedule are provided by us, as may be seen in the list of British imports.

Stearic acid was imported from Holland, Germany, Belgium, Austria-Hungary, and from sundry other countries. Italian orders in Holland and Germany for stearic acid increased in 1900 as well as in the United Kingdom.

The following imports under the second category showed a decrease under 1899.

Articles.	Value.	
	1900.	Decrease under 1899.
	£	£
Nickel, unwrought...............	25,823	1,715
Lead	57,345	6,660
Gold.............................	76,080	14,572

Nickel is almost exclusively supplied by Austria-Hungary and Germany, and lead in bars is chiefly provided by Spain. In 1900 the latter country sent 48,209 cwts. out of an aggregate total of 63,983 cwts. The quantity of lead from the United Kingdom has never been very great and in 1900 it was still less so. The trade of zinc in bars has for many years been in the hands of Germany. Our exportation amounted to 4,579 cwts. in 1896, and in 1900 it was reduced to only 957 cwts. Gold in any shape is not on the British import list.

In the second category straw and esparto exports increased 22,131*l*. to 392,601*l*.

The following exports showed a decrease:—

Articles.	Value.	
	1900.	Decrease as compared with 1899.
	£	£
Olive oil mixed with sulphur.....	39,306	48,682
Volatile oils and extracts.........	356,880	6,417
Sundry acids not specified	147,040	28,198
„ juices..................	161,272	3,648
Barks and roots for dyeing purposes, ground.	201,122	31,905
Charcoal	69,128	20,898
Silver scraps.....................	109,339	28,172

The limited oil production of 1900 explains the reduced exportation of the first two articles in the preceding list. No reason is given for the falling-off in acids and juices, unless it be due to increased absorption on the part of local manufactories. British markets seem to be providing themselves elsewhere with barks and roots, judging from the following figures of the exports to the United Kingdom:—

	Cwts.
1896..	351,133
1897..	319,652
1898..	215,695
1899..	285,190
1900..	184,347

France, which used also to import from Italy large quantities, has, since 1896, reduced her orders to almost one-half.

Category 3.

In the third category (manufactured articles) the following imports increased :—

Articles.	Value.	
	1900.	Increase over 1899.
	£	£
Petroleum	643,181	43,498
Alkaloids	173,398	54,038
Soap and perfumery	63,466	5,562
Paper	75,809	7,029
Mirrors and glassware	42,939	8,880
India-rubber articles	124,802	11,694

The alkaloid trade is chiefly in the hand of Germany. Very small quantities come from United Kingdom and Switzerland.

Soap is chiefly imported from—

Country.	Quantity.	
	1899.	1900.
	Cwts.	Cwts.
France	8,928	9,197
Germany	4,247	5,330
Belgium	1,802	4,371
United Kingdom	3,796	3,918

Compared with former years the importation from the United Kingdom was somewhat larger (4,867 cwts. in 1896). The quantity imported from the three other countries mentioned above has been regularly increasing. British soap is considered here as quite an article of luxury, both on account of its excellent quality and high price, rendered still higher by a duty of 2*l.* sterling per quintal (220 lbs.) Most consumers have recourse to the cheaper brands, and hence the decrease in the British article.

There was a slight advance in the importation of paper. Up to a few years ago British paper was in great request in Italy, but the decrease is due probably to local production. The British system of manufacture has been adopted, and Italy produces close to 2,000,000 cwts. of paper yearly. The number of mills is now 424, employing 15,766 workmen. The mills are distributed all over Italy. In former years France used to supply the best class of hanging paper; but the demand has almost ceased, as the same article is produced here at a smaller cost. An attempt was made to introduce on the Italian markets lincrusta of British origin for wall decoration in lieu of paper, but its price and the duty proved too heavy for the purchasers.

Visitors, however, continue to ask for British note paper, and that is the reason why in the import returns for the United Kingdom in 1898, 1899, and 1900, a certain quantity of it passed the Italian customs.

The following imports showed a decrease :—

Articles.	Value.	
	1900.	Decrease under 1899.
	£	£
Colours and varnishes	563,110	54,375
Articles of nickel	46,127	980
Starch	54,622	12,203

Germany suffered most from the diminished importation of colours. The depression may continue, as attempts are being made to produce locally colours and varnishes. Fairly good imitations of British colours have been made, and their cost less than for the qualities brought from abroad, considering the heavy duty and taxes on d substances containing alcohol.

The following exports in the third category show inc as follows :—

Articles.	Value.	
	1900.	Increas 18
	£	
Matches	120,052	15
Paper	268,378	4

The following showed decrease :—

Articles.	Value.	
	1900.	Decrea 1
	£	
Soap and perfumery	90,712	4
Colours, dyes, varnishes	44,709	7
Candles	21,151	4

Category 4.

In the fourth category the following imports sho increase :—

Articles.	Value.	
	1900.	Incr
	£	
Mineral waters	32,444	74
Beer	95,898	82
Alcohol	60,026	
Olive oil	719,312	1
Cocoa and chocolate	107,728	
Meat extracts	64,022	

Mineral waters chiefly originate from Austria- Germany, and France, and bottled wines almost e from the latter two countries. Wine in casks is from Austria, Spain, Turkish Dominions, &c.; Austria-Hungary, Germany, and Switzerland. T importation of British beer. Alcohol comes from Hungary, Germany, and France.

Of late years the importation of olive oil has rapidly, owing to industrial demands, and also to crops :—

	Gr
1896	69
1897	71
1898	3,57
1899	3,34
1900	3,88

There was an increase of 18,788*l.* in the alcohol to 113,961*l.*; and a decrease of 903,4 export of olive oil to 1,138,120*l.*

II.—FUEL, Etc.

PEAT AS A SUBSTITUTE FOR COAL IN SW

Foreign Office Annual Series, No. 25

H.M. Consul at Stockholm, in a recent repor it is interesting to note that at the Carpalund r is exclusively used as fuel instead of coal; it is the furnaces direct, but first converted into gas in Altogether peat is being extensively experimen Sweden as a substitute for coal.

Both refineries and factories maintain stea keep abreast with the times.

CALCIUM CARBIDE INDUSTRY OF SWEDEN.

Foreign Office Annual Series, No. 2590.

In a recent report to the Foreign Office, H.M. Consul at Stockholm states that the manufacture of calcium carbide, which suits a country like Sweden, with its numerous waterfalls, is greatly increasing.

III.—TAR PRODUCTS, PETROLEUM, Etc.

THE BEAUMONT OIL FIELDS (TEXAS, U.S.A.).

Bd. of Trade J., May 23 *and* 30, 1901.

The centre of the new Texas oil field is 84 miles east of ouston, the largest railroad centre in the State, and 18 iles from Port Arthur, one of the principal seaports on he Gulf coast. The first gusher was struck Jan. 10, 1901, nd at once an enormous stream of oil, the full size of the -inch casing, spouted to a height of over 200 feet, being rced upward by a pressure of over 6,000 lb. to the square ich. The pressure was so great that it was impossible to heck the flow, which continued for 10 days before being rought under control. The flow could not then be easured, but was conservatively estimated at 25,000 rrels a day.

From the information now obtainable, it is evident that e amount of illuminating oil which can be obtained from e Beaumont crude oil will not exceed 20 per cent. of mewhat inferior quality, so it never will enter into serious mpetition with the illuminating oil from the Eastern field. e quantity and quality of the lubricating oil that can be tained has not been fully ascertained, but it is probable at it will produce a large amount of lubricating oil of cellent quality. As it is well known that lubricating oil the most profitable part of refining, this will add very eatly to the value of the Beaumont oil. It is safe to say, wever, that at least 75 per cent. of the production will be fuel oil, and its importance to the South, and, in fact, the ole country, must be considered from that standpoint.

The Beaumont field is almost identical in relative location d geological conditions with the Russian oil fields. The ssian oil is a heavy fuel oil of about 26° B. gravity. The aumont oil is also a heavy fuel oil, and is 23° B. gravity. e Russian oil fields are located near the shore of the spian Sea, and the Beaumont oil fields only a few miles m the Gulf of Mexico. The most productive oil strata the Russian field are found from 1,000 to 1,500 ft. below surface and at practically the same depth below sea el, both of which facts are exactly the same in the Beau- nt field. The Russian wells are entirely through loose l and sand, which is the same in the Beaumont wells. e Russian and Beaumont oils both have an asphalt base l many other characteristics in common. The Russian d now produces over 185,000 barrels a day, and if the t wells can be taken as an indication, the Beaumont field l certainly become even more productive when sufficiently eloped. . . . .

uel oil from the wells in the Beaumont field can be piped he seaboard at Port Arthur and run into tank steamers total cost of production and transportation not exceed- 10 cents a barrel, and 3$\frac{1}{2}$ barrels of oil are equal to one of coal for steam purposes.

he Oil Paint and Drug Reporter of New York says :— the oil itself little need be said, as accurate descriptions ts physical appearance, and also analyses, have already n published. It has been claimed that other grades have n discovered, but these claims have not been proved or firmed. In fact, all sorts of claims are made for the umont oil in the extravagant statements of the company spectuses, but the plain fact is that the oil is fit only for as fuel, and latterly some doubts have been entertained o its value for this purpose, by reason of the large per- age of sulphur contained, which is believed will prove destructive to boiler flues, and every metallic surface which the combustion gases come in contact. Doubt- some valuable products can be made from this oil, but expense of producing them would prove too great. So as it is at present known, the oil is suitable only for manufacture of asphaltum mixtures for paving and other purposes, for application to roads to prevent dust, and for fuel, though, as above noted, its use as fuel may be restricted by reason of its sulphur content. That uses will be found for the product need not be doubted, but until its proper use is established and a market found, the oil has no actual commercial value, and it is idle to speculate as to what the production of any well is really worth.

MINERAL OIL INDUSTRY OF U.S.A.

Bd. of Trade J., June 6, 1901.

The recent oil discoveries in Texas and on the Pacific Coast lend especial interest to some facts just presented by the Treasury Bureau of Statistics regarding the exports of mineral oils from the United States. These show that the exportations of the fiscal year about to end will probably be the largest in the history of the industry which has increased its exports from 204,000,000 galls. of illuminating oil in 1875 to 721,000,000 galls. in 1900. In the quarter century from 1876 to 1900 the total value of mineral oils exported from the United States was about 1,200,000,000 dols., an average of about 48,000,000 dolls. a year; and during recent years it has averaged about 60,000,000 dolls. per annum, or 5,000,000 dols. per month.

One especially interesting feature of the development of the oil industry is that there has been a remarkable decrease in the price to the consumer during the period in which the actual exportations and the net value of the exports have been increasing. The average value of the illuminating oil exported in 1876 was about 15 cents per gallon, and in 1877, an exceptional year, 20 cents per gallon. By 1881 the price had fallen to about 10 cents per gallon, the figures for that year being 332,000,000 galls., valued at 34,000,000 dols. By 1891 the average price was about 7 cents per gallon, the exports of that year having been 564,000,000 galls., valued at 41,000,000 dolls. By 1898 the average export price was about 5 cents per gallon, the quantity exported having been 824,000,000 gals., and the value reported to the Bureau of Statistics by exporters through the Customs collectors 42,922,682 dols. In the nine months of the present fiscal year (ending April 30 last), for which the figures are completed by the Treasury Bureau of Statistics, the total exports of illuminating oil amounted to 569,624,751 galls., valued at 37,939,514 dols., or 6$\frac{2}{3}$ cents per gallon; while the total value of all mineral oils exported, including crude, lubricating, and illuminating oils, naphthas, and residuum was 52,745,096 dols., and for the full fiscal year seems likely to amount to 70,000,000 dolls.

VI.—DYEING, Etc.

TEXTILE DYEING IN PHILADELPHIA.

Foreign Office, Annual Series, No. 2,621.

Textile dyeing forms an important industry in Philadelphia, one-sixth of all the dyeing done in the United States being done there. 90 per cent. of this work is turned out in the mills of Kensington. In addition to the amount of dyeing done in the regular dye-houses, the majority of carpet and rug manufacturers dye their own yarn.

The bulk of the finer dyes are imported from Europe, East India, and South America. The principal dye business is in cotton yarns from the east and south; these yarns are sent to the dyer in hanks and are dyed without disturbing them in any way. Wool and cotton stock also constitute an import feature of this work. Wool stock is sent to be dyed before it is carded or spun. Cotton stock is the raw cotton, which is dyed in the same manner as wool before being spun. Practical dyers make from 10 dols. (2*l.*) to 12 dols. (2*l.* 8*s.*) per week, and assistants from 8 dols. (1*l.* 12*s.*) to 9 dols. (1*l.* 16*s.*). A considerable number of children are employed in the dye-works; the factory law of Pennsylvania prescribes 12 years as the lowest age for child workers, but as a rule there are very few at work under 13 years of age.

There are at present 64 plants in Kensington, employing 3,210 people, paying 2,002,877 dols. (400,575*l.* 8*s.*) in wages, and 2,744,574 dols. (548,914*l.* 16*s.*) for materials, and turning out 6,098,776 dols. (1,219,755*l.* 4*s.*) worth of work.

VIII.—GLASS, POTTERY, AND ENAMELS.

Earthenware at Porto Allegre, Brazil.

Foreign Office, Annual Series, No. 2602.

In the earthenware trade, the bulk of which is in the commoner qualities, such as granite, painted and common chinaware, the United Kingdom has the principal share, but painted and common chinaware from Holland is beginning to compete, and is generally better finished, the material being whiter and the glaze more brilliant. The colours in the painted ware are also brighter and the designs neater, while the shapes in both classes are newer and prettier than in similar British goods, which continue to come in the old designs and shapes, no endeavour being made, apparently, to get out of the beaten track, so that anything in the way of novelty offered by competitors immediately attracts attention. The differences are not great, but they are sufficient.

A kind of porcelain, or half porcelain as it is called, comes chiefly from Germany and Belgium; glassware from Bohemia and Germany. Common glassware—tumblers, lamp chimneys, medicine bottles, &c. — is now little imported, being made locally.

New Products in the Glass Industry.

Scientific American, May 1901.

M. Leon Appert has lately read an interesting paper before the Société des Ingénieurs Civils, relating to the progress of the glass industry as shown at the Paris Exhibition. After describing the different processes of manufacture, he mentions several new products which have lately been brought out. One of these is called glass stone by its inventor, M. Garchey. It has been found that when certain kinds of glass are cooled, and then slowly reheated, a kind of precipitation takes place in the mass. The inventor uses a glass rich in lime, such as bottle-glass, fo this purpose. The glass, cooled to a point somewhat belo fusion, is submitted to a temperature of 1,200° C., and th plastic mass then undergoes a strong pressure by means o powerful hydraulic presses. The piece, after it comes ou of the press, is annealed in the usual way. This product i said to possess remarkable qualities of hardness, inalter ability, and resistance to wear. It is more elastic tha ordinary glass, and is thus much less fragile. Its propertie render it well adapted for paving blocks or tiling, and i may be used to advantage on the outside of buildings. Th author mentions also the "strengthened glass" which ha come into use, this being a flat glass plate containing metallic network in the centre which renders it far superic to ordinary glass as regards solidity and resistance. I case of fire it will stand the highest temperature withou bending. This glass may be obtained in two different way The French process, due to M. Appert, differs from t American, in which the rigid metal network is forced int the glass sheet; in the French process, two separate shee of glass are rolled, and the network is introduced betwe them, the whole being pressed together in the rol Another glass which may be considered as new, althou known for some years past, is that known as "opaline This glass, of a milk-white or greenish hue, has come in use of late for tile-work, and it may in a great many cas replace ordinary tiles at a less cost. The undergrou stations of the Paris Metropolitan are entirely lined wi these "opaline" tiles, which produce an agreeable effe The St. Gobain glass works had an important exhibit opaline glass at the Exhibition. The author mentions al the perforated glass, which facilitates the ventilation dwellings, and thus renders great service from a hygie point of view. Plates of glass for buildings, roofs, &c., now being made of very large size, up to 15 and 18 ft. length, and glass tubes are made as large as 20 ins. diameter.

X.—METALLURGY.

Mineral Production of Great Britain.

Description of Mineral.	1900.				1899.
	Coal Mines Act.	Metalliferous Mines Act.	Quarries.*	Total.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.
Alum shale	1,308	..	..	1,308	5,820
Arsenic	..	4,081	..	4,081	3,829
Arsenical pyrites	..	9,573	..	9,573	13,519
Barytes	..	27,456	2,000	29,456	21,664
Bauxite	..	5,779	..	5,779	8,009
Bog ore	..	..	4,153	4,153	4,321
Chalk	..	10,124	4,363,207	4,373,331	4,678,132
Chert and flint	..	3,721	73,972	77,693	68,834
Clays and shale	3,025,054	111,570	10,913,070	14,049,694	15,064,857
Coal	225,170,163	..	11,137	225,181,300	220,094,781
Copper ore and precipitate	..	9,488	..	9,488	8,319
Fluorspar	..	1,413	35	1,448	783
Gold ore	..	20,802	..	20,802	3,047
Gravel and sand	2,215	27,026	1,807,961	1,837,202	1,771,276
Gypsum	..	152,720	55,318	208,038	212,563
Igneous rocks	..	97,698	4,536,603	4,634,301	4,709,925
Iron ore	7,667,578	1,863,714	4,496,916	14,028,208	11,461,830
„ pyrites	9,078	3,201	..	12,279	12,230
Lead ore	..	31,985	25	32,010	30,999
Limestone (other than chalk)	28,064	589,042	11,287,930	11,905,036	12,342,890
Manganese ore	..	1,362	..	1,362	415
Mica	..	..	..	..	650
Ochre, umber, &c.	..	4,270	10,930	15,200	10,314
Oil shale	2,282,221	..	..	2,282,221	2,210,821
Petroleum	..	..	..	..	5
Phosphate of lime	..	..	620	620	1,44
Rock salt	..	159,860	..	159,860	179,01
Salt from brine	..	..	1,701,487	1,701,487	1,735,88
Sandstone	105,591	258,346	4,655,894	5,019,834	5,212,62
Slate and slate slabs	..	166,695	419,645	586,340	639,84
Sulphate of strontia	..	..	9,121	9,121	12,62
Tin ore (dressed)	..	6,000	800	6,800	6,39
Uranium ore	..	41	..	41	
Wolfram	..	8	1	9	9
Zinc ore	..	24,675	..	24,675	23,13

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* Exclusive of the produce of most of the quarries less than 20 ft. deep, but including the produce of all open workings for iron o ore, ochre, phosphate of lime, sulphate of strontia, and tin ore.

MINERAL PRODUCTION OF ALGERIA.

Nachrichten für Handel und Industrie, Berlin, March 25, 1901.

From 1896 to 1900 the colony of Algeria exported 45,566 tons of minerals, of which 1,136,197 tons were osphates, 2,553.649 tons iron ore, 3,503 tons copper ore, ,391 tons lead, and 135,826 tons zinc. The net results of mineral production in 1900 were 50,000 tons less than the preceding year, as the following table shows :—

Description.	1899.	1900.
	Tons.	Tons.
osphates	281,113	273,500
n	633,304	604,053
per	1,596	24
d	6,217	2,084
	36,952	30,250
Total	959,182	909,911

he decline was important in all branches of the mining duction, but the outlook for the year 1901 is far better n that of 1899. Work will be resumed in the Guerna mines, which have been abandoned since 1893, and umber of projects will be initiated, as new companies powerful capital have been organised. Many large rich mineral deposits in the interior cannot be developed ccount of their distance from the sea and the lack of sportation facilities. The completion of the recently ected railways will have a beneficial effect on the eral industries, and the colony will become of importance ugh its mineral wealth.

MINERAL PRODUCTION OF SPAIN.

Eng. and Mining J., May 18, 1901.

figures for the mineral production of Spain, other than and steel and coal and coke, are given below, collected he *Revista Minera* of Madrid. The figures are all in ic tons.

lver.—The total production of silver in Spain in 1900 94,507 kilos., all of it being obtained by desilverizing except about 3,000 kilos. recovered from the dry ores iendelaencina. In addition 89,355 kilos. were exported rgeatiferous lead. This makes the silver output in a total of 183,862 kilos., against 169,451 kilos. in ; showing an increase of 14,411 kilos.

uicksilver.—The production in 1900 was 32,237 flasks, pared with 39,364 in 1899, showing reduction of 7,127 s, or 18·2 per cent. Of last year's output 30,612 flasks produced by the Almaden mines, 1,125 by the Sociedad rvenir, and 500 by other companies. The falling off entirely in the Almaden product.

pper.—The production of copper-bearing pyrites in the nces of Huelva and Sevilla last year was 2,652,640 tons, compares with 2,521,875 tons in 1899; showing crease of 130,765 tons. Of last year's production ,504 tons were from the Rio Tinto mines, and 449,226 from those of the Tharsis Company. Of copper ores than Pyritic there were mined last year 4,500 tons, of 3,184 tons were from Navarra. The exports of r material were, in metric tons :—

——	1899.	1900.	Changes.
eous pyrites	948,852	1,029,141	I. 80,289
r precipitate	28,444	29,084	I. 640
matte	14,509	19,591	I. 5,082
copper	1,089	1,235	I. 146

total production of copper from Spanish ores las s estimated at 45,000 tons.

d.—The production of lead in Spain is given as s in metric tons.

——	1899.	1900.	Changes.
Lead exported –			
In pigs, bars, &c.	162,131	153,937	D. 8,194
In pipe, &c.	664	544	D. 120
In ores	6,212	3,109	D. 3,103
Lead consumed in Spain	13,500	14,000	I. 500
Totals	182,507	171,590	D. 10,917

The production of white lead, made chiefly in Linares, was 3,000 tons last year. The lead used in making this is included above in the lead consumed.

The lead exported in bars and pigs was as follows, in metric tons :—

——	1899.	1900.	Changes.
Argentiferous lead	68,955	71,492	I. 2,537
Soft lead	93,176	82,445	D. 10,731
Totals	162,131	153,937	D. 8,194

Exports of lead ores in 1900 were 5,181 tons, of which 3,524 tons were argentiferous galena. The total showed a decrease of 5,173 tons from 1899.

Zinc Ore.—The zinc ore mined in 1900 was 87,000 tons, against 119,770 tons in 1900. The exports in 1900 were 41,776 tons blende and 19,423 tons calamine, a total of 61,199 tons. There is only one zinc reduction plant in Spain, the Arnao Works of the Real Compania Asturiana, where 5,784 tons of spelter were made last year. In 1899 the output was 6,328 tons; the decrease in 1900 being 544 tons.

Iron Pyrites. — Exports of pyrites last year were 356,019 tons, against 321,278 tons in 1899, an increase of 32,741 tons. Of these exports, 54,756 tons were ordinary crude pyrites; the balance was from the mines of the province of Huelva, and was the residue left after the copper had been extracted by the wet process.

Manganese Ore.—The manganese ores mined in 1900 reached a total of 131,450 tons, all of which was exported, going chiefly to Germany. The production in 1899 was 139,352 tons, showing a decrease of 7,902 tons last year.

Asphalt.—The output of asphalt in Aleva was 3,261 tons, and in Navarra 443 tons, a total of 3,704 tons, which compares with 2,537 tons in 1899.

Cement.—The production of hydraulic cement last year was 147,831 tons. Nearly all of this was made in Guipuzcoa, Gerona, and Barcelona. The production in 1899 was 169,966 tons, so that the decrease last year was 22,135 tons. There were two works in operation last year making Portland cement, and their output was 20,000 tons.

Salt.—The total production of salt in Spain during the year 1900 was 480,000 tons, against 598,000 tons in 1899. The exports were 205,562 tons, against 326,357 tons in 1899. The decrease of 120,795 tons was due largely to the loss of the colonial trade.

MINING INDUSTRY OF HUELVA, SPAIN.

Foreign Office Annual Series, No. 2592.

Mr. Vice-Consul Ricketts reports as follows :—

An incontestable proof of the actual prosperity of this district is to be found in the Treasury returns for 1900, for, although 1899 was a relatively good year, the tax on mining, the chief and almost the only industry in the province, yielded last year over 50,000*l.* more than in that period. The outlook for copper seems to be as favourable as possible for producers, and, whilst offering inducements for the discovery and opening up of new mines in this neighbourhood, gives increased confidence and encouragement to those who are interested in the older established concerns. A glance at the particulars which are here given with regard to the output of some of the latter, taking into consideration the sustained high price of copper and the favourable rate of exchange (which varied from 29 to 38 per cent. at different periods during the year), cannot be other than satisfactory to all who are aware of the enormous amount of British capital invested in the best of these undertakings, and a perusal of the return of imports from the United Kingdom will show that this is not only an important but a growing market for British trade.

Annex A shows the principal articles of import from the United Kingdom to the port of Huelva during the year 1900. Compared with the previous year, the following show a satisfactory increase:—Cement, coal, coke, naphtha, and manufactured iron and steel. The only items in the list which show an important decrease, on comparison with 1899, are railway material and anchors and chains, but these, of course, are supplied to meet special requirements and are not the object of a continuous steady demand. Rather less tin was imported than in the previous year, but all that was used came from the United Kingdom.

It is worthy of note that 1,245 tons of chemical manures were imported from the United Kingdom last year, and there will probably be a still greater demand in 1901. Another new feature, which has attracted some attention, has been the importation of some cargoes of Jarrah wood railway sleepers from Australia, an experiment which has met with great success.

Annex B deals with the exports to the United Kingdom, but there is nothing special to report in connexion with the same. Cupreous iron pyrites was again the principal article exported to the United Kingdom, and the quantity sent forward amounted to over 500,000 tons, or 10,000 tons in excess of the quantity shipped in 1899.

There was also an increase in the export of sulphate of copper, cork (both in bales and manufactured), copper matte, chestnuts, &c., whilst precipitate of copper, iron pyrites, lead ore, mercury, manganese, oranges and dried figs were in less demand, but not to an appreciable extent, except precipitate of copper.

To account for the slight reduction in the shipments of iron pyrites, it may be mentioned that almost invariably the mines working iron pyrites work also copper pyrites, and with copper at its present price the inducements are much greater to work the latter than the former.

The total extraction of mineral at the Rio Tinto mines during 1900 was 1,985,760 tons, with an average copper content of 2·74 per cent., as compared with 1,701,730 tons (2·72 per cent. copper) during 1899. The overburden removed in 1900 was 1,572,216 cubic yards, bringing the total removed up to 17,500,000 cubic yards.

The following was the distribution of the mineral last year:—

	Tons.
For export ...	781,377
„ smelter	111,250
„ washing in heaps	1,092,133

The exportation of ore during that period was divided as follows:—

	Tons.
Shipped to Great Britain and the Continent ...	554,572
„ United States	226,194

Of the products exported, 20,391 tons were in the form of precipitate (or "cascara,") and 19,344 tons in the form of matte. The sulphate of copper manufactured, and which was divided in about equal parts between Spanish consumption and export, amounted to over 4,000 tons.

The total shipments from this company's pier at Huelva amounted to 820,800 tons in 383 steamers, or an average of 2,143 tons.

The number of hands employed during the year by the Rio Tinto Company was 10,243, and the number of fatal accidents 14, or 1·36 per 1,000. The total mileage of railway is 74 miles main line, 85 miles mine lines with 21 main line and 50 mine line locomotives, and 2,600 ore waggons, in addition to passenger rolling stock. New lines are being constructed to Nerva and Zalamea, chiefly for the use of the company's operatives, who will get very cheap rates.

The new smelting and Bessemerising works, which will have two of the largest-sized copper furnaces ever made, and two large copper converters, for making blister copper, are nearly completed. All the required plant for these new works was obtained from the United States.

The Tharsis mines are reported to have shipped duri the past year some 8,000 tons of precipitate of copp 73,163 tons of washed ore, and 227,486 tons of cuprec iron pyrites.

The Peña de Hierro mine shipped some 50,000 tons copper pyrites ($2\frac{1}{3}$ to $3\frac{1}{2}$ per cent.) during 1900, and tons of precipitate.

Tinto and Santa Rosa shipped 41,384 tons of cuprec pyrites, most of it high grade, but some very poor.

Sotiel Coronada produced 16,000 tons of cupreous pyrit 285 tons of washed ore, and some precipitate.

El Castillo del Buition produced 14,560 tons of i pyrites and a little precipitate.

The San Miguel mines shipped 669 tons of precipitate.

At the Las Herrerias Mine 52,000 tons of pyrites, (ab $1\frac{1}{2}$ per cent. Cu.) were extracted. All this was treated at mines and gave about 1,090 tons of precipitate (82 cent.) all shipped to the Tyne.

The Campanario Mines produced 744 tons of cupre pyrites.

The Societé Francaise des Pyrites de Huelva h completed the railway for the Perrunal Mines, and expo tion will commence in June. The output, in iron pyı especially free from copper, is estimated at 100,000 per annum. This company also exported last year 70, tons of mineral from their old mine "Confessionario," exhausted.

Whilst referring to the taxation on minerals, spe attention is due to the recent legislation on the sub The decision at which the Director-General of Cust lately arrived with regard to the export tax on mineral of vital importance to Huelva as the largest shipping of copper ore in the Peninsula. The whole questic long and involved, but the chief features can be rou sketched as follows:—An export tax of $1\frac{7}{17}d.$ per m ton on iron ore, and of 1*s.* $2\frac{2}{17}d.$ on copper ore was imp in March, 1900. This tax, although much resented by mining interest, worked relatively smoothly at first, produced an enormous revenue, it being always unders that mineral and washed ores, containing so small a centage of copper, as to have no commercial copper were free of the copper tax. Towards the end of 1 however, the Director-General of Customs not only dec to the contrary, but ordered the Customs officials to c full copper dues on all washed ores, and to make the retrospective to all shipments since March, 1900. produced a great outcry, as it was beyond the powe mine owners or merchants to recover the tax after del of the mineral to buyers abroad, and a committe representatives of the principal mines proceeded to Ma and protested with some measure of success against was considered so arbitrary a proceeding.

It has been temporarily agreed, that this arrange will probably soon be confirmed by Royal Decree, that

"All ore under 1 per centum of copper be classed as pyrites.

"Ore declared to the Custom-house to contain 1 per cent. and found to contain more than 1 per cen less than 1·15 per cent. of copper will pay transport export taxes as copper, but will not be subject to fine.

"Ore found to contain more than 1·15 per cer copper will be liable to the fines and penalties which c generally for false declaration, unless so declared."

This applies to crude and to washed ores, and to all ments made since March, 1900, of which the Custom- have samples in Madrid. In future, samples of all ca will be sent to Madrid and there assayed to prov veracity of shippers' declarations.

Manganese.—The export of manganese from thi vince, which in 1899 amounted to no less than 148,41 or nearly 25 per cent. of the world's consumption, back in 1900 to 129,916 tons, or a reduction of 18,50 Of these 129,916 tons, 1,213 tons only were shipped United Kingdom, 2,221 tons to France, and the rem 126,482 tons to Antwerp. Fully three-fourths o quantity may be classed as poor ore averaging 31 to cent. of manganese metal and 28 to 30 per cent. of igh contents of silica render these ores unfit for treat-t of ferromanganese and for fair class iron ore, whilst are found suitable for the "Minette" ores of Luxem-g, which require silica. This circumstance accounts for arge export to Belgium.

e Huelva production for 1901 is likely to again show a g-off, as the manganese formation occurs in limited ficial lodes, which are being fast exhausted, and the quality and, in most cases, the heavy transport charges serious obstacle to the working of new mines at a er distance from the port.

act particulars of the world's production of manganese g 1900 are not available at the time of writing, but the ing table shows part of the European consumption at period and the source of supply :—

	Tons.
Caucasus	325,221
Chile	12,662
India	89,845
Turkey	21,355
Japan	250
Portugal	1,375
France	8,555
Greece	9,061
Brazil	74,910
Australia	5
Java	2,203
Southern Russia	17,313
Asia Minor	1,187
	563,945
Huelva	129,916
Total	693,861

e 693,861 tons must be added the United States tion, the United States home production, and the , Belgian, Swedish, Austro Hungarian, and Russian roduction and consumption; thus the world's con-n of manganese ore for 1900 can be safely computed 00 tons, or an increase of nearly 300,000 tons over umption of the previous year.

Annex A.—Return of Chemical Articles of Import from United Kingdom to the Port of Huelva during 1899–1900.

Articles.	Quantity.		
	1899.	1900.	
	Kilos.	Kilos.	Tons.
Cement	271,891	479,281	471
Coke	12,612,564	13,434,625	13,223
Pitch and tar	831	14,103	14
Mineral oils	81,575	..	..
Naphtha	55,207	147,625	145
Copper	17,172	18,320	18
„ tubes	9,961	8,467	8
Tin ingots	13,117	10,510	10
Copper wire	..	4,234	4
Beer	8,573	4,780	4
Chemical manures	..	1,265,487	1,245

Annex B.—Return of Principal Articles of Export to Great Britain from the Port of Huelva during the Years 1899–1900.

Articles.	Quantity.		
	1899.	1900.	
	Kilos.	Kilos.	Tons.
Cupreous pyrites	521,261,156	533,525,425	523,155
Copper precipitate	30,082,662	27,587,125	27,105
„ matte	14,508,745	19,555,080	19,247
„ sulphate of	24,210	129,147	127
Iron pyrites	66,783,940	39,780,360	39,154
Lead ore	1,092,290	525,380	521
Mercury	820,000	205,000	201
Manganeoe	103,820	..	..

IRON PRODUCTION OF BILBAO, SPAIN.

Foreign Office Annual Series, No. 2598.

The Biscay ores are generally divided into four classes, the vena or campanil, campanil (inferior), rubio (limonite), and siderite or spathic.

The following analysis of Biscay ores has been made :—

—	Spathic.		Vena.	Campanil.	Superior Rubio.	Inferior Rubio.
	Superior.	Inferior.				
of iron	1·400	2·850	81·157	75·357	78·514	72·950
e of iron	52·070	47·300	..	..	..	..
of manganese	1·480	1·100	1·340	2·110	0·900	0·780
copper	..	..	..	..	..	..
lead	..	..	..	..	..	..
	0·170	0·300	1·200	1·840	1·250	1·700
	1·700	1·560	1·310	5·530	0·850	0·500
	0·450	0·870	0·450	1·540	0·550	0·250
acid	0·351	0·675	0·042	0·035	0·058	0·095
ic acid	0·040	0·045	0·035	0·025	0·031	0·055
cid	..	..	..	..	..	..
acid	33·633	32·957	0·100	0·093	0·650	0·850
id	..	..	..	..	..	..
	6·590	8·990	6·210	5·300	7·120	9·750
water	0·480	1·480	0·120	0·700	4·100	6·950
	1·620	1·950	8·150	7·470	6·100	6·100
Total	99·984	100·077	100·114	100·000	100·123	99·980
on	41·474	38·780	56·809	52·746	54·959	51·065
e	0·935	0·695	0·846	1·333	0·568	0·492
s	0·017	0·019	0·015	0·010	0·013	0·024
	0·140	0·270	0·016	0·014	0·025	0·040
cination	32·270	32·480	..	..	..	..
calcined ore	58·100	55·500	..	..	..	..

na is the purest of all the Biscay ores, and was one worked when production was limited to the of local work. The Bessemer process caused o be largely used, but both the vena and campanil ow nearly worked out.

thic iron is found at times in small quantities masses of campanil or rubio, and in "pockets" other minerals, but more generally underneath

The vast proportion of ore now shipped from here consists of rubio.

It has been estimated that the mines in Biscay now being worked, and others which are constantly being opened, can put out 57,000,000 tons before they are exhausted, and those of Santander 10,000,000 tons.

The first attempts at calcination for the utilisation of siderite were made in 1881, but it was not until 1889 that it was resorted to on a large scale. At present there are about 33 kilns which turned out 613,575 tons in 1899.

The treatment of spathic ore by calcination was fully dealt with by Mr. Consul Smith in his report for 1894. The same process is now made use of for the treatment of inferior rubio. It has been found to answer well.

The increasing demand for the rich hematites of Biscay and the exhaustion of the beds also led mine-owners to resort to mechanical means for washing this ore and the contents of their old rubbish heaps. Two systems are in use: 1. The cylinder of open metal work revolving horizontally in a tank, thereby allowing the clay, &c., to dro through; 2. The drum system ending in a cone in whic the ore mounts and the water descends with the dirt. Th mineral comes out clean at the top and falls on a tabl where it is further dealt with. The latter system has bee almost generally adopted, and has given excellent result especially as regards old and formerly valueless rubbi heaps which have turned to good account.

The exports for the last seven years have been follows:—

To—	Quantity.						
	1894.	1895.	1896.	1897.	1898.	1899.	1900.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
United Kingdom	2,806,686	3,006,600	3,572,993	3,167,147	3,060,801	3,966,129	3,101,563
Holland	618,903	586,656	768,795	814,995	830,311	861,669	703,76
Germany	..	4,175	5,229	37,939	11,618	32,821	66,491
Belgium	83,859	121,605	129,037	280,108	154,526	205,953	207,925
France	280,411	209,527	312,370	316,971	285,561	282,109	200,22
Italy	..	964	1,810	..	976	..	..
United States of America	563	17,530	37,160	31,907	3,042	59,657	19,11
Austria-Hungary	..	..	..	..	1,382	..	..
Norway	..	..	..	..	..	4,425	..
Total	3,790,422	4,037,057	4,827,400	4,649,067	4,348,217	5,412,763	4,329,32

The largest shipment came from the Orconera Iron Ore Company, Limited, and amounted to 1,408,199 tons.

Mining Industry of North of Spain.

Bd. of Trade J., May 30, 1901.

H.M. Consul at Corunna, reporting on the mining industry in Spain (Foreign Office Annual Series, 2586), states that the arsenical gold pyrites of his district contain an average of about 20 per cent. arsenic, and from 10 to 16 dwts. of gold to the ton. The mispickel of Cornwall contains no gold, and only 8 per cent. of arsenic, and it is well known that these mines are the most paying and prosperous in Cornwall.

Considering the above figures, it certainly appears, therefore, that the Corunna mines are well worth attention, not only for the gold contained, but even more so for the arsenic. An influential group of Cornish capitalists, largely interested in the arsenic trade, has lately sent out an engineer and mining expert to report on these mines.

The Consul states that the demand from England for an ore as pure as possible from phosphorus has, perhaps, led exporters at Bilbao to cater too much for the British market. It is worthy of note that the German ironworkers make use of highly phosphoric ore, which British ironmasters will not even look at. A case has been quoted in which an engineer of the Government of India railways refused to accept a large supply of rails because the steel was found on testing to contain 0·005 of phosphorus above the usual British specification of 0·06 per cent. In Germany steel rails are made and passed with 0·08 and even 0·10 per cent. of phosphorus. It is contended by some that the British specification of 0·06 per cent. as a standard of purity is too high, and that a rail is perfectly sound and has as long a life with a percentage of phosphorus not exceeding 0·08 as one that has a much lower percentage, provided always that care is taken to regulate other ingredients. If, however, the percentage of 0·08 is exceeded the rail becomes crystalline in structure, and hence brittle and more liable to break. However this may be, the result is that Germans are able to obtain ore in large quantities and cheaper than British traders, and can utilise ore that a British ironmaster will not have at any price.

The Consul is of opinion that, coming as these statements do from a man who has had considerable experience in British foundries, they should not be dismissed without careful examination. Spathic ore and washed ore were both eagerly bought up by German houses and used for years before they were touched by British ironfounders, simple reason being that British makers would not m the necessary changes in their plant.

It is a curious geological fact that the further west mines are from Bilbao, the more phosphoric is the ore. highly phosphoric ore of Galicia practically all goes Germany. A considerable amount of Bilbao capital is beginning to be invested in Galician mines.

The report from the British Vice-Consul at Gijon, st that the advantages to be gained by a close study of mineral wealth of that district, have been commented o previous reports, especially since the question of c minerals has become so acute, and the Vice-Consul wi to impress the importance of becoming more acquai with the undeveloped coalfields, iron, manganese, and deposits of minerals in the province. The coal ar calculated to be 540 square kilos., of which onl insignificant part is being worked, owing to war better facilities for transport and improved accommod for shipment. The iron area is calculated at 145 sq. k of which 14 kilos. alone are being worked.

Iron ore in Asturias gives 40 to 51 per cent. It con a considerable proportion of silica and some sulphu this defect is fully compensated by the abundance o mineral, as there are beds of 5 kilos. long, with layers, some of which present a depth of 10 metres.

Mineral Exports of Milo (Cyclades) in 190

Foreign Office Annual Series, No. 2599.

The principal exports of Milo were mineral pr amounting to 338,267 dr. (8,210*l*.), and consisted of tons of manganese ore, of which 16,050 tons were sl for the United Kingdom, and the remainder to Lau 847 tons of sulphur sent to different Greek ports; pieces of mill-stone to Crete and Greece; 96 tons of of which 80 tons went to the United Kingdon, and okes (37½ cwts.) of gypsum sent to Greece. Th exports show a considerable decrease compared wi preceding year, but for no special reason beyo ordinary fluctuation of trade. The minerals expo the United Kingdom were carried in for British st representing an aggregate of 16,950 gross tonnage.

Mercury Production.

A. Weiskopf. Zeits. f. angew. Chem. 14, 429, 1
(See also p. .)

Mercury occurs in nature as a cinnabar HgS, in co tion with sulphides of copper, silver, and iron. It i sedimentary stone formations in Almaden, in Spain, milarly at Huancaorlia, in Peru, and in Idria; the same ineral occurs between the strata, and also mixed with tumen and earthy deposits. Other important sources are e mines of the Napa Consolidated Quicksilver Mining ompany, at New Almaden, New Idria, Altoona, and Ætna, l in California, where the cinnabar is mixed with serpente, trachite, and basalt, and their adjacent chalk formations. is also found at Kotterback and Dobschau, in Hungary, d at Monte Amiata, in Tuscany, as cinnabar; at Cornaccino and Montebuono as an ore, containing from 0·4 to 2 per cent. of mercury. In Russia, at Nikitowka, in the trict of Bachmunt, a cinnabar is mined which is similar that of Almaden, the ore yielding from 0·6 to 20 per at. of mercury.

The United States of America produced in 1898 31,092 ttles of mercury, worth 1,188,627 dols., and in the year lowing, 638 bottles less, but owing to the market conion the value in the latter year was 264,118 dols. more. e prices in 1899 were the highest since 1890. In uary 1899, mercury was selling in San Francisco at dols. per bottle (76½ lb.) for home use and 37·50 dols. export; but in December the prices had advanced to 50 dols. for home use and 47 dols. for export. During past twenty years all the American quicksilver has e from California. except 65 bottles from Oregon in 7, and Texas during the last year or two has supplied 0 bottles from the Terlingua quicksilver-mining district. Hungary the Rima Muranyer Gewerkschaft, including schau, produce about 1,000 kilos. per annum. The sian output is calculated to be 200,000 pouds of mercury, ud equalling 16·38 kilos. From statistics collected by Metal and Metallurgical Society at Frankfort, it appears the world's production in 1899 was as follows:—

	Tons.
Spain	1,357
United States of America	993
Austria-Hungary	500
Russia	360
Italy	206

e production for the ten years ending 1899 is shown by ollowing table, the figures as to quantities referring to ic tons:—

r.	U.S.A.	Spain.	Austria-Hungary.	Russia.	Italy.	Total.
	796	1,819	542	292	449	3,898
	794	1,790	570	324	330	3,803
	971	1,657	542	343	325	3,838
	1,047	1,665	512	200	373	3,697
	1,056	1,609	519	196	258	3,638
	1,179	1,506	535	434	199	3,835
	1,036	1,524	564	492	186	3,802
	965	1,728	532	617	192	4,034
	1,059	1,691	491	362	173	3,775
	993	1,357	500	360	206	3,416

addition to the sources above named, Mexico, China, , Chile, and Peru also contribute, but the amount t be accurately ascertained.

s in Mexico there is a large number of small mines, give no statistics; but apart from these, the following en the production in metric tons:—

1893	286	1897	294
1894	300	1898	535
1895	213	1899	324
1896	218		

MINING IN LAURIUM AND EUBŒA, GREECE.

Foreign Office Annual Series, No. 2,614.

rium Mines.—The output from the mines was rather he average, and there is a prospect of calamine zinc ng shortly entirely exhausted in this district, although ve works have been carried on to discover new About 10 years ago the output of this ore amounted to 60,000 tons in the year, whereas in 1900 the output fell to 18,500.

The ancient deposits of pit refuse are also being gradually worked out, and the lead foundries of the Greek company have of late not been fully working in consequence. This company has, however, purchased a considerable number of lots in the mines recently discovered in the island of Myconos, and it is expected that the foundries of the company will be well supplied for some years to come by the Caramania lead mines recently purchased by them.

The following are the quantities of marketable ore yielded by the mines all over the district:—

	Tons.
Manganese iron ore	320,245
Hematite iron ore	171,377
Roasted calamine or zinc ore	18,505
Export rich galena	1,552
Arsenic lead smokes	2,260
Speiss	1,832
Total	515,771

In addition to the above, 264,614 tons of raw and dressed lead ore passed through the furnaces, out of which 16,719 tons of pig-lead were produced, containing an average of about 81 ozs. of silver to the ton of lead.

Mining in Eubœa.—Attention should be drawn to the mining operations now carried on in the island of Eubœa. The company called "Petrifite, Limited," which was floated three years ago with a share capital of 12,450,000 dr. (300,000*l.*), the majority of the shareholders being British, has concessions for the extraction of magnesite in the north of the island. During last year 7,500 tons of this mineral were exported by the company, who are augmenting their appliances so as to enable them to increase the output on a a very considerable scale.

The Greek company called the "Société des Travaux Publics" has also concessions and ship annually some 20,000 tons of magnesite.

The green Cippolino marble at the South of Eubœa is being brought out now in larger quantities, as also is that from Tinos, and each of these marbles, more especially the former, is establishing a sound demand.

XII.—OILS, Etc.

CINGHALESE OILS.

Imp. Inst. J., June 1901.

Among the Cinghalese exhibits in the Paris Exhibition of last year were several oils obtained from trees and plants growing wild in that colony. Some of these have a considerable reputation among the natives of India and Ceylon as medicinal agents. With the view of making them better known, the *Tropical Agriculturist* of Ceylon, for March and April 1901, contains brief notes on some of the more important of them.

Duhudu Oil is obtained from *Celastrus paniculatus* belonging to the Natural Order *Celastraceæ*. The seeds of this shrub yield a dark-red pungent oil, which has a tendency to deposit a solid fat when kept. It is taken internally as a nerve stimulant, and is recommended for external application to sores.

Iriya Oil is the product of *Myristica irya* (*Myristicaceæ*), an evergreen shrub. The oil expressed from the bark is commonly applied to cutaneous diseases by the natives.

Wal-dei Oil is extracted from the seeds of *Artocarpus nobilis*, of the Natural Order *Urticaceæ*. The outer shell of the seed when roasted is used as a food-stuff, while the juice obtained from the bark finds application as an insecticide.

Makulu Oil, which is obtained from the seeds of *Hydnocarpus venenata* (*Bixineæ*), a large tree growing generally in the riparian forests, is of the consistency of soft butter. It is known in South India as *Thertay oil*, and is recommended as a valuable substitute for *Chalmugra oil* in the treatment of leprosy.

Divikaduru Oil, expressed from the seeds of *Tabernæmontana dichotoma*, of the Natural Order *Apocynaceæ*, frequently known as the "forbidden fruit" and "Eve's apple." The oil is used in native embrocations.

Madol Oil, the product of *Garcinae echinocarpa* (*Guttiferæ*). The seeds yield a thick oil, which can be used in lamps for burning. It is also used medicinally as a vermifuge.

Doruna Oil is obtained from the wood of *Dipterocarpus glandulosus* (*Dipterocarpaceæ*). It is a dark-coloured resinous oil. Like the *Makulu oil*, it is used in the treatment of leprosy, and as a substitute for gurjun balsam, derived from an allied species of plant. It forms a good varnish when mixed with Hal resin, and a red lacquer with vermilion.

Me Oil is yielded on crushing the seeds of *Bassia longifolia*, belonging to the Natural Order *Sapotaceæ*. It solidifies on standing, and is applied externally in the treatment of skin diseases. The residual cake, known as "Arappo," is exported to the Indian coast.

Kekuna Oil, sometimes known as candle-nut oil, is obtained from the seeds of *Aleurites tribola* (*Euphorbiaceæ*). It is suitable for soap-making and cloth-dressing. It resembles and is an efficient substitute for linseed oil in mixing paints. The yield of oil from the seeds is about 50 per cent. The roasted nut forms an agreeable food.

Domba Oil is obtained from the nuts of *Calophyllum inophyllum* (*Guttiferæ*), sometimes known as the Alexandrian laurel, a moderate-sized tree, growing generally by the sea coast. The yield of oil from the nuts, which are sometimes exported to India, is considerable, averaging up to 60 per cent. The oil is chiefly used as an embrocation for rheumatism and for burning. Domba oil is sold in Burma at four times the Calcutta price of castor oil, which it resembles.

Mr. L. Field, in reporting on Me oil, Kekuna oil, and Domba oil, predicts a considerable demand for them, if they can be supplied cheaply.

Margosa or *Kohomba Oil*, the product of *Asadriachta indica* (*Meliaceæ*), is an antiseptic, and as such is used as a cattle medicine. It is also applied externally for rheumatism. Unfortunately, it has a very objectionable odour, which may prevent its more extended use.

Kon Oil.—This oil, which is clear and quite liquid, is used for illuminating purposes, and in culinary operations. It is the product of *Schleicheria trijuga*, belonging to the Natural Order *Sapindacuceæ*, and is reported to have been introduced into German commerce under the name of Macassar oil.

MARKET FOR SOAP IN SPAIN.

Chem. and Druggist, June 1, 1901.

The American Consul-General at Barcelona states that the manufacture of soap in Spain has greatly increased during late years, the large exports of Cuba having fostered this industry, and enabled it to acquire an importance that but for that outlet it would never have reached. Especially was this the case before the loss of the colonies, for in 1897 Spain exported 7,045 tons to her dependencies, and only 112 tons to other countries. During 1900 the exports amounted to 6,107 tons, while those for the first two months of this year reached 1,792 tons. In the province of Barcelona alone there are over 100 soap factories. Cocoanut oil forms one of the principal ingredients of the soap made in Barcelona, the cocoanuts or copra being brought from the Pacific Islands, and crushed at the oil mills. Vegetable oils were formerly imported, but, owing to the high protective duties new levied on them, the principal firm in the Spanish trade found it necessary to cross the frontier and erect a mill at Barcelona, in order to compete with the local oil-crushers. Caustic soda of 60° strength is imported from England; the present price is 23.65f. per 100 kilos. c.i.f. Barcelona. The price at which the common yellow soap is sold for export is equal to about $1\frac{1}{2}$*d.* per lb. delivered f.o.b. at Barcelona.

BEAN OIL AND CAKE AT SWATOW, CHINA.

Foreign Office Annual Series, No. 2620.

To the Swatow farmer the supply of cheap beancake is of the first importance. With no system of rotation in the cultivation of his land, and raising crop after crop of sugar cane on the same fields, the soil soon becomes exhausted and artificial manures necessary. In this connexion beancake has been found to meet the farmer's requirements and the nature of the soil; it is an excellent fertiliser, besides being both cheap and plentiful.

Locally, the import of beans furnishes a new industry to Swatow in extracting and manufacturing bean oil. In addition to ordinary hand-presses there are now steam mill in full operation, with the result that, after satisfying th heavy local demands, 43,250 cwts. were shipped to Hong Kong, valued at 48,276*l.*, which in 1900 reached 59,868 cwts valued at 73,569*l.*

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

QUEBRACHO EXPORTS FROM BUENOS AYRES.

Foreign Office Annual Series, No. 2615.

Quebracho Colorado (red quebracho) is a hard wo which has been used with success in the tanneries Europe for some eight or ten years past and is now comi into use in the United States of North America.

The following figures show the export of quebracho wo from the Argentine Republic during the last nine yea viz.:—

	Tons.
1892	29,700
1895	155,000
1900	225,000

The quebracho tree, known to exporters as Gran Cha quality, is found in a large belt of forest which commen at the Fives Lille Station in the province of Sante Fé, a runs due north to the 26th parallel of latitude. This b of quebracho forest is about 15 to 20 miles in width and situated on the west bank of the River Paraná at distance of several miles from this river. The larg works are at Calchaqui, Guampita, Espin, Vera, Colme Garaboto, Golondrina, and other stations on the line f railway recently purchased by a French company from Sante Fé Government.

Quebracho Colorado is also found in Corrientes and interior provinces of the Argentine Republic, but it cont a smaller percentage of tannin than the Gran Chaco w and is therefore not exported, but a ready sale is found it in the Argentine Republic for railway sleepers, for wharves and bridges and for rafters of buildings.

The Gran Chaco wood, exported for tanning purpo is shipped in the form of logs from which the bark sap-wood have been pealed

The best Gran Chaco wood gives the leather a clear l yellow tint and considerably increases its weight. V good results are obtained by mixing quebracho hemlock, oak, gambier, and other tanning materials, the expense of tanning sole leather is thereby reduced.

Herr Eduard Muller in his pamphlet on the subject g the following

Comparative Analysis.

	Tannic Aci Per Cent.
Quebracho wood from the Gran Chaco	22—28
Empedrado	18—20
Santiago del Estero	10—17

The specific weight of the poorer kinds of queb wood is about 20 to 30 per cent. less than that of queb from the Gran Chaco.

For some years the quebracho forests have been w in a primitive manner, but lately two factories fo manufacture of extract of quebracho have been erect the Argentine Republic with German capital, and B ench, and North American companies are now sidering the advisability of putting up similar factories a large scale.

The principal port for the shipment of Gran Chaco ebracho is that of Colastiné in the province of Santa Fé. The value of quebracho sleepers exported in 1900 ounted to 47,000*l.*; in 1899, to 3,000*l.*; of quebracho ract in 1900, to 119,200*l.*; in 1899, to 63,400*l.*; of ebracho logs in 1900, to 479,600*l.*; in 1899, to 318,800*l.*

XV.—MANURES, Etc.

THE PHOSPHATES OF CHRISTMAS ISLAND.

Bd. of Trade J., May 30, 1901 (*see also this Journal*, 1901, 167 *and* 405).

he report for 1900 on Christmas Island, recently issued the Colonial Office, says that two kinds of phosphate found on the island, lump phosphate and granulated sphate, and it is understood that the latter is slightly more valuable of the two. Granulated phosphate has appearance of coarse white sand, and so far none has shipped, as it cannot be handled with the plant now se.

large number of narrow pits have been dug, and the ntity of phosphate discovered is enormous. In some s at a depth of 40 feet the bottom of the deposits has yet been reached.

give some idea of the amount of phosphate, details appended of seven pits sunk in a row across the mit of Phosphate Hill at intervals of 60 yards:—

t 1.—Lump phosphate from surface to 6 feet.
    Granular phosphate from 6 feet to 11 feet.
2.—Lump phosphate from surface to 2 feet.
    Granular phosphate from 3 feet to 26 feet.
3.—Lump phosphate from surface to 22 feet.
    Granular phosphate from 23 feet to 36 feet, and limestone not yet reached.
4.—Lump phosphate from surface to 13 feet.
    Granular phosphate from 13 feet to 22 feet, and limestone not yet reached.
5.—Lump phosphate from surface to 12 feet.
    Granular phosphate from 12 feet to 24 feet.
6.—Lump phosphate from surface to 7 feet.
    Granular phosphate from 7 feet to 11 feet.
7.—Lump phosphate from surface to 6 feet.
    Granular phosphate none.

a depth of 3 feet the lump phosphate can be picked and will not need washing. For the next 7 feet ing will probably be advisable, although not necessary. r that depth washing will be necessary until the lar phosphate is reached. This will never require ug, and can be exported in bulk in its present tion.

is understood that the latest estimate of the amount osphate on Phosphate Hill is 12,000,000 tons.

prospecting has been done in other parts of the , but it is known that phosphate exists at Murray s it was from there that the original samples were Even in the unlikely event of phosphate in paying ities not being found in other parts of the island, it is t that sufficient has already been discovered to give yment to the Christmas Island Phosphate Company very considerable period.

quantity of phosphate said to be shipped from the from November 1899 to October 1900 amounted to tons, and it is estimated that 175,000 tons will be d in 1901.

XVI.—SUGAR.

SUGAR INDUSTRY OF PERNAMBUCO, BRAZIL.

Foreign Office Annual Series, No. 2591.

sugar industry, which has thrived for several conve years, appears to be about to pass through as a crisis as has been experienced in British Guiana, est Indian Islands, and elsewhere. Nor will the of Cuba to the field of competition in the production e sugar make matters easier for the Brazilian sugar s of this and neighbouring states.

Diffusion.—In the 1894 report on the trade of Pernambuco, mention was made of the system of extracting the juice of the cane by diffusion. The factory mentioned (Cucaú) was then, and is still, the only one that has tried the system of diffusion. From a commercial point of view it has proved a terrible failure, and the company has become bankrupt, after expending some 9,000,000 milreis, or at 9*d.* exchange, which is taken as the average at which gold has been expended on it, over 300,000*l.*

Although this money includes the cost of a narrow-gauge railway some 44 miles long, with nine locomotives and sufficient rolling stock, yet the value of the whole concern could not be estimated at more than 100,000*l.* But this does not prove that the diffusion process is a failure in Brazil, and the consul is inclined to modify his views in this respect. He finds that the question of fuel, which he thought so vital, is partly solved in the present case by the long distance traversed by the railway, and, therefore, the wood fuel can be procured from far or near to the factory with practically little difference to the cost. Also, he finds that four boilers are fed with the megass and only two burn wood, instead of three with megass and three with wood, which makes a large difference in the calculation of cost of production. The process of diffusion is continuous, and if the diffusers are stopped through lack of cane, breakdowns, holidays, or any other cause, the juice commences to invert and the loss is very considerable, as the diffusers hold about 87 tons of cane; but this difficulty has not produced such ill effects as expected. Of course, in diffusion, a great deal more water has to be evaporated than by the crushing process, as about 30 per cent. of water is added to the cane in the diffusers, and this entails larger clarifiers, eliminators, and vacuum pans. The juice, already heated in the diffusers, commences boiling at a density of about 6° Beaumé, as compared with the juice from the cane by crushing at about 10 Beaumé. But on the whole the extra amount of sugar obtained, amounting to about 2 per cent. more than by the crushing process, may compensate for the extra initial expenditure on machinery and extra cost of manufacture.

Vast sums have been expended on improved machinery, but nothing whatever has been attempted in agricultural interests. No experiments have been made to improve the quality of the cane, or to discover new varieties, by planting from the seed and selecting the strongest and healthiest canes. No scientific examination and analysis of the various soils are attempted, and nothing has been done in the way of fertilising the impoverished fields.

SUGAR INDUSTRY OF BOHEMIA.

Foreign Office Miscellaneous Series, No. 554.

Various attempts to produce sugar from the maple tree were made in Bohemia during the early years of the last century which led, however, to no commercial result.

In 1831 the first factory for producing sugar from beetroot was erected by permission of Prince Thurn and Taxis at Dobrowitz, others followed in rapid succession, and in the year 1836 factories were working at Smidar, Schlan, Sadska, Peček, Neuhof, Libesnie, Vysoean, and other places.

The sugar industry to day is the most important in the Dual Monarchy, and especially so in Bohemia, which alone produces nearly half of the total amount manufactured in Austria-Hungary. There are in all 213 raw sugar factories in work, of which Bohemia has 130.

The methods employed in the raw sugar factories are the "Robert" system, with triple saturation and mechanical filtration. In 1885 the factories of Podebrad and Nimburg were the first to adopt lime and carbonic acid as means for filtration, which is now universally used instead of the expensive spodium process. The beetroots are conveyed from the yard to the factory by means of water channels into which they are thrown and by which much labour is saved; nearly all the factories are built where there is an abundance of water and in close proximity to the lines of railway.

The factories vary in size from those built with a capacity of dealing with 200 tons of beet daily (24 hours) to that of the largest at Laun, which can work 1,100 tons. The greater number are constructed with a capacity of from 400 to 800 tons daily. The working expenses in a raw sugar factory, here known as the "Regie," under the most favourable circumstances, are about 3*d.* per cwt. of beet, the average work at from 3*d.* to 5*d.*, and in small factories at 7*d.* per cwt. of beetroot. The refuse beet is sold to the farmers for cattle food, and is therefore an important by-product.

The sugar refining industry has reached a high state of perfection. There are in Bohemia 20 refineries which not only can refine the whole of their own raw sugar, but also a portion of the Moravian. The largest refineries are capable of refining on an average about 70,000 tons of raw sugar each per annum, and are at Schönpriesen, Aussig, and Nestomitz, on the northern frontier, and Skrschivan in the east.

The natural advantages for the cultivation of beet, with an abundance of coal and water, give to Bohemia its prominent position in the sugar industry, and its ready means of water transport to Hamburg as well as by railway makes it by far the most important in Austria-Hungary.

The sugar produced in Austria-Hungary was :—

Year.	Quantity.	Refined.
	Tons.	Tons.
1898—1899	1,041,768	871,108
1899—1900	1,098,546	841,965

In Bohemia :—

Year.	Quantity.	Refined.
	Tons.	Tons.
1898—1899	494,283	433,018
1899—1900	551,338	426,116

The sugar exported from Austria-Hungary was :—

Year.	Quantity.	Refined.
	Tons.	Tons.
1898—1899	140,270	519,873
1899—1900	134,013	516,016

From Bohemia :—

Year.	Quantity.	Refined.
	Tons.	Tons.
1898—1899	80,997	285,872
1899—1900	76,746	292,028

The total amount of molasses produced in Austria-Hungary in 1899-1900 was 252,696 tons, of which Bohemia gave 115,655 tons. The export of this article is trifling, being in all only 264 tons; it is principally used locally for the manufacture of spirits.

The total export of sugar from Austria-Hungary to the United Kingdom during the campaign, 1899-1900, was :—Raw sugar, with average polarisation of 90° and under 99°·3, 92,051 tons; refined, with average of 99°·3, 221,809 tons. There was also exported to Hamburg, 27,766 tons of raw and 23,219 tons of refined sugar, a large proportion of which also went to the United Kingdom, statistics of which I could not obtain.

The total amount of sugar produced for the present campaign in Austria-Hungary was: raw, 1,063,000 tons, a falling-off on the previous 1899-1900 campaign of about 35,000 tons. The production of Bohemia was 495,000 tons, as against 551,338 tons in 1899-1900.

The export from Austria-Hungary for the first eight months of the present campaign, that is to March 31, 1901, was: refined, 280,329 tons; refined, eight months, 1899-1900, 342,094 tons; raw, 44,224 tons; raw, eight months, 1899-1900, 63,114 tons. From Bohemia: refined, 172 tons; refined, eight months, 1899-1900, 146,685 t raw, 13,354 tons; raw, eight months, 1899-1900, 36 tons; the increase in the export of refined sugar this being very marked and due in a very great degree t increased imports into the United Kingdom, w imported from 1st April to 13th April 1901, no less 137,756 tons, of which 81,164 tons was refined, as ag a total of 56,285 tons during the same period of 190 which 33,753 tons was refined.

The greater portion of the sugar exported from Boh goes to the United Kingdom.

XVII.—BREWING, WINES, SPIRITS

Arsenic in Beer.

Report of the Manchester Brewers' Association's Commission.

Drs. Lauder Brunton and Thomas Stevenson, M Gordon Salamon, Dr. Luff, Mr. S. Buckley, Mr. Fletcher Moulton, K.C., were appointed by the chester Brewers' Central Association a commissi inquire into the causes of the beer poisoning which oc some time ago. Their final report, which was sign all the members, states that in all 663 samples hav analysed. The manner in which the brewers carri the previous recommendations made by the comm resulted in the beer brewed in Manchester being soo from arsenic, and analyses of recent date prove Manchester beer is now as pure as any produced United Kingdom in respect of its freedom from a In the preliminary remarks it is stated :—

"The analyses and investigations that we have prove, finally and conclusively, that the presence of in injurious quantities in the Manchester beer wa cases due to the sugars manufactured by Messrs. B and Co. (Limited), and that such sugars derived contamination exclusively from the employment i manufacture of arsenicated sulphuric acid, suppl Messrs. Nicholson and Co. (Limited), of Leeds other cause of contamination to which the prese arsenic in the observed quantities can be attribut been discovered by us, nor is one believed to hav possible."

Notwithstanding that brewing from Bostock's sug discontinued on December 1, 1900, arsenic continu found in smaller quantities in brewings in Manches elsewhere, and this has caused a prolongation inquiry, for the commissioners say, "Although these of arsensic in beer (of which the presence was quite unsuspected) cannot be said to be directly poi and are, perhaps, not even injurious to the human it is extremely desirable that they should be elimina be possible."

Proceeding to give details and results of their ana beers, the commissioners say :—

"One hundred and sixty samples of beer hav analysed by us for the purpose of this inquiry. samples were collected from all parts of the between November 22, 1900, and the end of Fe 1901, the largest proportion, however, being deriv Manchester and the surrounding districts. O 160 samples, 84 were found to be quite free from when examined by the Reinsch test. The re 76 samples were found to contain arsenic in ranging from 1-10th of a grain to 1-100th of a g gallon of beer. Of the 76 samples found to contain 53 were traced to have been brewed with Bostock and represented brewings previous to December Of these 53 samples, 27 contained more than 1-5 grain of arsenic per gallon, a quantity which regarded as dangerous. Of these 53 samples, brewed in Manchester and district, and 16 were from other parts of the country where Bostock had been used. The remaining 23 samples, wh not brewed from Bostock's sugar, were found to quantities of arsenic ranging from 1-30th to 1-4 grain per gallon of beer. Of these, 21 contained 1-70th of a grain per gallon. In our opinion th ıll quantities were, in every case, derived from the lt. The sample containing approximately 1-30th grain gallon was clearly proved to be in all malt beer. Such was the case in respect of a sample containing roximately 1-70th grain per gallon."

he report goes on to state the result of the examination materials used in brewing. One hundred and thirty ıples of brewing sugars were analysed, made up as ɔws:—Glucose, 63; invert sugar, 53; raw and purified ır, 11; and caramels, 3.

Eight samples of glucose were proved to have been le by Messrs. Bostock and Co. (Limited), and were ɔably delivered to breweries between September and ember, 1900. All contained arsenic in quantities ging from 0·027 per cent. to 0·075 per cent. The aining 55 samples were independently obtained from ding sugar factories, merchants, agents, brokers, and eries, and represented normal output and deliveries, British and foreign, of all such goods employed in ing in this country. Of these 55 samples, five were rtained to have been made by different makers previous ıe contamination of Manchester beer by arsenic. They found to be free from arsenic, with the exception of which contained an infinitesimal quantity, approxily about 1-600th of a grain per pound. The employt of even so large a proportion as 20 per cent. of this r glucose for brewing purposes would have introduced nount of arsenic into beer almost incapable of detection ertainly negligible. The remaining 50 samples were und to be free from arsenic by the Reinsch test. Six les were made by Messrs. Bostock and Co. (Limited), vere probably delivered into breweries between Septemınd November, 1900. These samples all contained ıe ranging in amounts from 0·021 per cent. to 0·067 ent. The remaining 47 samples represented every n manufacture, and were independently obtained, as case of the samples of glucose. Of these, five were ained to have been manufactured previous to the tion of arsenic in Manchester beer. These five s were all found to be free from arsenic by the ch test. The remaining 42 samples were also found free from arsenic by the Reinsch test."

to other materials, the commissioners report that raw urified sugars, caramels and malt adjuncts, such as made from rice, maize, sago flower, tapioca flower, orrified barley, were all free from arsenic. In the f hops, again, 11 typical samples were analysed, and ınd to be free from arsenic.

evertheless, there exists the possibility of minute ities of arsenic being present in hops, and we are that such traces have been found to exist in hops by ts of authority. It is conceivable, but extremely bable, that they are introduced with the sulphur yed when the hops are upon the poles, but they are more likely to be derived from the fuel and brimstone yed for kilning operations in the oast houses. The ty of arsenic thereby introduced into beer must in se be infinitesimal."

orting on preservatives, water-hardening materials ings, the Commission found an infinitesimal quantity nic in the former group, owing to gross negligence in acture, but in the samples submitted of finings for ing beer, there was no trace of arsenic. As to yeast y:—

ıeteen samples of yeast produced in Manchester ies at or about the time of the outbreak were ed to analysis. Of these, 10 contained arsenic in ies ranging approximately from 1-4th grain to 1-200th er pound of pressed yeast. Analyses made during ry last proved that the Manchester yeast had been rom arsenic, and may to-day be regarded as quite This statement applies even to those breweries in ster in which Bostock's sugars had previously been ed. The interesting discovery has been made that, nic be present in worts, yeast will take up a very rable portion of it. It would be rash to hazard the on as to whether this is due to mere mechanical ion, or to any physiological or chemico-physiological ns between the arsenic and the yeast. The fact remains, however, that in a brewery in which only minute quantities of arsenic are to be found in the brewing materials, much more definite quantities of arsenic are to be found in the yeast."

Dealing next with 11 samples of barley, the commissioners report that five samples of the 11 contained minute quantities of arsenic, while one of unkilned barley contained approximately 1-400th of a grain of arsenic per pound. The remaining 10 were entirely free. From the results of the tests applied, the report says there can be no doubt that barley is liable to take up very minute quantities of arsenic when grown upon land manured with arsenicated fertilisers.

As to malt, 138 samples were examined. Of these, 97 were free from arsenic, and in the remainder it was found in quantities, varying from 1-39th of a grain per lb. to 1-300th of a grain. The samples which contained arsenic were mainly derived from maltings in the Midlands and the Northern counties, while those from the Southern and Eastern counties were entirely free. "The malt containing these traces of arsenic when brewed would, in all probability, impart only a minute quantity of arsenic to the beer, having regard to the removal of arsenic effected by yeast, and it is probable that such traces have existed for many years past. There can, however, be no doubt that it is quite practicable wholly to avoid this contamination, and no better evidence could be given in support of this statement than by reference to the malts supplied to-day to the breweries in and around Manchester, which are remarkably free from arsenic."

The importance of thoroughly examining this arsenical contamination led the commissioners to examine two products of the malting process not used in brewing, namely, malt culms and kiln dust, as well as the coal and coke used in malting. As to malt culms, they found cases where the malt was free from arsenic, yet the culms from the same malt were contaminated, while, in the case of 20 samples of kiln dust, 18 contained arsenic, in seven of them as much as 1 grain to 2 grains of arsenic per lb. being discovered. Arsenic was also found in minute quantities in the coal and coke used for malting.

Then follows a long list of recommendations, foremost among them being advice to brewers to make it a rule to require a written guarantee of freedom from arsenic with all purchases of brewing materials of every kind. The commissioners add:—Summing up the above results, it is clear that the most frequent source of arsenical contamination in beer is the use of malt which has been kiln-dried or malted with improper fuel containing arsenic. At the same time, the experience of the late outbreak has shown that precautions must be taken against the presence of arsenic in brewing sugars and other materials (except, perhaps, malt adjuncts), on account of the serious consequences of any carelessness in manufacture which might introduce arsenic. Notwithstanding the absence of arsenic in the samples of caramel which have been examined by us, it cannot be denied that the method of manufacture of caramel, and the fact that it is employed for imparting colour to beer (as well as spirits, sauces, and many other foodstuffs), admits of the possibility, though remote, of the introduction of arsenic in very small quantities in beer, and, therefore, although the amount of arsenic that could be so introduced would be infinitesmal, the brewer is recommended to obtain from the manufacturer a guarantee that the caramel has been tested and found to be free from arsenic."

In the case of hops the brewer should demand that the hop merchant should obtain from the factor, who in turn would obtain it from the grower, a guarantee that none but the purest "flowers" were used upon the poles, and that the fuel and brimstone employed for drying were free from arsenic. As to malt:—"Our investigations have shown that the contamination of malt culms and kiln dust is chiefly due to the use of coke, and especially of gas coke. Inquiries made of the principal maltsters in England have elicited the practically unanimous opinion that there is no necessity whatever to employ gas coke in the preparation of malt. Nor, indeed, is there any real necessity to employ coke at all for purposes of malting. If the use of coke were dispensed with, a good many malt kilns would have to be structurally modified, but the brewer would not fail to appreciate the benefit of such alterations."

As regards the testing of beer for arsenic, the report goes on to say:—

We have now examined all the possible sources of arsenic in beer, and have pointed out the precautions necessary in each case. If such precautions be taken we believe that the beer will be brewed free from arsenic, and at no substantial increase of cost. And in view of the desire of the brewers that the beer supplied to the public should be free from all suspicion of containing arsenic, we recommend that the following should in future be adopted as the standard test and should be regularly applied. It is more stringent than the one recommended in our former report, but it is not too delicate for the standard of purity to which, in our opinion, the beer should attain.

This test (Reinsch) should be performed as follows:—

Take 200 c.c. of the beer in a porcelain evaporating dish, acidulate with 1 c.c. of pure concentrated hydrochloric acid, and evaporate till the volume of liquid is reduced to one-half. Then add a further 15 c.c. of the hydrochloric acid and insert a piece of pure burnished copper foil, a quarter of an inch by half an inch in size, and keep the solution gently simmering for an hour, replacing the evaporated liquid from time to time by distilled water. If at the end of an hour the copper remains bright and red, the beer is arsenic-free.

If a deposit is obtained on the copper, the foil should be removed, washed successively with water, alcohol, and ether, dried at a temperature not exceeding 100° C., and subjected to slow sublimation in a thin reduction tube, not less than two inches long and having an internal diameter of 0·15 inch, the upper portion of which should be warmed before the sublimation begins. For the purpose of the sublimation a small spirit-lamp flame should be used. If any sublimate is obtained, it must be examined under a magnifying power of about 200 diameters. Any sublimate which does not show well-marked octahedral or tetrahedral crystals is not to be considered arsenical. Mere blackening of the copper, or deposit thereon, does not demonstrate the presence of arsenic.

The addition of oxidising agents to decompose sulphites, and the use of reducing agents to decompose possible arsenates, is not recommended, as such a procedure is, in our opinion, unnecessary in the testing of beer, and introduces sources of error.

In all cases where the presence of arsenic is ascertained by this test, it is then desirable to estimate the amount by means of the Marsh test, which, although not giving an accurate quantitative determination, will, when properly applied, give an approximate estimation of the amount of arsenic present.

When arsenic is detected by the above test its quantity is best determined by the process of Marsh (Marsh-Berzelius), which should be performed as follows:—

The beer, preferably 50 c.c., is acidulated by the addition of 1 c.c. of pure concentrated hydrochloric acid, and gently boiled in a porcelain evaporating dish for a few minutes till frothing nearly ceases, cooled, and gradually introduced into a Marsh apparatus of 200 c.c. capacity, which is already giving off a gentle stream of pure hydrogen gas, evolved from pure zinc and diluted hydrochloric acid. The purity of the evolved gas is first tested by ascertaining that it yields no mirror after 15 minutes, when it has been passed through a drying tube charged with successive layers of cotton wool, lead carbonate, and spongy calcium chloride, and then heated to dull redness in a narrow glass tube drawn out to a capillary size just beyond the point of heating. The open point of the tube at which the gas escapes should be turned upwards at right angles, so that the amount of issuing gas can be regulated by seeing that when lighted the flame of the burning gas is just perceptible. The beer is introduced by means of a straight thistle funnel provided with a stopcock, so that the admission of liquid into the apparatus can be regulated without introducing air. From time to time a little pure concentrated hydrochloric acid is also introduced, so as to maintain the uniform evolution of gas.

The blank experiment having shown no mirror in heated tube at the end of 15 minutes, the experimei continued for half an hour after the commencement of introduction of the beer. The arsenical mirror obtained is then compared with standard mirrors obta by treating known quantities of arsenious oxide disso in water with the addition of pure hydrochloric acid u precisely similar conditions as to generation of gas, and quantity of arsenic present is thus judged with approximate accuracy. The mirror may subsequentl converted into crystals of arsenious oxide by sealin the portion of the tube containing the mirror at each by means of a blowpipe, and then gently heating the by which means the mirror is volatilised, oxidised, converted into crystals of the oxide. The mirrors obt should be small, the comparison of small mirrors yie more accurate results than where large mirrors compared.

In conclusion, the commissioners state that if the cautions they recommend be observed they believe that will be brewed free from arsenic, and at no subst increase of cost.

BOARD OF TRADE RETURNS.

Summary of Imports.

Articles.	Month ending 31st	
	1900.	19
	£	
Metals	2,835,636	2,
Chemicals and dyestuffs	496,625	5
Oils	849,070	[illegible]
Raw materials for non-textile industries.	4,948,216	5,0
Total value of all imports	43,576,427	42,

Summary of Exports.

Articles.	Month ending 31st	
	1900.	1
	£	
Metals (other than machinery)	4,506,390	3,
Chemicals and medicines	863,553	
Miscellaneous articles	3,261,695	3,
Total value of all exports	24,715,930	23,

Imports of Miscellaneous Articles for M ending 31st May.

Articles.		Quantities.		Valu
		1900.	1901.	1900.
				£
Cement	Tons	9,820	22,422	21,115
China and earthenware.	Cwt.	36,214	35,973	86,772
Drugs	Value £	..	..	89,455
Glass:—				
Sheet	Cwt.	108,184	105,860	68,407
Plate	„	30,981	56,414	33,141
Flint	„	48,881	48,419	93,731
Bottles	Gross	151,278	151,206	61,768
Other	Cwt.	25,908	19,130	15,907
Glue, size, gelatin	„	19,807	21,911	44,048
Leather, unmanufactured.	„	117,610	101,387	731,322
Oil seed cake	Tons	31,022	31,179	200,828
Paints and pigments.	Value £	..	..	118,120
Paper, pasteboard	Cwt.	580,351	566,395	403,711
Scientific instruments.	Value £	..	..	56,959
Soap and soap powder.	Cwt.	15,335	23,158	20,180
Zinc manufactures.	„	37,915	46,091	49,834

IMPORTS OF METALS FOR MONTH ENDING 31ST MAY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
per :—				
re .... Tons	11,331	10 540	173,572	156,277
egulus .... „	8,963	8,501	360,129	329,550
nwrought ..... „	7,303	6,000	552,885	433,268
d, pig and sheet „	16,939	17,553	283,798	228,076
ites .... „	65,832	52,736	107,623	91,672
cksilver .... Lb.	89,370	88,575	10,186	11,239
er ore .... Value £	..	..	76,222	84,943
.... Cwt.	34,019	36,185	229,248	212,901
.... Tons	7,364	5,913	157,769	101,233

IMPORTS OF OILS FOR MONTH ENDING 31ST MAY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
a-nut .... Cwt.	43,548	30,579	53,358	37,917
.... Tuns	1,049	2,081	44,873	78,625
.... Cwt.	94,914	111,426	117,864	125,727
eum :—				
uminating .. Gall.	16,660,024	20,436,254	328,008	345,861
bricating ... „	3,178,291	2,757,009	102,156	90,612
.... Tons	3,322	3,611	87,835	91,103
, &c. .... Tuns	1,327	1,060	27,583	20,924
entine ..... Cwt.	14,153	32,230	26,873	42,412

IMPORTS OF RAW MATERIAL FOR NON-TEXTILE INDUSTRIES FOR MONTH ENDING 31ST MAY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Peruvian .. Cwt.	3,721	2,882	7,442	7,824
chouc ...... „	39,917	39,511	568,001	510,926
—				
bic .... „	5,389	9,752	13,297	19,168
, &c. .... „	9,366	16,332	30,945	48,758
percha .... „	8,843	5,153	108,404	77,096
, raw :—				
.... „	104,250	32,032	271,426	90,790
.... „	49,387	64,952	121,154	149,620
.... „	495	1,057	22,613	36,514
re :—				
no .... Tons	4,547	134	30,200	737
es .... „	5,037	7,494	22,792	30,614
n .... Cwt.	50,795	25,679	70,129	33,205
rags .... Tons	1,984	1,263	17,952	12,393
o .... „	13,691	22,387	55,089	92,002
l wood ..... „	40,509	40,750	223,703	236,719
.... Cwt.	112,078	94,224	26,246	21,465
and stearin „	229,499	164,746	305,204	211,823
—				
.... No.	1,405,112	2,054,751	134,870	184,367
p .... „	795,715	1,586,497	85,900	133,791
e of soda ... Tons	8,833	8,960	72,837	75,302
ate of lime „	30,979	24,435	52,649	34,895

ORTS OF CHEMICALS AND DYESTUFFS FOR MONTH ENDING 31ST MAY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
ng materials „	32,325	31,628	16,884	10,468
mpounds ... Cwt.		26,494		8,878
&c. .... „	1,037	25,335	1,133	14,842
one .... „	69,859	6,717	13,667	1,804
of potash .. „	19,268	23,704	16,605	19,650
als, other Value £	..	..	131,116	152,516
nd gambier. Tons	1,675	1,140	33,820	23,822
in .... Value £	..	..	18,922	23,874
e and other „	..	..	50,302	47,289
.... Cwt.	1,544	1,410	24,785	22,702
.... „	44,243	49,903	19,002	20,202
.... Tons	5,837	1,883	31,364	19,242

EXPORTS OF METALS (OTHER THAN MACHINERY) FOR MONTH ENDING 31ST MAY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Brass .... Cwt.	10,712	8 272	54,232	46,665
Copper .... „	51,863	88,016	205 525	333,397
Lead .... Tons	5,268	5,340	94,987	81,641
Plated wares ... Value £	..	..	30,354	37,217
Tin .... Cwt.	9,504	9 881	66,185	60,632
Zinc .... „	13,344	23 248	14,422	19,288

EXPORTS OF DRUGS AND CHEMICALS FOR MONTH ENDING 31ST MAY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Alkali .... Cwt.	356,060	..	109,750	..
Bleaching materials „	112,604	57,181	33,095	19,180
Copper sulphate .. Tons	5,876	4,919	143,902	116,258
Chemical manures „	24,585	26,860	179,893	191,135
Medicines .... Value £	..	..	114,581	125,115
Soda compounds :—				
Ash .... Cwt.	..	95,243	..	20,612
Caustic .... „	..	99,313	..	50,482
Bicarbonate .... „	..	22,516	..	7,813
Crystals .... „	..	20,815	..	3,465
Sulphate .... „	..	52,318	..	3,895
Other sorts ..... „	..	25,831	..	13,810

EXPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 31ST MAY.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Gunpowder ..... Lb.	641,900	Cwt.3,459	14,980	10,402
Candles .... „	2,130,300	1,591,600	37,820	28,697
Caoutchouc ..... Value £	..	..	125,890	114,205
Cement .... Tons	49,015	34,682	89,030	67,425
Products of coal. Value £	..	..	178,967	109,737
Earthenware ... „	..	..	140,716	164,357
Stoneware ...... „	..	..	16,485	15,580
Glass :—				
Plate .... Sq. Ft.	192,471	Cwt.5,793	11,615	9,085
Flint .... Cwt.	8,452	9,859	21,033	23,210
Bottles .... „	85,191	72,155	41,354	36,874
Other kinds ... „	23,152	17,710	23,572	19,220
Leather :—				
Unwrought .... „	12,793	10,662	140,694	114,250
Wrought ...... Value £	..	..	33,809	39,959
Seed oil .... Tons	5,012	4,673	126,186	121,574
Floorcloth .... Sq. Yds.	2,164,800	2,468,900	118,301	124,144
Painters' materials Val. £	..	..	189,180	195,233
Paper .... Cwt.	96,901	83,889	146,540	151,514
Rags .... Tons	5 872	5,473	38,059	32,021
Soap .... Cwt.	85,247	69,802	91,800	77,011

Monthly Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

APPLICATIONS.

9901. E. E. Glaskin. Improvements relating to automatic governors for mixed gases. May 13.

10,303. O. Michael. A new or improved crucible furnace. Complete Specification. May 17.

10,332. F. Snowden. An improved construction of steel or iron stills for gas works, tar works, and the like purposes. Complete Specification. May 18.

10,412. The Actiengesellschaft für Zink Industrie vormals W. Grillo and M. Schroeder. Process for the production of porous contact substances or masses for use in catalytic processes. May 20.

10,421. J. Davis. Improvments in apparatus for calcining and disintegrating ores or other minerals, applicable to all processes where the alternate exposure of the material to heat and atmospheric air is of advantage. May 20.

11,032. E. G. Scott. Improvements in the distillation of ammoniacal and other liquors, and in apparatus therefor. May 29.

11,273. C. Schumann. Improved means and apparatus for emptying acid carboys by the pressure of air. June 1.

11,429. H. H. Lake.—From N. B. Powter, United States. Improvements in apparatus for separating liquids of different densities. Complete Specification. June 4.

11,435. E. A. Sperry. Improvements in concentrators. June 4.

11,603. E. C. H. Pape and W. S. Henneberg. Improvements in and connected with filters. Complete Specification. June 6.

11,935. E. S. Beaven. Improvements relating to the cleansing of furnace gases and means for use therewith. June 11.

12,014. Royles, Ltd., J. J. Royle, and O. M. Row. Improvements in or relating to evaporators. June 13.

Complete Specifications Accepted. *

1900.

10,156. C. Tellier. Apparatus for the production of ice and cold. May 30.

10,925. W. P. Thompson.—From The Firm of Litzelmann and Tailfer, France. Apparatus and method of decomposing alkaline and other amalgams. May 22.

11,268. J. Gore. Apparatus for compressing gas or air. May 30.

11,301. A. Gibb. Furnaces for melting or smelting. May 30.

11,852. Meldrum, Bros. Ltd., and J. S. Orton. Kilns and appliances for calcining, heating, and drying mineral substances. June 5.

12,431. G. B. Schwerin. Extraction of water or other liquid from mineral, vegetable, and animal substances. May 30.

12,789. W. G. Atkins. Construction and arrangement of filtering apparatus. May 22.

13,780. E. Paul. Heaters, condensers, evaporators, and the like. June 19.

14,013. J. Prentice and A. W. Prentice. Working of automatic refrigerating apparatus. June 5.

14,026. J. Keith. Gas or air compressors or pumps. June 12.

14,364. K. Enzinger. Filter presses and material for use in connection with the same. June 12.

14,592. R. C. Sayer. Apparatus for boiling and evaporating water. June 19.

19,003. J. Laidlaw. Centrifugal drying machines. June 12.

1901.

1153. A. J. Boult.—From A. Roller, Maschinenfabrik, Germany, and A. Schiff, Russia. Drying apparatus. June 5.

1780. P. E. Domergue. Apparatus for regulating the density of liquids. May 22.

5559. R. A. Sloan.—From W. H. Martin, Holland. Evaporators. June 12.

6737. M. Güttner. Centrifugal separators. May 30.

6801. F. W. Parker. Processes and apparatus f cooling or condensing fluids. May 22.

7330. B. J. B. Mills.—From B. Lande, United State Furnaces. June 12.

II.—FUEL, GAS, AND LIGHT.

Applications.

9890. J. Y. Johnson.—From The Deutsche Continent Gas Gesellschaft, Germany. Improvements in the trea ment of residue obtained in the treatment of coal gas (f obtaining cyanogen compounds therefrom) for the purpo of obtaining Prussian blue. May 13.

10,013. G. Westinghouse. Improvements relating to th production and utilisation of gas. May 14.

10,023. J. A. Rey and J. M. B. Rey. Improvements apparatus for burning hydrocarbons, alcohols, and oth combustible liquids for heating purposes. Complete Spec fication. May 14.

10,024. L. Breittmayer. An apparatus for extracting t naphthaline contained in illuminating and heating gas Complete Specification. May 14.

10,183. C. Busch. Improvements in apparatus generating acetylene gas. May 16.

10,336. H. Koppers. Improved method for the heati of by-product-saving coke-ovens. Complete Specificati May 18.

10,337. H. Koppers. Improved coke-oven adapted to worked with or without saving of by-products. Compl Specification. May 18.

10,585. R. Gray. Improvements in gas produce May 22.

10,632, F. C. W. Timm. Improvements in or relat to the manufacture or production of oxygen gas. Co plete Specification. May 22.

10,725. W. L. Wise.—From R. Klinger, Austria. provements in acetylene gas generators. Complete Spec cation. May 24.

10,867. C. D. Abel.—From Siemens and Halske, Ak Gesellschaft, Germany. *See* Class XX.

10,868. C. D. Abel.—From Siemens and Halske, Ak Gesellschaft, Germany. *See* Class XX.

10,869. C. D. Abel.—From Siemens and Halske, Ak Gesellschaft, Germany. Manufacture of incandesc bodies for electric lighting. May 25.

10,913. S. Nobel. Improvements in and connected the economising of fuel and the prevention of sm May 28.

10,923. G. L. Hogan. Improvements in acetylene generators. May 28.

11,145. G. A. Bronder. Improvements in gas r charging apparatus. Complete Specification. May 30

11,167. G. W. Morrison. An improved process fo treating and moulding of carbide of calcium and carl containing calcium, with the view of controlling the pro tion of gas therefrom. May 30.

11,187. H. Ledger. Improvements in illuminant ma for gas or other burners, applicable for general lig purposes. May 31.

11,218. F. C. von Heydebrand und der Lasa. Arti fuel. Complete Specification. May 31.

11,255. G. R. Hislop. Improvements in incande gas burners. June 1.

11,356. R. J. Milbourne. Improvements in gas pur June 3.

11,466. G. F. Jaubert. Improvements in the prepar of oxygen gas. Complete Specification. June 4.

11,504. J. B. Leroux and P. J. Carmien. Improve in apparatus for burning mixtures of air and inflam vapour for heating and incandescent lighting. Co Specification. June 5.

11,519. C. Jousset and W. R. McKay. Improve relating to the manufacture of artificial fuel. June 5.

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* *See* note (*) on previous page.

11,532. F. Ferguson and E. Blau. Improvements lating to apparatus for the production of carburetted air. une 5.

11,682. A. A. Masters. Improvements in and relating lighting and heating. June 7.

11,714. H. Kinsey, G. Challenger, and J. H. Nott. Improvements in apparatus for generating and storing acetylene s. June 7.

11,735. H. Lux. Improvements in and relating to inndescent gas burners. June 8.

11,790. T. E. Pye. Improvements in apparatus for nerating, storing, and delivering acetylene gas. June 8.

11,804. G. Smith. Improved acetylene gas machine ithout generators). June 10.

11,825. S. S. Chandler and S. B. Chandler. Improvents in gas purifying apparatus. June 10.

12,137. J. Wilson. Improvements in and in the manuture of mantles for incandescent gas lighting. June 14.

Complete Specifications Accepted.

1900.

429. R. Harrison. Production of combustible gases n peat, spent tan, and similar substances, and appliances onnection therewith. May 30.

877. J. F. Wittemann. Treatment and utilisation of nentation gas. May 22.

988. A. M. Plaissetty. New process for the incandesce of gas. May 22.

,132. G. Bower. Apparatus for mixing and burning mmable gas and hydrocarbon vapours and air for the uction of light, heat, and power. June 12.

,511. A. S. Bower. Apparatus for carburating and asing the pressure of combustible or incombustible orm fluids for the purpose of heat, light, and power. 22.

,865. S. Biheller. Burners for incandescent gas lights. 22.

,523. H. Holm. Carbonisation of peat and apparatus for. June 19.

,201. H. Gerdes. Pressure regulating apparatus for enerators. June 12.

205. H. Gerdes. Gas generators. May 30.

259. H. Hill. Manufacture of mantles for incandescent ng. May 22.

,814. J. Y. Johnson.—From The Deutsche Continental Gesellschaft and J. Buel, Germany. Manufacture of d coke. May 22.

138. C. Hennings. Apparatus for the production of lene gas. June 12.

126. J. P. Johnston. Apparatus for use in the facture of gas. May 22.

27. F. Hasselmann. Method of producing fuel from earth and moor moss. June 19.

73. C. Joly. System for the preservation of liquid d other liquefied gases in the liquid condition. 0.

1901.

1. F. M. Bennett and J. O. Fowler, jun. Appliances ducing perfect combustion of gas. June 12.

. G. R. Bond, A. C. Buell, and C. D. Washburn. ene gas generators. May 30.

. A. J. Boult.—From Société Lumière Boule, n. Incandescent or Bunsen gas burners. June 19.

. A. J. Boult.—From Société Lumière Boule, n. Mantle supports for incandescent gas burners. 9.

. M. Graham. Hot coke conveyors. June 5.

. C. J. Johnson. Apparatus for manufacturing gas. 2.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Complete Specification Accepted.

1901.

5047. J. Wetter.—From Aktiengesellschaft für Theer-und-Erdol Industrie. Germany. Process for obtaining pure hydrocarbons, such as fluorene and phenanthrene contained in coal-tar, and for recovering certain by-products. June 19.

IV.—COLOURING MATTERS and DYESTUFFS.

Applications.

9999. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in the manufacture or production of anthracene derivative. May 14.

10,277. H. H. Lake.—From K. Oehler, Germany. Improvements relating to the manufacture of disazo-colouring matters. Complete Specification. May 17.

10,728. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of a brown colouring matter. May 24.

10,729. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture and production of contact bodies for use in catalysis especially intended for use in catalytic process for the manufacture of sulphuric acid. May 24.

10,833. W. P. Thompson. — From Chemische Fabrik Opladen vormals Gebr. Flick Gesellschaft mit Veschränkter Haftung, Germany. Improvements in a process for the reduction of indigo. Complete Specification. May 25.

10,886. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture and production of colouring matters of the anthracene series and of intermediate products for use therein. May 25.

11,022. A. Rahtjen. Method of preparing monobromeindigo and dibrome-indigo as well as monochlore-indigo and dichlore-indigo as well as monochloremono-bromeindigo. Complete Specification. May 28.

11,162. G. W. Johnson.—From Kalle and Co., Germany. Manufacture of a black dye containing sulphur. May 30.

11,163. A. Meyenberg, R. J. Lévy, and The Clayton Aniline Company, Limited. Improvements in the manufacture and production of colouring matters containing sulphur. May 30.

11,358. B. Willcox.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of new halogenised bodies, new indigo colouring matters, and of indigo. June 3.

11,359. L. Aloy. Improvements in the manufacture of dyeing compositions. Complete Specification. June 3.

11,533. A. Thilmany. Improvements in or connected with the manufacture of composite colouring matters or pigments. Complete Specification. June 5.

11,624. J. Y. Johnson —From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture and production of colouring matter for the direct dyeing of black or blackish shades. June 6.

11,733. R. J. Urquhart.—From The Chemische Fabriken vormals Weiler-ter Meer, Germany. Improvements in the manufacture of dyestuffs. Complete Specification. June 8.

11,753. C. D. Abel.—From The Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of new azo dyestuffs, and of an intermediate product for use therein. June 8.

11,766. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. The manufacture or production of new azo colouring matters, and of intermediate products for use therein. June 8.

11,839. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. The manufacture and production of new azo-dyestuffs. June 10.

12,021. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture of an amidophenol derivative, and new intermediate products relating thereto. June 12.

12,185. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of new colouring matters of the anthracene series. June 14.

12,202. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of rhodamine derivatives. June 14.

Complete Specifications Accepted.

1900.

10,316. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of colouring matters of the anthracene series and of intermediate products relating thereto. May 30.

12,517. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of dyestuffs containing sulphur and material for use therein. June 12.

12,804. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of black azo dyestuffs for cotton. June 12.

12,819. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of azo-colouring matters and material for use therein. June 12.

14,879. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of new rhodamine sulphonic acids. June 12.

1901.

7560. A. Haagen. Manufacture of colouring matters. June 12.

V.—TEXTILES; COTTON, WOOL, SILK, Etc.

Applications.

11,287. H. Ferguson and J. Keefe. *See* Class XII.

11,288. H. Ferguson and J. Keefe. *See* Class XII.

11,858. A. J. Boult.—From C. Masse and La Société Francaise de Ramie, France. Improvements in or relating to the treatment of ramie, china-grass, and other fibrous material. Complete Specification. June 10.

Complete Specifications Accepted.

1900.

9505. J. M. Ross and J. Schneider. Apparatus for use in mercerising yarns. May 22.

11,749. L. Lederer. Manufacture of acetylcellulose. May 30.

1901.

3861. J. Imray.—From Heberlein and Co., Switzerland. Manufacture of lustrous and variously coloured threads and strips of textile materials. May 30.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, and BLEACHING.

Applications.

9817. E. Knecht. An improved method of discharging dyed textile fabrics. May 13.

11,853. C. Wolf. Improvements relating to apparatus for the dyeing, bleaching, and other similar treatment of fibrous materials. June 10.

11,912. J. Wezel. Improvements in the preparation of art chromo and other colour printing papers. Complete Specification. June 11.

Complete Specifications Accepted.

1900.

13,027. W. Ruttenan and Co. Machine for and meth of dipping and dyeing skins, fabrics, cotton, wool, or oth substances. May 22.

14,174. C. L. Jackson. Kiers for bleaching or othe wise treating textile and other materials. June 12.

14,518. L. Schreiner. Dyeing of textile fabrics. June

15,413. A. G. Green, A. Meyenberg, and The Clayt Aniline Company, Limited. Process of dyeing bla June 12.

15,486. W. W. L. Lishman, T. W. Haughton, J. J. Ki patrick, and The Lishman Process Bleaching Compa Ltd. Kiers for containing liquors for boiling, bleachi and dyeing purposes. June 19.

1901.

2182. J. Müller. Process for dyeing gloves and like. May 30.

VII.—ACIDS, ALKALIS, and SALTS.

Applications.

10,224. S. Trivick. Process for the production of cer acid compounds. May 16.

10,226. H. R. Angel. Improvements in the manu ture of caustic soda as a bye-product from the reductio refractory ores. May 17.

11,312. J. R. Leaver and H. A. Leaver. *See* Class

11,365. G. W. Bell. Improvements in or connected the purification of brine. June 4.

11,436. R. Pearson. Improvements in the productio metallic nitrides and of ammonia. June 4.

11,497. F. P. Gutierrez. Improvements in and conn with the manufacture of common salt (chloride of sodi June 5.

11,500. A. Sansone. Improvements in the manufa of chlorine and chlorides and in the production of el energy therewith. June 5.

11,772. J. W. Weston. Improvements in the man ture of salt and apparatus therefor and for other pur June 8.

11,792. H. Briegleb. Improvements in and relati the manufacture of sulphuric anhydride. June 8.

11,919. E. Teisler. Improvements in processe preventing the escape of silicon fluoride in the de position of phosphates. Complete Specification. Ju

11,999. A. Boake, Roberts, and Co., Ltd., and R. St Improvements in the manufacture of hydrogen per June 12.

12,019. G. B. Ellis.—From Société Chimique des du Rhône anciennement G. P. Monnet et Cartier, F Improvements in the manufacture of salicylic June 12.

12,083. C. D. Abel.—From Actiengesellschaft für Fabrikation, Germany. Improved manufacture of phorus oxychloride. June 13.

12,093. H. W. Hemingway. Improvements in connection with the separation of sulphuretted hy from gaseous and other fluids containing the same, the desulphurisation of sulphuretted hydrogen. Ju

12,250. G. W. Johnson.—From The Chemische Griesheim - Elektron, Germany. Improvements connected with the manufacture or production of ch compounds and alkalis. June 15.

Complete Specifications Accepted.

1900.

3866. A. W. Lawton. Manufacture of com June 5.

9350. J. Y. Johnson.—From Stassfurter Chemische Fabrik vormals Vorster und Grüneberg, Germany. Manu- cture or production of cyanides. May 22.

9351. J. Y. Johnson.—From Stassfurter Chemische Fabrik vormals Vorster und Grüneberg, Germany. Im- rovements in the production or manufacture of cyanides lay 22.

9352. J. Y. Johnson.—From Stassfurter Chemische abrik vormals Vorster und Grüneberg, Germany. Im- rovements in the manufacture or production of cyanate of otassium. May 22.

9710. H. F. Kirkpatrick-Picard. Manufacture of the aloid compounds of cyanogen. May 30.

10,925. W. P. Thompson.—From The Firm of Litzel- iann and Taiffer, France. *See* Class I.

11,678. S. R. Adcock. Process for the production of pric oxide from natural sulphates or carbonates of pper. June 5.

12,180. J. Raschen, F. J. Norman, and W. G. Luxton. pparatus for the manufacture of cyanides from sulpho- anides. June 19.

13,263. A. Gutensohn and H. H. Price. *See* Class X.

14,021. A. Shearer. Manufacture of alkaline chromates d bichromates. June 12.

14,572. E. M. Hall. Process for obtaining pure alumina m bauxite. June 19.

1901.

5239. W. H. Wheatley.—From The Clyde Chemical ., Ltd., New South Wales. Means employed for the traction of oxide of chromium from its ores, and its sequent treatment to obtain soluble salts. June 12.

7999. A. Zanner. Manufacture of concentrated sulphuric d. May 22.

230. J. Y. Johnson.—From the Atmospheric Products ., United States. Manufacture of nitrogen compounds m atmospheric nitrogen. June 12.

VIII.—GLASS, POTTERY, AND ENAMELS.

Applications.

0,550. E. Lee. Improvements in printing tiles and other ects by means of collotype blocks, with natural colours, with other designs or patterns, and in apparatus there- May 21.

1,595. F. T. Brearley. Improvements relating to matic plate glass. June 6.

2,017. L. Stein and W. Storr. Process for uniting es of glass, porcelain, or like material, for mosaic work the like. Complete Specification. June 12.

Complete Specifications Accepted.

1900.

2,070. F. W. Gaunleit and J. H. Lloyd. Production of gns upon glass and other surfaces. June 12.

3,579. W. F. Stiel. Compressing moulds for manu- ring glass or enamel facing plates. June 19.

3,580. W. F. Stiel. Glass or enamel facing plates, and ess of manufacturing same. June 19.

—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Applications.

92. H. E. Carter. Improvements in and relating to nanufacture of artificial stone. May 13.

,084. S. E. Boivie. An improved process for the ufacture of artificial stone. Complete Specification. 15.

,124. H. Higgins. Improvements in or relating to ratus for drying, seasoning, and impregnating wood and substances. May 15.

10,297. C. von Forell. Improvements in processes for the manufacture of Portland cement. Complete Specification. May 17.

10,418. G. F. Lebioda. Improved apparatus for impregnating wood and the like with preservative or other fluids. Complete Specification. May 20.

10,622. P. Timofeeff. Improvements in pavements. May 22.

10,634. A. Skrobanek. A new or improved process for the manufacture of wood-like material. May 22.

10,857. A. M. Clark.—From The Firm of Fellner and Ziegler, Germany. Apparatus for the manufacture of cement and the like. May 25.

10,958. E. H. Hurry and H. J. Seaman. Improvements in process of manufacturing Portland cement and apparatus therefor. May 28.

11,045. J. Pfister. Improvements in processes of dyeing or preserving timber. Complete Specification. May 29.

11,715. C. Lorenc. Improvements in the manufacture or production of mortar, and the treatment of stone, and the construction therewith of masonry work. Complete Specification. June 7.

11,724. A. Tracy. Improved construction of fireproof flooring. June 8.

11,927. H. H. Lake.—From S. Giussani, Italy. An improved process for the preservation of wood.—Complete Specification. June 11.

12,073. S. Shorowitz.—Process for producing imitation marble. Complete Specification. June 13.

12,207. E. Serre and E. Oulmière. Improvements in cement or mortar.—June 14

12,272. H. H. Lake.—From The Firm of Fried, Krupp Grusonwerk, Germany. Improvements relating to the manufacture of artificial stone blocks, slabs, and the like. June 15.

Complete Specifications Accepted.

1900.

12,513. H. H. Lake.—From Wachtel and Co., Germany. Manufacture of artificial sandstone. May 22.

13,467. T. M. Thom and A. C Oakes. Manufacture of artificial stone. May 30.

15,940. W. Schwarz. Manufacture of limestone. June 19.

1901.

2861. V. Barreto. Apparatus for slaking lime. June 19.

8282. F. Boas. Manufacture of building materials. June 12.

9739. F. A. Beny and J. Heinrigs. Apparatus for slakin lime. June 19.

X.—METALLURGY.

Applications.

9903. The British Aluminium Company, Ltd —From A. Hutchinson Cowles, United States. Improvements in obtaining volatile elements from their ores and compounds. Complete Specification. May 13.

9927. S. Cowper-Coles and Co., Ltd., and S. Cowper-Coles. Improvements in or relating to the deposition of metals or compounds. May 14.

9990. A. Reynolds. Improvements in metallurgical converters. May 14.

10,008. E. Schilz. Improvements in the cyanide process of gold extraction. May 14.

10,039. R. McAllister. Utilization of steel slag. May 15.

10,105. C. H. T. Havemann. An improved process for the treatment of mixed ores and compounds for the extraction or separation of lead and zinc therefrom. May 15.

10,198. S. R. Adcock. Improvements in obtaining copper from mixed sulphates. May 16.

10,351. G. G. M. Hardingham.—From F. Heberlein, Switzerland. Improved means applicable for use in the separation of volatile from non-volatile metals, metalloids, and other metalliferous substances. May 18.

10,415. T. H. Cobley. Improvements in the treatment of copper ores for the production of copper salts, copper oxides, copper and iron paint, and metallic copper. May 20.

10,668. Sir H. S. Maxim. Improvements relating to the smelting of iron and other ores and to furnaces therefor. May 23.

10,670. H. C. Bull and A. Watling. Improvements in or connected with the extraction of gold and other metals from sea-water and in apparatus therefor. May 23.

10,705. A. G. Betts. Improvements in or relating to the coating of aluminium or its alloys. Complete Specification. Filed May 23. Date applied for Oct. 24, 1900, being date of application in United States.

10,859. H. Goldschmidt. A new and improved process for welding metals. May 25.

10,964. H. Batt. An improved method of and apparatus for the treatment of ores for the extraction of the metals therein. May 28.

10,983. E. D. Wassell. Improvements in and relating to the manufacture of wrought iron. Complete Specification. May 28.

11,312. J. R Leaver and H. A. Leaver. Improvements in the treatment of tinning residues containing chlorine. June 3.

11,319. H. R. Angel. Improvements in the concentration of zinc from slags and ores. June 3.

11,339. J. Armstrong. Improvements in or connected with smelting or refining zinc, cadmium, or antimony. June 3.

11,480. P. Auchinachie. The hardening of metals, particularly iron and steel. June 5.

11,547. J. R. Leaver and H. A. Leaver. Improvements in the treatment of flux skimmings, residues from zinc galvanizing. June 6.

11,687. O. Schramm. Improved process for hardening iron. Complete Specification. June 7.

11,765. R. Hutchinson and H. Mitchell. An improved composition for hardening and toughening steel and cast iron. Complete Specification. June 8.

11,832. R. Dietrich. Process for the production of highly carburised steel. Complete Specification. June 10.

11,933. H. S. Blackmore. Improvements relating to the reduction of metals and to the production of alloys of the same. Complete Specification. June 11.

12,006. H. R. Beringer. A process for the treatment of residue and low-grade ores containing copper, tin, and other metals. June 12.

12,268. O. Massenez. Improvements relating to the manufacture of steel. June 15.

12,274. W. B. Middleton and the Non-Injurious White Paint Syndicate, Ltd. *See* Class XIII.

Complete Specifications Accepted.

1900.

10,915. J. L. Babé and A. Tricart. Process for extracting zinc, and apparatus therefor. May 30.

11,602. E. Martin. Manufacture of sheets or plates of aluminium covered with silver May 22.

12,823. F. L. Saniter, J. L. Smith, R. Bedford, and the South Durham Steel and Iron Company, Ltd. Open-hearth steel furnaces. June 19.

13,263. A. Gutensohn and H. H. Price. Process of eliminating the sulphur from sulphide ores. May 30.

13,299. J. L. Smith, R. Bedford, jun., and the South Durham Steel and Iron Company, Ltd. Open-hearth steel process May 30.

13,952. H. H. Lake.—From Société Fonderia Milanes D'Acciacio, Italy. Manufacture of steel. June 12.

22,699. H. A. Frasch. Process of recovering and separating metals from their ores and concentrates thereof June 19.

1901.

1758. H. H. Lake.—From A. G. Betts, United State Refining of lead. May 22.

4696. A. Ronay. Process of making briquettes fro comminuted or pulverulent ore, including purple or June 12.

6330. A. J. Lustig, L. Kahn, and I. Lehman. Casting ingots. May 22.

8097. R. B. Wheatley. Manufacture of metallic alloy June 3.

8153. W. B. Johnson.—From The Pittsburg Reductio Company, United States. Process for the purification aluminium. May 30.

8175. E. Herter. Method of and means for casting an simultaneously refining raw zinc and other metals, exceptin iron. May 30.

8904. H. H. Lake.—From W. E. Simonds, Unite States. Alloys, and processes for the production thereo June 5.

9124. W. S. Mather. Crucibles for smelting. June 12

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

Applications.

10,191. A. d'Arsonval and G. Vaugeois. Improvemen in and in apparatus for the manufacture of the plates electric accumulators. Filed 16 May. Date applied f 27 Dec. 1900, being date of application in France.

10,459. V. G. Apple. Improvements in storage batterie Complete Specification. May 20.

10,482. A. A. Govan. A cell for electrolysis. May 21

10,505. T. A. Edison. Improvements in storage batteri Complete Specification. May 21.

10,879. W. K. L. Dickson. Improvements in volta cells. May 25.

10,903. E. J. Plummer. Improvements relating to t electrolysis of salt. May 28.

10,974. P. M. Justice.—From Castner Electrolytic Alk Company, United States. Improvements in and connect with electrodes for electrolytic cells. Complete Specificati May 28.

10,975. P. M. Justice.—From Castner Electrolytic Alk Company, United States. Improvements in electrodes f electrolytic cells. Complete Specification. May 28.

10,976. P. M. Justice.—From Castner Electrolytic A kali Company, United States. Improvements in electroly cells. Complete Specification. May 28.

11,600. J. J. H. Hunte.—From J. Lürgen, Germa Improvements in or relating to the formation of positi plates for electric accumulators or secondary batteri June 6.

11,619. E. W. Jungner. A method of producing ele trodes for electric accumulators. Complete Specificatio June 6.

11,625. The Electrical Power Storage Company, Lt and W. H. Hanson. Apparatus for applying plas material to matrices more especially intended for use applying the paste to the grids in making secondary batte elements. June 6.

11,702. B. J. Lürgen and The D. P. Battery Compan L'd. Improvements in and relating to electric accumul tors. June 7.

12,186. G. W. Johnson.—From The Chemische Fabr Griesheim-Elektron, Germany. Improvements in t electrolytic production of lead dioxide. June 11.

12,195. W. P. Thompson.—From R. J. Gülcher, G many. Improvements in and in the construction electrodes. June 14.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

12,531. C. von Seduetl. Positive electrode for accumulators. June 19.

1901.

3192. P. Jurié. Electric furnaces. May 22.

1494. W. P. Thompson. — From Akkumulatoren und lectricitäts Werke Aktiengesellschaft (formerly W. A. oese and Co.), Germany. Process for making electrodes r accumulators. June 19.

XII.—FATS, OILS, AND SOAP.

APPLICATIONS.

9897. B. Crowther, Jun. Improvements in or relating the manufacture of soap. May 13.

9969. A. J. Boult.—From C. Wacker. United States. provements in or relating to apparatus for extracting oil m fish or other material. Complete Specification. ay 14.

10,384. J. B. Seammell and E. A. Muskett. Improvents in solidifying and toughening oils. May 20.

10,629. H. H. Lake:—From J. S. Stewart Wallace, lland. Improvements in and relating to the treatment of eral or vegetable oils or the distillates or residuals reof. May 22.

0,637. O. Gillon. Process for the use of soda salt in manufacture of soap. May 22.

0,663. C. Daeschner. Process for separating the nous parts without their decomposition from mineral oils he like. May 23.

0,825. C. A. McKerrow. Improvements in the prepara- of fullers' earth, silicates, and siliceous matter for use he treatment of oils, fats, and greases. May 25.

1,012. J. Snowdon. An improvement in lubricants. nplete Specification. May 28.

1,074. G. Dangoise and La Société Generale Belge de glycerination. An improvement in separating glycerine n oils and fatty matters. May 29.

1,155. F. G. Scott. Improvements in melting tallow like fatty bodies. May 30.

1,165. T. Weyl. Manufacture of compounds of fatty s and their derivatives with ozone. May 30.

1,287. H. Ferguson and J. Keefe. The manufacture n improved detergent for the treatment of raw silks silk yarns in the gum. June 1.

,288. H. Ferguson and J. Keefe. The manufacture improved detergent for treating raw wools and wools. June 1.

,289 H. Ferguson and J. Keefe. The manufacture improved laundry detergent. June 1.

,419. The Cotton Seed Company, Ltd.—From J. C. tanley, United States. Improvements in or relating to leaching of oleaginous matter. Complete Specification. 4.

,941. A. J. Boult.—From L. Grassie, United States. ovements in or relating to the treatment of cotton June 11.

,200. The Shell Transport and Trading Company, Ltd., P. Dvorkovitz. Improvements in the purification of ral oils. June 14.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

4. F. Kinneavey. Preparation for washing and ing. May 22.

4. A. Klumpp. Manufacture of soap. June 19.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, ETC.

APPLICATIONS.

0. J. Thame and The South Western Rubber Com- Ltd. Improvements in and relating to the treatment de rubber. May 13.

10,696. C. Wallis and R. E. M. Lagerwall. Improvements in roller mills, applicable for the manufacture of paint, white lead, pigments, printing ink, confectionery, or the like. May 23.

10,865. J. Lones, E. Holden, and J. Lones. New or improved processes or combination of processes for the manufacture of a white pigment from zinc, and for utilising residual products obtained during the conducting of the said processes or combination of processes. May 25.

10,962. C. A. Day.—From The Coleman International Ship and Pile Coppering Company, United States. An improved anti-fouling coating for metal structures. Complete Specification. May 28.

10,963. C. A. Day.—From The Coleman International Ship and Pile Coppering Company, United States. An improved anti fouling coating for metal structures. Complete Specification. May 28.

11,149. G. E. Heyl Dia and The Dialene Rubber Company, Ltd. Improvements in desulphurizing vulcanized rubber. May 30.

11,238. E. Edwards.—From Oxylin - Werke Actien-Gesellshaft, Germany. Improvements in rubber-coated materials and in the method or process of preparing or treating the same. Complete Specification. May 31.

11,337. F. J. Corbett. An improved apparatus for manufacturing white lead. Complete Specification. June 3.

11,533. A. Thilmany. *See* Class IV.

11,569. G. Rigg. Improvements in and connected with the manufacture of zinc oxide. June 6.

11,658. A. O. Gill and W. S. Gill. A solvent for paint and varnish. June 7.

12,022. J. W. Worsey and J. H. Lancashire. Improved process for treating zinc oxide. June 12.

12,274. W. B. Middleton and The Non-Injurious White Paint Syndicate, Ltd. Improvements in the treatment of zinc and other ores, chiefly for the direct production of zinc white, and in furnaces therefor. Complete Specification. June 15.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

9037. A. M. Plaissetty. Collodion of aluminium nitro cellulose for the obtaining of inexplosibles and uninflammable products. May 22.

19,871. J. Hommel. Heat-insulating paint. June 12.

1901.

7625. J. Welter. — From The Elektricitäts Aktiengesellschaft vormals Schuckert and Co., Germany. Process for hardening colophony and other soft resins. May 22.

8995. A. Beute. Process and apparatus for the manufacture of soot from tar. June 5.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

APPLICATIONS.

10,152. C. A. Allison.—From The Scott Leather Machine Company, United States. Improvements in apparatus for treating and colouring hides and skins. Complete Specification. May 16.

11,092. M. C. Lamb and P. Spence and Sons, Ltd. Improvements in and connected with the manufacture of leather and the preservation and curing of skins. May 30.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

10,308. W. P. Thompson.—From A. Bloch and W. Reuter, United States. Apparatus for the treatment and preparation of fur. June 12.

1901.

9025. L. B. Traut, G. Soldani, and P. V. San Martin. Tanning. June 5.

XV.—MANURES, Etc.

Complete Specification Accepted.

1901.

9514. T. Storer and R. McAlley. Treatment for fertilising purposes of the distillery refuse known as burnt or pot ale. June 12.

XVI.—SUGAR, STARCH, and GUM, Etc.

Applications.

10,113. W. P. Thompson.—From H. A. J. Manoury, France. Improvements in processes of refining sugars of low quality. May 15.

10,461. J. Y. Johnson.—From The Cereal Sugar Company, United States. Improvements in and apparatus for refining sugar. Complete Specification. May 20.

10,861. B. J. B. Mills.—From The Société Anonyme "Trust Chimique," France. The treatment of feculent and amylaceous matters, and of natural products containing these matters. May 25.

10,884. C. Steffen. Improved process of obtaining very pure concentrated saccharine juices and nutritious or pulp poor in water from beetroots without the use of water. Complete Specification. May 25.

11,442. C. B. Duryea. Improvements in the method of manufacturing thin boiling or modified starch. Complete Specification. June 4.

Complete Specifications Accepted.

1900.

9356. M. Daniczewski. Apparatus for manufacturing lump sugar. May 30.

1901.

4199. A. Classen. Process for converting cellulose into sugar (dextrose). June 12.

XVII.—BREWING, WINES, SPIRITS, Etc.

Applications.

10,015. H. J. Haddan.—From J. C. Riley, United States. A new or improved process for ageing liquors. Complete Specification. May 14.

10,074. S. N. Pinkus and S. B. Schryver. Improvements in the manufacture of preparations containing ferments. May 15.

10,127. F. E. Bradley. Improvements in the drying of malt so as to prevent its contamination with arsenic. May 16.

10,287. C. F. von Schlichtegroll. Improved process of rectifying spirit by the action of refrigeration and filtration. Complete Specification. May 17.

10,356. T. Haynes, jun. An improvement in malt kilns. May 18.

10,741. F. Singer. An improved machine for turning green malt. May 24.

10,813. W. J. Menzies. Improvements in pressing machinery for the treatment of brewers' and distillers' grains, hops, and the like. May 25.

11,035. T. Hancock. Improved method of obtaining diastase and preparing it for use. May 29.

Complete Specifications Accepted.

1900.

991. G. Valentine. Utilisation of pressed yeast. May 30.

2,459. A. Eckardt. Brewing process for the production of high or low fermenting beer-wort. June 12.

12,949. J. W. Bennett. Bennett's anti-bacteria syste and appliances for the use of brewers of ale, beer, an porter or stout during the processes of cooling, fermen tion, and racking. June 12.

19,946. R. Flessa. Process for producing colour malt. June 12.

1901.

3194. B. E. R. Newlands. *See* Class A.

8363. O. Imray.—From Joshua Brothers Proprieta Ltd., Victoria. Method of accelerating the maturing whisky, brandy, and other strongly spirituous liquo May 30.

9511. T. Storer and R. McAlley. *See* Class XV.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

Applications.

A.—Foods.

10,283. H. W. Potter. An improved animal food a process or method of preparing the same. May 17.

B.—Sanitation ; Water Purification.

9982. L. Gathmann. Improvements in water purify apparatus. Complete Specification. May 14.

10,346. J. W. Welch, H. W. Heywood, and T Wollaston. Improvements in apparatus for the treatm of sewage. May 18.

10,404. W. C. Easdale. Improvements in filter construction and means of liquid distribution. May 20.

10,838. A. J. Boult.—From E. Vial, Belgium. Impr ments in or relating to the treatment of sewage. May

11,353. C. H. Koyl. Improvements in apparatus softening and purifying water. Complete Specificat June 3.

11,354. C. H. Koyl. Improved process for the pu cation of water. Complete Specification. June 3.

11,366. T. Waite. Improvements in apparatus softening, filtering, and purifying water. June 4.

11,944. J. C. Miller. Process and apparatus for sterili and cooling liquids. Complete Specification. June 11

12,015. J. Week. Improvements in sterilizing appar Complete Specification. June 12.

C.—Disinfectants.

9936. M. Condron. An improved preservative pound. May 14.

10549. C. Billing. New or improved antisept detergent. May 21.

11,286. H. Ferguson and J. Keefe. The manufa of an improved disinfectant detergent for household personal purposes. June 1.

11,670. J. Baxeres de Alzugaray. Improvements i connected with the manufacture of disinfecting and septic fluids and compounds. June 7.

12,120. V. A. M. L. Beck. Insect destroying p June 14.

Complete Specifications Accepted.

A.—Foods.

1900.

9648. J. M. Rodoconachi and W. M. Briggs. Ne of food preparation. May 30.

9649. M. Phillips and O. Müller. Process for the ment of cotton pods or shells for the manufacture o for animals. May 22.

12,676. J. Jensen. Process for the preservation o June 5.

1901.

3194. B. E. R. Newlands. Drying or roasting or smoking f malt, hops, hams, or other alimentary matters. June 5.

7545. L. O. Ferson. Food products and processes of reparing the same. May 22.

7620. G. C. Marks.—From Force, Société Anonyme. rance. Process for preserving butter and animal fats, ay 22.

B.—Sanitation; Water Purification.

1900.

12,619. R. G. Brooke. Apparatus suitable for purifying ids. June 5.

1901.

6121. B. Seufer. Processes for eliminating iron from ter and aqueous solutions. May 1.

6931. J. Fischel. Treatment of liquid waste products. y 30.

7806. H. H. Lake.—From J. M. A. Lacomme and W. uder, United States. Apparatus for use in the purifica- n of water. May 22.

8088. A. G. Brookes.—From W. Trippe, Germany. atment of waste liquors from the manufacture of phite cellulose in order to render the same useful, and to ain certain products therefrom. May 30.

C.—Disinfectants.

1901.

719. J. Welter.—From The Aktiengesellschaft für er-und Erdöl. Industrie, Germany. Treatment of nols to render them soluble in water. June 12.

XIX.—PAPER, PASTEBOARD, Etc.

Applications.

0,099. F. Rymkiewicz. Process for drying and con- sing pulps and plastic substances. May 15.

0,213. E. Zühl. A new or improved process for the nufacture of a celluloid-like material. Complete cification. May 16.

0,535. C. I. Goessmann. Improvements in the manu- ure of paper and other fabrics. Complete Specification. 21.

1,153. H. H. Lake.—From F. B. How, United States. rovements in apparatus for making carbon paper. plete Specification. June 4.

Complete Specifications Accepted.

1900.

53. F. Wittstock. Coloured mosaic paper. May 22.

,751. E. Zühl. Method of producing celluloid. 30.

,131. J. N. Goldsmith and The British Xylonite Com- Limited. Manufacture of celluloid. May 30.

,048. F. Haenle. Metallised paper. May 30.

1901.

72. E. Zühl Process for the manufacture of a loid-like substance. May 30.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

Applications.

867. C. D. Abel.—From Siemens and Halske Aktien schaft, Germany. Manufacture of thorium, zirconium, lements of the ytterite group. May 25.

10,868. C. D. Abel.—From Siemens and Halske Aktien Gesellschaft, Germany. Manufacture of metallic thorium, zirconium, and elements of the ytterite group, and the production of coatings of the said metals upon other bodies May 25.

11,229. C. Bachadour. Purgative preserve, extract, decoction, and syrup made from rose leaves. June 31.

11,301. H. L. F. Moulton.—From A. Verley, France. Improvements in the manufacture or production of bodies for use in perfumery and confectionery. June 1.

11,328. J. Mayer. An improved process for the production of tea extract. June 3.

11,474. M. Ekenberg. Improved manufacture of coffee extract. Complete Specification. June 4.

11,783. J. Y. Johnson.—From The Vereinigte Chininfabriken Zimmer and Co., Germany. Acidyl derivatives of the cinchona alkaloids and their manufacture. June 8.

Complete Specifications Accepted.

1900.

14,213. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of organic bromo compounds. June 19.

14,491. A. M. Clark.—From F. Blum, Germany. Process for the preparation of prophylactic immunifying or curative substances. June 12.

1901.

526. G. W. Johnson.—From C. F. Boehringer and Soehne, Germany. Manufacture or production of homologues of xanthin. June 19.

6537 R. Reitmeyer.—From J. Volmar, Germany. Manufacture of saccharin. May 22.

XXI.—PHOTOGRAPHY.

Applications.

9983. H. H. Lake.—From R. B. West. United States. An improved sensitised paper for photographic printing May 14.

10,524. S. E. Page.—From The Grenier Art Company United States. Improvements in photographic fabrics. Complete Specification. May 21.

10,721. H. E. Newton.—From The Farbenfabriken vormals F. Bayer und Co., Germany. The preparation of new chemical compounds, and their use as developing means in photography May 24.

11,232. W. P. Thompson.—From La Société Anonyme de Photographie Automatique Inalterable et Instantanée, France. Improvements in apparatus for rapidly producing photographs. May 31.

11,719. C. D. Abel.—From The Actiengesellschaft für Anilinfabrikation, Germany. Process of rendering silver-haloid layers sensitive to rays of different degrees of refrangibility. June 7.

11,866. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of photographic developers stable in the dry state. June 10.

Complete Specification Accepted.

1900.

10,795. A. Sauve. Apparatus for the simultaneous production of triple negatives, especially for colour photography. June 19.

XXII.—EXPLOSIVES, MATCHES, Etc.

Applications.

9984. J. E. Blomén. Improvements relating to the manufacture of high explosives. Complete Specification. May 14.

9991. D. Hickie. Controlling the temperature of explosives. May 14.

10,784. C. Helcke. Improvements in or connected with the manufacture of nitroglycerin. May 25.

10,994. A. J. Boult.—From Fritiof Safström, Sweden. Improved ignition composition for matches. May 28.

11,065. R. Hawkins. Improvements relating to the manufacture of explosive compounds. May 29.

11,212. J. S. Potts. Improvements in matches. Complete Specification. May 31.

11,400. F. Edwards. From W. Kent, United States. Improvements in smokeless powders. Complete Specification. June 4.

11,711 W. Friese Greene. Improvements in the manufacture of explosives. June 7.

11,959. F. Bale. Improvements in the manufacture and production of matches and striking compositions, and in the substances and processes employed therein. June 12.

Complete Specifications Accepted.

1900.

17,809. L. Varicas. Set time and automatic explosive liquidised gas shell. June 3.

1901.

2339. D. Bachrach. Nitrocellulose and similar con pounds, and process of making the same. May 30.

5264. R. W. Scott. Explosive charges for guns. April 2

XXIII.—GENERAL ANALYTICAL CHEMISTRY.

Complete Specification Accepted.

1900.

11,101. F. W. Le Tall.—From M. Walker, Unit States. Measurement of the magnetic properties of ir and steel. May 22.

PATENTS UNCLASSIFIABLE.

Applications.

10,827. S. Bornett. A process for the production products of crystallisation in the form of bars. May 25.

10,926. K Koch and A. Stelling. A new article manufacture, consisting of felt manufactured from me May 28

11,407. R. Oblath. Improvements relating to the ma facture or construction of rubies. June 4.

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Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—

THE JOURNAL
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thors of communications read before the Society, or of its Local Sections, are requested to take notice that Rule 43 of the Bye-laws the Society has the right of ty of publication for three months of all such papers. gement of this Bye-law renders papers liable to be ed by the Publication Committee, or ordered to be cted for the Journal, in which case no reprints can nished to the author.

Arsenic.

view of the great public interest which has been ed by the Arsenic Epidemic, it has been decided to lish, in pamphlet form, uniform with the Journal, the s, discussions, and abstracts dealing with the detection termination of Arsenic and other associated elements, have appeared in the Journal since the beginning of ar. To these have been added extracts bearing on bject from other sources, including a description, from lyn's new book on Arsenic, of the Marsh test, in the or's own words, and dated 1836. Copies, price 1s. nay be obtained from Messrs. Eyre and Spottiswoode.

Arsenic Committee.

Joint Committees of the Societies of Chemical ry and Public Analysts have circulated a number of s containing definite quantities of arsenic, and have ly considered the results returned by the members. Committee believe that these results justify them in ing a method for dealing with the various substances, ore taking this course think it desirable to submit thod to somewhat more extended trials.

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Mayfield, Thos., Fair View House, Heanor, near Nottingham, Hosiery Manufacturer.

Miller, Stuart B., 148, Hancock Street, Cambridge, Mass., U.S.A., Chemical Engineer.

Moore, Chas. W., 12, Beech Road, Chorlton-cum-Hardy, Manchester, Chemical Student.

Morse, Willard S., c/o M. Guggenheim's Sons, 30, Broad Street, New York City, U.S.A., Assistant Manager.

Nicholson, Jos., McClary Manufacturing Co., London, Ont., Canada, Enamel Ware Manufacturer.

O'Connor, Chas. P., 38, Clinton Street, Brooklyn, N.Y., U.S.A., Analytical Chemist.

Ralston, Wm., Lagos, West Africa, Government Chemist.

Renwick, Frank F., 42, Balfour Road, Ilford, E., Chemist (Photographic Works).

Sim, Wilfrid A., c/o Wm. Sim and Son, 40, Jane Street, Leith, N.B., Colour Manufacturer.

Smith, H. Procter, 146, Harrington Road, Workington, Cumberland, Metallurgical Chemist.

Spencer, Robt., jun., The Sycamores, Blackburn, Lancashire.

Taylor, Maurice I., 460, Jarvis Street, Toronto, Ont., Canada, Soap Manufacturer.

Watt, Francis L., 111, Lauderdale Mansions, Lauderdale Road, Maida Vale, W., Student.

Wedlake, H. D., 4, Clarence Terrace, Penzance, Cornwall, Technical Chemist.

CHANGES OF ADDRESS.

Battye, Chas., l/o Albion Mills; Meltham, Swanston Street, S. Geelong, Vic., Australia, Lecturer on Chemistry.

Bucher, Prof. J. E., l/o Kingston; Brown University, Providence, R.I., U.S.A.

Burls, F. B., l/o Greenwich; 19, Cleveland Mansions, Chapel Road, Brixton Road, S.W.

Carter, W. Chas., l/o Belfast; 5, Sunnyside Villas, Child's Hill, N.W.

Collingridge, Frank, l/o Willesden Lane; Warwick Lodge, Hadley, Barnet.

Darling, G. A., l/o Durban; Robinson G. M. Co., Box 1024, Johannesburg, S.A.

Dewey, F. P., l/o Ninth Street, N.W.; McGill Building, Washington, D.C., U.S.A.

Dunn, Dr. J. T., l/o London; Messrs. J. and H. S. Pattinson, 75, Side, Newcastle-on-Tyne, Analytical and Consulting Chemist.

Durant, H. T., l/o Salvador; c/o Chas. Butters and Co., Dooly Building, Salt Lake City, Utah, U.S.A.

Ellis, G. Beloe, l/o 56; 70, Chancery Lane, London, W.C.

Fallon, J. M. H., l/o Havana; 61, Birdhurst Rise, South Croydon.

Felix, Dr. L., l/o Hamburg; 53, Rue Petit, St. Denis s/Seine, France.

Fox, J. Wesley, l/o Lower Thames Street; 7, Bushell Street, London, E.C.

French, Wm., l/o Bury; Storey Institute, Lancaster.

Fry, H. E.; retain Journals until further notice.

Guitermann, E. W., l/o Passaic; c/o U.S. Finishing Co., Pawtucket, R.I., U.S.A.

Harvey, Chas., l/o Liverpool; 163, Kensington Avenue, East Ham, E.

Hewitt, T. Lacey, l/o Malvern Link; 66, Belgrave Gate, Leicester.

Hills, Harold F., l/o Bow; 29, Cavendish Mansions, Clapton Square, London, N.E.

Ichioka, T.; Journals to No. 1 Department, Kansei-Honba, Admiralty, Tokio, Japan.

Kohn, Dr. Chas. A., l/o Liverpool; St. Albans, Horley, Surrey.

Levinstein, Dr. Herbert; Journals to Hawkesmoor, Fallowfield, Manchester.

Lindsay, Robt. D., l/o Busby; Hayfield, Alexandria, N.B.
McCaffery, R. S., l/o Chile; 120, Broadway, New York City, U.S.A.
Marshall, A., l/o Waltham; Hope Cottage, Church Hill, Loughton, Essex, Explosives Chemist.
Mills, Prof. E. J., F.R.S., l/o Glasgow; 11, Greenhill Road, Harrow.
Morson, T., l/o 124; 31, Southampton Row, London, W.C.
Muir, J. Stanley, l/o Hungary; 8, Westminster Gardens, Glasgow, W.
Nicholson, Wm. J., l/o Glasgow; Ardeer, Stevenston, Ayrshire, N.B.
Nimmo, Jas., l/o Stanger Road; 8, Lawrence Road, South Norwood, S.E.
Novarine, J. L., l/o Henry Street; 79, Main Street, Brooklyn, N.Y., U.S.A.
Pidduck, E. W., l/o Portland Street; Bodwilym, Llanbadarn, Aberystwith.
Schweich, Emil, l/o Belgrave Road; 20, Hyde Park Square, London, W.
Scott, L. C.; Journals to c/o Grasselli Chemical Co., East Chicago, Ind., U.S.A.
Scrymgeour, Wm., l/o Kalgoorlie; 4, Cobden Place, Mt. Florida, Glasgow.
Shields, Dr. Jno., l/o Leven; 22, Upper George Street, Bryanston Square, London, W.
Smith, Dr. E. Ellsworth, l/o 5th Avenue; 26, East 29th Street, New York City, U.S.A.
Stock, W. F. Keating; Journals to Dinsdale Rectory, Darlington.
Studer, Dr. A., l/o Manchester; Postgebäude, Olten, Switzerland.
Swanson, J. F.; Journals (temp.) to 13, Belville Street, Greenock, N.B.
Twynam, T., l/o Egham; Hawthorne House, Slaid Hill, Moortown, Leeds.
Voorhees, S. S., l/o Albany; c/o Supt. Architect, Treasury, Washington, D.C., U.S.A.
Whichelo, M. A., l/o Enfield; 9, Eversfield Road, Eastbourne.
Wickens, B. Foster, l/o Queen Street; 31, Bermondsey Wall, London, S.E.
Yamaoka, S., l/o Chikugo; 10, Nishikatamachi, Hongo, Tokio, Japan.

CHANGES OF ADDRESS REQUIRED.

Goodhue, F. A., l/o India Street, Boston, Mass., U.S.A.
McCowan, W., l/o Marlborough Mansions, N.W.

Deaths.

Barclay, Hugh, Calder Ironworks, Coatbridge, N.B.
Loos, Hermann A., l/o 119, East 115th Street, New York City, U.S.A.

PROCEEDINGS

OF THE

TWENTIETH ANNUAL MEETING.

PRESIDENT:

MR. JOSEPH WILSON SWAN, F.R.S.

WEDNESDAY, JULY 24, 1901.

The twentieth annual meeting of the Society took place in the Chemical Lecture Theatre, The University, Glasgow, on Wednesday, July 24, 1901, Mr. Joseph Wilson Swan, F.R.S., President of the Society, in the chair.

The LORD PROVOST OF GLASGOW (SAMUEL CHISHO Esq., LL.D.), in welcoming the members of the Societ Glasgow, said: Mr. President, Ladies and Gentleme shall not detain you from the address of your lear President, to listen to which you are gathered here morning. but I do desire to take advantage of the op tunity which is afforded me to offer you, in the nam the City, a most hearty and cordial welcome. We delighted that you have chosen Glasgow as the scene of meeting on this occasion. The last time you honoure with your presence was on the occasion of our last Exl tion in 1888. Possibly that may be a reason why we sh not have Exhibitions at such long intervals, but I as you that none the less cordially do we rejoice to have in our midst. We all know something of the importan such a Society as yours, and of the great objects for w such a Society exists. The chemist of my youth was ciated with the compounder of those vile decoctions w unhappy children were expected to swallow; but those have passed away, and, when we speak of chemists chemistry now, we associate them with the marvels have wrought during late years, and which have in been the distinguishing features of the Victorian era. laboratory of the chemist is now the scene of p investigation and organised science, and these, com together, have resulted in some of the most marv discoveries of modern days, discoveries which hav merely added to the sum of our abstract knowledge have enlarged the fields of our industries, afforded em ment to multitudes—to hundreds of thousands—o industrial classes, and presented not a few prizes t successful investigator. We trust that your Societ continue to flourish and to stimulate still further patient investigations to which I have referred. Gl owes much to its chemical industries. We have no important industry than that in connection with whic are gathered together, and if the result of your m here to-day shall be either to enlarge the interest public in the objects of your Society, or to add still m those discoveries to which I have referred, we shall great reason to congratulate ourselves on your pr Again I desire to offer you, in the name of the Corp and the City at large, a most cordial welcome to our

THE PRESIDENT, in acknowledging, said: My Provost, I thank you most heartily for the courte kindness of your welcome. This is not the first tin the Society of Chemical Industry has visited Glasgo you have reminded us, the Society of Chemical In was in Glasgow thirteen years ago, and on that o the Society experienced a hospitality which has been extended to institutions like ours. We found sympathy and kindness which was quite unusual, knew that in returning to Glasgow, whatever chan might find in this great progressive City, we should find the old sympathy and the old kindness uncl I thank you, my Lord Provost, and desire to offer t you to the great community over which you presi most hearty and grateful thanks.

The Minutes of the last Annual General Meeting been read and confirmed,

The GENERAL SECRETARY announced that the n tions being equal to the vacancies in the Council, n was necessary on this occasion. The followin therefore duly elected:—

COUNCIL FOR YEAR ENDING JULY 1902.

President:

Ivan Levinstein.

Vice-Presidents:

George Beilby.
R. Forbes Carpenter.
Prof. C. F. Chandler, D.Sc., M.D., Ph.D., LL.D.
Prof. G. G. Henderson, D.Sc.
Robert Irvine.
Dr. R. Messel.
J. M. C. Paton.
Dr. Boverton Redwo
Walter F. Reid.
A. Gordon Salamon.
Jos. W. Swan, F.R.S.
R. C. Woodcock.

Ordinary Members of Council:

. A. Brotherton.
ustace Carey.
r. Edw. Divers, F.R.S.
hos. Fairley.
rof. W. R. E. Hodgkinson, Ph.D.
. Grant Hooper.
David Howard.
Prof. E. J. Mills, D.Sc., F.R.S.
Max Muspratt.
Dr. F. B. Power.
Dr. W. S. Squire.
Thos. Tyrer.

Sectional Chairmen and Secretaries.

LIVERPOOL.	
Longuet Higgins.	Dr. T. Lewis Bailey.
LONDON.	
to Hehner.	A. R. Ling.
MANCHESTER.	
J. Grossmann.	J. Carter Bell.
NEWCASTLE.	
L. Rennoldson.	F. C. Garrett.
NEW YORK.	
ford Richardson.	Dr. H. Schweitzer.
NOTTINGHAM.	
Archbutt.	J. T. Wood.
SCOTTISH.	
Robert Pullar.	Dr. Thos. Gray.
YORKSHIRE.	
rge Ward.	Prof. H. R. Procter.

Honorary Treasurer:

Samuel Hall, East London Soap Works, Bow, E.

Hon. Foreign Secretary:

Dr. Ludwig Mond, F.R.S.

e PRESIDENT, in introducing the President-elect, Ladies and Gentlemen, I have much pleasure in ucing to you Mr. Levinstein. He has been unani- y elected to be my successor. Mr. Levinstein is ally known to many, and by reputation he is to you all. He is known as an assiduous worker e cause of technical education. He has been nent in connection with the administration of the ester Section of our Society for many years, and he o been conspicuous as a powerful advocate of patent form, such reform as would have the effect of ing from our statute book those legal blemishes operate unjustly towards British manufactures, and especially those connected with chemical industries. stly, Mr. Levinstein is very well known, I may say, r the world, as a chemical manufacturer. I congratu- r. Levinstein on the honour he has received by this . I felt it to be an honour when I was put in the osition, and I am sure that he also must feel it to honour. During my tenure of office I have found ; but pleasure, and I hope that Mr. Levinstein may e same experience. I congratulate the Society on ice they have made. In choosing Mr. Levinstein ve chosen a President who will work for the Society o will work successfully. I wish Mr. Levinstein a t year of office.

GENERAL SECRETARY then proceeded to read the—

REPORT OF COUNCIL.

Council has the honour to report that at a meeting January 23rd last, a resolution was passed ex- profound sorrow for the death of Her late Majesty en.

umber of members on the register is now 3,635, as d with 3,459 at the last Annual Meeting. During 335 new members have been elected, as compared last year. The loss has been 159, as against 158 . There have been 34 deaths, as compared with 36 last year:—Sir H. W. Acland, Bart., Lord Armstrong, Jno. Borland, Fred Burton, Stratford Burtt, Jas. Butterworth, C. Claus, H. C. D. France, Samuel Green, Jno. A. Guthrie, F. Cyril Hart, Robt. Holliday, J. Henry Johnson, Dr. W. Johnstoun-Coombes, Jos. Kershaw, A. J. Kirkpatrick, Harold T. Lloyd, Dr. Stevenson Macadam, S. T. Mander, F. A. Manning, J. C. Mewburn, Dr. Jno. A. Myers, C. Chauncy Parsons, C. W. Raymond, R. A. Robertson, R. P. Rothwell, Saville Shaw, Wm. Smith, Thos. Taylor, Chas. Truby, Chas. Valentine, Surgeon Lt.-Col. C. J. H. Warden, G. Watson, and T. Graham Young.

Sir Henry Acland was intimately associated with the University of Oxford all his life. The Oxford Museum and School of Science and the Oxford Faculty of Medicine are the best monument of his labours.

By the death of Lord Armstrong, the Society of Chemical Industry loses one of its most distinguished members, and the world one of its greatest men.

C. F. Claus will be remembered by his ingenious inventions, one of the most important of which was associated with the Chance process for the recovery of sulphur from Leblanc alkali waste.

Dr. Stevenson Macadam was an original member of the Society and a member of the Publication Committee until his death last January. As a lecturer and teacher he was very successful, and attracted large classes. He took particular interest in the technical applications of chemistry.

Mr. Saville Shaw was Hon. Local Secretary and Treasurer of the Newcastle Section of the Society. Those who were present at the Annual Meeting of 1899 will in some measure understand how great a blow the Section received by his sudden death. The success of that meeting was mainly the result of Mr. Shaw's untiring energy and his thoughtful organisation.

During the past Session 80 original papers, together with discussions thereon, have appeared in the Journal, as compared with 81 last year. The Council has thought it desirable to re-publish, in pamphlet form, the papers, discussions, and abstracts on the subject of arsenic which have recently appeared in the Society's Journal. The methods of analysis are at present under the consideration of a committee of the Society, with a view to formulating a uniform procedure.

The Hon. Treasurer will submit his financial statement, which appeared in the June issue of the Society's Journal.

Allusion was made in last year's report to the application of the Scottish Papermakers' Association to the Council for aid in the solution of certain problems connected with their industry, and for which the Association offered prizes to the value of 100*l.* A prize committee appointed by the Council set forth the conditions of the competition, and Mr. R. C. Menzies explained to a meeting of the Scottish Section the nature of the problems to be solved. Five papers were received; and a prize of 30*l.* was awarded to Mr. Frank Fillis, Fairlight, Rhoose, Cardiff, for dealing with the utilisation of refuse lime mud in a practical manner, and a prize of 10*l.* to Mr. Martin L. Griffin, of Mechanicville, N.Y., for his investigation of esparto liquor.

During the year the Council agreed to subscribe for the volumes on Physics, Chemistry, Bacteriology, and Mineralogy, in the forthcoming International Catalogue of Scientific Literature, which is to be brought out under the auspices of the Royal Society. The Council has also agreed to co-operate with the Verein Deutscher Ingenieure in the production of a "Technolexicon," in German, French, and English.

Dr. JOHN CLARK (Glasgow) moved that the report be adopted.

Dr. A. B. PRESCOTT (Ann Arbor, Michigan), in seconding the motion, said: I desire to take this opportunity to acknowledge, on behalf of myself and of many teachers of chemistry in the United States, the great value that the services and administration of the Council of this Society have been to us during many years. When the American Chemical Society was reorganised ten years ago, it gave great encouragement to the reorganisers to know that the plan of a scientific society with local sections was meeting with great success and had such prospects of usefulness.

That plan was at once adopted by the American Chemical Society and has proved most advantageous. Meanwhile, our own Society has so far extended in the United States that we Americans can take pride in it as being almost an American Society as well. In fact, it is a society of chemical workers throughout the world. I beg to second the motion for the adoption of the report.

On being put to the meeting the motion was unanimously agreed to.

REPORT OF HON. TREASURER.

The HON. TREASURER (Mr. SAMUEL HALL), in presenting his annual statement, said:—

Mr. President, ladies, and gentlemen, it is to me a very great pleasure, as well as my duty as treasurer, to present at this meeting the accounts for last year, that is for 1900. The first account is the statement of revenue and expenditure for the year. The second is the Treasurer's account of our investments, cash at the bank, and the cash transactions of the Society for 1900. This has been examined by your auditors and the investment certificates have been inspected by them, and the bank balances certified by them. It will be seen from this account, that on 31st December last, there was 10,700*l.* invested yielding 3*l.* 2*s.* 6*d.* per cent., free of income tax, and giving a permanent income of 336*l.* per annum. Since then the Society has been able to invest a further sum of 1,000*l.* Turning to the first account, which gives the receipts and expenditure of 1900, we have received 4,015*l.* as subscriptions from 3,210 members. Life members, having already paid their compositions, do not pay anything annually. There is an increase under this head of 143*l.* over 1899. Entrance fees are 13*l.* more and life compositions are 80*l.* less, but these two items are not reckoned as revenue and are always invested. Interest of investments shows an increase of 9*l.*, advertisements and sales of journals of 28*l.*, and sales of collective index 26*l.* The total available income is 5,439*l.* On the other side of the account, we have, for publishing the Journal, which includes paper, printing, and postage, 1,983*l.*, or 71*l.* more than 1899. The Journal has increased in size, and it keeps on growing in all ways. Editorial expenses were 10*l.* less, making the cost of the Journal 3,317*l.* The items which are less for 1900 than for 1899 are—sundry printing, 19*l.*; sectional expenses, 35*l.*; annual meeting, 5*l.*; together, 59*l.* The items in excess of 1899 are—stationery (this includes new registers, &c.), 30*l.*; writing up new registers and assistant during Secretary's absence through ill health, 83*l.*; taking all the items together, an increase of 54*l.* The total expenditure was 4,689*l.*, as against receipts of 5,439*l.*, leaving a balance to the good of 750*l.* for the year. This, from the Treasurer's point of view, is a very satisfactory condition of accounts, and one which I trust may continue for years to come, but it requires jealous watching that expenses do not improperly creep up, as expenses often have a faculty for doing. At the same time it must be borne in mind that the efficiency of the Journal is of first importance for the continuance of the revenue as well as for the individual benefit of each member of the Society; and if only on these grounds, we must strive to make the Journal, if possible, more useful and up to date. It travels now to nearly every country where scientific chemical work is being carried on, and we send it to fifty different countries, and many are the letters of thanks received for sending it. The other day there was one from Johannesburg, in which the writer says: "You can hardly credit how I enjoyed having a look at them, after so long a time out of touch with the outside chemical world." I shall be pleased to explain any points in the accounts which may not be quite clear.

Mr. WALTER F. REID, Vice-Chairman of the London Section, said: Gentlemen, the applause with which you have greeted the financial statement read by the Treasurer shows your appreciation of his services, and of the very satisfactory statement of accounts that he has been able to present to us. There are over 3,600 members in the Society, and it is no easy matter to do the work in connection with it, but you have here the proof of the successful working of our Treasurer. Those who come into personal contact with him know that he has a manner about him w disarms all opposition, and it is greatly due to his succe labours that our finances stand in such a good posi That we have been able to invest 1,000*l.* again on beha the Society is gratifying to all of us. We are much inde to Mr. Hall that he has been able to get a uniform int of more than 3 per cent. with safe investment. One of great difficulties that our Secretary and Treasurer have enormous area that is covered by our members. I much pleasure in proposing a hearty vote of thank our Hon. Treasurer for the great services he has ren to us.

Mr. H. GRIMSHAW, Past Chairman of the Manc Section: I have very much pleasure in seconding the of thanks to Mr. Hall. On occasions of this kind o generally expected to sympathise with the Chancell the Exchequer, especially in times such as we have having during the last 12 months; but our Treasu not troubled with a war, and it is a pleasant duty t gratulate him. Apart from the hard work which h done, he needs no sympathy. The most gratifying f the way in which we are establishing a reserve fu invested money which will produce a permanent in An income of 300*l.* or 400*l.* is not a great deal, but grow. It is perhaps a pity that we do not possess amo any Carnegies who could endow us from their munit and place us in a position of affluence, but we must hope that they will yet arise. It is a pity that w not a little more American in this way. We must that America sometimes shows us the way in de large sums by commercial men towards educatio similar objects.

The HON. TREASURER, in returning thanks, said: A of the original members of the Society it has alway a great privilege to me to watch its growth. I fee over and above our own needs, the rapid diffusi knowledge advances, of the application of chemical to the wants of mankind must be for the good of the at large, and we may claim some little share in p that knowledge before the world, and that is rea thanks for the work that I have been enabled to feel that "the good the more diffused, the more ab grows."

PRESIDENT'S ADDRESS.

Before proceeding to read his address, the PRE said: Ladies and gentlemen, we have almost as la audience as the room can hold, and yet there are ab whose presence we should have welcomed. Among Sir Henry Roscoe. I have a telegram from Sir H which he says: "Duties as Vice-Chancellor of the sity of London prevent my attendance to-morrow your address. Please make apology and express wishes for successful meeting.—Roscoe." Sir L Bell also desires it to be known that he is with us i although regretfully absent in body.

Since our last annual general meeting many events have occurred, to which, if time permitted, i have been proper to have made reference, but whic the circumstances of our meeting, must be passed silence. But there is one great and overshadow which cannot be passed over, though it cannot be with the fulness that the theme deserves. It is t of the late Queen, the great Queen, who for 63 ye the throne of Britain with a dignity, wisdom, and goodness without parallel in the long and glorious h our country.

During those 63 years, so great was the pr science and the applications of science to indus in the departments of chemistry, electricity, and m that the work of many centuries appears to h accomplished within her reign.

In January last the Council passed and record of condolence with the King. We may congrat King on having entered upon so splendid an in From our hearts we wish that the reign of Ed Seventh may be as distinguished in history for t best and worthiest as the reign of Victoria.

On the occasion of our last meeting in Glasgow, in 1888, President of the year was that distinguished Scotsman, of. Dewar. Thirteen years ago Prof. Dewar was eminent ong eminent men, but during the long interval between t time and this he has gathered fresh laurels. He has tinued the great work to which he has devoted so large art of his immense energy, tenacity, skill, and knowledge. has not only solidified hydrogen, but has reached a perature within 15° of absolute zero. And he is still hing his sap further and further towards the citadel to ich he has so long laid siege. We all wish him the ess he so well deserves.

r. Mond was the President-elect at the time of our last sgow meeting. I had hoped that we should have had pleasure and advantage of his presence with us on this sion, for he told me that he intended to come, but I sorry to say that at the last he found the effects of stress ork made it necessary for him to take rest, and go away n crowded cities and international exhibitions. We regret absence. And there are other notable figures that we l miss, and not only for the present, but, alas! for all re time. We shall not again be amused by the witty es or cheered by the stimulating presence of E. C. C. ford, our President for 1893 and 1894, and, as you have d, since we met in London last year we have to deplore r severe losses; among these you would notice the es of two distinguished men, Sir H. Acland and Lord strong, and also of two of our very active members, Saville Shaw and Dr. Stevenson Macadam. In Dr. enson Macadam we lose a veryable technical chemist a most zealous member of our Society.

ELECTRO-CHEMICAL INDUSTRY.

nineteenth century will be for ever memorable for great scientific discoveries which it produced, and the lerful developments that marked its progress, in the cations to industrial uses of science in general, and particularly of chemistry and electricity.

seems to me therefore that this is a fitting occasion assing in brief review the leading events of the past ry in connection with the rise and progress of *o-chemistry*, and for considering its present position ts prospects.

e birth of the century was heralded by signs and ers; the whole horizon of chemical physics was aglow the light of Volta's great discovery and the con- ion of brilliant discoveries to which it gave rise. It n that outburst of new light that the history of o-chemistry began.

idea of the correlation of electricity and the energy determines chemical action was then for the first grasped; and the prescience of great minds, like that vy, led even to an anticipation of that then far distant , the utilisation of electricity as an operative force in cal industry.*

the light of that morning glory did not rapidly grow noonday clearness. Much had to be done before rial electro-chemistry was possible.

the first decade the marvellous analytic power of city was fully realised, and the idea was generally ed that electricity was probably of the nature of the that controls chemical combination. We also then e familiar with those heat-producing effects of the current that have only within the lifetime of our been turned to practical use. The three succeeding s show no sensational discovery such as made the first conspicuous, but they yielded an immense product, ly of new knowledge, but also of many indispensable ons and developments of what had already been partly d; above all they produced the work of Faraday. So the work done hitherto was preparatory and scientific, spired by the pure and noble aim of the man of who seeks truth and new knowledge for its own sake. But on the near approach of the fifth decade, the eyes of men of different ideas—of practical men—were opened to the advantages of employing the so far unused power, electricity, to reach new and useful ends. We all know that the first outcome of this recognition was the origin of that small department of electro-chemical industry to which Smee gave the apt name of electro-metallurgy. While this name applied only to the humble but beautiful art of electrotype, and electro-gilding and plating, it seemed pretentious. Smee felt the objection; in answering it, he predicted with rare foresight the future expansion of this field. But, much as he foresaw, it was only the fringe of the wide territory that has since been added.

Faraday, who had lately discovered and laid down with great exactness most of the laws governing electro-chemical action, yet further increased our indebtedness by his discovery of magneto-electricity, which brought within reach a more economical means of generating electricity through the magneto-electric transformation of motive power. By the employment of this fundamental principle, all the wonderful developments of the use of electricity that we see to-day have been rendered possible.

Historical relics are always interesting, and I feel sure many of you who may visit the Glasgow Exhibition, will look with interest on one of the exhibits of Messrs. Walker and Hall, an ancient magneto-electric machine used long ago for depositing silver. It is a progenitor of the dynamo, that to-day is the essential means of supplying all the great cities of the world with electric light, of working railways, propelling cars through crowded city streets and under them, and of performing a great amount of electro-chemical work.

It is a singular coincidence that the discovery of the magneto-dynamic mode of generating electricity occurred almost at the very moment, when several other discoveries and inventions were made which presently called for the assistance of cheaply produced electricity. One of these inventions was submarine telegraphy, with its requirement of large quantities of the purest copper. As I have said, it was in connection with electrotype and electro-plating that the first industrial application of power-generated electricity was made, and it is equally illustrative of the reciprocal action of demand and supply, that the demand for pure copper, arising out of the use of copper wire for submarine telegraph lines, gave rise to the first large and improved mechanical generators, like those of Wilde. When other and yet larger uses for electricity developed, the electrical engineer discovered his vocation, and, by gradual steps, there was evolved the modern dynamo.

But several important events in the development of electro-chemical industry had already taken place before that evolutionary process was fully accomplished. I go back to the time of our last meeting in this city 13 years ago; it is a most interesting point of departure. In that year, 1888, those responsible for the publication of the Journal of the Society first paid to electro-chemical industry the homage of sectional recognition; then, for the first time, there appeared in the Journal, under the heading, "Journal and Patent Literature, Section XI."—"Electro-Chemistry and Metallurgy." It is a tribute due to the Editor and his colleagues to say that they hit the true psychological moment. Before that time electro-chemical industries certainly existed and even flourished—notably electrolytic copper refining—but it is since then that they have grown, in number and variety, to a degree of importance which now requires the most respectful consideration of all who are interested in chemical industrial progress.

Electro-chemical industry depends on the production of chemical effects in a new way; sometimes the effects themselves are new, and not otherwise producible, and in other cases the results are merely improvements on old chemical methods, either in respect of economy or superiority of the product, or both.

Electrotype and electro-gilding belong to the first class; the results are unique, and constitute valuable additions to the resources of industry and art. Electrolytic copper refining is so great an improvement on the old method, both in point of economy and superiority of product, as to have

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he Bakerian Lecture of 1806 Davy says:—"It is not impro- at the electric decomposition of neutral salts, in different ay admit of economical uses."

largely supplanted it, and incidentally to have sensibly raised the value of commercial copper as an electrical conductor.

In another department of electro-chemical industry, the manufactures of calcium carbide, of carborundum, and artificial graphite (all new products) have attained large proportions. These wholly depend, as industrial processes, on the high-temperature effects only obtainable economically by means of the electric furnace.

The aluminium and sodium industries have developed into their present large dimensions, solely in consequence of the much greater economy of production of these metals by electrolysis than was ever attained by the old chemical processes. These are typical examples of electro-chemical industries, and they serve also to illustrate the causes of their existence.

In reviewing the salient features of the different sections of electro-chemical industry, I propose first to speak of the electrolytic group of industries, and afterwards of that newer group in which, not electrolytic action, but the extremely high temperature obtained by the electric furnace is the operative agent. Outside these groups there is a miscellaneous group to which I must also briefly refer.

Prof. Chandler, in his most interesting and valuable presidential address of last year, gave a large amount of information relating to the progress of electro-chemical industries in America. I shall not repeat what he said, but confine my remarks almost entirely to the developments to be found on this side of the Atlantic.

I have attempted — with, I fear, imperfect success — to obtain authentic information concerning the present position of the electro-chemical and electro-metallurgical industries. I have been in communication with every firm I know of in Europe, applying electricity to the manufacture of chemical and metallurgical products. When I inform you that these firms now number over 150, you will recognise that this new field is being extensively cultivated. The information obtained in answer to a circular letter, issued through the medium of Mr. John B. C. Kershaw, whose valuable assistance I here desire to acknowledge, has been tabulated, and is presented as an appendix. I take this opportunity of also thanking those firms who have placed at my disposal all the information asked, and thus assisted me to the utmost. In many cases figures have been given with the understanding that they shall not be published; hence there are many gaps in my tables. In a number of instances, however, manufacturers have declined to give any information whatever. Of this reticence I make no complaint, for I recognise that it is only natural that those who have acted as pioneers in a new industry and worked out new processes should desire to reap to the full the fruits of their labour. At the same time I cannot but regret that, in consequence, the picture I have to present to you, will here and there be wanting in some of the detail that otherwise I should have been glad to have been able to supply.

COPPER REFINING.

As the senior member of a new industrial line that has won its way to a great and commanding position, the place of honour in my review must be given to electrolytic copper refining. Prof. Chandler, in his address at our last meeting, gave the figures which represent the gigantic copper output of America, and I find that, bringing the production down to 12 months later, there is continued growth.

The total production of raw copper in the year 1900 was 486,084 tons, to which total the United States contributed 268,787 tons. The latest published estimate of the proportions of these totals, refined by the electrolytic methods, gives roughly 172,000 tons for the American refineries* and 37,000 tons for the 27 refineries located in our own country and on the Continent. My own inquiries would seem to indicate that the latter estimate is rather too high, and that the European production of electrolytic copper is now less than 37,000 tons a year. The figures available are given in Table I. in the Appendix, but as certain copper refineries have not filled up the return, this table is necess incomplete.

America is by far the largest producer of copper, with characteristic thoroughness, she not only produces copper, but also refines it. The refining is often carried close proximity to the mines, although there is as lit to a particular locality for an electrolytic copper worl there can well be in the case of any industry. But if is water-power conveniently near to the mines, the in ment to finish the work on the spot is sufficiently stro make it worth doing. Electrolytic copper refining i of the things that can be done profitably withou advantage of extremely cheap motive power. It i one of the class of industries to which, for exa calcium carbide belongs, which can only be carried o success where the motive power is of the cheapest.

It has been said that an infinitely small amount of can deposit an infinitely large quantity of copper. is not quite true, but it *is* true that in copper refini power element of cost is not vital, and that with arrangements and the use of large depositing tanks given output, the cost of power, even when coal is u produce it, is not the chief item in the total cost process. Hence, this is one of the electrolytic ind that it is possible to carry on successfully in a count ours, which is not largely supplied with water-power.

Copper refining is a conspicuous example of the tages of electricity as applied in a large metall industry. Here electricity has everything in its Not only is the electrolytic process more economical, it requires little power to be expended and little labou because the precious metals found as impurities in the are more completely recovered, but the purity of th duct is much greater than that resulting from process of refining, and when the copper is requi the purpose of an electrical conductor, its money v enhanced in proportion to the increased purity.

In a recently published pamphlet, entitled " of Copper," Messrs. Brown and Turnbull give sta information relating to the growth of the copper i and state that at present 300,000 tons, or over 60 p of the total output of copper, is utilised in electrical c ing. This demand, it may be noticed, is almost wh growth of the last 15 years, and it is rapidly increasi

Before electrolytic copper refining became general early days of the submarine telegraph, there was deficiency in the conductivity of commercial copper copper, for conductors, has almost uniformly the conductivity of pure copper, with the result of a sa at least 10 per cent. (arising from the use of elect refining) in the quantity of copper used. Besi saving, there is a much more complete recovery precious metals commonly associated with crude The total saving, at a moderate estimate, exceeds a half million pounds sterling per annum.

It is the common practice to melt up the rough that come from the depositing vats, in order to metal in the form of ingots, preparatory to its use foundry or the rolling mill. This treatment is atten an appreciable loss of conductivity. To avoid thi has been attempted, with considerable success, to the metal in such forms as to render unnecessary t process of fusion. Those who visited the Paris E last year may have seen some of the results, in the large and beautifully smooth tubes and plates show French and German Elmore Companies. The chief h to the direct production of the electrolytic deposit finally required form, is the strong tendency of th deposited from solutions of the ordinary compositi crystalline and rough and deficient in strength. El met this difficulty by causing the deposit to take pl a revolving cylindrical surface against which an ag nisher presses. The burnisher has imparted to it reciprocating lateral movement, which, combined rotatory movement, results in the entire surface of the being repeatedly traversed while it is receiving the At the Paris Exhibition there were also some fi shown by Cowper-Coles, who, in producing them, ployed, not a mechanical rubber, as in the Elmore ut simply a rapid rotation of the cylinder in the copper olution, and in that way had obtained favourable condiions both of a mechanical and chemical kind. A third nethod for obtaining sheets and tubes of smooth copper by lectrolytic deposition is that known as the Dumoulin rocess. In this process, specially prepared strips of skin upply the friction necessary for obtaining dense and homoeneous deposits.

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* Ulke, in a recent article, has "estimated" the U.S.A. production at 211,000 tons per annum.

From experiments I made many years ago, I ascertained hat it was possible, by varying the composition of the epositing solution, to suppress almost completely the comon tendency to a strongly crystalline character of deposit, ud to obtain a quality of deposited metal comparable to rought copper in smoothness, hardness, and elasticity. most remarkable change in the character of the deposit as produced by the addition of a minute proportion of solution of gelatin in dilute nitric acid, to an ordinary pper sulphate solution (composed of a two-thirds saturated lution with 5 per cent. of sulphuric acid). If so much the gelatin solution as represents 1 part of gelatin 30,000,000 parts of the copper solution be added, instead the deposit being pliant and crystalline, it will, under the oper conditions of temperature and current density, be ooth, bright, and elastic, and if the gelatin be in excess e deposit will be extremely hard and brittle.

The usual slow rate of electrolytic copper deposition ecessary where the object is to obtain pure copper of the hest conductivity), is often a serious limitation of the lity of a most beautiful process. But in those cases where e is of essential importance and where extreme purity is t necessary, the rate can be increased. Where even a fold more rapid rate would be necessary or advaneous, the means certainly exist for obtaining it—of rse, not for nothing; the price to be paid is the use a higher voltage, and therefore, extra power. But siderable gain in speed of deposit can be obtained taking proper advantage of the help that is given employing a highly metallised solution of low specific stance, such as the nitrate, coupled with the use of means obtaining rapid diffusion of the electrolyte at the cathode face. By using these simple means I have produced a fectly good electrotype in a single minute.

Bullion Refining.

he principle of the separation and purification of metals lectrolysis, that has been so largely and so successfully loyed in copper refining, has been also applied with ntage to the parting of gold and silver, and to the ing of base bullion.

ilver bullion is refined at Frankfort by the Rössler or zkow process, at Pforzheim by the Dietzel process, and amburg by the Moebius process. Nitrate of silver or corresponding copper salt is used as electrolyte, and gold is recovered from the slimes by chemical methods. Hamburg gold bullion is refined by the Wohlwill ess, which depends upon the use of an acid solution ld chloride. The silver and platinum pass into the e sludge, and are recovered by chemical methods. value of these recovered "impurities" helps to pay for cost of treatment, and, in particular cases, more than s it.

llion refining by electrolytic methods is finding extenuse in America, and at the Guggenheim Refinery at -Amboy a plant for refining silver by the Moebius s, having a capacity of 100,000 oz. of silver per day, ecently been put in operation.

Electro-plating.

is an interesting point in connection with the rise ctro-plating, the oldest but one of electro-chemical tries, that it was to meet its requirements that a mechaniproduced electric current was first industrially employed. nagneto-electric machine was patented by Woolrich 2, and the first machine built was used by Prime, of gham, for electro plating. At the Exhibition in Kelvin- there are two exhibits in this class well worth inspecone, that of Messrs. Walker and Hall, where the old eto-electric machine, of which I have spoken already, is to be seen; and the other, that of Messrs. Elkington who, 60 years ago, obtained a patent for electro-plating and gilding by means of cyanide of potassium solutions of gold and silver. During all the progress of later years in other branches of electro-chemical industry, there has been little or no change in this. The solutions as patented by Elkington are identical with those in general use at the present day.

Zinc and Nickel Plating.

An important development in the application of the principle of electro-plating, is its use for the purpose of giving to an inferior metal a protective coating of a metal of a harder or less oxidisable metal, other than gold or silver. The most noteworthy instances of this kind are the galvanic coating of iron with zinc; of copper with a thin protective film of iron, industrially known as "steel facing"; and the plating of iron and other metals with nickel. So-called galvanised iron is, as we all know, a misnomer; there is nothing more galvanic about it than there is in coating iron with tin by dipping it in a bath of fused metal. But there is a true galvanic zincing process, which is used to a limited extent in coating boiler tubes; the advantage claimed over the dipping method is that the physical properties of the iron are less altered. The deposition of iron on copper is mainly employed for preventing the wear of engraved copper plates. The steely hardness of the thin coating, which is nearly pure iron, except for occluded hydrogen, is very remarkable. The plating of small articles with nickel has now grown into a considerable industry, chiefly owing to the requirements of the cycle trade and the demand for nickel-plated accessories. Electrolytic coatings of cobalt, platinum, and palladium have also been quite successfully applied to other metals as protective coatings, but, so far, no great use has been found for them. Perhaps one of the most notable of these outlying examples is the use made by Cowper-Coles of the deposition of palladium on the electrotype concave mirrors in order to improve and preserve the reflecting surface.

Aluminium.

I now enter a different and a wider field, that of the extraction of metals from their ores, a field in which successful work was only possible after the dynamo was well developed, because the consideration of extremely cheap power is much more pressing in this case than in copper refining, or any other of those cases in which the same metal is dissolved at one pole and deposited at the other.

For the moment interest chiefly centres in aluminium and sodium. Both these metals had been for many years produced in considerable quantities by purely chemical means—the method of Deville in the case of aluminium, and that of Castner in the case of sodium—but the commercial results were such that the market price of aluminium never reached a lower point than 16*s.* per pound. A revolutionary change was brought about through the successful working out of electrolytic processes by Hall in America, and Héroult in France, each working independently of the other. The Hall process was clearly described by Prof. Chandler in his address last year. The process of Héroult is similar. Some little difference there may be in the electrolytic bath and in the form of the apparatus, but substantially they are one and the same. These processes have now been in successful operation for 11 years, and the results are, the total extinction of the chemical method, and the reduction of the selling price of aluminium to between 1*s.* and 1*s.* 6*d.* per pound. This great reduction in the price of aluminium has led to the creation of a new and large metallurgical industry, by which a most valuable addition is made to the common metals. The production of last year has been estimated at about 6,000 tons. This is divided between Europe and America in the proportion of two to one.

Further details of the position of this industry in Europe will be found in Table III.

Before passing from the subject of aluminium I may refer briefly to its most important uses. First, we have the use of aluminium in the iron and steel foundry. The addition of a small amount of aluminium, or of an aluminium alloy, the moment before casting, serves to remove any oxygen the melted metal may hold in combination, and consequently to increase the fluidity of the metal to be cast. The heat of combination, moreover, is sufficiently great to sensibly raise the temperature of the fused metal. I am unable to give figures showing the amount of aluminium used for this purpose, but it is undoubtedly one of the chief outlets for the metal at present. Probably the next most important use of aluminium is as an electrical conductor in lieu of copper. This application of aluminium has hitherto been chiefly confined to America, and our friends across the Atlantic have shown their confidence in the durability of the new metal, by erecting several hundreds of miles of bare aluminium overhead transmission lines. Whether aluminium will prove as resistant to atmospheric corrosion as copper, time alone will show. Experimental trials of aluminium for similar purposes have also been made on this side of the Atlantic, but so far the results are not decisive. In the Glasgow Exhibition you will find an example of this use of aluminium, for the overhead wiring of the outside arc light installation, has been undertaken by the British Aluminium Company with metal made at Foyers.

This rivalry between aluminium and copper, even if it be only a limited rivalry, may prove a salutary check on the price of copper.

Limits of time forbid mention of all the various other uses that have been found for aluminium, which result in the consumption of more than 20 tons a day of what was once an expensive metal, before it became the product of an electro-chemical process. I am told that a large proportion of this huge quantity is used in the manufacture of small articles, such as cooking pans, drinking cups, water bottles, scientific instruments, and innumerable nicknacks of various kinds. Aluminium bronze and aluminium brass and similar alloys are also applications of importance, and absorb a considerable quantity of the metal.

Through cheap aluminium and the Goldschmidt process, the engineer becomes possessed of a means of producing, in an easy and convenient way, an extremely high temperature, applicable to the welding of iron. The chemist and metallurgist are already busy utilising the same means for the reduction of the oxides of the more infusible metals, and the formation of their alloys, in accordance with the original proposal of Vautin. Particularly useful members of this class are chromium and ferrochromium. I trust that ere long new and still more important uses will be discovered for aluminium.

SODIUM AND MAGNESIUM.

The electrolytic extraction of sodium is so closely related to that of aluminium, that the few observations I have to make on it may be fitly introduced here.

The sodium industry affords another instance of the displacement of an old and purely chemical process by an electrolytic one. As in the case of aluminium the change has been brought about on the sole ground of the greater economy of the electrolytic method.

The discovery of sodium recalls a memorable episode in chemical history that links past and present closely together, for the Royal Institution, where we held our meeting last year, is the birthplace of sodium. There, 94 years ago, in the Albemarle Street cellar, where, as of old, ambitious research is still carried on as actively and enthusiastically as ever, sodium first put off its rusty vesture, and in silvery splendour mirrored the eager face of Davy.

The principle of Castner's sodium process is exactly like Davy's—both are electrolytic, and in both the electrolyte is fused sodium hydrate. The apparatus as patented is simple. An iron pan with a fire under it contains the fused sodium hydrate. The cathode passes up into this vessel through an opening in its base, and is surrounded by the anode. A strong current is employed, which helps to keep up the temperature of the electrolyte to fusion point. The sodium is released as liquid metal, and rises to the surface of the fused soda, means being taken to remove it and to prevent its combustion on coming in contact with the air.

By this process sodium is now manufactured by hund
of tons, and passes into commerce partly in the metallic fo
chiefly for use in the cyanide manufacture, but a consider
portion is converted into peroxide of sodium. The Cast
sodium process is operated at Runcorn; at Rheinfeld
and at Niagara. Electrolytic processes are also in us
Bellegarde; at Bitterfeld; at Höchst, near Frankfort;
at Neuhausen. Further details will be found in Table
It is worthy of remark that in England the electricity
ployed in the process is generated by steam power. In
manufacture advantage is taken of the exceptional purit
the soda produced by the Castner-Kellner alkali process

The consideration of the methods by which sodiu
produced naturally leads me to speak of the sister m
magnesium. In the extraction of magnesium also,
electrolytic method has superseded the chemical met
The process is analogous to that used for the extractio
sodium. The electrolyte is fused carnallite. The magne
industry is small, no large use for the metal having
been found—and the only factory known to me is th
Hemelingen in Germany. Quite lately a promising all
aluminium and magnesium (called "magnalium"), sai
have excellent qualities, has been attracting attention.

ZINC, COPPER, AND NICKEL EXTRACTION PROCES

Before I pass from this section I ought to mention
of the other numerous attempts that have been
to apply electrolysis to the extraction of metals from
ores, and particularly I ought to mention the electr
extraction of zinc. Zinc ore has been the subje
innumerable essays, almost all of them failures fr
commercial point of view. But I am informed t
process of electrolytic zinc extraction, in which chlor
well as zinc is produced, is in successful operati
Winnington. This process is based on the pate
Hoepfner, and a considerable quantity of extremely
zinc is the result. Specimens of this zinc, by far the
commercial zinc ever made, testing 99·96 per cen
shown by Messrs. Brunner, Mond, and Company
Glasgow Exhibition.

* * * *

The problem of the recovery of the metals contai
the mixed sulphide ores of the Broken Hill district of
South Wales has exercised the skill and ingenuity of
chemists—a full description of the various processe
would itself occupy more than the time at my di
to-day.

In this field electrolytic methods have not, it m
confessed, met with the success that was at on
hoped.

The Swinburne-Ashcroft process is still in the
mental stage of development. Many modifications
original method have been made, and that now bein
consists, I am told, in the mixture of the pulverised
fused zinc chloride, in the removal of the silver a
after chlorination by chemical substitution, and in
lysis of the molten mass, containing only zinc chlori

The attempts to apply electrolytic methods in the
tion of other metals directly from their ores have
as yet achieved distinct success. Both copper and
ores have been the subjects of many experiments
some cases large installations of plant have been pu
and operated. In the eighties the Siemens and
and Marchese methods for treating copper ores
industrial trial; I believe without permanent
More recently the Hoepfner processes have been the
of similar large scale tests in Germany; and in A
there has been considerable activity in connecti
processes for nickel extraction at Niagara, and at Sa
Marie. I have been unable to ascertain the com
results of these recent industrial trials.

The Hoepfner process for treating nickel-copper
residues is operating at Papenburg in Germany
production towards the end of 1900 was stated to
rate of one ton of nickel per day. I am not awar
existence of any other nickel works in Europe us
process; but electrolytic nickel is said to be prod

wo firms using methods similar to those employed in opper refining, *i.e.*, using anodes of raw nickel.

Dr. Mond has estimated that the total consumption of ickel is now 9,000 tons per annum, and the new Clydach orks in South Wales, where his most beautiful nickel arbonyl extraction process is about to be worked, are esigned to produce 1,500 tons of nickel per annum. Nickel ay therefore now be regarded as one of the common etals.

Gold Recovery from Cyanide Solutions.

On the border of the field of electrolytic metal extraction, e find in successful operation a process for the recovery of old from the weak cyanide solutions yielded by the treatent of the tailings and slimes of the Rand goldfield. The ocess is that of Messrs. Siemens and Halske. An extremely eak electric current is used, and the gold is deposited as a own coating on thin lead cathodes. When the gold posit has sufficiently accumulated, the cathodes are changed for new plates, the gold-coated plates being elted, and the gold recovered by cupellation.

The lamentable war in South Africa has caused the spension of all mining operations for nearly two years, and nsequently no very recent statistics of this process are ailable. On January 1st, 1898, it was stated that 13 works the Rand district were using Siemens and Halske's process, d that 12 others were about to adopt it. Pauli, in the me year, estimated that 88,000 tons of tailings, and 46,000 s of slimes, were being treated monthly by this process t improvements in the older zinc process, which are said have made it the equal of the electrolytic process for ating very dilute cyanide solutions of gold, had been made rtly before the war broke out. The first cost of the nt for the improved zinc method of treatment is conerably less than that required for an electrolytic plant, l therefore the limits of expansion for the electrolytic cess may probably have been reached. The costs of rating the two processes were given by Yates in 1897 as 2*d.* for the electrolytic, and 2*s.* 6*d.* for the zinc process ton of tailings, but the modified zinc process costs rather e than the original one; and the cost of treatment glecting interest on capital outlay) is now, I believe, ut equal.

efore leaving the subject of gold recovery I may refer he Riecken process, now being tried on a large scale in stern Australia. In this process the finely divided ore gitated with a solution of sodium chloride containing ssium cyanide; and during agitation the mixture is trolysed, with amalgamated copper plates as cathodes, carbon anodes. The mechanical difficulties involved is method of treatment are obvious.

e Electrolytic Alkali and Chlorine Industry.

now pass on to speak of the electrolytic alkali and rine industry, embracing the production of caustic carbonated alkali, and of bleaching powder, hypoites, and chlorates. The alkali industry has been ified with the Clyde for 100 years. The Tyne began anufacture two years earlier, viz. in 1798; that great tor Lord Dundonald being a partner in the adventure. da crystals were then 56*l.* the ton.

r obtaining chlorine and sodium, or chlorine and soda, ocess can, theoretically considered, be more beautifully e and complete than the electrolysis of chloride of m. But when an attempt is made to carry out this of decomposition on an industrial scale, a number of exing practical difficulties present themselves.

with a view to obtain a high yield from a small plant, loride be used in the state of fusion, then the selection suitable material for the electrolytic cell, and the tion of the electrolytic products, both at a high rature, are found to be matters of serious difficulty.

merous attempts have nevertheless been made to ome these obstacles, and two processes, namely, that lin and that of Ackers, have obtained industrial trial ance and America respectively.

Hulin process has not yet achieved financial success, odifications of the original process are now, I underbeing introduced. The Ackers process is more recent, and, though now in operation at Niagara, its ultimate value is uncertain.

Greater success has attended the employment of aqueous solutions of common salt as the electrolyte for the production of alkali and bleach. The electrolytic decomposition of brine, or of potassium chloride solutions, has already attained the rank of a stable and successful industry. But the forms of apparatus employed have not yet settled down to uniformity of type, such as obtains in the competing chemical processes; and there is much obscurity concerning details of the processes employed at several of the continental electrolytic alkali works.

I may, however, state that there are two well-marked types of cell employed in the electrolysis of brine for production of alkali and chlorine. One is the type in which mercury is used to amalgamate with and separate the sodium or potassium set free at the cathode, and to remove it from the area of electrolytic or chemical reactions within the primary cell. In the other type of cell a diaphragm is used to divide the anode and cathode compartments, and the secondary chemical reaction, by which the metal is transformed into the hydrate, is, as far as possible, restricted to the cathode compartment.

With respect to the first type of cell, two forms are in actual use, and are working with satisfactory results, namely, the Castner-Kellner and the Solvay cells. The former is operated at Weston Point, Runcorn; at Osternienburg; and at Niagara; while the latter is stated to be in use at Jemeppe, in Belgium, and at Donetz, in Russia. The process worked out by the "Elektron" Co., of Frankfort, and now employed in works in Germany, France, Switzerland and Russia, is stated to be a diaphragm process; but as this company refuses to give any information on this point, the above statement is conjectural. The Castner-Kellner and the Solvay cells have so often been described in print, that it is unnecessary for me to repeat the description. Through the courtesy of the directors of the Castner-Kellner Company I have been permitted to visit their works at Weston Point. There I saw in full operation a chemical works employing 4,000 h.p., and yielding a large output of very pure soda and very strong bleaching powder, and also a large quantity of sodium and its products, without creating any kind of nuisance. There were, it is true, four tall chimneys, but these were almost smokeless. The ashes from the engine furnace and a little thin smoke from the chimneys were the sole products in the nature of refuse. The solid contents of the brine, brought into the works by a pipe from the neighbouring salt beds, were wholly transformed by steam power into valuable products. The bleaching powder plant covered two acres. I believe it is the largest in the world. The cleanliness and regular working of an electrolytic alkali process are by no means unimportant points in its favour.

Turning now to a consideration of the industrial position of the diaphragm type of cell, I find that three modifications of it are in actual use.

One of the best known of this type of cell is that devised by Hargreaves and Bird, and described in great detail by Mr. Hargreaves before the London Section of this Society, in December 1895.

The success of an experimental plant which was worked for six years at Farnworth has led to the erection of a large factory at Middlewich, in Cheshire. On the occasion of a recent visit to these works, the building of which is not yet completed, I saw a double series of 11 large cells in operation, each cell taking an E.M.F. of nearly 5 volts and a current of 2,000 to 2,500 ampères. I have since learned that there are now four rows each of 3 cells actually working in series, and that the voltage has been reduced to less than four volts per cell. The products are bleaching powder and soda crystals.

The higher E.M.F. required per cell than that given by Mr. Hargreaves in his original paper, is stated to be due to the use of thicker diaphragms. The product here is not caustic, but carbonate of soda, and bleaching powder.

Asbestos and Portland cement, rendered porous by the admixture of various salts during setting and subsequent lixiviation, have both been successfully employed as the material for the diaphragms.

Other diaphragm processes in actual operation are the Outhenin-Chalandre and the Le Sueur processes. The first is worked at Chèvres, near Geneva, and at Montiers, in France; while the second is used at a paper mill near Berlin Falls, New York.

The Outhenin-Chalandre cell consists of a bell-shaped anode chamber of suitable material, into the sides of which a large number of porous tubes are fixed in a position slightly inclined from the horizontal. These tubes act as diaphragms, and contain the sheet iron cathodes. The caustic soda solution formed at the cathodes passes to the lower ends of the tubes, and then collects at the bottom of the cell by gravity.

The Le Sueur cell contains a horizontal diaphragm, with the anode compartment on the upper side. According to Weightman, the diaphragms are of asbestos, and last from 3—6 weeks. Each cell takes 800 ampères at 6 volts, and has a current efficiency of 70—80 per cent.

Although the principle of cell construction in which gravity is allowed to effect the separation of the sodium hydrate formed at the cathode, and in which therefore a diaphragm, or mercury, is dispensed with, has been discredited by the failure of the Richardson and Holland process at St. Helens, yet a cell on that principle is said to be working with satisfactory results at Aussig, in Austria, and, according to Häusserman, this works is producing alkali and bleach at the rate of 2,640 tons per annum.

A recent laboratory research by Adolph has shown that, under carefully regulated conditions, a current efficiency of over 80 per cent. can be attained in these cells with continuous work; and, as the saving in cell construction and E.M.F. is considerable, it is possible that "gravity" cells may once again come into use.

There are now 23 electrolytic alkali works in operation in Europe, disposing in the aggregate of 50,000 h.p. I have figures in my possession showing the production of many of these works, but in some cases I am not allowed to make use of them for publication. All the details that can be given are presented in the Appendix in Table V.

HYPOCHLORITES.

As regards the production of hypochlorites, limits of space will only allow me to state that there are a very large number of firms in Europe using electrolysis for production of bleaching solutions, containing sodium hypochlorite. The cells are patented under various names, and differ in details of construction, but the principle of the method employed is common to all, and depends upon the chemical action that takes place when chlorine gas is passed into a solution of sodium hydrate at a temperature below 20° C. The solution obtained may contain up to 10 grms. of available chlorine per litre. Bleaching liquids prepared in this way are being utilised in the textile and wood pulp industries of the Continent to an increasing extent. The installations are in many cases small, and it is impossible to obtain details of all; but I am informed that 1,600 h.p. is being utilised in South Germany by one form of apparatus alone, so that the aggregate power utilised by the six different types must be comparatively large. One of the most notable installations of this kind is at Lancey, Isère, where Messrs. Corbin et Cie. are employing 700 h.p. for the bleaching of cellulose, using their own form of apparatus and cell. The Kellner-Partington Paper Pulp Co. have also a large installation at Sarpsfos, in Norway.

CHLORATES.

The production of chlorates by the electrolysis of solutions of potassium or sodium chloride is one of the older electrochemical industries, Gall and Montlaur having commenced to manufacture chlorates in this way on a small scale at Villers-sur-Hermes in France in 1889, and on a large scale at Vallorbe in Switzerland in 1890.

There are five different types of cell now in operation for production of electrolytic chlorates; but, as in the case of hypochlorites, the principle of the method employed is the same in all cases, and the differences are simply in details of cell construction. The diaphragm principle is still employed in the original process of Gall and Montlaur, but elsewhere this feature appears to have been abandoned.

The number of works producing chlorates by the elec lytic method is now ten, seven of these being in Europe, 28,000 h.p. is available for this manufacture. The p of chlorate have fallen greatly since the electrolytic pro was adopted on a large scale. Whereas 10 years chlorate of potash was selling at 6*d*. per lb., it is quoted at 3½*d*. The manufacture having become remunerative, some of the electrolytic chlorate factori being used for other products. Table VI. in the Appe gives all the available information relative to power output, in condensed form.

Before leaving this branch of my subject I may that the manufacture of ammonium persulphate and chlorate has now become a sub-branch of the electr chlorate industry, and I am informed that these chen are being produced by Messrs. Carbin and Co., at Ch and by the Swedish Company at Mansboe.

In this case electrolysis has afforded a convenient me for producing compounds of high oxygen value commercial scale. These products are used in photogr and in the manufacture of some of the modern explosives.

ORGANIC PRODUCTS.

Besides the larger uses made of electricity in conne with the chemical processes of which I have spoken, th considerable experimental activity in the field of or chemistry. Up to the present time it cannot be that any very large or important section of the fi being successfully cultivated, but there is actual ac ment of a substantial kind. In proof of this I gi following list of organic compounds, all of which hav produced in the chemical laboratory by aid of elect methods. The first five have been produced in this am informed, on a commercial scale, but I am no position to positively state that their manufactu electrolysis is still continued.

Iodoform; vanillin; chloral; azo- and hydrazo pounds; oxidation products of fusel oil; dyestuffs phenylmethane type; Aniline Blue and Aniline Black mann's Violet; Alizarin; Congo Red; oxidation prod the alcohols; sulphonic acids; piperidine; dihydroqui benzidine; amidophenol.

As these products are nearly all of industrial impo it is possible that some of these methods may eventu adopted for regular use.

Messrs. Schering of Berlin; the Badische Anili Soda Fabrik; the Farbwerke Meister, Lucius und Br and the Farbenfabriken vormals Fried. Bayer and Co. I believe, using electrolytic methods, but definite infor upon this point is lacking.

In all factories where organic products are mad large scale, chromic acid is the usual oxidising Meister, Lucius und Brüning are now using an elec process for renewing exhausted chromic solutions, a process is said to have many advantages.

The electrolytic production of inorganic colouring has not developed into a recognised industry, bu informed that there is a firm at Cologne producin lead and other chemicals of this kind by elec Unfortunately I have not been able to obtain any as to the extent or character of these products. In to the subject of electrolytic colour making, it interesting reminiscence that so long ago as 1852, a for the production of colours as by-products in co with the generation of electricity in a new form of cell, was granted to Watson and Slater, and that 1880, Goppelsroeder showed that Indigo could be p at the anode and reduced at the cathode of a voltaic

OZONE.

The odour that pervades the atmosphere during a storm, due to the formation of ozone, is one of t ancient of observed electrical phenomena. It is prising that, with the large means we now po generating electricity and ozone, uses should ha sought and found for this powerful oxidiser. Acc we find that in the field of organic chemical man it has been utilised with great effect, especially isformation of oil of cloves into vanillin and into helio- pin. I am informed that the quantity of these two uable substances manufactured yearly amounts to 10,000 s., and that 350 h.p. (steam) is used in their production. here are numerous types of ozone apparatus in use, and), Marmier and Abrahams, Siemens and Halske, and Ireoli have all patented particular forms that have ived practical trial. Ozone is also used in bleaching ations in conjunction with hypochlorite of soda.

mong the more important uses proposed for ozone, the lisation of water must be mentioned as occupying the ition of hygienic engineers. The principle of water lisation by ozone has been definitely adopted for the r supply of Lille. The decolorisation and defecation of p in the sugar manufacture, and the rapid production ie effect of "ageing" on alcohol, are among the many uses proposed for electrically produced ozone.

The Fixation of Atmospheric Nitrogen.

close relationship to the electrical generation of ozone atmospheric oxygen, is the important question of the iction of nitric acid from atmospheric air.

a Royal Society Soirée in 1892 Sir William Crookes ited the flame of burning nitrogen; and in the address at the Bristol meeting of the British Association in he pointed out the great possibilities latent in atmo- ic air as a source of nitrates for the fertilisation of the

ing his calculations on figures given in a paper read the Chemical Society by Lord Rayleigh in 1897, m. Crookes found that 14,000 B.T.U. would yield ent nitric acid to form one ton of nitrate of soda; and t Niagara this quantity of power would not cost more l. Since then Messrs. McDougal and Howles have further experiments, and obtained even better results. l account of these experiments will be found in a ir communicated to the Manchester Literary and ophical Society last year (No. XIII., vol. 44, part 5). ollowing is an extract from that paper, which gives st results so far obtained :—

n experiment was conducted with a mixture of oxygen trogen in the proportion of two to one. The gaseous e was passed through the apparatus at the usual rate. ntity of acid almost double that previously obtained s, when atmospheric air pure and simple was used), ting to 590 grms., was produced." With the same and time, *viz.*, 12 h.p. hours, Lord Rayleigh's result ly 440 grms.

manufacture of nitrate of soda in this way is still loped industrially. The idea is nevertheless alluring, ely chemical science and chemical industry can be no higher or fitter use than to help to increase the of our fields.

e immense sources of motive power, the waterfalls of rld, which are now for the most part running to require some great employment such as this, the ion of nitric acid. If the quantity of nitric acid d per k.w. of power expended can be increased yet further—and such a development seems to be far iopeless—this immense application of electricity become profitable. The subject is certainly worthy erious attention of chemists.

The Electric Furnace.

come to a section of the subject of more recent d one that has forced itself into a position of great nce with suprising rapidity,—the section in which, electrolytic, but the thermic power of electricity is e.

e largely indebted to the initiative of Sir William for the idea of turning the heat effect of electricity ical account, so as to obtain chemical effects not e possible. Sir William Siemens exhibited his furnace in action before the Society of Telegraph rs in June 1880, and lucidly pointed out its many ges. The employment of electricity in this way to extremely high temperatures has, within the last s, been greatly developed. Yet it may be antici- th much confidence that the industrial use of the electric furnace has not nearly reached its practical limit, although for the moment there appears to be a check along at least one of the lines of operation, the result of over-haste and excessive production. But in several directions progress is still being made.

Regarded from a narrow point of view, to carry on a chemical process by electric heating instead of by the heat of combustion seems, at first sight, of all methods the most wasteful. As we all know, in generating heat electrically by steam power, so many energy-expending transformations have to be passed through, that only a small fraction of the whole energy expended is finally effective as heat.

Where the electrically produced heat is derived from steam power, there are, at the outset, the losses incidental to the transformation of heat energy into motive power. These losses amount to 85 per cent., and often more. Before the remaining effective 10 or 15 per cent. is electrically re-transformed into heat through the medium of a dynamo, other losses, mechanical and electrical, have to be incurred, so that before the end is reached, a still smaller fraction of the actual energy of the coal remains to be finally utilised. Hence, from a superficial consideration of the question, it might well be concluded that to carry on large chemical operations economically by electrically generated heat, was of all hopeless projects, the most hopeless in its extravagance. But on a close examination of the case, it will be seen, that there are many compensations for these great losses, the chief one being that when at last you have obtained your electrically produced heat, you obtain it in a form so convenient for applying to the exact place where it is wanted that, in many cases, the wasteful mode of production is more than compensated for. For example, in the reduction and distillation of zinc by the process in general use, it is not uncommon to consume five tons of fuel in producing one ton of metal. If the statement lately made in a foreign journal in relation to the electrical extraction of zinc be true (and I see no reason to doubt it), only two tons of fuel would be required if the power had been generated by an economically working steam engine employed to generate electricity, that power being afterwards transformed into heat and properly applied to the reduction of a mixture of calcined ore and carbon in the electric furnace.*

In the Presidential address delivered before the Society two years ago by Mr. Beilby, the great waste of heat common in our factories and in our houses was clearly pointed out. Wasteful of energy as is the double transformation of steam power into electricity and electricity into heat, it is not so wasteful as are many of the ordinary chemical and metallurgical operations.

The electric furnace not only has the merit of making very good use of the heat developed in it, but it has the further merit that much higher temperatures are attainable than are reached in ordinary furnaces; consequently a new group of high-temperature products has been brought within the range of industrial use by means of the electric furnace.

Electric Furnace Products.

The most conspicuous members of this new series of electro-chemical products are calcium carbide, carborundum, and artificial graphite. All these demand temperatures for their formation, so high, that their industrial production is only possible by means of the electric furnace. There is also another class of electric-furnace products assuming importance; at present, the class which, while not demanding the highest temperature producible by the electric furnace, yet requires a temperature exceedingly high, and in reaching, maintaining, and applying it, electric heating has several advantages. I refer to the reduction of the more refractory metals and their alloys.

In the hands of Moissan the electric furnace has proved a most effective instrument of chemical research. The results of his operations, as set forth in his treatise, "Le Four Electrique," and as illustrated at the Paris Exhibition by the large and splendid collection of new and rare products, were in striking contrast to the simplicity of the apparatus by which the results were achieved.

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* "Elettricità," Milan, Sept. 22, 1900.

Calcium carbide, carborundum, and artificial graphite are, in their origin, as industrial products, all more or less accidental results of the experimental operation of the electric furnace. The way in which the new industries, the manufacture of carborundum and artificial graphite, have been built up in America by Acheson deserves the highest admiration. Useful as artificial graphite has already been found to be in electrolytic operations, it would not be surprising if even more important uses for it were yet to be found. Prof. Chandler, in his address last July, gave details of these two very interesting industries.

Chromium, tungsten, molybdenum, and titanium, and their alloys with iron, are, through the electric furnace, now for the first time producible in such quantities and with such economy, as to allow of their entering into the larger schemes of the mechanical engineer.

Calcium Carbide.

After electrolytic copper refining, there is no branch of electro-chemical industry so large as that of calcium carbide. I am credibly informed that the European production in 1900 was about 60,000 tons, and that works exist with power to produce three times this amount, if the demand and price warranted such an increase of production.

Further details relating to the position of this industry will be found in Table VII. of the Appendix.

In nearly every case the power by which the electric heat is generated is derived from water, and, considering the smallness of British water power, the manufacture of carbide is a matter of less interest to ourselves than to some of our foreign confrères. The only considerable production of calcium carbide in Britain is at Foyers, where there is a factory for the production of between 2,000 and 3,000 tons a year.

As a convenient means of generating acetylene, calcium carbide is interesting to chemists, and it is not improbable that it may play an important part as a reducing and carbon-carrying agent in metallurgy.

Of late there has been most serious disproportion between the supply and the demand, with the result that only those factories that are most favourably situated in relation to cost of power and raw material, and also cost of carriage of the product to the place of consumption, have been able to carry on the manufacture with profit. Calcium carbide is one of those products not well able to bear long and difficult carriage. Not only has the immediate cost of carriage to be considered, but also troublesome restrictions of freedom of transport. These restrictions tend to embarrass and lessen manufacture. The anticipations of an almost unlimited demand have not been realised, and there are in consequence many carbide works idle, with water running to waste; and fully equipped power-plants ready to be applied to some more immediately profitable use. Such use may possibly be found for some of them, in connection with an extension of the alkali and chlorine manufacture. New electro-metallurgical processes, such as those for the production of steel, ferro-manganese, ferro-chromium, ferro-silicon, or other alloys of the more refractory metals, which are either already in demand or which promise to supply new requirements, may also be taken up by these works.

Chromium and its Alloys.

The production of chromium and of chrome-iron at Essen by means of the Goldschmidt-Vautin process—indirectly dependent on an electro-chemical product (aluminium)—has already been mentioned (p. 666). The Willson Co. in America have also been producing ferro-chrome alloy by a direct electric furnace method, and in 1898 they were stated to be making 60 tons of this alloy per month.

Chromium is reported to be made at Bitterfeld, in Germany, and also by several of the French electro-metallurgical companies, but I have not been able to obtain any very reliable figures showing the output of these works. Table VIII. in the Appendix gives some further details of this manufacture.

Ferro-Silicon.

Ferro-silicon is one of the newer class of alloys now being produced on a commercial scale by the electric furnace. At present the demand is small, and the production excee the requirements, but it is hoped that in time there may a large demand for this alloy in connection with the man facture of iron and steel. It has been proved that, whe there is no excess of carbon, silicon improves some of t physical properties of steel, and that its thermal energy of value in steel casting. Ferro-silicon is at present bei manufactured at Meran, in the Austrian Tyrol, and at oth carbide works in France.

Scrap iron, quartz, and coke are used as raw materi of the manufacture. The daily yield of each furnace 1,200 kilos. The product contains 77·5 per cent. Fe. a 21·5 per cent. Si., and costs at Meran 8*l*. per ton. The yi in the electric furnace is 1 ton per 5,000 kw. hours.

Ferro-Titanium.

The manufacture of ferro-titanium is carried on Niagara.

Scrap iron, titaniferous ore, and aluminium are hea together in a resistance furnace, and the product is sold use in the manufacture of iron and steel.

Demand for this alloy has to be created; but it is pected that in time a large industry will be developed.

Steel.

One of the latest and most startling developments in industrial applications of the electric furnace is the prop to use electricity in the manufacture of steel direct from ores of iron. The Stassano process, which has already recei experimental trial near Rome, is about to be tested o considerable scale at Darfo, in Northern Italy, where 1, h.p. is available, and an output of 4,000 tons of steel per y is expected. In Switzerland and in Sweden also, the ap cation of the electric furnace to the direct smelting of i ores is being discussed. In the latter country it has l stated that a works is in actual operation, and is produ 10 tons per day; but I have not been able to obtain confirmation of this report. I may, however, say tha seems to me that in those countries where coal and are extremely dear, and water-power, and hence electri are extremely cheap, it is conceivable that the ele furnace may, in exceptional circumstances, find a limited economic employment in the reduction of iron o

Phosphorus.

The manufacture of phosphorus, the last electro-che industry of which I shall speak, is another case wher old process has been modified and improved by the electricity.

As in the case of sodium, it is probable that few years the older method of manufacturing phosph will be entirely superseded. In 1899 Tatlock s that one-half of the phosphorus production of the (estimated at 1,000 tons) was yielded by the ele furnace, and now every country of importance poss phosphorus works depending on the use of electr In this country the Readman furnace is in operatio Wednesfield, and uses about 500 h.p. Electric-fu phosphorus works are also said to be operating at Nia Paris, Vernier, and Griesheim.

Miscellaneous.

There remain to be noted a few miscellaneous uses o electric current, which fall outside the classification l adopted. One of the most interesting of these is the i trial production of oxygen and hydrogen by the electr of water. Several forms of cell have been patented are in actual operation at Rome, Brussels, Mon Toulouse, Milan, Zürich, Lucerne, Hanau, and other In most cases a solution of sodium hydrate is us electrolyte, with sheet-iron electrodes, but in one in a dilute sulphuric acid solution is employed, with electrodes. The cost of the gases obtained in this course varies with the cost of power, but at Rome, current generated at the Tivoli power station is utili manufacture, 1 cb. m. of hydrogen and ½ cb. m. of gen are said to cost only 20 cents.

\s the cost of hydrogen generated from zinc and sulphuric l is stated by Schoop to be 2*s*. per cubic metre, the gain conomy is striking. Electrolytic hydrogen gas is used inflating military balloons, and the two gases together used for blow-pipe and furnace work of all descriptions.

he application of electricity to tanning has been much ussed, but, so far as I can learn, only one system of tric tanning, that of Groth, is now in actual use. Groth's ess is in operation at Wernersborg in Sweden, and at n in Shropshire. The system combines mechanical ement of the hides in the tanning pits, with electrolysis he tan solution. Other large tanneries in Germany, sia, and Austria are stated by the inventor to be about lopt his system. The present capacity of the plant at n is 200 hides per week. The gain in time varies from to two-thirds of that required by the older method, some doubt still exists as to the durability of the ied leather.

gar refining by means of ozone has been already red to. Other processes, however, have been tried ort Salut in France, and at Stefanowka in Russia), in the destruction of the colouring matters in the sugar is brought about by electrolysis of the syrup, with r aluminium electrodes. The results as regards colour good, but the economy of the method is not yet d.

ally, I must allude to the use of electricity in the cal laboratory.

following metals can be quantitatively determined ctrolytic methods :—

per, nickel, cobalt, lead, antimony, bismuth, iron, zinc, um, manganese, silver, mercury, tin, gold, platinum, lladium. The first six of these metals are, in fact, quickly and conveniently determined in this way than e ordinary gravimetric or volumetric methods of is.

trolysis can also be used with advantage to prepare rd acid solutions for volumetric analysis. Standard ric acid is now being made in some laboratories by lysis of copper sulphate solutions. The chemical ory of the present day cannot therefore be con- l fully equipped, unless provided with the fittings and tus required for electrolytic work.

The Future.

r I have spoken of the past and present; allow me r a few moments to direct your thoughts to the We have seen that electricity has revolutionised cess of copper refining, made aluminium one of the n metals, and so far reduced the cost of sodium that l large uses have been found for it, and dependent es created. Electricity has successfully invaded the of the alkali and chlorine manufacture, and now is to encroach on the province of the blast and the Bessemer converter, and to become an ngly important factor in the reduction and treat- metals in general. Are these achievements of the ude of the nineteenth century but the prelude to still developments in the century upon which we have ered, and will electricity become a yet greater n the chemical and metallurgical processes of the This question requires earnest consideration; it interests of national importance, for chemical tures occupy, and have always occupied, a leading ong the industries of our country.

f the larger questions brought into view by the of a more extended use of electro-chemical pro- ith their immediate dependence on power for the on of electricity, is that of the position of those which possess coal, but do not possess waterfalls. ately, though we have an abundance of coal, we little water in the form available for the economical n of motive power. Therefore the question comes s, whether with coal only, we can carry on electro- industries with profit, in competition with the countries which possess a large supply of easily engineered water-power.

The question is complicated in many ways. In the first place it is necessary to find what is the cost of power developed by coal, and what the cost of power developed by water. The cost in neither case is uniform; the cost of water-power, and the cost of power generated by coal, both vary exceedingly, under different conditions. It is even a fact that water-power in some cases (no doubt exceptional cases) is more expensive than the power obtained from gas or steam.

The difference in cost in different circumstances is extremely great. From data gathered from many sources I find that there is one place (it is in Norway) where power is generated at a cost of 20*s*. per horse-power year. This cost is chiefly interest on capital expenditure on the works. But, on the other hand, there are cases where water-power costs 10 times, or more than 10 times, this amount. The capital outlay at Lyons has been 84*l*. per horse-power developed, as compared with 3*l*. 9*s*. 3*d*. at Vallorbe, in Switzerland. Niagara power is a mean between high and low water-power costs; there, the charge to large consumers is at the rate of 4*l*. per e.h.p. year.

Difference of cost is equally wide in the case of coal-produced power. I am informed on good authority that there are steam-power plants in operation in the United Kingdom which yield the power at a cost equivalent to 5*l*. per e.h.p. year; and certainly there are many where the cost will be twice and even four times that amount.

Such figures are for power generation on a large scale (not less than 1,000 h.p. units), and also, of course, continuously and uniformly delivered. One other essential condition for obtaining a low cost for steam-power is, obviously, low-priced fuel. In the case where the e.h.p. year is said not to exceed 5*l*., fuel costs only 4*s*. 10*d*. per ton delivered at the boilers.

But, notwithstanding the fact that under extremely favourable conditions electrical energy can be generated from coal at a comparatively low cost, the fact remains that the greater number of electro-chemical and electro-metallurgical plants are operated by water-power, and in Table IX. in the Appendix you will find the results of my own inquiries on this point. Summarised, the returns sent to me show that 50 works in Europe have 149,000 h.p. available from water, 16,700 h.p. available from steam, and 250 h.p. from gas.

In considering the bearing of these facts upon the actual position, it is to be borne in mind that the last word has not yet been spoken as to the cost of power developed by coal. Great advances have in recent years been made in the direction of reduction of cost, by improvements in the steam engine, the gas producer, and the gas engine. In the best modern steam engines a heat efficiency of 15 per cent. is obtained. There is great reason for hope that help in the more economical generation of power for electro-chemical work may come from the further development of the gas engine. Already much has been done, both in the improvement of the gas engine and also in providing it with cheap gas. Our honoured past President, Dr. Mond, has made a valuable contribution in this direction.

One of the drawbacks to the employment of gas engines for large operations has been that they were not adapted for large units of power, but now engines of 500 h.p. and even 1,000 h.p. are manufactured, and work with successful results.

Perhaps it is not wholly futile to inquire whether there is any other way of generating the electricity required for electro-chemical operations. The perfection to which dynamo-electric generators have been brought, both mechanically and electrically, is now so high, that almost the utmost possible limit of economy in the transformation of power to electricity has been reached. When there is put in comparison with this most convenient and effective means of generating electricity mechanically, the cost of obtaining the same results by the best chemical means now known, the question of displacing the mechanical method of generation, by the voltaic method, seems almost useless.

The difference is extreme. In comparing the cost of electricity produced by mechanical and chemical means, it has been usual to emphasise the difference between the cost of coal and of zinc. But even if the high price of zinc were not a hindrance, and if zinc were as cheap as coal, or if it could be had for nothing, it would still be practically impossible to carry on the electro-chemical industries of the world by means of the voltaic cell as it exists to-day. The cost of the labour, and the complication of handling the gigantic cells, and keeping them in operation, would so far exceed the cost of producing electricity as we now produce it, that we should still continue to use the far more convenient water turbine, and steam engine, and dynamo, which yield us such great effects, with comparatively small apparatus, and with very little manual labour.

But that somewhat sweeping statement does not wholly dispose of the question, so far as it applies to the case in which cheap water-power is unobtainable.

We know that the best of our heat engines utilises but a small proportion of the potential energy resident in the fuel it consumes. Hence there is the possibility of a more economical way being found of transforming the heat energy of the fuel into electric energy, possibly even on the voltaic principle. But in order to obtain what is required, that principle must be employed in a manner widely different from that hitherto attempted in the so-called carbon-consuming cells, or in any of the forms of cell where the electrolyte is a liquid, and the elements are plates that require renewal. I do not pretend to say how it can be done, or that it can be done in any way, but it seems to me that if there is a way in any direction, it is in the direction of a gas-consuming cell. A bold attempt at the solution of the problem in that way was made some years ago by Mond and Langer, when they produced a gas battery, on the principle of Grove's gas battery, that yielded a considerable current in proportion to its size, and consumed nothing but hydrogen and atmospheric oxygen. Unfortunately, since one of the essential materials in its construction was platinum, the apparatus, whatever its other merits, was too costly to be of practical use. There is one other attempt of the kind, which deserves to be remembered in this connection; I refer to the experiments of Kendall and his very ingenious gas cell, with fused glass as the electrolyte, and hydrogen and atmospheric oxygen as the source of energy. Here, too, the high price of platinum was an insurmountable bar to its practical utility.

For the present, it is to be realised, that electricity cannot be generated in the British Islands by means of coal, as cheaply as in those countries where abundant, accessible, and easily engineered water-power is available, and hence it is necessary to consider what is best worth doing with the little water power and the more costly steam-power or gas-power, at our disposal. Some of the new industries I have been discussing cannot be carried on with profit in our almost water powerless island. Those industries, I mean, which use a great quantity of power in proportion to the value of the product. An extreme example would be the electric-furnace production of iron and steel, and the alloys of the more refractory metals. Such uses of electricity in this country are, in the present state of things, nearly out of the question. But I trust that gas engines in conjunction with cheap gas may ameliorate the situation, and that at no very distant date blast-furnace gases may be generally utilised for power production, in conjunction with some complementary or auxiliary electro-chemical manufacture. We cannot do everything, but it is certain that within the limits of our capacity there is yet ample scope for the profitable exercise of our energies. There are many electro-chemical industries in which the ratio of cost of power to value of product is such that the cost of power, at a rate which we know to be attainable in many of our manufacturing centres, is not prohibitive. We must concentrate our attention on these.

The alkali manufacture is in a state of unstable equilibrium. The electrolysis of brine from a commercial point of view must, under existing circumstances, be considered as a process for the production of chlorine rather than as a process for the production of alkali, because it is only to the extent equivalent to the chlorine required in commer either directly or incidentally to chemical operations, tl soda can be manufactured by electrolysis as economica as by other means. Electrolytic soda must therefore treated as the by-product, and chlorine as the princi product, of the electrolysis of chloride of sodium.

It is with the Le Blanc process chiefly that it comes i competition, to the extent to which the hydrochloric acid used for chlorine generation, and that, of course, is to a v great extent. The scope of the one process is limited by same disability as the other, *viz.*, the demand for chlor in some form; and that demand is, according to Dr. Lun only about one-eighth part of the demand for the equival of soda. But yet that one-eighth is a very large quant and within that limit, electrolytic production appear have a fair prospect of commercial success, under favour conditions.

Chemical industry is, almost beyond any other indus liable to change. Twenty-five years ago we possessed nigh a monopoly of the manufacture and export of all The Clyde, the Mersey, and the Tyne were the su markets of the world for this typical and indispens chemical product. We well know that that state of th no longer exists. The causes of the transformation many, and most of them in the natural order of thi Taking a large and liberal view of the subject, they to be in the direction of progress, and for the general g and yet it is a kind of progress in some respects detrim to our interests, and not to be contemplated with pe equanimity. Among what I term natural causes is spread of knowledge, and especially such knowledg we are so effectively helping to diffuse, a knowledge to build, equip, and manage chemical works. Then, there is general increase of wealth abroad, and development of commercial enterprise. But one of the satisfactory causes of change, from the point of vie the British manufacturer, is that non-natural, that artificial cause—prohibitive tariffs, the force of the prin of boycott. But that is a difficult and many-sided que which cannot be discussed on this occasion. I menti because it is necessary to explain, or partly explai falling off of our exports in heavy chemicals. A suggest that probably the want of the open door has one of the contributing causes.

Then there is the great question of education, bearing on the future prosperity of chemical industr industry in general. It was refreshing to hear fron late President how thoroughly the advantages of tc logical teaching, and education of the highest kind appreciated in America, and how generously educa institutions are supported.

Speaking in one of the lecture theatres of this University, which has lately reverberated with the ac tions of the world in honour of its long and sp services to education, I cannot but congratulate Sc and the Scottish Section of the Society, on the very a tageous position it occupies in this respect. In Er and Ireland we are suffering acutely from dire educ neglect and destitution, and that worst kind of p *insensibility to our deficiencies.*

Our English system of scientific and technical edu is not equal to the present needs of the country, seein severely we are pressed on every side by the most en and intelligent competition. We are giving to the cla the bottom of the industrial ladder a disjointed sma of miscellaneous science, of no great value, though pr good so far as it goes, while we are neglecting to thor educate those upon whose shoulders will soon rest the of the management of our great manufacturing ind In the present state of things a competent knowle the science of the business in which a man is engaged, as an active interest in it, whether it be chemical indu any other, are essential conditions of any large deg success in meeting the emergencies of a highly com and progressive time. A scientific training of uni standard for our manufacturers and for our te chiefs, is an absolute necessity. Surely public cannot be better spent than in providing adequate f for the educational equipment of the men of the is essential means of national defence. Our country ses great stores of mineral wealth, a precious heritage e are lavishly spending. That gift of nature will ly not avert, and cannot go far to compensate for, nsequences of neglect of the scientific training ry to turn our fast-diminishing mineral wealth to the vantage.

of the most pressing requirements of the moment, led not only in the interest of chemical industry, that of our manufacturing industries generally, *quate endowment and encouragement of research.* l scientific research is the fountain-head of new dge, the vital stimulus of industrial growth, the or of new industries and sustainer of old. Yet, lly, in the organisation of our educational and al system, we give to scientific research no ity—we barely pay it the respect of recognition.

dvances in knowledge, and the consequent revolu- changes that have taken place in almost every of chemical industry during the last hundred years, ably not greater than those further changes that een at the end of the present century; for change, about by scientific discovery, grows ever swifter e sweeping.

hange is in the natural order of things, and so long in harmony with progress and improvement, it is elcomed—it cannot be resisted. We must prepare it, and we had better meet it on the threshold. enefit by it, and to take complete advantage of it, the fullest measure of assistance that education, and enterprise can unitedly give.

ief object of our Society, when it was founded, was the progress of the chemical industries of the by means of the interchange of technical informa- ugh association of its members and the publication of its Journal. It was an educational object, and it has in a large measure been realised. But now, after twenty years, at the beginning of a new decade and a new century, we see that the need of such assistance is no less urgent than at the outset, though happily the means and opportunities of help are greater than ever before. It rests with us to avail ourselves of them.

If, as we enter the darkness of the future, we firmly grasp the guiding hand of Science, and, with full faith in her leading, follow her with an alert step, we may go on with the full assurance that we shall be led in the way of prosperity.

APPENDIX.

Introductory Notes.

Excepting where otherwise stated, all the information given in the following tables is based upon figures, supplied by the various firms, in answer to a circular letter sent out in May of this year.

In all the tables, "Horse-power available" represents the power actually developed, and ready for application to any electro chemical or electro-metallurgical manufacture. This figure is generally larger than that given in the next column, "Horse-power utilised"—because in many works different chemicals are produced, and the whole power available is not devoted to the production of one chemical or metal. In many cases, a portion of the power is not utilised at present—especially in the earbide works.

Where an "N" appears in any column, it signifies that figures have been received, but not for publication. These have therefore been used for preparing aggregates, in the different industries, when such a course would not disclose the position as regards output, of individual firms.

Table I.

Copper Refining and Depositing Works in Operation in Europe, 1900—1901.

Name of Firm.	Locality.	Source of Power.	Horse Power		Output in 1900.
			Available.	Utilised.	
					Tons.
che Gewerkschaft	Eisleben	Steam, Gas	100	N	N
Eisenhütten Gewerkschaft	Wittkowitz	Steam	10	10	180
etal Company	Pembrey	"	600	?	N
o-metallurgische Gesellschaft	Papenburg	"	N	N	?
nd Sons	Oakamoor	"	?	?	N
ents Industriels. E. C. Gramont	Pont-de-Cheruy	Water	150	50	150
ctro-metallurgical Co.	Hunslet	Steam	N	?	?
Huttenamt	Oker	Water and steam	N	N	N
etall-Akt. Gesell.	Schladern	" "	550, 360	850	1,200
Hutten-verwaltung	Brixlegg	Water	N	N	N
he Affinerie	Hamburg	Steam	N	N	N
tall-Werk Nikolajeff	Moscow	"	60	35	350

y.—Eleven of the above twelve refineries have available 4,580 h.p. (steam), 763 h.p. (water), and 50 h.p. total of 5,393 h.p.

put of nine refineries in 1900 was 18,962 tons of copper. The remaining 18 refineries in Europe have failed to returns.

Table II.

Bullion Refining Works in Operation in Europe, 1900—1901.

Name of Firm.	Locality of Works.	Source of Power.	Power utilised.	Output in 1900.
ld- u. Silber-Scheide Anstalt	Frankfort	Steam	30 H.	Gold, 261,312 oz. Troy. Silver, 7,186,080 oz. Troy.
he Affinerie	Hamburg	"	N.	Gold (N.). Platinum (N.).
	Pforzheim	"	?	?

.—The value of the output of the Frankfort and Hamburg refineries in 1900 was estimated to be over

n, a large amount of silver is annually recovered from the anode slimes in the electrolytic copper works. nnual value of the precious metals won by electrolytic methods in Europe is probably over 3,500,000*l*.

TABLE III.

Aluminium Extraction Works in Operation in Europe, 1900—1901.

Name of Firm.	Locality of Works.	Source of Power.	Horse Power		Output in
			Available.	Utilised.	
					Ton
Soc. Electro-Metallurgique Française	Le Praz	Water	12,500	?	N.
The British Aluminium Company	Foyers	„	5,000	?	N.
Compagnie des Produits Chimiques d'Alais	St. Michel	„	2,000	?	?
Aluminium Industrie Aktien Gesellschaft	Neuhausen	„	4,000	?	?
	Rheinfelden	„	5,000	?	?
	Lend-Gastein	„	5,000	?	?

Summary.—Only two of the above firms have given the information asked, and in the remaining cases the figu the power available have been obtained from other sources. The above six works have 33,500 h.p. availa production of aluminium. In 1900 they are estimated to have produced 4,000 tons.

TABLE IV.

Sodium Extraction Works in Operation in Europe, 1900—1901.

Name of Firm.	Locality of Works.	Source of Power.	Horse Power		Out
			Available.	Utilised.	
Elektro-Chemische Werke	Bitterfeld	Steam	3,000	?	
Castner Kellner Alkali Company	Weston Point	„	4,000	?	
Elektro Fabrik Natrium	Rheinfelden	Water	?	?	

In addition to the above, one or two of the German colour works are producing sodium by the electrolytic met their own requirements.

TABLE V.

Alkali and Bleach Works in Operation in Europe, 1900—1901.

Name of Firm.	Locality.	Source of Power.	Horse Power		Output in 1
			Available.	Utilised.	
					Tons.
Bosnische Elektricitats Aktiengesellschaft	Jajce	Water	9,200	?	?
The Castner Kellner Alkali Co.	Weston Point	Steam	4,000	N.	N.
Elektro-chemische Werke	Rheinfelden	Water	3,500	?	?
„ „	Bitterfeld	Steam	3,000	?	?
Société des Soudières Electrolytiques	Les Clavaux	Water	2,600	At present stopped.	..
Soc. Italiana di Elettrochimica "Volta"	Bussi	„	2,800	Under construction.	..
Societa Anonyma Elektra del Besaya	Barcena	„	2,400	„	..
Solvay et Cie.	Jemeppe	Steam	1,500	1,000	Caustic, 631 : ble
Deutsche Solvay Werke	Osternienberg	„	1,500	1,000	Caustic, 1,585 : bl
Lubimoff, Solvay et Cie.	Donetz	„	1,500	Under construction.	..
Société des Usines de Produits Chimiques de Monthey	Monthey	Water	1,500	680	Caustic, 1,000 ; bl
Akcyjne Fowarzystons "Elektryczuon"	Zombkowice	Steam	1,200	1,200	Caustic, 1,250 ; bl
Societe Anonyme Suisse de l'Industrie Electro-chimique "Volta."	Chevres	Water	1,000	500	Caustic, 600 ; ble
The Electrolytic Alkali Co.	Middlewich	Steam	1,000	N.	N.

Summary.—The above 14 works have available 13,700 h.p. (steam) and 23,000 h.p. (water). Total 36,700 h.p. The output of six works in 1900 was 12,000 tons of caustic soda and 26,000 tons of bleaching powder. Ni have failed to send any figures.

TABLE VI.

Chlorate Works in Operation in Europe, 1900—1901.

Name of Firm.	Locality.	Source of Power.	Horse Power	
			Available.	Utilised.
Corbin et Cie.	Chedde	Water	12,000	9,000
Société d'Electro-chimie	St. Michel de Maurienne.	„	4,000	?
„ „	Vallorbe	„	3,000	?
Superfosfat Fabriks Aktiebolag	Mansboe	„	4,600	N.
„ „ „	Alby	„	?	?
Consortium f. Elektrochem. Industrie	Golling	„	4,500	?
Gesellschaft fur Elektrochem. Industrie	Turgi	„	800	600

Summary.—Only three of the above firms supplied the desired figures. In the remaining cases the deta power available have been obtained from other sources.

The above seven works have over 28,000 h.p. available for the production of chlorates, and their output estimated to have been about 9,000 tons.

TABLE VII.

Calcium Carbide Works in operation in Europe, 1900—1901.

Name of Firm.	Locality of Works.	Source of Power.	Horse Power		Output in 1900.
			Available.	Utilised.	Tons.
Electro-chimique de la Romanche	Livet	Water	12,000	Under construction.	..
sche Elektricitäts Aktiengesellschaft	Jajce	,,	9,200	?	?
taliana Carburo di Calcio	Collestatle near Terni	,,	9,000	?	?
selskabet-Hafslund	Sarpsborg	,,	8,000	?	?
s Electriques de la Louza	Gampel	,,	7,500	3,500	3,500
selskabet Karbidindustrie	Sarpsborg	,,	7,000	?	1,500
é Suisse de l'Industrie Electro-Chimique lta."	Vernier	,,	7,000	3,000	3,000
Electrochimique du Giffre	Bellegarde	,,	6,000	?	?
lene Illuminating Company	Foyers	,,	5,000	1,200	1,200
fosfat Fabriks Aktiebolag	Mansboe	,,	4,500	N	N
a Espanola Carburos Metalicos	Berga	,,	4,000	?	?
izerische Gesellschaft f. Elektrochemische ustrie.	Thusis	,,	3,500	2,000	900
ochemische Werke	Rheinfelden	,,	3,500	?	?
a Piedmontese-Carburo di Calcio	St. Marcel	,,	3,000	?	?
Elektriska Aktiebolag	Orebro	,,	3,000	?	?
é Niçoise d Electrochimie	Plan-du-Var	,,	3,000	?	?
attans Elektriska Kraft Aktiebolag	Troilhattan	,,	2,600	1,800	1,500
é Hydro-Electrique des Pyrenées	Le Castelet	,,	2,400	2,000	?
eine Carbid und Acetylengesellschaft	Matrei	,,	2,250	2,250	2,250
koski Aktiebolag-Wiberg	Hauckoski	,,	2,000	?	?
ne Fowarzystons "Elektryeznon"	Zombkowice	Steam	1,200	?	?
gnie française des Carbures	Sechilienne	Water	1,150	1,055	600
emberg Portland Cement Werke	Lauffen	,,	500	500	200
iz. Gesellschaft f. Elektrochemische Industrie	Luterbach	,,	500	?	?
gnie des Salines du Midi	Salies du Salut	,,	300	300	215
nited Alkali Company	Widnes	Gas	N	N	?

mary.—The above 26 works have available 107,000 h.p. (water), 1,200 h.p. (steam). Total 108,200 h.p. output of 13 works in 1900 was equal to 17,065 tons carbide. A very large number of carbide works failed to any returns.

TABLE VIII.

Works for the Production of Ferro-Chrome and other Alloys in Europe, 1900—1901.

Name of Firm.	Locality of Works.	Source of Power.	Horse Power Available.	Output in 1900.
				Tons.
Electro-Metallurgique Française	Le Praz	Water	12,500	N
Electro-Chimique de la Romanche	Livet	,,	12,000	?
n Gas Gesellschaft Wien	Meran	,,	2,400	?
d'Electro-chimie	St. Michel	,,	4,000	?

dition to the above, an Italian company is about to apply 1,500 h.p. at Darfo, in Northern Italy, to the production by the Stassano process; and at Essen, ferro-chrome is made by the Vautin-Goldschmidt process.

TABLE IX.

Total Power available in 50 *Works in Europe for Electro-Chemical and Electro-Metallurgical Industries.*

Country.	No. of Works.	Horse Power Available.			
		Water.	Steam.	Gas.	Total.
Kingdom	6	5,000	8,600	200	13,800
	11	54,100	Nil	Nil	54,100
y	9	4,550	5,340	50	9,940
nd	7	25,000	Nil	Nil	25,000
and Sweden	4	25 200	,,	..	25,200
	2	9,218	10	..	9,228
	5	17,850	Nil	,,	17,850
	4	2,000	2,760	,,	4,760
	2	6,400	Nil	,,	6,400
Totals	50	149,318	16,710	250	166,278

bove table only includes one-third of the existing European works.

essed as Percentage of the Total Power.—89 per cent. is generated from water, 10 per cent. is generated from nd under 1 per cent. is generated from gas.

Mr. **Ivan Levinstein** (President-elect) said: Ladies and gentlemen, it is a great honour and a pleasure for me to propose the vote of thanks to our President for the address to which you have just listened. In my opinion it is one of the most instructive and valuable addresses which has been delivered at any of our meetings. To those who are not conversant with chemico-electricity, or its application to the arts and manufactures, it must have been a great pleasure to listen to the beautiful and poetic language in which our President has clothed dry and technical facts. Those who are conversant with the subject will agree that this address will be the most useful publication on chemico-electricity that could be in the hands of technologists. I know no treatise which deals with the subject so completely as has been done by our President. It must be gratifying to all of you that chemico-electricity was born in Great Britain. It was not only born here, but we have heard that in its application to the production of chlorine we are the largest manufacturers. I feel that sometimes we go too far in undervaluing our power, our ability, and our greatness in manufactures. This modesty has had the effect of inducing in foreigners a tendency to over-estimate their superiority to us. There was one charge that our President brought against England. He said we were entirely insensible to our deficiencies so far as education is concerned. I have the honour to be connected with the two principal educational institutions in Manchester, and when I tell you that the Owens College is every year extending its laboratories, and last year established the only existing chemico-electrical research laboratory in Great Britain, and that we are opening, next month, one of the finest technical schools in the world, you will grant that we are not altogether insensible to our deficiencies—at least not in Manchester. With reference to education, there has been a good deal of misunderstanding. The few young men who are trained at some of our University Colleges are quite as good chemists as those trained in Germany. I have had some experience of them. I have employed German chemists, and also chemists who have been trained in British schools, and, so far as mere chemical training is concerned, their training is as good as that received in Germany. With regard to technical schools, there are very few in this country which are at all adapted for training chemists who are fit to meet the fierce foreign competition, and those few again are labouring under the great disadvantage of not being able to secure students adequately prepared to take full advantage of their teaching. Sound secondary education is of far more pressing need than the multiplication of technical schools of an inferior type. I feel sure that I express your feelings when I allude to the great regret that everyone feels at the President resigning his office. He has thrown a new lustre on our Society, not only during his term of office, but by the address which he has given us. He combines qualities which are rarely found in one man. He is endowed with the highest gift to mankind, namely, that of originality. He is an inventor and also a poet, and yet what is rarely the case he is also a first class man of business, and it is due to his great business qualities that our proceedings have been carried to such perfection. May his very useful and valuable life be spared for many many years to come.

Sir **Robert Pullar** (Chairman of the Scottish Section), in seconding the motion, said: I entirely concur with the proposer of the vote of thanks that probably we are a little too modest about our own importance. If we in this country were to put ourselves to the front in regard to various matters that are taken up in Germany, France, and even in America—although the Americans are making wonderful progress—we would find that we are quite able to hold our own. We have no heat waves and winter time where people can hardly work, but we have an admirable country and many scientific men, and it only remains to encourage them, as they are doing in Manchester. It is severe on our southern friends to say that they are insensible to their deficiencies. We in Scotland are sensible to our deficiencies, and are trying to repair them as fast as we can. The President alluded to the disjointed smattering that is given, but I can only say that I wish that I had had that smattering, for I should have been a better chem We are giving in a number of schools in Scotland a gro work of technical subjects, and some have found fault ns for so doing: but there are gentlemen here who trained in those schools and have attained a high posit and the smattering which they received stood them in stead in raising them to the secondary schools and a wards to the University. The great thing is that we help and encourage all efforts towards research. I remen a remark of Faraday which we would do well to tak heart: "Without experiment I am nothing; still try for who knows what is possible?" When this Society last in Glasgow who would have thought that the add to which we have listened to-day could have been g and such wonderful discoveries made? We have to th our President for the admirable words that he has spo they are a great encouragement to go on, and if we g we shall prosper like our neighbours.

The **President**, in reply, said: I thank you for further kindness. It has been a very great pleasure fo to read my address to such an appreciative and sympat audience. May I be allowed a single word in comme Sir Robert Pullar's remarks? When I spoke about e tion I distinctly differentiated English and Irish educ from Scottish education. I am very sensible indeed o fact that education is highly appreciated in Scotlan am also sensible of the corresponding fact that edu is very cheap in Scotland, whereas it is very dear in Eng and I am sorry to have to retain the feeling that the of secondary education is not appreciated as it de to be in England. I entirely except Scotland from corresponding want of appreciation. It is a great rel hear from our esteemed President-elect that so mu being done in Manchester. I am ready to believe th views are, as regards Manchester, entirely correct. I be so, then I can only say that I most earnestly that this desire for education, such as is being c in Manchester—perhaps through the instrumental Mr. Levinstein himself—may spread to other parts country, and that Manchester may prove to be a that may spread to every part of the country. W such work to be going on, not in one place alone, all our large industrial centres. The means of edu should be provided much more easily and more exten and every section of the country should be adeq provided for. I thank you, gentlemen.

Miscellaneous Business.

Mr. **R. B. Batty** (Birmingham): I beg to propo appointment of Messrs. Miall, Wilkins, Randall a as auditors at a fee of 10 guineas.

On the motion being seconded by Dr. J. Lewk (London), it was unanimously agreed to.

Mr. **Thos. Tyrer**: I beg to propose that the sentative who has been doing so much work at the I Institute, Mr. George Beilby, be again elected.

Prof. **W. R. Lang** (Toronto): I have very pleasure, as representing those members of our Ins in the Colonies, in seconding the motion that Mr. be appointed our representative at the Imperial Instit principal object of which is the knitting together industries of the Colonies with those of the Empire.

The motion, on being put to the meeting, was unani agreed to.

Place of next Annual Meeting.

Mr. **C. Longuet Higgins** (Chairman of the Li Section), in proposing that the Society should me year in Liverpool said: I have been authorised to in Society to hold its next annual meeting in Liverpool have much pleasure in proposing that the meeting be held there. It is a considerable time since you Liverpool, and we hope you will do so next year. agree to this I need scarcely say that we shall do to make the meeting a successful and enjoyable one

r. **Eustace Carey** (Liverpool): I have much pleasure econding the motion, and if the Society will consent to our Liverpool with its presence next year I can assure members that they will receive a very cordial welcome, only from members of the section, but from the people iverpool.

he **President**: I feel sure that we could not do better accept the invitation from Liverpool, and that we shall the people of Liverpool as ready to receive us with arms as we have found the people of Glasgow.

being put to the meeting the motion was unanimously ed to.

Vote of Thanks.

r. **George Beilby**: It is due to the Senate of the ersity of Glasgow that we should record our hearty s to them for giving us this peculiarly suitable meeting . It is close to the Exhibition, and an admirable from its historic associations.

. **Clifford Richardson** (Chairman of the New York on), in seconding the motion, mentioned that the New Section of the Society—although they felt that they not alter arrangements for next year—were proposing he meeting of the Society in 1903 should take place nerican soil.

motion was carried by acclamation.

President: That terminates the proceeding of the nual meeting of the Society of Chemical Industry.

Proceedings at Luncheon.

he conclusion of the Annual General Meeting the rs and friends, to the number of 250, were entertained Scottish Section to luncheon in the Grosvenor rant, within the International Exhibition grounds. obert Pullar, chairman of the Scottish Section, d the chair. After an excellent luncheon—

President said: Ladies and gentlemen, we all that we are enjoying the generous hospitality of ottish Section of the Society of Chemical Industry. v of no kind of hospitality more thorough than hospitality. It is like the water that comes from atrine, a pure product of nature. The long series of oments, of which this is the first, have not been d without much labour and thought. The bulk of bour and thought has fallen upon the Secretary of ottish Section and upon its Chairman, Sir Robert Sir Robert says that the greater share of the has fallen upon Dr. Gray. That is natural, because e younger man. In his capacity as Secretary of the he has imposed upon himself a herculean labour, has discharged that labour like a Hercules. Let our thanks to the Scottish Section for this entert and for the care with which they have arranged gramme of all our proceedings while visiting ; let us drink the health of the Scottish Section of ety of Chemical Industry. I couple with that toast es of Sir Robert Pullar, the honoured Chairman of tion, and Dr. Gray, the Secretary.

ast was drunk with enthusiasm.

Robert Pullar, in reply, said: Mr. President, nd gentlemen, on behalf of the Scottish Section I y great pleasure in acknowledging the kind words e been spoken by our President. It does our od in Scotland to see our southern friends coming s, and it is all we can do to make them feel happy y come. Everyone has wrought with a will to the comfort of our visitors, and it is exceedingly ing to see the attendance that has been given at us meetings.

ay: Mr. Chairman, ladies, and gentlemen, I have at pleasure in returning my thanks to you for my name in this toast, and for the kind words been said about my work.

hos. **Tyrer** said: This is an occasion the like of en during the hospitalities of the Glasgow meeting, occur again, and it will be well to recall the fact that there is a New York Section. We have here the Chairman of the New York Section, Mr. Clifford Richardson, as well as Dr. Prescott, from Michigan, and we have two professors from one of our colonies, Canada. The President, with that geniality and tact which characterises all he does, has written to our friends across the seas a delightful letter—a letter which, were I the recipient of it, would be framed in gold—so worthily do I regard it (see p. 689). That letter had its origin in the fact that he was unable to go across the seas to pay a visit to the Section. When I went across the seas on business (I happened to be President at the time) I had such a welcome that I have never forgotten and never shall. It would be ill-fitting on this occasion, when the international character of our Society has been accentuated, not to propose success and prosperity to our members and their sections, or sections to be (for Canada has applied for the rules by which it can be constituted a section). Thus has the influence of the Society and its Journal spread, and it must be a source of gratification to all that the English-speaking peoples fully appreciate it. Therefore I wish to couple with this toast, best wishes to the people across the seas who speak our language, and know us so well—the New York Section and the section about to be—in the persons of Mr. Clifford Richardson and Prof. Prescott, of the United States, and Prof. Girdwood and Prof. Lang, of Canada.

Prof. **Prescott** (Senior Professor of Chemistry in the University of Michigan) in reply said: Let me thank you for proposing the health of the New York Section, and of giving me this opportunity of sharing in the common interests of the English-speaking people represented here in the United Kingdom. In the English tongue we have a family bond, and in our common science we are held as members of a family. The state of many salts in the sea has never been adequately investigated, but certainly the salts of the Atlantic Ocean cannot separate chemists. The ties of common enterprise bind people of all countries together. I have derived pleasure from the interesting address of the President to-day, and I propose reading it to my colleagues at home, and of giving them an account of this representative meeting of our Society. I have been engaged for the last 20 years in the work of chemistry in our University, and have a large number of students in technical chemistry who make the Journal of this Society a book of daily reference in their studies. Allow me once more to thank you for the honour you have done me in coupling my name with this toast.

Prof. **Lang** (Toronto), in reply, said: I have been rather taken by surprise in being called upon to reply to the toast of the health of a section of this Society that is yet unborn. The Canadian section has not yet been born, but about 40 members of the Society of Chemical Industry resident in Canada have indicated a wish to form a section of the Society. The development of the resources of the Dominion of Canada has interested me, and is interesting a great number of people. These resources are practically illimitable, and what we want is people to develop them. We have large tracts of land and towns with but few men in them, and there is no subject that will so tend to develop the national resources as this subject of chemical industry. To show how generous is the support on which we may rely, I may say that the Canadian Government recently brought in a new University Bill, in which it took over from the University of Toronto all the management of the three Chairs, namely, Geology, Engineering, and Chemistry. The Minister said, "Ask for what you want and we will give it to you. Make your demands large enough, because we cannot give you more than you ask." I made my estimate about four times what it was before, and I had it. The members of the Society resident in Canada felt that they had no place where they could meet, and have been exceedingly envious of the New York Section. If you honour New York with a visit in 1903, although we have to go ten hours in the train from Toronto down to New York, we shall be there. The chemical manufacturers of Canada want to meet together on some common ground, so we have determined to ask you to allow us to form a colonial section, with its seat in Canada. I thank you for the kind way in which you have referred to me and to my adopted country. If the Society does come to New York the Canadian Section will be there *en masse*, and we hope that you will bring all the visitors to the Province of Ontario.

The company then joined in singing "Should auld acquaintance be forgot," and then dispersed to visit the International Exhibition.

RECEPTION AND CONVERSAZIONE IN THE GLASGOW MUNICIPAL BUILDINGS.

A reception in honour of the Society of Chemical Industry was given in the evening by the Lord Provost and Corporation in the Municipal Buildings, George Square. The guests were received by the Lord Provost and magistrates, and spent the earlier part of the evening in promenading the salons and corridors, music being provided by Herr Iff's orchestra and by the band of the Glasgow Highlanders. A vocal concert was given later, in the Banquetting Hall by the Glasgow Glee Party. During the course of the evening also, the company being assembled and the Lord Provost presiding, several brief addresses were delivered.

The **LORD PROVOST**, in the name of the Corporation, welcomed the guests, remarking that if in any city the Society of Chemical Industry had a right to expect to be received with cordiality, it was in Glasgow, to the growth and prosperity of which the chemical industries had so largely contributed. Chemistry had not yet spoken its last word; there remained for it, as well as for other sciences, very much ground to be covered, and the cordial welcome they were extending to the Society had in it the hope of still larger and more fruitful discoveries. He was glad to think that some at least of the munificent gift of Mr. Carnegie to the Scottish universities would be directed towards the further equipment of chairs of chemistry. Remembering that he had the honour of being one of the executive of the Carnegie Trust, it was not for him to make any statement on the subject, but he not only cherished the hope, but desired to express the conviction, that one of the results of the benefaction would be to stimulate efforts to develop all that was within the reach of chemical scientists, and enable them to prosecute investigations into yet undiscovered fields.

Mr. **SWAN**, in acknowledging the cordial welcome extended to the Society, remarked that in nothing is change and progress more strikingly apparent than in connection with chemical industry. In coming to Glasgow again after a considerable interval, he observed the signs of many changes in the city. He noticed that electricity was now largely used for light and traction. He remembered that 20 years ago he had difficulty in getting for the purpose of an experiment a comparatively small electric current. Now, if he wanted a thousand times as much, he would have no difficulty in getting it. That fact told him of the appreciation on the part of the people of Glasgow and the Municipality of Glasgow of the advantages to be derived from the utilisation of the resources of science.

LORD OVERTOUN also acknowledged the hospitality of the Corporation to the Society. The Corporation, he said, had shown their appreciation of the furtherance of science in all its aspects, and it was gratifying to know that there loomed in the near future the likelihood of the chairs of science in Glasgow, especially in regard to chemistry, being still further strengthened. The presence of the Society of Chemical Industry in Glasgow showed that scientific knowledge was being turned to practical account. Glasgow owed a great deal to the various industries which had their roots in the science of chemistry. Referring briefly to what he described as the trials that had to be faced in connection with the chemical industry, his Lordship instanced among others the disappointments that often resulted from experiments and the difficulty of complying with the regulations as regards the emission of smoke. Then there were the large number of alkali and factory inspectors. He would like to speak very kindly of those gentlemen, because while they discharged their duties experience was that they were always fair and courteou all their dealings with manufacturers. Sometimes they to speak plainly, but manufacturers were prepared to li to them, because the inspectors had the happy knack trying to carry manufacturers with them in any suggest they had to make. There were also, his Lordship remar the difficulties of strikes, the high price of coal, and m other trials that vexed the souls of those engaged in chemical industries. But they must be content to take bad times with the good, and hope that on the ave of years the conditions would not be so trying as they at present.

Sir **GEORGE DUFFY** and the Chairman of the Sco Section, Sir **ROBERT PULLAR**, also spoke briefly.

On the suggestion of Sir **JOHN NEILSON CUTHBERT** a vote of thanks to the Lord Provost was passed for interest he had taken in promoting the success of the of the Society to the city.

VISITS TO WORKS AND PLACES OF LOCA INTEREST.

SECOND DAY.—THURSDAY, JULY 25TH.

WELLPARK BREWERY (MESSRS. F. & R. TENNEN

Leader: Dr. WM. FREW.

This brewery, which covers a large area in the ea of Glasgow, was founded in the end of the 18th centu

As the brewery is complete within itself, the v had an opportunity of seeing the whole process, the malting of the barley to the final bottling beers.

The principal raw material, barley, has to be before it can be used in the brewery. The malting consists in steeping the grain in water for 60 to 70 after which it is laid out in shallow heaps on the floors, in order that it may germinate. During the 12 days devoted to germination, the grain is fre turned, so as to supply the necessary oxygen and the temperature of the heaps from rising much above After germination, the green malt is dried and c suitable kilns at temperatures varying from 170° to 2 according to the kind of malt required. The mal removal of the rootlets, and storage for some ti ground and subjected to the action of warm (mashed), whereby the starch is converted into and dextrins by the action of the diastase present malt. The wort, or liquid resulting from this ac drained off and boiled for some time with the r quantity of hops, after which the exhausted h strained off and the boiling liquid cooled down necessary temperature for fermentation.

From this stage there are very marked difference treatment of the hopped wort, according to the na the final product. In the case of pale ales and st wort is cooled down to a temperature of about 60 is added, and the primary fermentation goes on f three days. The yeast appears as a scum on the the fermenting liquid, and is skimmed off for furt When the primary fermentation is complete, the beer is racked off into barrels or vats along with a pr of dry hops, and is there allowed to mature and the necessary secondary fermentation at a tem from 55° to 60° F.

The wort for the Lager and Munich beers, on th hand, is cooled down to a temperature of 43° F entering the fermenting tuns, and the primary ferm which occupies 8 to 12 days, is conducted at temp ranging from 43° to 51° F. The yeast, in this cas as a compact layer on the bottom of the fermen and is, in consequence, known as bottom ferm yeast. After the completion of the primary ferm the beer is run off into large store ("Lager") ca undergoes its necessary after-fermentation at a ten rly approaching the freezing point. During this long d cool ripening, the Lager and Munich beers accumulate necessary carbon dioxide and develop their characteristic, uant flavours.

Vithin the walls of Wellpark, there are the pale ale and ut breweries, as well as the German brewery for the duction of the well-known Lager and Munich beers of firm. There are also large and complete maltings for production of the different malts required; a large tling and packing department; cooperage and box-king department; also smiths, joiners, printers, and er tradesmen necessary for the conduct of the brewery.

he products of the firm include all kinds of ales, stouts, porters for consumption at home and abroad, and man Lager and Munich (brown) beers, which are red exactly as in Germany, and are said to be "equal xcellence to the well-known German beers, light in holic strength, wholesome, and palatable."

fter the party had inspected the works and processes, were hospitably entertained to luncheon by the firm.

the motion of Mr. Newlands, seconded by Dr. John k, a vote of hearty thanks was accorded to their hosts e visitors.

THE BRITANNIA POTTERY (MESSRS. COCHRAN AND FLEMING).

Leader: Mr. J. ARNOLD FLEMING.

e Britannia Pottery was established in 1856. It is at ut one of the largest works of its kind in Scotland, ding over 10,000 square yards, and employing over orkers. The pottery supplies goods to all parts of the , especially to Canada and South America, and has an ge output of 1,000,000 pieces per week. From the ay for the "seggars" to the crates in which the goods cked, everything is manufactured in the works, and he coal, of which 30 to 40 tons are consumed daily, e raw materials, are obtained from external sources.

raw materials employed, are Cornish stone, contain- kali, which helps to bind the clay firmly together, and btained from France. The latter material is calcined being used. These are finely ground, levigated, and in water, the proportions of the ingredients being ined by the quality of the ware to be produced. The e is then run into tubs containing the requisite ty of ball clay from Devon and kaolin from Cornwall, ghly mixed with water. From these the material into filter presses, in which the excess of water is ed out. The clay, which is now in a plastic state, is ed to the pug mills, from which it issues in elongated ready for use, and is hoisted in trucks and delivered potter. For the production of round pieces of ware, plates, saucers, and cups, the clay is worked up on ; whilst oval pieces, such as cover-dishes, vases, and aments, are formed in plaster moulds; the various ons of fixing handles, spouts on teapots, &c., are ently carried out. The ware is now in the "green" state. When dry it is taken to the kilns and placed clay compartments called "seggars," where it is r several days at a temperature of about 3,000° F.; ulting product is termed "biscuit-ware" This is metimes printed and painted with underglaze colours, ich it is dipped into ground glass, again placed in s," and fired in the so-called "glost" kilns, some h contain over 200,000 pieces. In these kilns the separated by small pieces of baked clay of various termed "thimbles," "saddles," "devils," "stilts," " &c., which are made on the premises. Finer ware, "semi-china," is now decorated, after passing the glost kilns, with gold and colours, to give the fine effects seen in expensive articles of various This Royal semi-china has the fineness of china, rder and more durable, although not translucent.

ng on the glaze is now largely practised, as the re finer and of a more delicate tone than those derglaze. The colour is rubbed into a pattern on ved copper plate heated by steam, a piece of fine tissue paper is placed on the plate, and the whole is passed through a press. The paper on which the pattern is thus printed is then cut into shape, firmly pressed on the ware, and finally washed off, leaving the pattern printed on the ware. The painting and further decorations are now completed, and the ware is fired for about 20 hours in a "muffle" kiln. In some cases several firings are necessary for the production of the required richness of decoration. The decorative work is carried out by a staff of designers, engravers, and modellers.

Amongst the varied classes of ware manufactured in the Britannia Pottery, the following may be specially mentioned:—Familiar articles for household use, such as tea and dinner sets, &c.; dairy ware; tiles for decorative purposes; fine white ware for use in ships of all classes and for holding preserves, &c.; in addition to the large variety of goods required for the supply of American, Colonial, and Eastern markets. Of special interest is the revival of the manufacture of "Royal Marle" ware, originally made in Staffordshire, the production of which has not been extensively practiced since 1740.

After their inspection of the works and processes, the visitors were hospitably entertained to luncheon by the firm.

CORPORATION SEWAGE PURIFICATION WORKS, DALMARNOCK.

Leader: Mr. M. A. PARKER.

The main sewer from the city, 7 ft. 6 in. in diameter, is brought down the centre of Swanson Street and led into the entrance chamber, which is 17 ft. × 9 ft. × 16 ft. 1 in. deep, and situated at the north-west corner of the precipitation tanks. On the east side of the chamber, in front of three 4-ft. penstocks, there is a wrought-iron grid, 3 in. wide, to catch heavy floating matter. From this chamber the sewage is taken into the machinery building by three 4 ft. × 4 ft. invert channels placed underneath the precipitation tanks and aerating beds to the west side of the catchpits, where it has to pass through three 4-ft. rotary screens made of cast steel, the bars of which are $\frac{5}{8}$ in. apart. It then flows into the 5-ft. feed channel on the west side of the catchpits. The level of this channel is 18 ft. 6 in. below the floor line. Lifting plates, 4 ft. × 6 in., are securely attached every 4 ft. to the rotary screens for the purpose of taking up all floating matter and depositing it into a wrought-iron trough placed in front at a depth of 10 ft. 6 in. below the floor line. The rubbish here collected is passed into a square wrought-iron self-tipping bucket, which is daily emptied into the destructor furnace. The screens work at an angle of 45°, and make 14 revolutions per minute.

The sewage flows from the 5-ft. channel into the two catchpits, each of which is 47 ft. 10 in. long by 20 ft. broad and 10 ft. deep. The bottom of the catchpits at the elevator trough is 28 ft. 6 in. below the floor line, and rises to the north and south end walls, which enables the soft material to come gradually forward to the elevator trough, the bottom of which is 33 ft. 6 in. below the floor line. The solids are raised by the elevator buckets into a railway waggon on the floor level. Each catchpit can be worked separately as may be required. The sewage, free from the heavy matter, then flows from the catchpits into a 10-ft. channel on the east side, leading to the pump well, the depth of which is 31 ft. 1 in. below the floor line.

The suction pipes from the centrifugal pumps are led down to within 15 in. of the bottom. The water is raised through these into a 3-ft. 9-in. cast-iron pipe placed against the south wall of the pump room, through which it flows into the mixing pit, where the chemicals are introduced. Sulphate of alumina and lime are the precipitants at present used, in the proportion of two of the former to one of the latter. The quantities used vary according to the nature of the sewage.

There are two 18-in. and two 15-in. pumps, with a total of 350 horse-power, capable of raising $1\frac{1}{4}$ million gallons per hour. The two 6-in. pulley pumps on the east side of the pump room discharge the sewage into the lime mixers over the sludge tank.

These pumps are driven from the main line of shafting, which is operated from the engine room, where there are two pairs of compound condensing engines, each of 120 horse-power. These engines drive all the shafting. There is a dynamo in the engine-room which gives a current of 130 ampères at 110 volts. There is also one compound wound dynamo, to give 250 ampères at 110 volts, situated in the pump room. Either of these can supply the whole light for the works. There are 35 arc lamps of 5 ampères each, and 160 incandescent lamps of 32 and 16 candle-power.

The precipitated sewage water is used for the condensers. Leaving the sewage water at the mixing pit, which is 10 ft. × 10 ft. × 8 ft., with a centre tongue going down to within 3 ft. 6 in. from the bottom, the sewage mixed with the chemicals passes under this tongue into an outlet channel, 8 ft. × 3 ft. 6 in., which leads to the feed channels of the precipitation tanks.

The mixing pit is situated in the south east corner of the main floor, over the catchpits.

The sludge from the precipitation tanks is brought into the works by a 6-ft. 6-in. main channel, starting at a depth of 17 ft. 4 in. from the west wall of the sulphate of alumina room. This channel rises 3 in. in 100 ft. till it reaches the front of the west section of the precipitation tanks. There is a sludge channel, 3 ft. 3 in. wide, in front of each section of the precipitation tanks, with a fall of 3 in. to the 100 ft., into the main channel, through which the sludge runs by gravitation into the sludge tank, which is under the sulphate of alumina room. This tank is 40 ft. × 46 ft. × 21 ft. below the floor line. The liquid sludge is raised from this tank by a 6-in. centrifugal pump into three sludge-settling tanks and allowed to precipitate. When 50 per cent. of the water is run off into the pump well, the precipitation sludge is then drawn from these tanks into a tank 46 ft. × 40 ft. × 23. ft. below the floor line under the lime-mixing room. In the north-east corner there is a low-pressure sludge ram 29 ft. below the floor line, capable of holding 1,800 gallons, through which the sludge is raised by compressed air into the two sludge mixers at the east wall of the lime-room. Here hot lime is added to the sludge to facilitate the pressing.

In the low floor of the sludge-receiving room there are four high-pressure rams, each holding 900 gallons. The sludge runs from the mixers by gravitation through a 6-in. cast iron pipe into these rams, from which it is raised by compressed air at 100 lb. to the square inch into the sludge presses. When this air has blown the sludge from the high-pressure rams, it is then transferred into the large low-pressure ram in the north-east corner of the sludge tank, thereby effecting a saving of fully 80 per cent. of compressed air, by raising sufficient sludge into the mixers to again recharge the high-pressure rams. To duplicate the high-pressure rams there is a horizontal duplex pump, with 11-in. cylinder, $7\frac{1}{2}$-in. pump, 10-in. stroke, capable of discharging 50 tons per hour of crude sludge against 100 lb. pressure. This pump can draw direct from the sludge well or from the sludge mixers. The compressed air is made by two high-pressure engines to the north of the rams, where there is also a duplex steam pump for feeding the water into the boilers. To the south of the rams, there is a bath-room for the employees.

In the press-room, on the top floor, there are 12 sludge presses, seven of which hold 25 cwt. each and five 32 cwt. each, when fully charged, making a total of 16 tons 15 cwt. of pressed sludge cake each round of the presses. This sludge cake is dropped through shoots in the floor on to an endless band or conveyor, 115 ft. long, which conveys and discharges it on to a set of breakers, where the cake is broken up as it falls into the railway waggons, which are immediately underneath. From this band or conveyor the pressed cake can be conveyed automatically into the drying machine, which reduces the moisture to 15 per cent.; it is then screened, disintegrated, and put up in bags, and sold as the "Globe Fertiliser Sewage Manure."

In the boiler shed, to the north of the sludge-receiving room, there are six 28 ft. × 7 ft. Lancashire boilers. The working pressure is 100 lb. per square inch. The fuel used is the coke from the filtration beds when it has bee too dirty for filtration purposes. There is no difficulty keeping up steam with this fuel. At the north end of shed there is a Babcock and Wilcox economiser, thro which the feed water is pumped into the boilers at 20 North of the engine room there is a workshop for doing necessary repairs.

Returning to the sewage water as it enters the channels to the precipitation tanks at the north-east co it can be directed into either the eastern or the w double feed channels to the tanks. In each section are 12 tanks, 50 ft. × 40 ft., capable of holding 8 galls. each, also nine recently added tanks 100 ft. × 5 capable of holding 190,000 gallons each, making in precipitation tank capacity of nearly six million gal The 50 ft × 40 ft. tanks are worked on what is calle *Under-surface Continuous Flow System*, which is g great satisfaction. The whole of the 42 tanks ca worked on the intermittent system if required, whe clear water has been drawn off by the water drainers. sludge is passed through a 12-in. disc valve int 3-ft. 3-in. underground channel, and flows into the sl tanks, as previously explained.

The water from the precipitation tanks passes i 17-ft. 6-in. channel leading to the filtering beds, whic on the west side of Swanston Street. The wa siphoned through below the street in three cast-iron and rises into a 20-ft. main channel, from which the four 5-ft. channels branching off to distribute the wate the filters. There are 20 downward coke filters, 40 ft. × 10 ft. × 3 ft. 6 in., through which the water and rises in a 3-ft. open channel. It again passes through the 40 sand filters, each being 40 ft. × 38 2 ft. 3 in. The sand in these filters, when it become on the top, is washed with precipitated sewage water, flows by gravitation to the sand-washing machin thereafter the sand is used over and over aga addition to the above filters, there is a land filter, o in extent, on to which the effluent can be passed if re The water then passes into a 20-ft. effluent channel, through five flap valves into the outlet chamber, and into the River Clyde. The works, as they at present can deal with 15,000,000 gallons of sewage per about one-fourth part of that of the entire city; b works can be extended to treat twice that quantity area drained into these works is 3,165 acres, with a population of 265,000. The buildings, railway tanks, and filtering beds cover an area of 19 acres, 28 purchased and available. The land cost 35,50 the buildings, tanks, and machinery an additional = 132,100*l*. in all.

CORPORATION ELECTRIC POWER STATION, PINK

Leader: Dr. W. C. ANDERSON.

Ground.—The site of the generating station w chased in May 1899. It extends to 18,997 sq. yd site is eminently suited for the purpose, being bou one side by the Forth and Clyde Canal, from abundance of water can be obtained for condensi poses. Both the Caledonian and North British Companies have sidings connected with the out bunkers, which will be convenient for the handling The coal bunkers, which are built on the outside of wall of the boiler house, have a capacity of abo tons. Electric locomotive cranes are used for hand tipping the coal wagons in the sidings.

Buildings.—The main building consists of a ste work, comprising about 1,300 tons of steel, and su the roof independently of the walls. Stanchions into the walls, which are of plastic clay brick, fa terra-cotta bricks on the outside, and cream and grey enamelled bricks on the inside. The bu 244 ft. long by 200 ft. broad. It is divided into th The east bay, forming the boiler room, is 244 ft 81 ft. wide; the centre bay, forming the engine 244 ft. long by 75 ft. wide; and the west bay, c ie auxiliary plant, is 241 ft. long by 40 ft. wide. The o chimney stacks are 263 ft. in height from the ground vel.

Plant.

Boiler Room.—In the boiler room there are 16 Babcock d Wilcox water-tube boilers. They are divided into eight tteries of two boilers each—four batteries on each side of boiler room. Each boiler is capable of producing ,000 lb. of steam per hour at a working pressure of 0 lb. per square inch. The furnaces are fed by mechanical kers of the new Babcock and Wilcox chain grate type. e coal bunkers on the top of the boilers can hold 2,400 s. The coal conveyors can deal with 50 tons per hour. e coal is automatically weighed as it passes through the ots into the furnaces. The mechanical stokers are ven by two 30-h.p. electric motors. Two water-storage ks for the boilers are placed on girders between the chimneys. These tanks hold 18,000 galls. each. The fuel economisers are capable of dealing with 12,000 galls. eed water per hour.

ngine Room.—In the engine room there are four main ines, Nos. 1 and 2 being American, and Nos. 3 and 4 ish make. Each of these engines is designed to operate ,000 i.h.p. at its normal rate of working, but is capable leveloping 5,000 i.h.p. at 75 revolutions per minute. steam consumption is about 14 lb. per b.h.p. per hour. re is one high-pressure and there are two low-pressure nders in each engine. The diameter of the high-pressure nder is 42 ins., and that of each of the low pressure nders, 62 ins. The diameter of the shaft through the of the fly wheel is 36 ins. The fly wheel is 24 ft. in eter, and weighs over 120 tons. The weight of each ne complete is about 700 tons. Measured over all, each ie is 43 ft. long—or 52 ft. including the fly wheel and mo—35 ft. high, and 24 ft. deep from back to front.

ch engine is directly connected to a three-phase rator, designed for an output of 2,500 kilowatts at a ure of 6,500 volts. The weight of the revolving fields each machine, nearly 38 tons, while that of the armand its ring frame is 44 tons. The generator complete is fully 90 tons.

addition to the four main engines, there are two ary engines of the vertical cross compound type, each 0 i.h.p., but capable of developing 1,000 i.h.p. The t of each of these engines is 122 tons. Each of the es is directly coupled to a 500-volt dynamo of 600 k.w. ity. These two units are for driving the auxiliary and for supplying power and light to the car depots g the night.

ween the auxiliary engines and the switchboard there ix exciter engines and dynamos. Each of these s has a capacity of 85 i.h.p. running at 300 revolutions inute. These machines are used for exciting the field main generators.

two electric cranes in the engine room are each e of lifting 50 tons.

switchboard is placed on the north gable wall, and ts of four generator panels, six panels for the six exciter os, four inter-connector panels, and 20 feeder panels, ll the instruments and appliances. The whole switchhas an area of 1,500 sq. ft. of marble.

iliary Room.—In this room there are five surface sers—one for each of the four main engines, and one two auxiliary and six exciter engines. Each of the condensers can condense 60,000 lb. of exhaust steam r, and the smaller condenser 24,000 lb.

e are four centrifugal circulating pumps, having a pacity of 240,000 galls. per hour, and one with a y of 96,000 galls.

e are four air pumps of the Edwards type, with a pacity of 60,000 lb. of exhaust steam per hour, e with a capacity of 24,000.

e are four boiler feed pumps capable of delivering galls. per hour. The boiler feed steam pump is of delivering 16,000 galls. of water per hour.

The electric crane in this room can lift 30 tons. All the auxiliary plant is electrically driven.

CARPET WORKS OF MESSRS. JAS. TEMPLETON AND CO., GREENHEAD.

Leader: MR. GEO. LEAN.

The manufacture carried on is that of carpet weaving. The firm has three factories, situated respectively in William Street, Greenhead; West Street, Bridgeton; and Crownpoint Road, Mile-End.

The manufacture of Axminster carpets and rugs on the "chenille" principle was first shown. Here the worsted which is to form the surface of the carpet is first woven into a many-coloured cloth, which is subsequently cut into chenille strips, and these are finally interwoven with the carpet to form the surface pattern.

Another method of weaving Axminster carpets is also employed by the firm. This may be called the "tufting" process. Here no chenille is used, but tufts of wool are drawn from prepared bobbins and inserted in the carpet as it is being woven by ingenious mechanism attached to the loom.

The processes of designing, dyeing, colouring, and finishing were also inspected.

The weaving of Brussels and Wilton carpets was afterwards shown. In these fabrics the loom employed is of the Jacquard type. The pattern is produced by the warp threads, which are woven over wires. These wires, being afterwards withdrawn, leave a loop pile surface which is designated "Brussels." The wires may be furnished with knives at the ends, in which case the loops are cut as the wire is withdrawn, and a cut pile or "Wilton" carpet is the result.

A luncheon was provided for the visitors, by kind invitation of the firm.

THE ARDGOWAN DISTILLERY (THE ARDGOWAN DISTILLERY CO., LTD., GREENOCK).

Leader: DR. W. S. SQUIRE.

The Ardgowan Distillery, the building of which was commenced in 1896 and completed in 1898, is equipped with the most modern labour-saving appliances.

From the grain stores, which are capable of accommodating 4,615 tons of grain, the grain passes, by means of elevators and travelling belts, to the mill, where it is ground by means of five pairs of stones and several Bamford and Corbett rapid grinding mills.

A mixture of several varieties of grain is employed; to the mixed grain, malted barley is added in the proportion of 3 to 4 parts of the former to 1 part of the latter. For the production of this malt, 360 quarters of which are used weekly, the barley, after steeping, is allowed to germinate in cylindrical drums, which are kept revolving slowly, the temperature being regulated by means of a current of cold moist air which is drawn through the drums. When germination is sufficiently advanced, the malt is passed into drying drums, where it is dried by a current of hot air drawn through the malt in the drums from a coke furnace.

The crushed maize is conveyed to the maize ton, where it is boiled with water; after it has been boiled sufficiently, it is run off into the mash tun, where it is thoroughly mixed with its proportion of malted barley at a temperature of about 69° C. After some time it is run off, and a second supply of water, heated to about 65 C., is added, and the whole is thoroughly stirred up; the mixture is then allowed to stand, to ensure the conversion of the starch into sugar through the agency of the diastase of the malt. The cold wort is then pumped into the fermenting vats, where it is mixed with yeast.

The fermenting plant consists of 11 "wash backs" and two "wash chargers," having a total capacity of 500,000 galls.; from these, when fermentation is complete (an operation which lasts from four to five days), the wash is pumped through a "Coffey" still capable of distilling

8,000 galls. of wash per hour. The spent wash from the still is run into vats, which are six in number, with a total capacity of 540,000 galls., and the sediment is allowed to settle; it is then filtered off, and finds a ready sale, as does also the dried grain, as cattle food.

Warehouses have been erected for the accommodation of about 4,000,000 galls. of spirits.

Dr. Squire met the party at St. Enoch Station, accompanied his visitors to the Distillery, and there explained the processes to them, afterwards entertaining them to luncheon. After lunch a cordial vote of thanks to Dr. Squire was proposed by Mr. Tyrer, seconded by Mr. W. F. Reid, and carried by acclamation.

GLASGOW CATHEDRAL.

Leader: Mr. P. MACGREGOR CHALMERS.

The cathedral is associated with St. Kentigern, familiarly known as St. Mungo, the patron saint of Glasgow, who is credited, it is said, with the performance of some notable miracles, three of which the city arms, (tree, fish, and bird), commemorate. St. Kentigern, born early in the sixth century, was the founder of a church, on the site of which the present cathedral stands. No trace of this church now remains, but St. Mungo's Well, which probably lay to the south-east of the church, is enclosed in the present cathedral. St. Kentigern died about the year 603, and was buried on the south side of the altar of his church. From this date till the foundation of the See of Glasgow by Prince David in the 12th century, very little is known of the history of the church. Bishop John Achaius, the first bishop of the new foundation, erected a church which was consecrated in 1136; but this church has also disappeared, and nothing now remains even of its foundations.

The earliest portion of the present building is attributed to Bishop Ingelram, who was elected in 1164; but of this a mere fragment—a portion of the south aisle—remains. Bishop Jocelyn was consecrated in 1175, and began to enlarge the church erected by his predecessor by the addition of a large nave; but this work had not proceeded far when the choir was destroyed by fire. He now directed his energies to the restoration of the choir, which was dedicated in 1197; of this choir the south aisle of the lower church and part of the north aisle remain. The erection of the present choir and lower church was commenced by Bishop William de Bondington in 1233, the choir which was begun by Bishop Jocelyn having been destroyed or removed, and the new choir and lower church were probably completed about 1258. In 1272 Bishop Robert Wyschard, the great patriot and friend of King Robert Bruce, was elected to the see, and began work afresh on the nave. The records of this period refer specially to the north-west tower.

The nave and the lower part of the centre tower were completed about the middle of the 14th century. At the beginning of the 15th century Bishop Lauder restored the north-west tower, carried on work on the central tower, and built a large portion of the chapter house. The room was completed by Bishop Cameron, who also erected the sacristy over it, and built the central spire and the consistory house. The last named stood at the south-west corner of the nave, and was destroyed in 1846.

Bishop, afterwards Archbishop, Robert Blacader, elected in 1484, built the rood screen at the entrance to the choir, as well as the two altars which still remain, and vaulted the low building at the south of the south transept.

The building as a whole is characterised by great simplicity, but the choir and lower church are generally considered as amongst the finest examples of 13th century work in this country.

RECEPTION AND AFTERNOON TEA IN THE EXHIBITION.

In the afternoon, from 4 to 5 p.m., Sir Robert Pullar, Chairman of the Scottish Section, held a reception in a marquee in the Exhibition grounds, the members and their friends then partaking of tea.

THE ANNUAL DINNER.

The annual dinner of the Society was held on t evening of Thursday, 25th July, at the Windsor Hotel, President, Mr. Joseph W. Swan, F.R.S., being in the ch and about 130 members and friends being present. T President was supported by the Lord Provost of the c (Samuel Chisholm, Esq., LL.D.). The Very Rev. Rob Herbert Story, principal of the University of Glasgo Sir Robert Pullar, Chairman of the Scottish Section; Thomas Wardle, Sir John Neilson Cuthbertson, Mes Ivan Levinstein, president-elect; Robert Caird, LL Greenock; and Clifford Richardson, chairman of the N York Section; Prof. A. B. Prescott, senior professor chemistry in the University of Michigan, U.S.A.; Mes James Macfarlane, deacon-convener of the Trades' Ho Glasgow; and George Beard, president of the West Scotland Iron and Steel Institute; Dr. Fergus, hono secretary of the Glasgow Philosophical Society; Mes Thomas Tyrer, London; Samuel Hall, treasurer of Society; W. R. Copland, C.E., chairman of the Gover of the Technical College; George Beilby and N. Martin, Newcastle-on-Tyne; Prof. G. G. Henders Prof. Ferguson; Mr. Henry A. Mavor; and Dr. Tho Gray, secretary of the Scottish Section.

The following telegram was received by the Presi from Prof. C. F. Chandler, M.D., D.Sc.:—

"Best wishes for continued success and usefulness o Society of Chemical Industry. Warm regard for offi and members."

(Signed) CHARLES F. CHANDLE

To which the President replied as follows:—

"Many thanks for welcome telegram. Most succe meeting."

(Signed) SWA

Sir Robert Pullar, on behalf of the Scottish Section, telegraphed to Dr. Schweitzer as follows:—

"Glasgow Section greets New York Section."

(Signed) PULL

The toast of "The King, the Queen, and the Family" having been duly honoured,

Mr. IVAN LEVINSTEIN (president-elect), in proposin toast of "The Society of Chemical Industry," said President, my Lord Provost, and gentlemen, the pl duty has fallen on me to propose "The Society of Che Industry." The object of the foundation of the S was to disseminate chemical knowledge and subject kindred character, to do away with a thing which pre to a large extent at the time of its foundation, ab years ago, namely the rule of thumb, and to rep by science. It was further felt that we were in wan journal which not only should contain the original contributed by its members, but also contain any ma interest—scientific or technical—to those engaged i chemical industry and manufactures of a kindred ch At that time no such journal existed. It is true, th few years before, had established a journal calle *Chemical Review*, of which I was not only the found the only contributor. *The Chemical Review* did revi doubt, all which came to its notice, but want of tim pelled me to give it up. How far did we succeed in ca out the ideas and intentions of the founders of our Sc You will agree with me that our Society, during it paratively brief existence, has done wonderful wo has brought together men employed in similar trad manufactures; it has removed much jealousy which before; it has made friends of people who were un to each other, and it has cemented many friendships. annual gatherings have contributed much toward friendships, and this gathering in Glasgow is one most successful we have had. The Society has to extent removed rule of thumb, and thrown light darkness hitherto reigned. A membership of 3,000 eases yearly by 125, and an accumulated capital of 00*l*., shows its important and substantial position. Journal we have established, so far as a work of renee is concerned, is the best in the world. To this nt we have been successful beyond the expectation of e who established our Society. May I throw out some s which may be conducive for further improvement? mists know that it is difficult to reach perfection, and we are constantly trying to improve what we have hand, and if we did not do that we should not be true ur profession. Since our Journal was founded, as is ase with many other things, competition has increased. uld point out that it is of paramount importance that hose, who are engaged in the preparation of products h require constant improvements and much research, ld be supplied with any published research or work scientific character, any improvement in the application cience to art and manufacture, at the earliest date. our foundation there have been other journals of milar character started on the Continent. These als do not appear once a month, but once a week, l submit that our journal should appear weekly, or, if is absolutely impracticable, at least twice in a month. Publication Committee may say, "What do you want do? We are not paid for the work which we do. Do expect us to do still more? We are already over-ed." Our honorary treasurer, Mr. Hall, will say, at are you going to do with my reserve? You are to ruin me." My reply is, the object of this Society to hoard up money, but to spend money for the benefit ence and for the benefit of those who are engaged in dustries. We shall lose nothing financially; if any-, we shall gain. A weekly journal gets far more tisements than a monthly, and some of the abstracts be condensed. Take, for instance, the abstracts from ts. For those who are specially interested these cts are not long enough, and for those who are not interested in the respective subject they are too This is simply a hint which I desire to throw out interests of our Society, and I am sure that you will e the increase of membership in a very short time if carried out. There could be no better occasion to such an alteration than when we come of age, next I should like to be able to announce in Liverpool ur Journal will be a bi-monthly or possibly a weekly al.

time has also come when our Society ought to take erest in questions which relate to the welfare of our and industries. It is degrading and depressing to see ny questions discussed in Parliament and elsewhere ning ourselves without our opinion being asked. are questions of greatest importance to our trades, s cheaper freight, extension of waterways, carriage of ous chemicals, fire insurance, reform of our patent &c., in which our Society ought to influence, or at ents advise our Government. You have considerable , if you care to use it; you have sections at home and d seas. In all industrial centres you have Chambers nmerce which will be only too anxious to be asked to ent your interests. Our Sections ought to influence hambers of Commerce, as is already the case in n and Manchester. The Chambers would be only d to take such questions up, and so press your claims Board of Trade that it cannot resist you. I cannot de my remarks without referring to the work of my Mr. Thomas Tyrer, because he is the man to whom cess of this Society is largely due. By his ability, al, and his diplomacy he has kept many of the ers together who might otherwise have been separated. much pleasure in proposing the toast of the Society mical Industry, coupled with the name of its President, W. Swan.

President, in reply, said · My Lord Provost and nen, in proposing the toast of "the Society," Mr. tein has very rightly given prominence to the name . Tyrer, who is not only one of the creators of ciety, but he is also the most laborious of the many and assiduous workers who have made the Society what it is. In responding to the toast I avail myself of one of his ideas, that as this is the 20th year of the Society's existence, it is entering upon the year of its majority. This critical point in its history was used as a reason why I should serve a second term. If my strength had permitted it I should have consented. But when I found what manner of successor I should have, I felt that it was well for the Society that I had not yielded. You have in the President-elect the right man. He will infuse new life into the Society, and, working hand in hand with the council, the officers, and the indefatigable publication committee and editor, I see before the Society a year of great prosperity.

I hope that the idea of Mr. Levinstein as to the improvement of the Journal will not be treated as a criticism, but as he himself has put it, a friendly suggestion. Mr. Levinstein has correctly described the objects of the Society.

In the address delivered by Sir Henry Roscoe when the Society held its first meeting in London, in June 1881, we were told that the Society was founded with the object of engendering and fostering in the various branches of chemical industry that spirit of fraternity, co-operation, and mutual help which unity of aim and the harmonising forces of science and commerce naturally tend to create and develop. The objects were partly scientific and partly social, and there can be no question that both objects have been in a large measure attained. The career of the Society has been a continuous progress; year by year the membership has increased at an almost uniform rate, till now we count the respectable figure of 3,600. A remarkable and gratifying feature is the wide area from which our members are drawn, and the comprehensive character of the industries they represent.

We are glad to have with us to-night several of our transatlantic brethren, among these the Chairman of the New York Section (Mr. Clifford Richardson), Prof. Prescott, and Prof. Girdwood.

Gentlemen, we have every reason for congratulation that the objects we set before us have been so fully attained. It was perhaps a question whether men engaged in the same industry could co-operate as we have done. But the faith of the founders of the Society in the uniting and consolidating power of a common object—more especially when that object is in close touch with science—has been fully justified. In an after-dinner speech I lately heard made by that eminent captain of industry, Mr. Andrew Carnegie, he said he did not accept the commonly received dictum that "two of a trade cannot agree." It was his experience to have found some of his best friends among his industrial rivals. That, I am sure, has been, almost without exception, the experience of the members of our Society. There is a true and natural basis of union and friendship in commerce. Commerce rightly understood and rightly pursued is one of the best peacemakers, its origin and fundamental motive being mutual advantage.

I need say nothing more about the Society except that I wish it great prosperity, and that the experience of my worthy successor in his connection with it as president may be as happy as my own has been. I tender to all the officers of the Society, to my colleagues on the council, to the publication committee, and especially to those hard-working members, Dr. Lewkowitsch, Mr. Walter F. Reid, and Dr. Squire, my heartfelt thanks.

This visit to Glasgow recalls one I made to it 20 years ago. Almost at the very moment of the birth of the Society, I was showing my incandescent lamp in Glasgow for the first time. Glasgow was one of the first provincial cities where the lamp was exhibited. One of the attractions to Glasgow—indeed the chief attraction—was the fascinating personality of him whom the world then knew by the name of Sir William Thomson, now Lord Kelvin. Lord Kelvin took a fatherly interest in my lamp, and I shall feel for ever grateful to him for the aid and comfort he gave me at that critical time—a time when not a single house in the United Kingdom was lighted by electricity, except Lord Armstrong's and my own.

I remember discussing the prospects of electric lighting with Mr. Foulis, then manager of the Glasgow gasworks, and, I am glad to learn, manager still. Mr. Foulis did not, if I remember rightly, believe quite as strongly in the future of the electric lamp as in that of gas. His highest hopes have no doubt been realised as to the development of the gas industry, and I may say that mine have been realised as to the development of electric light. Glasgow appears to appreciate the value of light. I trust that electric light has contributed somewhat to the success of her beautiful exhibition, for I greatly rejoice in the success of the exhibition, as I rejoice in the success of everything that is good.

I thank you, gentlemen, for having given so cordial a reception to the toast of the Society.

Mr. George Beilby, in proposing "Our Guests," said: Mr. President, my Lord Provost, and gentlemen, those of us who are in the habit of attending public dinners must have grown accustomed to find this toast at the bottom of the list. But on this occasion the Secretary of the Scottish Section has given it proper prominence, because, after all, what is a feast without guests? We are to be congratulated to-night in not only having guests, but in having with us most welcome guests. Let us tell them how delighted we are to see them, and how heartily we welcome them, that they may unite with us in our joy. I should like to couple this toast with the names of the Lord Provost of Glasgow and Principal Story. I am sure I express your feelings when I say that we admire and respect the Lord Provost, and that not the least pleasant recollection of this meeting will be that of the charming hospitality of our Lord Provost and his fellow magistrates. He has appeared as a marvel of shrewd and kindly insight to all who have heard his speeches, especially when he welcomed us last night to Glasgow. We all know and appreciate the Rev. Dr. Story, Principal of the University of Glasgow. On the recent occasion of the ninth Jubilee of the University the Society presented an address to the Principal of the University. On that occasion, when there were so many representatives present, we could not say to the Principal all we should like to have said as to our hopes and wishes in connection with the prosperity of the University, but this is not an unfit opportunity to say that the Society of Chemical Industry wishes that Glasgow University may take one of the highest places in the land as a university of modern times, in fitting the citizens of this great city for the work they have to do. In drinking this toast to our guests, and thanking them heartily for coming to help us in our rejoicings to-night, we could not do better than couple it with the names of the Lord Provost of Glasgow and the Principal of the University of Glasgow.

The Lord Provost, in reply, said: Mr. President, Mr. Beilby, and gentlemen, I esteem it a high privilege to have been invited as a guest to the hospitable board of so important a Society as that of the Chemical Industry. That honour is increased when I find that I am called upon to reply to the toast which has been so genially proposed by Mr. Beilby, and so warmly responded to by this company. If anything could add to that honour it is to be found in the fact that I find my name bracketed with the honoured representative of that ancient seat of learning, to the celebration of whose Jubilee you have referred. When I come to the specific task that lies before me in responding for the guests I am immediately confronted with a difficulty. I have searched the faces of this company in vain to see if I could by any means differentiate the hosts from the guests, and I find myself at so absolute a loss that I give the task up in despair. Taking for my key the fact that I found my name bracketed with that of Principal Story, I assumed that the guests might be divided into two companies, namely, the professional and the lay. Leaving Principal Story to respond for the professional, I would like to say a word as a layman. Mr. Levinstein, a few minutes ago as a professional man, offered suggestions to this learned Society. It would ill become a layman to do anything that could be considered a suggestion or a criticism, but I should like to ask a question or two. I said last night that chemical science
had not yet spoken its last word. There are three questic
would ask of chemical science, and three answers I sh
like to receive at your hands. I know that chemical sci
is a mere abstraction, and it is to you who have chosen th
your line of study, the secrets of which you have ple
yourselves to find out, that I address myself. My
question is, what are we to do with our black smo
I know we can shut up the works, and you would hav
smoke, but what we want is to have the works withou
smoke. It is in vain for the magistrates to impose p
fines. What are the fines we can impose to the fortun
the people who produce that black smoke? They pa
fines and repeat the offence. How are we to unite the
the maintenance of these industries on which the prosper
I might almost say the very existence—of your So
depends, and the abolition of the smoke, which is a m
to the health of the community as well as to the comf
the citizens? I have another question to ask. There
as you know, not a few important chemical wor
Glasgow. Much of the refuse from these works is p
into our sewers and finds its way into our beautiful C
Can chemical science tell us how these works are
utilise their refuse as to make it a source of profit to
selves instead of making it an injury to our city
destruction to our river? I know not why che
science should not devise some way whereby this r
wherein I believe there lies a fortune for the student
discovers the secret, may be utilised,—and solve this
cipal problem as well as make a great advance in che
science itself. My third question is somewhat si
We have set about the purification of our sewage
away in the east end we are now purifying one-third
sewage of the city of Glasgow. We do it, not b
bacterial method, but by filtration and precipitation.
result is the production of a quantity of sludge, whi
have turned into as merchandisable a commodity
can. We have got a most persuasive traveller to
and we have given it a most attractive name, the "
Fertiliser." But in thousands of tons it lies there, a
cannot dispose of it. Chemical science has a sec
discover there, and I proposed in all seriousness t
Town Council of Glasgow to offer a prize of 1,000*l.*
man who will solve the secret, to make that which is
useless a profitable commodity. While I thank y
drinking this toast so cordially, if the result of my
to the students of chemical science should be to solv
one of these three questions, then I shall look back
profound gratitude to this visit of the Society of Ch
Industry.

Principal Story, in reply, said: Mr. President, m
Provost, and gentlemen, when I was asked to join i
banquet it was suggested that I should, along with th
Provost, reply for the guests. I objected, chiefly b
the Lord Provost was perfectly certain to say all th
appropriate to such a toast. I think that I was rig
that this division of labour is entirely uncalled for
occasion, especially since the Lord Provost has m
represent the professional side. At a meeting of a S
like this the professional is the member of the Socie
all others are the laymen. However, I perhaps
venture to take advantage of the professional or prof
character prescribed to me by the Lord Prov
endeavouring to offer an answer to one of the conu
which he put to you, and that is what to do to s
smoke which pollutes the atmosphere. I would say
Lord Provost, and to all raisers of fire and of smoke, w
manufacturers, theologians, or scientists, that the sim
is to consume your own smoke. Each man ma
without any great scientific appliance, how to do t
himself. As for the cleansing of the river, that is a
more difficult subject, but as far as I have stud
progress of the works at Dalmarnock and elsew
should say the simplest way to arrive at the clea
the Clyde is not to purify the water at Dalmarnoc
all the filth of Clydesdale is allowed to fall in fro
a dozen towns above Glasgow itself. We should b
the top and gradually come down, instead of be
in the middle. These matters are strictly professi
the Society to consider at its leisure. I am ex

ged to you for having so kindly referred to me,
use I regard it as a tribute, not to myself, but to the
t institution, the oldest Corporation in Glasgow, as
Lord Provost will acknowledge the University to be, of
h I have the honour to be at present the head. We
just been celebrating the 450th year of the foun-
n of that great University, and at this period of
cistence, instead of wearing any of the signs of age,
showing symptoms of youth, progress, and activity
as it has not shown for some time past. As regards
tudy of chemistry in that University, it is not exactly
e position in which we should wish to see it, but I
that ere long, with the help of that munificent bene-
n of Mr. Carnegie, it will be placed on a more effective
ng, since it is a science in direct contact with nature,
induces those who pursue it to devote their energies
ng to light the secrets which have been hid from the
lation of the world, and which is valued by those who
e themselves to it, not because it is a means of making
fortunes or of realising money, but because they
it the welfare of the human race. Chemical dis-
ies alleviate the troubles of humanity, enlighten its
ess, and make life more worth living to those who
advantage of them. There is no science more to
mired than that in which you are engaged. May
gress, and may this Society help in advancing its
and as often as you do us the favour of coming to
ow I hope it will be my happy lot to meet you again,
see larger numbers and more enthusiastic followers
have met here to-night.

Thomas Tyrer, in proposing "Kindred Societies,"
Mr. President, my Lord Provost, and gentlemen,
resident-elect, like many of his predecessors in the
a, has asked me a good many questions. I need
ologise for so energetic and able a man. There is
deal in what he says, and I hope members will take
eart. Whether his desires be carried out or not, it is
that we shall have a development which the position
Society and its funds justify. A step for which good
s may be given will be at least respectfully considered,
possible, carried out. The toast allotted to me is
f the kindred societies. Everything centres round
try, and one cannot well be a chemist who has not
tance with other sciences. It is therefore appro-
to propose on an occasion of this kind the toast of
l societies. It would be impossible to build ships of
the iron were not of the proper chemical quality.
pleasure in associating this toast with the name of
bert Caird, past president of the Institute of Ship-
s and Engineers in Scotland. He retired in May
A retiring president often knows more than an
g president. That is why we were hoping that
n Society might prevail on Mr. Swan to act for
year, and if it had not been for the consideration
e has put before us this evening I am quite sure we
have welcomed him in that post for a second time.
er association with that toast I have to mention the
Dr. Fergus, the hon. secretary of the Philosophical
of Glasgow, founded in 1802. Dr. Birkbeck, founder
rn technical education, was one of the first sub-
and an original member. In London we have the
k Institute Buildings, and in them very much
chnical and philanthropic institution should contain.
kbeck Institution is an excellent example of what
e called an evening technical school. Dr. Birkbeck
nded a bank, which has been a great help to those
associated with the Birkbeck Institution. Their
went into it. A few years ago, when a financial
me, the Birkbeck Bank stood firm. Then, again, a
ng to know with regard to the Philosophical Society
gow is that Thomas Graham was connected with
n we have an honoured name—a name that we
receive in silence and regret—the name of Edward
tanford, a past president of that institution as well
own. The Philosophical Society of Glasgow has
r of sections; they are chemical, physical, geo-
, political economy, and public health. I have
asure in associating with this toast the names of
l and Dr. Fergus.

Dr. Caird, in reply, said: I rise with great pleasure to acknowledge the able speech in which Mr. Tyrer has proposed the toast of kindred societies, and also the cordial reception which you have accorded it. That pleasure is somewhat overshadowed by regret that Lord Blythswood, who had undertaken to respond to this toast, has been prevented from being present, and especially because there is no one better qualified to represent societies devoted to culture and to science. In his absence, Dr. Fergus, the honorary secretary of the Philosophical Society, has been good enough to promise to support me. The Philosophical Society and the Institution of Engineers and Shipbuilders in Scotland, with which latter I am identified, are two of the strongest learned societies in this country, and they are very closely connected. They have their home in the same building; they store their books on the same shelves, which I am bound to confess are quite inadequate. They have both recently displayed great vitality, which goes to show that the advancement of science progresses *pari passu* with material prosperity. Let me thank Mr. Tyrer for the remarks which he has made, and also for his eulogy of the societies kindred to that of chemical industry. I trust that the friendly relations which exist among these societies will be ever maintained in the interest of science and the material prosperity of our beloved country.

Dr. Fergus, in reply, said: I have to thank you for the manner in which you have proposed this toast. We are the oldest scientific society in the West of Scotland, and within 15 months from now we hope to celebrate the centenary of our foundation. During that time we have had many excellent members, many active members in the Society. I have only to mention such names as Rankin, Kelvin, Graham, Birkbeck, and a host of other distinguished men, who have not only been members of our Society, but have been office bearers. The Philosophical Society of Glasgow contains the best technical library in Scotland, which is open at a moderate fee to all students in the West of Scotland. Mr. Tyrer was wrong in saying that we had still a chemical section. We once had, but it came to an end with the foundation of your Society. We miss very much the earnest band of workers that we had in that section. Still it founded for us the Graham Lecture and Medal, which will keep his memory ever green in Glasgow. We have had many secessions, but still we manage to maintain full vigour.

Mr. Clifford Richardson, chairman of the New York Section, in proposing the Scottish Section, said: I can only imagine that I have been called upon because Dr. Gray has found out that my ancestors left here 300 years ago to-night, and considers me a competent person to represent the Scottish Section. I feel that I ought to be a member of the Scottish Section. I propose the Scottish Section with greater pleasure on that account. The President-elect has described this meeting as being one of the most charming that the Society has ever had. It seems to me to be so attractive that I am inclined to regret the invitation, which I extended the other day, to meet in New York, because I feel that the meeting would compare very unfavourably with this. Still I propose that you should come and meet with us in 1903. It seems a considerable undertaking; but I have crossed the water, and it is nothing compared to crossing our own continent. It is a rest to cross the sea, and you can cross without trouble. It has been my ambition for years to come to Glasgow, and now that I am here I am more than pleased at my reception. Among those whom I have met is Sir Robert Pullar, the chairman of your Section, and I call upon him to respond for the Scottish Section.

Sir Robert Pullar, in reply, said: I am sure that you will excuse little being said about the Scottish Section. You see what it is doing; you see what kind of men there are at the head of it. I have no doubt whatever that it will go and increase in Glasgow especially. We are but a small body, but the Scottish Section are always ready to do their duty and try to forward the interests of chemical industry. We have had questions put to us by the chief magistrate of the city, which, if the 1,000*l*. is forthcoming, will be answered. It is an honour that this Scottish Section has been proposed by the chairman of the New York Section. The great and mighty country whence our friend comes is a productive country. It is the freest trade country in the world so far as itself is concerned. Within the United States we find no custom houses. These States send their products from one to another without restriction. We just open our ports and let everybody send in as much as they can. The Americans are developing most wonderfully their technical schools and colleges. We wish the United States the greatest possible prosperity, and if our friends repeat their invitation to meet in America many hard-headed Scotchmen will go over, who, perhaps, will be able to show the Americans a thing or two. The Americans will be able to show us a great many things. I have very great pleasure in replying for the Scottish Section. I should like to propose the health of Dr. Gray.

Dr. Gray : I have to thank you very much.

The President : I have much pleasure in proposing the health of Mr. Thos. Tyrer.

Mr. Thos. Tyrer : I take this opportunity of sincerely thanking you all and saying that the work that is done emanates in a sense from other people. You must have all felt how well Mr. Cresswell did his work at the annual meeting. That is the easiest part of his work. He has many difficult tasks to perform, and one of the most difficult is as sub-editor as well as secretary. In the capacity of sub-editor he has to write letters to authors and the secretaries of sections about the revision and even rejection of papers. I would ask you to pass on any compliments you have been good enough to offer me, to my friend the secretary. In this connection, too, I might mention our indefatigable editor, Mr. Watson Smith, who is not well enough to be with us to-night.

Mr. Cresswell : I beg to thank Mr. Tyrer most heartily for the kind and graceful words with which he has referred to any labours of mine. I can only assure you that were it not for the assistance that is rendered to me in the most encouraging way by every man who is associated with me, it would be impossible to carry on the work of a society of this magnitude with the success that it is perfectly evident from the proceedings of this evening it has achieved. May we go on to better things in the future.

THIRD DAY.—Friday, July 26th.

Excursion on the Firth of Clyde.

This excursion formed the third and final feature of the Annual Meeting.

The weather was, on the whole, perfect—a circumstance contributing greatly to the full enjoyment of scenery, the beauty of which is not exceeded by any of its kind in Great Britain.

The party, numbering about 200, one-third of which were ladies, left St. Enoch Station at 9 a.m. The steamer "Juno," with the party on board, left Princes Pier, Greenock, at 10 a.m., and proceeded up Loch Long to Arrochar, the head of the loch, where it arrived at about 11.30 a.m. Here the party were photographed, after which they left the steamer and went, some on foot and some by carriage, across the narrow neck which divides the sea loch from the freshwater Loch Lomond.

They then returned, the steamer leaving Arrochar a little after 1 p.m., retracing its course down Loch Long, and proceeding to the Kyles of Bute by a route down the Clyde lying nearer to the Dunoon and Innellan side of the firth. At about 1.30 p.m. lunch was partaken of in the saloon of the steamer, and later on tea was served. Considering the large size of the party, the luncheon and tea arrangements were excellent.

During the day a good selection of music was performed by a band of six performers. The route lay around the Isle of Bute, with Arran to the south-west, and after passing Garroch Head, the course of the Clyde was followed, now on the Largs and Wemyss Bay side, and so on, back to Greenock. On nearing Princes Pier,
President ascended the bridge, and, whilst biddin
graceful adieu to the party, proposed a vote of than
the Chairman and the Scottish Section.

Sir Robert Pullar replied, and again moved a si
vote to Dr. Thos. Gray, who had acted so abl
organising the excursion. These votes were all carri
acclamation. On reaching Greenock the party took
for Glasgow, arriving about 7 p.m.

As a reminiscence of this most delightful excursi
more detailed description of the route is now given.

Glasgow to Greenock, the Clyde, and the Kyles of Bute.

The line to Greenock passes through Paisley (pop. 79
This town has been celebrated from a very early peri
its textile manufactures, and is at present well known
site of the thread factories of J. & P. Coats, Ltd. C
other places on the Glasgow and South-Western R
route, Elderslie, the birthplace of the patriot W
Wallace, may be specially mentioned. Shortly after p
Kilmalcolm an excellent view of the Clyde is obt
among the prominent features of the landscape m
mentioned the peak of Ben Lomond in the distan
hills of Loch Goil and Loch Long, and Dumbarton R
which stands Dumbarton Castle. At the foot of t
along which the line passes is situated Port Glas
well-known shipbuilding centre. The town of Gr
(pop. about 68,000), notable as the birthplace of
Watt, though of comparatively modern origin, is one
most important seaports of Great Britain. It has lon
associated with sugar refining, and possesses large en
ing and shipbuilding establishments. The steamer sai
Princes Pier, on which the terminus of the Glasgo
South-Western Railway is built. Opposite Greeno
situated at the mouth of the Gareloch, an arm of t
stretching northward for a distance of 7½ miles,
popular residential seaside resort, Helensburgh. I
Princes Pier the steamer passes Fort Matilda and Gou
a terminus of the Caledonian Railway—on the le
crossing to Kilcreggan, turns into Loch Long (24 mil
2 miles broad), near the mouth of which, on the eas
lies Cove. At this point a fine view is obtained of t
Long hills to the north, and of Ben Lomond to the
east. About 10 miles from its mouth Loch Long
a branch to the left, Loch Goil, which runs in a
westerly direction for about 6 miles. At the head
loch lies the small village, Lochgoilhead, from wh
Hell's Glen, a road leads through wild and pict
mountain scenery to St. Catharine's Ferry on Loc
opposite Inveraray. Carrick Castle, an old strong
the Dunmore family, is seen on the left side of L
when sailing up the loch. Returning to Loch L
steamer proceeds into the upper part of the loch,
here less than ⅔ of a mile broad. At this point the
Hills, among which the Brack (2,500 ft.) and Ben A
the "Cobbler" (2,750 ft.), may be mentioned, are w
The village at the head of the loch is Arrochar, w
steamer waits for 1½ hours to give the passen
opportunity of crossing to Tarbet (2 miles) for a
Loch Lomond. On the way to Tarbet, "Arroc
Tarbet," a station on the West Highland line, is pa

Leaving Loch Long on the way to the Island of
Holy Loch is observed on the right. At the mout
loch, on the south side, is situated Hunter's Q
head-quarters of the Royal Clyde Yacht Club. Th
now passes in succession the popular watering pla
Dunoon, and Innellan. On the hill above Dunoo
seen the ruins of Dunoon Castle, the hereditary k
of which was conferred by Robert Bruce on the
Sir Colin Campbell, an ancestor of the Duke o
On rounding Toward Point, on which a lighthous
Rothesay Bay comes into view. Rothesay (pop
the chief town on the Island of Bute, is situated i
In the centre of the town are the ruins of Rothes
supposed to have been built about 1100, and at o

ral residence. On the east side of the island, 5 miles m Rothesay, is Mountstuart, the seat of the Marquis of te. Passing Port Bannatyne and Kames Bay on the left l the mouth of Loch Striven on the right, the steamer, ers the Kyles of Bute, the strait separating the island m the district of Cowal. On its way through the Kyles, steamer passes on the right Colintraive, Loch Ridden, l the pretty village of Tigh-na-bruaich. Leaving Ardlamont Point at the entrance to Loch Fyne on the right, the mer proceeds past the small island of Inch Marnock to south end of Bute, from which an excellent view of the nd of Arran is obtained. This island, which is about miles long and 11 miles broad, is almost entirely the perty of Lady Mary Douglas Hamilton. The Arran ls, composed mainly of granite, are a prominent ture in the landscape. The highest peak is Goatfell 866 ft.).

ounding Garroch Head the steamer passes the small nds Little and Great Cumbrae, and proceeds northwards Wemyss Bay, near which is situated Wemyss Castle residence of Lord Inverclyde), and Inverkip. After ing Cloch Point (lighthouse) the steamer soon reaches enock, having passed Ashton, Gourock, and Fort Matilda he right.

THE GLASGOW INTERNATIONAL EXHIBITION.

lthough this Exhibition has been termed an internal one, and the term in a certain widely general sense it be accepted, yet the title is scarcely suitable in any ial sense, and, for example, so far as the chemical on thereof is concerned, since outside the spaces allotted reat Britain and her colonies, the only countries repred are France and Russia, with the exception of the l portion of Germany represented by Stassfurt and its s and staple industry.

REAT BRITAIN AND HER COLONIES.—Even as offering a tive picture of the chemical industries of Great in, this Exhibition is by no means complete. Certain ical industries, it is true, receive full illustration, but s remain absolutely unrepresented.

nong the exhibits of the so-called "heavy chemicals," of the United Alkali Co., Ltd., is the largest and fullest. fine exhibit gives a vivid illustration of the wide range of ompany's manufactures and business. Although the it of Messrs. Brunner, Mood, and Co. is less many-sided, is is more than compensated for by the individual excel and beauty of the products, the caustic soda of 76—77 ent. strength, the pure soda ash of 98—99 per cent., he crystallised sodium sesquicarbonate, offering much st, and the same may be said of the pure zinc of per cent. strength made by Höpfner's process. hing powder, and also ammonium sulphate recovered crude gas made in the Mond gas producer, form onal items of interest. There is a beautiful model of ond gas plant in the Grand Avenue of the Exhibition.

ssrs R. and J. Garroway exhibit besides other products, sulphate of alumina, alum-cake, "sewage borates of calcium, and acetates of alumina, ead, and lime; and the old firm of Messrs. J. Riley ons, of Hapton, in Lancashire, have an interesting and among other substances exhibit arseniate and te of soda, and crystallised stannous chloride ("tin s"). Messrs. John and James White have two cases devoted to chrome products, and some magnifi- crystals of bichromates and chromates. The larger contains samples of the ores which are employed in g chromium compounds, and an exceptionally complete of the latter.

Patent Borax Co., Ltd., exhibits the crude borates which borax is manufactured, and also the pure salt, with sundry soaps, cosmetics, &c.

exhibit leads on naturally to the branch of *Oils*, &c., and of these the most comprehensive is that ice's Patent Candle Company, Ltd., which is in a magnificent case, each of the four parts being devoted to a particular department of the Company's manufactures—candles, night lights, soaps, and other toilet products, and pure glycerin with various galenicals in which it forms an important constituent. Messrs. J. C. and J. Field, Ltd., have an elegantly arranged case. It contains, besides night lights, candles, and soaps, some samples of perfumery, &c. Messrs. Lever Brothers, Ltd., have two distinct displays of Sunlight and other soaps with which their names are associated; and Mr. Richard Armstrong, of Preston, exhibits an ammonia soap-powder. The Chiswick Soap Company confine their exhibit to soft soap and various specialities; but Messrs. Isdale and McCallum, of Paisley, show a very wide range of soap-products, and one has an opportunity at this exhibit of tracing the soap manufacture from beginning to end. Besides household and toilet soaps, the firm show glycerin and other by-products of soap manufacture. The largest exhibit in this department is made by Messrs. Ogston and Tennant, Ltd., of Glasgow, an amalgamation of two of the oldest firms of soap manufacturers in Scotland.

Varnishes.—The exhibits of oils, paints, and varnishes are interesting. In the Main Avenue, Messrs. Mander Brothers, of Wolverhampton, have placed an attractive stall representing a Moorish building, where one can rest and write a letter. Specimens of resins used in the manufacture of varnishes, and of wood coated with the latter, are shown. Another show-case which presents much interest on account of the fine collection of resins exhibited, is that of Messrs. Wilkinson, Heywood, and Clark, Ltd., of London, a company whose history as a varnish-making firm dates back to 1770. Their exhibit contains some beautiful specimens of work done with varnishes and colour enamels, not the least interesting being a series illustrating the application of the dipping process, which gives a remarkably brilliant and smooth surface, even in the case of vermilion enamels.

The Mineral Oil Industry.—There are four exhibits of mineral oil and wax products, namely, Young's Paraffin Oil Company, Broxburn Oil Company, Pumpherston Oil Company, and the Burmah Oil Company. The first three are Scottish companies, and all show practically similar products, such as mineral naphtha, gasoline, petroline, paraffin burning oils, lighthouse oil, gas oil, lubricating oil, paraffin scale, and refined wax of various melting points, candles, and sulphate of ammonia. The founder of the mineral-oil industry, the late Dr. James Young, F.R.S., erected works at Bathgate in 1849, and 15 years later works at Addiewell, both of which passed into the hands of the Young's Company in 1866. In their exhibit is a model of the patent manual gravitation retorts, showing the latest development of that description of plant. In the Broxburn Oil Company's case is a "tree," illustrating the gradual derivation of the various products from shale.

Closely allied to these exhibits is that of Messrs. Stern Brothers, of London, which illustrates the variety of distillates and products obtainable from crude petroleum. Naturally, lighting and lubricating oils form the major part of the exhibit; but some excellent specimens of *paraffinum molle*, and of petroleum oil which is water-white and free from sulphur compounds, are noticeable. "Sternoline" oil, for screw-cutting and for hydraulic machinery, may, it is claimed, be mixed with 19 times its volume of water, and will yet prove a good lubricant.

While dealing with lighting oil, it may be mentioned that there are numerous exhibits of acetylene apparatus in the grounds.

Manurial Salts and Products.—A separate pavilion is devoted to exhibits dealing with agricultural science, apart from machinery, and there is here much that is of interest. The first object to meet the eye is the splendid trophy of the German Potash Syndicate, of Stassfurt, which shows a miner handing up a block of salt to one of two allegorical figures seated on a pedestal of the same material, the Spirit of the Mine overshadowing the whole. The exhibit is most extensive, and contains specimens of the various minerals and products manufactured by the syndicate. Up till fifty years ago the salt industry in Stassfurt consisted simply in evaporating the natural brine obtained from the salt springs, but about the middle of the century, borings were made in the hope of finding more profitable salt-deposits. Immense quantities of rock-salt were discovered at a depth of about 1,000 feet, but immediately above these the shafts passed through a layer of minerals the value of which was not known at the time. These are now the source of most of the potash used in the world to-day. Upwards of three million tons were produced last year, of which about one-half was used in agriculture, as compared with less than 200,000 tons in 1880. Even this large consumption is bound still further to increase, for Great Britain does not use a sixth part per acre of cultivated land compared with Holland, Belgium, and Sweden, whilst agricultural science has completely proved the high value of potash as a manurial agent. About 14,000 miners and labourers are employed in the mines alone, in addition to the thousands of hands that are necessary for the distribution of the products throughout the world.

Another exhibit of great interest is that of the Nitrate of Soda Association, which controls the great nitrate industry of Chile. There is here also a trophy which represents in a series of cubes the production of nitrate since 1830. In that year 800 tons were produced; last year 1,340,390 tons were exported, and it is rather interesting to observe that Germany took about one-third of the total quantity, while the United Kingdom only took one-tenth. Here, too, are shown photographs of the results obtained by using nitrate as a manure, but it is to be observed that the best results were obtained when potash also formed part of the manurial combination. The Sulphate of Ammonia Committee are also in evidence with specimens of potatoes and turnips grown with and without sulphate. There are interesting exhibits of fertilisers, dissolved bones, and superphosphate, and mineral phosphates from Christmas Island, Algiers, and Florida, containing from 60 to 86 per cent. of phosphate.

Gums, &c.—A peculiar substance, called gum tragasol, is exhibited by the Gum Tragasol Supply Company, Ltd., of Liverpool. It is a substitute for, and is said to have all the properties of, tragacanth. It is made from the seed of *Ceratonia Siliqua*, which resembles quince, and which Messrs. Norman Tate and Co. have found, on analysis, to contain: Oil, 0·58 per cent.; albuminoid matters, 3·29 per cent.; mucilage, gum, &c., 72·05 per cent.; woody fibre, 7·18 per cent.; ash, 1·56 per cent.; and moisture, 15·34 per cent. The gum is prepared in various forms, the finest resembling tragacanth in colour and properties, and is used as a size in textile industries, although other uses for it are suggested.

Fine Chemicals.—Messrs. T. and H. Smith and Co., Edinburgh, have among their four cases, one devoted to dietetic preparations and another to opium, its alkaloids and their salts. The varieties of opium exhibited are: Australian, Karahissar, Persian (five kinds, *viz.*, brick, cone, carrot, ball, and stick), Ghévé, Bogaditz, Malatia, Salonica, Egyptian (brick), Tokat, Indian (ball), China, Yerli, and Younghournia, or pudding opium. This is probably the first time that so many varieties of Persian opium have been publicly exhibited. Morphine is shown in large crystals, and the hydrochloride in cubes and blocks of minute crystals; also such uncommon salts are to be seen as the bromide, iodide, lactate, and nitrate. The finest thing in the case is the crystallisation of codeine, 28 ins. high. This is the first time that codeine has been crystallised in sugar-candy form. The crystals contain about 26 lb. of the alkaloid. This mass took six months to crystallise, and is as bright and transparent as alum. Of the other alkaloidal products here exhibited, one of the most interesting is xanthaline sulphate, a new salt of the last opium alkaloid ($C_{37}H_{36}N_2O_9$), discovered by this firm twenty years ago. The free alkaloid is a white crystalline powder, and is a somewhat feeble base, for the salts formed with mineral acids, though permanent *per se*, are very apt to decompose on solution. The salts are also distinguished by their yellow colour; hence the name xanthaline.

British Colonial Courts.—The Septic Tank Syndicate, Lt of Exeter and Westminster, show models and photograp of Donald Cameron's system of treating sewage, whic consists substantially in passing the sewage through two more filter beds filled with furnace clinker charged wi micro organisms that break down all the organic solid rendering them soluble, and so altering the constitution the dissolved substances as to yield a filtrate which may run into streams or rivers without contaminating the Sludge is the bane of sewage treatment generally, but the is none in the Cameron process, and the fact that t method is equally applicable to a single dwelling and such a town as Exeter is evidence of its utility. Close it are found a number of exhibits by sanitary enginee such as Messrs. Doulton and Co., Ltd., of Lambeth.

A remarkable mercury fountain is exhibited on behalf the Queensland Government to illustrate the Queensla production of mercury ores. Of these there is a series specimens exhibited in a glass case along with all the 18 Pharmacopœia salts of mercury prepared by Messrs. Tyrer and Co., Ltd., who also exhibit other merc compounds as well as bismuth salts. The specimens cinnabar exhibited, come from the Kilkivan district. T ores do not seem to be rich in mercury, and the out must be small, as quicksilver does not figure in the colon exports. In 1898 the bismuth exported was valued 700*l.*, as compared with 131*l.* in 1897. The colony is fai rich in bismuth ores, and tungsten ores are also obtai to a considerable extent, the value of the exports in 1 having been 2,540*l.* The following ores are also represent gold, silver, copper, tin, lead, and antimony. The qui silver fountain already referred to was designed by Charles Bright, and it is worked in an ingenious way. one side of the gangway is a trough into which quicksil flows from the fountain at the other side by means of a beneath the floor, and from this trough it is carried by endless band bearing tiny buckets up to a tank wl stands higher than the fountain. Each bucket as it reac this tank empties its contents into it, and from the t the quicksilver flows automatically to supply the foun once more. The fountain may possibly impress visi with the idea that Queensland is a mercury-produ country, three tons of the metal being used in the fount This is, however, probably more of the metal than has been obtained in the colony, and it would be interestin know what the object of this feature of the exhibit is.

Western Australia.—Gold is shown in various crysta forms: also telluride ores, sometimes containing upw of 40 per cent. of gold. Copper and tin ores are exhibited.

The British South Africa Company have an exce general exhibit, chiefly devoted to Rhodesia, and speci of gold and gold ores are shown.

Canada.—In the Canadian exhibit are shown: petrol (Ontario); mineral pigments, such as iron oxide and h spar; common salt (Ontario); apatite (Quebec); gold gold ores; also ores of silver, copper, nickel, manga and iron. Coals are also shown from the Atlantic Pacific coasts.

France.—The French section is somewhat reminisce last year's Paris Exhibition. In the food-group ther several rather interesting exhibits: for example, th Roquefort cheese, which includes a small collectio cultures of the micro-organisms which produce the characteristics of this noted cheese. It will be remem that about 12 years ago it was scientifically deter that the fine flavour of the cheese depends upon a sp micro-organism, and if any foreign organisms gai mittance to the ripening chambers, the result is disa to the cheese.

M. Gustave Chalmel, exhibits a number of spirit nishes; M. Louis Plassard, the Paris perfumery ma turer, exhibits a magnificent collection of soaps perfumery, which last year formed an attractive feat the Perfumery Section at the Paris Exhibition. M Chevrier and Helouis, also of Paris, are the manufac a proprietary medicinal tonic entitled "La Vanadine." is preparation seems to owe its tonic property to ammo- al vanadate, and it appears to be the first medicinal paration of vanadium—at least of modern times. In zelius's day, fully half a century ago, vanadium salts were gested as a substitute for arsenic, but they did not find a e in medicine. A good exhibit of Armenian paper made M. Fernand Moussaud, of Paris, is shown. It is sold in active little booklets, made up of triple strips of the er, one of which is placed in a neat tripod easel for ning. An exhibit of wood products, consisting of ates and acetone, is placed in the corner of the group Messrs. Pages, Camus and Co., of Paris.

ssia.—The majority of the exhibits are of great ral interest, and a few appeal specially to fine chemical ufacturers. One of the latter is the small case shown in Industrial Hall by Prof. Dr. A. Poehl, of St. Petersburg. is a series of very superior "photograms of Charcot- ea's crystals of spermine phosphate," which show the varied appearances assumed by this compound. There also standardised solid extracts of aconite, 1·72 per alkaloid; belladonna, 1·27 per cent.; conium, 0·58 per ; and hyoscyamus, 0·82 per cent. In view of the fact Merck recently stated that he had never met with al extract of henbane containing 0·75 per cent. of oid, it is interesting to find as much as 0·82 per cent. s Russian extract. It would be more valuable if there details of the process by which the alkaloid was esti- l, not only in henbane, but also in the other extracts. sed oxide of iron and glycerophosphate of iron, n scales, are interesting; glycerophosphate of lime, num, and some mercury preparations are shown.

Russian Company of Chemical Products, St. Peters- show a fine collection of coal tar products, benzene, 0·875 and 0·880, 90 per cent. benzol, toluidine, lysol, ic acid crystals and powder, &c.

Bone Products Fabrication Company, of St. Peters- exhibit glue and other specimens.

e *Mining Pavilion* is an exhibit by Nobel Brothers, who show, besides explosives, also products from ite, such as cerasin, white vaseline, crude oils, e oils, gasoline, kerosine, and benzine. A. M. f, St. Petersburg, exhibits naphtha pitch, stearin nd machine oils.

Forestry Pavilion.—There are here complete series tive of the dry distillation of wood, models of distil- r making pitch and turpentine, and of manufactories h-tar and lampblack. Specimens of all the products wn. White resin, as obtained by tapping the pine, to 10 per cent. of essence of turpentine, and 80 per resin, of which 50 per cent. is colophony and 30 t. crust. Pale rectified turpentine is obtained by g the yellow essence by means of a double distilla- presence of lime, and refrigeration in the air. At distillation yellow turpentine yields 75 to 85 per pale green turpentine, and the latter yields rectified ne equal to about 70 per cent. of the whole. The ture of birch-tar (*oleum rusci*) and charcoal is also ed.

New York Section.

TER FROM THE PRESIDENT TO THE NEW YORK SECTION.

llowing letter has been written by the President V. Swan, F.R.S.) to the New York Section:—

airman and Members of the
York Section of the Society of Chemical Industry.

London, W.,
June 1901.

EN,

is a source of deep regret that during my tenure now nearly at an end, I have been unable, through dering circumstances—ill health being one—to avail myself of the most kind and warm invitation, conveyed to me through our late highly esteemed President, Dr. Chandler, to visit your great country and make the personal acquaintance of the members of the New York Section of the Society. But, failing that pleasure—and it would have been for me a very great pleasure—I am obliged to content myself, as far as it is possible to do so, with this alternative mode of communication, and, by means of a letter, to send you fraternal greeting and congratulations; and I take this opportunity of expressing, on behalf of my colleagues of the Council and on my own behalf, very sincere thanks for the many valuable contributions which you have made to our proceedings, and for the loyal support which you have given to all the steps taken by the Council on your behalf to maintain and improve the position of the Society.

I offer you hearty congratulations on the prosperous position of the New York Section. The increase in the membership is all the more a source of satisfaction in that it is an indication of the wonderful development of chemical industry in America, of which Dr. Chandler, in his admirable presidential address last year, gave such astonishing details.

It is one of the merits of our Society that its aims have close relationship with those of pure science, and appeal to interests so universal that their pursuit tends to lessen if not efface the jealousies of race and the asperities of competitive commerce.

To that small extent we are philanthropists, and promoters of general progress and international goodwill, through the harmonising influence of science and trade.

But, gentlemen, my purpose in this letter is not to moralise; it is simply this: that since I have not been able to give myself the great pleasure of visiting you at your meeting place, and of showing, by personal contact with you, all the good fellowship and appreciation that I feel—since I could not shake each one of you by the hand—I would at least give myself the partial satisfaction of holding out to you an imaginary "hand across the sea," with the intention and desire of confirming and strengthening, by some outward sign, the fact and feeling of our unity.

Allow me, in saying good-bye, to express my most earnest wish for the continued prosperity of the New York Section of the Society of Chemical Industry, and the hope of not infrequent visits over here of its members, who may always feel assured of a cordial welcome.

I am,
Very truly yours,
(Signed) J. W. Swan.

THE CHAIRMAN'S REPLY.

To the above the following reply has been received:—

Long Island City, New York,
June 21, 1901.

J. W. Swan, Esq., F.R.S.,
President of the Society of Chemical Industry.

Dear Sir,

I desire to acknowledge, on behalf of the members of the New York Section of the Society of Chemical Industry, your very friendly letter of recent date, and to express the very general regret that any circumstances, and especially ill health, should have prevented our welcoming you in our country during your term as President of the Society—something which we had been led to believe by Dr. Chandler was possibly to be our pleasure. We trust, however, that it will be only a pleasure deferred.

I think I can assure you, and, through you, the Council, that no Section is more loyal to the parent Society than our own, and that it will in the future, as in the past, do everything for its advancement, being well aware, however, that our efforts bring forth small results as compared with the benefits we reap from our friendly relations with industrial chemists in Great Britain, and from the valuable pages of the Journal, which is thoroughly appreciated by Americans of all the professions in which chemistry finds an application.

Our part of the membership of the Society is increasing rapidly, and it is not improbable that before many years it may equal the number in Great Britain. Then I believe we shall have what may, perhaps, be called an International Society of Chemical Industry, and we may do our full share from this side of the water towards its development and prosperity.

We grasp your extended hand with our own advanced more than half-way to meet it, and thank you for your kind wishes and for the welcome you hold out to us on your shores. Personally, I may say that I am sailing for Paris on the 29th of this month, and, if it can possibly be arranged, I shall be present in Glasgow at the Annual Meeting in July, when I hope to be able to express to you in person much that it is impossible for me to put on paper.

Our Section does not meet again until October, so that the pleasure of placing your letter before our members must be deferred until that time.

With renewed assurances of our appreciation of your thoughtfulness in remembering us,

I am,
Very truly yours,
(Signed) Clifford Richardson,
Chairman, New York Section,
Society of Chemical Industry.

Meeting held on Friday, February 15th, 1901.

MR. CLIFFORD RICHARDSON IN THE CHAIR.

PETROLEUM FROM THE BEAUMONT, TEXAS, FIELD.

BY CLIFFORD RICHARDSON AND E. C. WALLACE.

The Lucas or Beaumont well, and the several others, seven or eight in number, which have been brought in since the first strike, are situated about two miles from the Neches river, the eastern boundary of Jefferson county, Texas. This county lies on the Gulf of Mexico at the south-eastern corner of the State, and adjoining Louisiana, from which it is separated in part by the river and in part by Sabine Lake. From Port Arthur, a railroad and shipping terminus on the latter, the well is distant between 13 and 14 miles, while the town of Beaumont is a little more than three miles to the north-west.

Two pipe lines will connect the oil field with Port Arthur, and others perhaps later with Sabine Pass and with New Orleans, 278 miles to the east. The new field is about 200 miles to the south-east of the well-known Corsicana field in Navarro county, and only 20 miles from the Sour Lake oil region of Jefferson county, the oils from which were described in this Journal for February 1900.

The Beaumont wells lie in the coastal plain of the Gulf of Mexico, which extends back from the coast about 100 miles, and the oil is found in tertiary strata at a depth of about 1,100 feet.

According to Prof. J. C. White (Pet. Indust. and Tech. Rev. **4**, 394, April 27, 1901) the initial output of the Lucas well was 10,000 barrels per day, but it increased to 70,000. How long this will be maintained is a question which the future alone can answer.

What the extent of the new field may prove to be is uncertain. It has been suggested that the entire area extending over the 200 miles between Beaumont and Corsicana may be oil-bearing; but the oils at present obtained at the two points are quite different, the latter consisting predominantly of paraffin hydrocarbons with some paraffin scale in the highest distillates, while the former is largely, if not entirely, a polymethylene oil. A well recently sunk in the Sour Lake field, and deeper than those hitherto bored at that point, 820 feet, is reported as yielding 500 barrels per day. The field may, therefore, be assumed to extend as far as this point, although whether wells at that locality will be permanent is, of course, not known.

Mr. Robert T. Hill, of the United States Geologi Survey, has made an investigation of the field and has gi the following preliminary report of his conclusions :—

"The importance of this oil field is far greater thar present can be described or estimated. It means not a cheap fuel supply to the largest State in area in the Un but owing to its proximity to tide water it promises an ex trade such as exists nowhere else in the world. Prep tions are being made to sink hundreds of wells, and soon the present output of 500,000 barrels a day ma quadrupled.

"It is certainly within the limit of probability tha will be found at many places throughout the coastal pr especially in its southern extension towards the Rio Gr and in the north-eastern State of Mexico at Tamal The outcrop of the Tertiary formations in south-west T in Wilson, Atascosa, McMullen, Duval, and other coun is naturally rich in oil, and practical oil men are ex menting in that region. As the oil-bearing tertiary s extend east of the Mississippi into Mississippi and Alab it is not beyond probability that oil may be found in States.

"It is impossible now to state exactly the extent o oil-yielding bed which supplies the Beaumont well, an can only be determined by drilling experiments.

"The area of profitable exploitation of the Beaumo fields is confined between San Jacinto and the S rivers, east of the Houston and West Texas Railroa south of Oil City, Nacogdoches county. This area m extended or restricted by future exploitation.

"It is very probable that other oil fields may be disc in the coastal plain between the Beaumont and Ta fields. Here lies a vast territory underlain by th bearing eocene formations which has not been exploit

The Beaumont petroleum, being of tertiary occu is, therefore, of great interest to compare with tertiary oils, such as those from California.

Specimens of the Beaumont oil were received fr original Lucas well, taken in January and again in 1901. They were examined according to methods may be outlined as follows :—

Specific gravity, flash point, refractive index were mined, the first in a pienometer at 25° C., the secon New York State oil tester, and the third with an refractometer at 25° C.

Viscosity.—The figures represent the number of which were required for the oils to flow from a 100 c.c. according to the Pennsylvania Railroad specification results are only relative.

Sulphur was determined by Carius' method.

Volatility in an Open Dish.—When 20 grm. o petroleum are heated in a dish, $2\frac{1}{2}$ inches in diam $1\frac{1}{4}$ inches deep, to various temperatures for various of time, or until the loss becomes small enough to in any period of heating, results are obtained whic interest, especially when compared with well-kno The volatilisation under these circumstances goes o the boiling point, and, the vapour not being confin is no cracking. The amount volatilised will, of co somewhat influenced by the size of the oven and nu determinations made in it at one time. The determ were made under very uniform conditions, but a considered as of only relative value.

Distillation in Engler's Flasks.—This was car according to Engler's directions (Petroleum, 1 p. 502), the distillate between 150° and 300° (representative of the burning oil available comm Duplicate determinations by this process were cordant. The distillate of burning oil was trea enough strong sulphuric acid of specific gravity produce an oil as nearly water-white as possil quantity necessary for the purpose and the amou oil removed by the acid were determined.

Fractional Distillation.—For this purpose ab litre of oil is distilled in a litre flask, of Engler's s larger. The flask is supported on a six-mesh and surrounded with an oven built up of loose b covered with an asbestos board. The distillate is in an air condenser three feet long, connecte l's receiver, in which a vacuum of 20 mm. can be tained. All the joints are mercury-sealed, or of solid s, to avoid access of air, which would induce decompo- n. A current of carbon dioxide is conducted to the m of the distilling flask to agitate the oil and remove om the apparatus. The oil is heated by a ring flame her burner, and distilled at ordinary pressure as long ere are no signs of cracking. As soon as any decom- ion is recognised, or the temperature has reached a figure, the oil is cooled and the vacuum made. The ence in boiling point at atmospheric pressure and at m. for hydrocarbons, boiling under 760 mm. at about C., is 117°, a distillate coming over at 317° at atmos- : pressure beginning to distil at 200° in a vacuum of n. For lower boiling hydrocarbons the difference is 2° for an oil boiling at 148° C. in air. The specific y and refractive index of the original distillates were at about 25° C. They were then treated twice with ess of sulphuric acid, washed with dilute soda, dried sodium, and the determinations repeated. Finally, the distillates was treated with a mixture of equal es of sulphuric and nitric acid, washed, boiled with ı, and examined. Ordinarily, in distillates of low point, this would remove aromatic hydrocarbons, the case of the polymethylenes of high boiling point, s occur in Texas oil, the acid combines with and s a different class of hydrocarbons with the formation morphous resin-like nitro derivative.

mination of Residues.—The residues left after evapo- in the open dish, or from either of the methods of ion are characteristic and of value in determining re of any petroleum, and as to whether it has a so- sphaltic or paraffin base; that is to say, whether it largely of cyclic polymethylenes or paraffin hydro- . Mere inspection will often reveal the presence of , while in other cases the residue is plainly asphaltic. cases the soft residue or pitch, as it may be, is d further, more particularly in respect to the fixed which it contains, its solubility and specific gravity. eterminations are of great relative value, as will ater, at least if the distillation or evaporation has carried so far, that the residue consists largely of

ate Analyses.—These were made with the pre- which have been found necessary in burning the ylene hydrocarbons, which very readily escape combustion.

Examination of Beaumont Petroleum.

esults of our examinations, together with some eterminations on Pennsylvania and Ohio oils, were s:—

No. 44,651.—Oil received February 5th, 1901.
45,392.— „ March 27th, 1901.
19,708.—Oil from Noble Co., Ohio.
16,484.— „ Pennsylvania Pipe Lines.

Ultimate Composition.

—	Beaumont.	Penna.*	Ohio.†
....	85·03	86·10	85·00
....	12·30	13·90	13·80
....	1·75	0·06	0·60
....	0·92	..	0·60
atment with excess of	39·0	21·0	30·0

* Engler. † Mabery, Noble Co.

Beaumont Oil.

—	Test No. 44,651.	Test No. 45,392.	Test No. 19,708.	Test No. 46,484.
ity 25° 25° C	0·912	0·914	0·8014	0·8293
....	Ord. Temp.	110°	Ord.	Ord.
ty R.R. pipette	..	75″	42″	37″

Volatility in Open Dish.

—	Test No. 44,651.	Test No. 45,392.	Test No. 19,708.	Test No. 46,484.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
110° C., 230° F. : 7 hours	19·19	20·0	41·2	47·3
162° C., 325° F. „	31·31	27·0	43·0	58·0
205° C., 400° F. „	57·57	49·0	59·0	68·0
To constant weight—				
105° C., 221° F.: 42 hrs.	48·0	48·0	48·7	58·7
162° C., 325° F.: 70 „	64·0*	57·0	61·0	71·8†
205° C., 400° F.: 49 „	74·0	74·0	75·0	84·0

* 49 hours. † 42 hours.

Viscosity of Residues.

7 hours at 205° C., 400° F. .	Quick flow.	Quick flow.	Soft	Soft
49 „ 205° C., 400° F. .	Solid	Solid	Brittle	Brittle
Penetration................	10°	8°	Pitch	Pitch

Distillation: Engler's Flasks.

—	Beaumont. Test No. 44,651.	Ohio. Test No. 19,708.	Pennsylvania. Test No. 46,483.
Distillation begins	110° C.	85° C.	80° C.
Below 150° C.................per cent.	2·5	23·0	21·0
150°—300° C............. „	40·0	21·0	41·0
300°—350° C............. „	20·0	21·0	14·0
350°—400° C............. „	25·0	27·0	{23·0 99·0
Loss on acid treatment (150°—300° C. fraction).	10·0	5·0	1·8
150°—260° C.............per cent.	30·0	..	..
Loss on acid treatment ... „	8·0	..	..
Percentage of acid used... „	7·0	2·5	2·0

Specific Gravity and Refractive Index.

—	Beaumont.		Ohio.		Pennsylvania.	
	Sp. Gr.	Refrac. Index.	Sp. Gr.	Refrac. Index.	Sp. Gr.	Refrac. Index.
Below 150°...	(Amount too small.)		0·7297	1·412	0·7188	1·415
150°—300°...	0·8749	1·473	0·8014	1·442	0·7984	1·437
300°—350°...	0·9089	1·501	0·8404	1·468	0·8338	1·462
350°—400°...	0·9182	1·508	0·8643	1·481	Paraffin	1·470
	After acid treatment.					
150°—300°...	0·8704	1·473	0·8006	1·443	0·7791	1·438

The residue amounting to 9·9 per cent. of the original oil was evaporated in an open dish to 6 per cent. It was then a brittle pitch which had the following properties:—

Specific gravity	1·0454
Colour	Black.
Lustre............................	Shiny.
Structure............................	Massive.
Fracture............................	Conchoidal.
Hardness-penetration	15°
Soluble in CS_2..........................	99·8 per cent.
Organic insoluble........................	0·1
Mineral matter........................	0·1
	100·0
Soluble in 88° naphtha	60·0
This is per cent. of total bitumen...	60·1
Soluble in 62° naphtha..................	64·8 per cent.
This is per cent. of total bitumen.........	64·9
Bitumen yields on ignition:—	
Fixed carbon........................	21·13 per cent.
Volatile hydrocarbons..................	78·8

A similar but softer pitch, made by boiling the crude oil for 20 hours in an open dish, had the following properties, as compared with a D grade residue or paving asphalt from Los Angeles oil:—

—	Beaumont.	California.
Penetration	78°	78°
Specific gravity	0·9943	0·9964
Bitumen soluble in 88° naphtha	78·3	74·4
„ „ 62° „	84·3	81·6
Fixed carbon	8·7	15·0

Fractional Distillation.

—	Fractions.		Distilled.	Specific Gravity, 26° C.	Refractive Index, 26° C.
	° F.	° C.	Per Cent.		
Atmos.pres.	300—401	149—205	1·0	0·8114	1·459
„ „	401—441	205—227	8·4	0·8408	1·461
„ „	441—480	227—249	4·4	0·8569	1·467
„ „	480—520	249—271	10·8	0·8705	1·476
„ „	520—559	271—293	10·8	0·8863	1·485
„ „	559—602	293—317	13·1	0·9009	1·492
20 mm. „	392—464	200—240	13·0	0·9184	1·505
„ „	464—536	240—280	8·8	0·9349	1·514
„ „	536—608	280—320	10·6	0·9429	1·521
		Total	80·9		

Residue, heavy: slow flow at 70° F.
Difference in boiling point for 760 and 25 mm. pressure, 117° C.

Effect of Reagents on Distillates.

Fractions.	Removed.	Specific Gravity after Treatment.	Refractive Index, 20° C.
	Excess of strong H_2SO_4.		
F.	Per Cent.		
401—441	7·7	0·8357	1·463
480—520	17·8	0·8497	1·474
559—602	21·6	0·8929	1·486
	Excess of $H_2SO_4 + HNO_3$ after H_2SO_4.		
559—602	11·0	0·8879	1·483
	Total Oil removed by Reagents, 32·6		

Examination of the preceding Results.

From the preceding results it appears, although the two specimens are slightly different in their specific gravity and flash points, that the Beaumont oil has a very high density for one beginning to distil at 110° C., and that the hydrocarbons of which it is composed, as shown by the ultimate composition of the original oil, and by a comparison of the specific gravity and refractive indices of the 150°—300° C. distillates from the Engler flasks with similar distillates from Eastern oils, must belong largely or entirely to some series other than the paraffin, and probably to the same series as those found in the Sour Lake petroleum which we have previously examined (this Journal, 1904, 121), rather than those of the Corsicana oil, which consists largely of paraffins. It is also plain that the oil contains a much larger proportion of unsaturated hydrocarbons removable by sulphuric acid than either Pennsylvania or Ohio petroleum. The Beaumont oil has a high sulphur content and carries, as it comes from the wells, a large amount of hydrogen sulphide in solution. This gas has previously been observed in solution in petroleum, but not in so large quantity as at Beaumont. The sulphuretted hydrogen is largely lost on standing and more completely on blowing air through it. After such treatment the oil contained 1·75 per cent. of sulphur in the form of sulphur derivatives of the hydrocarbons. Mabery has found 2·16 per cent., but, apparently without removal of the gas. From an industrial point of view the former figure is the one of importance to the refiner, but the latter if the oil is to be used for fuel.

This amount of sulphur, it has been inferred by
authorities, would make it impossible to use the petr
for fuel, but many coals with less fuel value contain as
sulphur, and are used for steaming purposes without s
difficulties being encountered.

Fuel Value of the Oil.

A comparison of the ultimate compositions of the
oil with other oils used for fuel shows that while not
to Pennsylvania and Ohio oils, owing to the low carb
high sulphur, it is not inferior to the California petr
in any marked degree.

Possibilities of Refining the Oil.

Distilled in an Engler flask the Texas oil begins
at 110 C., but only 2·5 per cent. goes over below
compared with 21 per cent. volatilised under simil
ditions in Pennsylvania, and 23 per cent. in Noble
Ohio, oil. It contains, therefore, little or no naphtha

Between 150° and 300° C. 40 per cent. of the o
over, this fraction being ordinarily considered, in th
of Pennsylvania oils, as suitable for an illuminan
large a percentage of the oil is found in this frac
occurs in the average run of the Pennsylvania pi
deliveries. Its gravity is, however, quite different,
as compared with ·7981; it contains much sulphu
large amount of unsaturated hydrocarbons, so that a
to refine it with sulphuric acid necessitated the us
impossibly large amount of this reagent and a gre
of oil. The resulting illuminating oil is not water
and colours on standing. A better oil can be m
cutting out the distillate above 260° C.

If the oil is distilled *in vacuo* and the same fracti
to 300° C., is treated with an excess of sulphuric
water-white product is obtained, but it is evident
treatment is not possible commercially. In fact,
new process of handling this oil is developed, it ca
made to yield a satisfactory illuminant, even
found possible to invent a lamp and wick to burn
duct satisfactorily. It would not be safe to say,
that the Beaumont oil could not be refined ur
circumstances so as to give a good burning oil,
although this was thought to be impossible in the
with the Lima, Ohio, oil, Frasch invented a proce
enabled the Standard Oil Company to remove th
from the distillates and to turn out an illuminating
to the best Pennsylvania. It is highly probable,
judging from analogy, that no such process is poss
the Texas oil, since no success has been attained in
a first-class illuminant from California oils of sim
stitution, all the product turned out being ro
with Eastern oil to make it passable and marketab

The dicyclic polymethylenes burn with a very y
smoky flame.

Residuum from Beaumont Oils.

The Beaumont oil, heated to various temperat
open dish, does not differ essentially from Pennsyl
Ohio petroleum in the amount volatilised after lon
of time, or until there is no further loss. After se
heating the oil loses much less at 110° C., owi
absence of any large amount of naphtha.

The greatest difference between Pennsylvania
oils and that found in Texas is in the charac
residue, which in the latter case resembles mo
by the California oils, whereas the former leaves
containing paraffin scale, and without the sticki
enables the latter to be pulled out into threads.

The final residue, after heating to 400 F., is in
a solid, but that from the Eastern oils is a brittle
45 per cent. of fixed carbon and coke, while th
resembles in some respects an asphalt, althou
strongly heated this becomes a pitch also.
products of and residues from the distillation o
tion of these oils are much affected in character by
in the conditions under which they are made.

The nearest approach to an asphalt was p
boiling down the crude oil in an open kettle unt

onsistence of California asphaltic residues, and solid h to be handled without sticking to the fingers badly. nparison of the properties of this material with the rnia product showed, however, that it was not as asphaltic, as the fixed carbon which it yielded was ian two-thirds as large as it should be for a true t.

Beaumont oil can hardly be called asphaltic, in so furnishing a commercial supply of asphalt is ned, both because of the small amount of residue it on evaporation, only about 6 per cent., and on t of the character of this residue. In this respect it les Sour Lake oil.

Distillation in Vacuo.

llation of one of the samples, with the aid of a , at that point where boiling ceased to go on without g, gave distillates better suited for examination as haracter of the hydrocarbons which make up the oil ose from the Engler flask. Comparison of the distillates from Corsicana, Sour Lake, and California oils, this Journal (*loc. cit.*), with those from the Texas he same boiling point, shows that the Beaumont m is more closely related, as would be expected, to Lake than to the other oils.

Specific Gravity of Oils Boiling between 100°—175° C.

——	100°—150° C.	150°—175° C.
....	0·8637	0·8863
)..........................	0·8693	0·9056
....	0·7932	0·8187
....	0·9195	0·9547

atment of these distillates several times with strong sulphuric acid, washing with soda and was found that the loss due to the presence of ed hydrocarbons and other constituents removable id, was large. The fraction, boiling between 205° C., lost 7·7 per cent., while that boiling between 317° C., lost 21·6. A very considerable part of carbons in the Texas oils are, therefore, of an ed nature.

ne removal of these hydrocarbons with sulphuric ixture of equal volumes of sulphuric and nitric quite strongly on the fraction collected between 317° C., removing an additional 11 per cent. The thus acted on are probably of a series, the ons of which, as shown by Markownikoff, saturated, contain tertiary carbon atoms readily the cold by nitric acid. These hydrocarbons in Russian and California oils and in the

of the distillates purified with sulphuric acid and ixture of sulphuric and nitric acids have the omposition:—

at	Specific Gravity.	Refractive Index.	C.	H.
			Per Cent.	Per Cent.
C.	0·8357	1·463	86·20	13·51
C.	0·8879	1·483	85·95	13·48

J. Amer. Chem. Soc. **23**, 265) has found for his stilling between 155°—160° C. at 14 mm. a nposition, 86·25 per cent. carbon, 13·48 per gen. He, of course, properly assumes that, as carbons are saturated and as the analyses show elong to the C_nH_{2n-2} series, they must be lymethylenes, as suggested by Markownikoff **101**, 159) for similar hydrocarbons in Russian us (*On the Nature and Origin of Asphalt*, City, 1898) for the constitution of the lighter ts of Trinidad Lake asphalt. In fact, the asphalt hydrocarbons distilling at about the same temperature as those from the Beaumont oils have a similar specific gravity, index of refraction, molecular weight, and ultimate composition as do the corresponding California distillates.

——	Sp. Gr.	Refrac. Index.	C.	H.
Asphalt Hydrocarbons:— Distillate, 300°—310° at 760 mm.	0·8914	1·4815	Per Cent. 85·98	Per Cent. 13·62
Sunset Oil:— Distillate, 265°—270°...	0·8860	1·486	86·59	13·32

The same series of hydrocarbons evidently occurs in all these oils. They are saturated and not easily oxidised, but on heating are readily condensed to more complicated molecules, and are at the same time in part cracked.

Conclusions.

The petroleum from the Jefferson County, Texas, field is, therefore, valuable and available as a safe and desirable fuel oil, notwithstanding its relatively high percentage of sulphur.

Owing to the fact that the oil contains such a large proportion of unsaturated hydrocarbons and their sulphur derivatives, and that the saturated hydrocarbons, if refined without regard to cost, are dicyclic polymethylenes which do not prove satisfactory for illuminants, as is known from experience with California petroleum, it is not probable that Texas oil can ever prove to be available otherwise than as fuel.

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* Any of these specifications may be obtained by post by remitting 8*d*.—the price now fixed for all specifications postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS, AND MACHINERY.

PATENTS.

Kilns and Appliances for Calcining, Heating, and Drying Mineral Substances. Meldrum Brothers, Ltd., Manchester, and J. S. Orton, Derby. Eng. Pat. 11,852, June 30, 1900.

In kilns in which materials are treated on hot floors, the floors are heated by the products of combustion from an external furnace, passing through flues arranged concentrically, or in parallel lines under the whole area of the floors.—J. W. H.

Drying Apparatus. A. J. Boult, London. From The A. Roller Maschinenfabrik, Berlin. Eng. Pat. 1153, Jan 17, 1901.

The drying apparatus has a heating device at the bottom, a fan at the top, and a series of horizontally revolving blades. Between the blades are arranged supports for the material to be treated, such supports being made of perforated material, and consisting of movable trap doors, or perforated movable bands, moving in a horizontal direction. The operation of the supports is such as to allow the material to pass from the uppermost support to the next, and so on to the lowest, without necessitating any handling.
—R. A.

Water or other Liquid; Extraction of ——, from Mineral, Vegetable, and Animal Substances [*Electro-osmose*]. G. B. Schwerin. Eng. Pat. 12,431, 1900.

See under XI. A., *page* 726.

Evaporating Liquids by means of Steam; Apparatus for ——. D. B. Morison, Hartlepool. Eng. Pat. 13,775, Aug. 1, 1900.

This invention is an improvement on the evaporators described in Eng. Pat. 9548 of 1893 (this Journal, 1894, 622), in which the heating coils are mounted upon a tube or tubes constituting the steam supply to, and the drain from the coils, such coils being hinged on trunnion joints. In the present arrangement the trunnion hinge or hinges is or are employed to sustain the weight of the tubes and coils only, the inlet and discharge tubes having either a spigot and faucet connection with the supply or discharge passage at the free end or at an intermediate part or parts of the tube or tubes, or a tube and socket connection, the axis of which is in line with that of the hinge of the tube or tubes. The supply and discharge tubes with which the heating coils communicate, are formed in one girder-like casting hinged at one end, and have at the other end a palm or compound flange with a double joint connection to the supply and discharge passage. The double joint is secured by a single central bolt or stud.—R. S.

Evaporators. R. A. Sloan, Liverpool. From W. H. Martin, Flushing, Holland. Eng. Pat. 5559, March 16, 1901.

A steam separator with a spiral inlet is located within the evaporator, and a drain pipe leads from the separater to a non-return valve submerged below the water in the evaporator, the water separated in the separator passing back through the valve to the main body of the water in the evaporator.—R. A.

Cooling or Condensing Fluids; Processes and Apparatus for ——. F. W. Parker, Chicago, U.S.A. Eng. Pat. 6801, April 1, 1901.

The fluid to be cooled or condensed, is brought into contact with a series of tubes, &c. of heat-conducting material, through which a mixture of air and vapour is passed in a rapidly flowing current. The vapour employed, is preferably vapour of water, at a temperature below that of steam at atmospheric pressure. The fluid treated may be caused to expand before entering the chamber containing the tubes.
—R. A.

Pumps for Fluids of Low Boiling Point. V. I. F
London. From The Abwärme Kraftmaschinen
Berlin. Eng. Pat. 7911, April 17, 1901.

A chamber is introduced into the delivery or pressur
of the pump, and, by means of a supply of heat, is
filled with vapour from the fluid to be pumped.
arrangement corresponds with the compressed air ch
in ordinary pumps, and ensures steady working
continuous formation of vapour in the pressure pipe.
—F

*Filter Presses, and the Material for use in connectio
the same.* K. Enzinger, Worms-on-the-Rhine, Ge
Eng. Pat. 14,364, Aug. 10, 1900.

The filtering material or medium is formed from
guhr, which is heated with a diluted solution of hydro
acid and nitric acid, to a temperature of about 1
and then filtered and washed to secure the remova
the acid. The substance so obtained is capable o
pressed, and packed in parchment paper, &c. Th
press for using this material is provided with filtering
formed by the deposition of the material on cloths
are stretched over both sides of a gridiron or hollow
—

Crushing or Grinding; Apparatus for ——.
Askham, Sheffield, and W. F. Keevil, Bath. E
11,061, June 18, 1900.

The apparatus is of the type in which the ma
crushed or ground between a circular grinding p
rollers, which are carried round by arms or discs,
on a rotating shaft. The grinding path consists
mental pieces or blocks forming a circular seri
block having two acting faces, and so fixed that i
readily detached and reversed, or replaced by a fre
A space is left between adjacent blocks, for the p
the crushed material, which is prevented from
by a casing enclosing the blocks; or, a circular
ring may be employed instead of the segments,
spaces formed by distance pieces between the ring
sides. The spindles of the crushing rollers are
in slots in or between discs or arms carried by the
shaft, and the slots are fitted with removable and
cheeks or blocks, against which the spindles wo
pellers, for feeding the material into the path of the
rollers, may be fixed to the discs or arms by the b
secure the cheeks or blocks in position.—R. A.

*Cooling Vapours, Gases, Liquids, and the like; A
for ——.* R. Moodie, London. Eng. Pat. 11,
29, 1900.

The apparatus is similar in general constructi
described in Eng. Pat. 233, 1896, and consists of
containing a fan, &c., a liquid sprayer and a li
for the cooling medium, but the liquids, vapou
be treated, are kept separate from the cooling
vapours by being passed through coils or chambe
the outer surfaces of which the cooling agent is
by the sprayer. Vertical plates or fins are fi
bottom of the casing outside the path of the rot
of the lifter, to prevent rotation of the cooling lic

Purifying Fluids [*Steam, &c.*]; *Apparatus
——.* R. G. Brooke, Macclesfield, Cheshire.
12,619, July 12, 1900.

The apparatus is applicable for extracting wat
from, or for filtering, steam, &c., and compris
body portion having two outer purifying chamb
to its opposite walls. The body portion is
ternally so as to form inlet and outlet compartm
communicate respectively with peripheral inlet
passages. The opposite side walls of the b
are also formed with lateral inlet and outle
communicating respectively with the inlet and
partments and with the two purifying cha

ifying chambers may contain filtering material, or may provided with wire screens or baffles adapted to trap separate the impurities, &c.—R. A.

ering Apparatus; Construction and Arrangement of —. W. G. Atkins, London. Eng. Pat. 12,789, July 5, 1900.

apparatus is of the character of that described in Pat. 5199, 1878, in which a hollow shaft is employed t as a centre tube for collecting and carrying away the ed liquid. In the present invention, double hollow rs, of which two or more form approximately a lete circle, are attached to the hollow shaft, with h they communicate, the chambers formed by the rs being closed at the periphery and along their radial , while their lateral sides are covered with perforated l, or woven wire, &c., suitable for supporting the filter , felt, or like filtering material.—R. A.

id Air and other Liquefied Gases in the Liquid ndition; System for the Preservation of —. C. y, London. Eng. Pat. 14,673, Aug. 16, 1900.

eserve the liquefied gases through a length of time ent for transport, they are placed in an insulated , which is enclosed in another vessel containing ice ezing mixture, &c. Three or more vessels may be yed, the innermost one containing the liquefied gases, the spaces between the others are filled with the ting and cooling material, or a number of vessels ning the liquefied gas may be enclosed in one ing and cooling receptacle.—R. A.

acles for Volatile Inflammable Liquids; Stoppers the Inlet and Outlet Apertures of —. L. Schön, na. Eng. Pat. 4023, Feb. 25, 1901.

safety stoppers are each provided with:—(1) e gauze or perforated sheet metal diaphragm, may be cup-shaped, having a flange; (2) a ed portion of the bore between the receptacle and phragm, controlled by a slide valve; (3) a male n the outside of the free end of the neck, and a female on the inside thereof; and (4) a screw cap for g upon the outside of the neck, a suitable packing, inner central screw-threaded nipple.—R. S.

Density of Liquids; Apparatus for Regulating the —. P. E. Domergue, Haiphong, Tonkin, French Indo-China. Eng. Pat. 4780, March 6, 1901.

The density of the liquid is regulated by causing the liquid to be withdrawn as soon as its density exceeds a certain degree, and admitting at the same time an equal volume of liquid of less density. The apparatus comprises essentially a valve forming a float, and adapted to lift as soon as the density of the liquid around it exceeds a predetermined degree, thus establishing communication with a lower closed vessel entirely filled with liquid of lower density. When the valve is opened, the heavy liquid gravitates from the containing tank into the closed vessel, and displaces an equal volume of the lighter liquid, which then takes the place of the heavier liquid withdrawn from the tank.—R. A.

II.—FUEL, GAS, AND LIGHT.

Bagasse as Fuel; Approximate Value of —. F. N. G. Gill. J. Soc. Arts, 1901, **49**, [2530], 517—519.

Bagasse wet from the mill is commonly regarded as being equivalent in fuel value to from $\frac{1}{5}$ to $\frac{1}{6}$ of its weight in coal. The author states that his object is to determine, from the data at hand, the actual fuel value of bagasse. He makes use of the values published in 1891–92 by F. Stohmann and H. Langbein (see this Journal, 1891, 1020) for the heats of combustion of saccharose, invert sugar, and cellulose, whilst for the albuminous and gummy matters designated as "unknown," he assigns the same heating value as for cellulose, any error arising in this way being practically negligible, as the amount of "unknown" matter is very small. The values given by Stohmann and Langbein have been converted into British thermal units. The author takes three cases as typical examples, the cane containing 9 per cent. of "bagasse proper" (fibre, 8·7, and ash, 0·3), and yielding juice containing 17·2 per cent. of solids (sugar, 15; invert sugar, 1·7; "unknown," 0·2; and ash, 0·3) and 82·8 per cent. of water. (1) Single and simple milling giving 66·2 per cent. of juice. (2) Double and simple milling giving 70 per cent. of juice. (3) Double milling and maceration, with 10 per cent. dilution, giving 75 per cent. of juice. Then from 100 tons of cane crushed, the actual bagasse will contain in (1), 33·8 − 9·0 = 24·8; (2), 30·0 − 9·0 = 21·0; and (3), 25·0 (+ 2·96 added water) − 9·0 = 16·0 tons of juice. The bagasse, therefore, consists of—

—	(1.)		(2.)		(3.)	
	Tons.	Per Cent.	Tons.	Per Cent.	Tons.	Per Cent.
llulose)	8·7	25·74	8·7	29·0	8·7	31·12
vn"	0·05	0·15	0·04	0·13	0·03	0·10
	8·75	25·89	8·74	29·13	8·73	31·22
icrose or saccharose)	3·72	11·00	3·15	10·50	2·40	8·58
gar	0·42	1·24	0·36	1·20	0·27	0·97
	0·37	1·09	0·36	1·20	0·35	1·25
	20·54	60·78	17·39	57·97	16·21	57·98
	33·80	100·00	30·00	100·00	27·96	100·00

uhor then deduces the thermal units available in e per lb. of bagasse.

calorific power of ordinary dry coal be taken as iermal units per lb., then, judged from the heat in the boiler fire, bagasse is worth from $\frac{1}{8}$ to $\frac{1}{7}$ of t of ordinary coal, but of the heat available in the , an undue proportion is wasted in heating a large air. It may be accepted that bagasse is burnt verage of 150 per cent. excess air, as against an f 75 per cent. for coal, and this difference entails t on the heating value of bagasse compared with oal of nearly 11 per cent. Thus bagasse, as urnt and coming straight from the mill, has, nly from $\frac{1}{9}$—$\frac{1}{8}$ of the value of an equal weight inary quality of coal. The author suggests that rrangement of chambers in front of the furnace,

—	1.	2.	3.
Fibre and "unknown": 7533 T.U. × lb.	1,950	2,194	2,352
Sugar (saccharose): 7119·5 T.U. × lb.	783	748	612
Invert sugar: 6748 T.U. × lb.	84	81	65
Gross thermal units per lb. of bagasse	2,817	3,023	3,029
Less T.U. required to vaporise water of combination and raise vapour to temperature of flue gases, say, 584° F.	275	295	293
Nett T.U. per lb. of dry bagasse	2,542	2,728	2,736
T.U. required to vaporise associated water and raise vapour to 584° F.	753	718	718
T.U. per lb. of bagasse available in boiler fire	1,789	2,010	2,018

the bagasse could be fed through and through mechanically controlled doors, so that direct pressure draught of 0·5—1 in. could be used, the air supplied might be easily reduced to 50 per cent. excess: whilst by means of economisers, the temperature of the flue gases might be reduced from 500° F. above atmospheric temperature to 300° F. In this way, an economy of 393 thermal units per lb. of bagasse could be effected. Also, the loss of heat due to associated moisture, might to a considerable extent be avoided, by spreading the bagasse over the ground and keeping it turned for about two days. This would result in a reduction of the amount of moisture to from 15·5 to 43·7 per cent., say an average of 35 per cent., which is equivalent to a saving of 433 thermal units per lb. of bagasse.

The author concludes from his results that the bagasse of cane cannot work more than from $\frac{1}{2}$ to $\frac{2}{3}$ of its juice into sugar.—A. S.

Carbon and Hydrogen ; Direct Union of ——. Part II. W. A. Bone and D. S. Jerdan. Proc. Chem. Soc. 1901, **17**, [240], 162.

The authors have already shown (Trans. Chem. Soc. 1897, **71**, 41) that carbon and hydrogen combine at 1200° C., forming a saturated hydrocarbon; and also that when the electric arc is formed between carbon terminals in an atmosphere of hydrogen, a saturated hydrocarbon is produced in addition to acetylene, the formation of each continuing until a definite equilibrium between acetylene, the saturated hydrocarbon, hydrogen, and carbon vapour is established. It was then provisionally assumed that the saturated hydrocarbon produced both at 1200° C. and in the arc, is methane.

Further experiments have been made in which the saturated hydrocarbons in question have been separated from the large excess of hydrogen (by means of palladium), and also, in the case of the arc gases, from the acetylene simultaneously produced. Analyses of the residual saturated hydrocarbons, mixed with whatever nitrogen was contained in the original hydrogen employed, have shown that whereas the gas obtained by the direct action of hydrogen upon solid carbon at 1200° consists of methane only, the saturated hydrocarbons produced in the arc consist of methane with one of its homologues, which further investigation has shown to be ethane.

The authors are able to show further that in the arc, methane and ethane are produced simultaneously, and at rates which bear a constant ratio to one another throughout an experiment, until a definite equilibrium is reached. By calculation from the results of the previous experiments, interpreted in the light of later work, the proportions between the various hydrocarbons and hydrogen when this equilibrium is attained are shown to be—

	Per Cent.
Hydrogen	90 to 91
Acetylene	8 to 9
Methane	1·25
Ethane	0·25

Hydrocarbons at High Temperatures ; Decomposition of ——. Preliminary Note. W. A. Bone and D. S. Jerdan. Proc. Chem. Soc. 1901, **17**, [240], 164.

For some months past the authors have been studying the decomposition of various hydrocarbons at a temperature of about 1150° C. Since methane is the only hydrocarbon produced by the direct combination of carbon and hydrogen at 1200°, it seemed probable that any hydrocarbon would, at this temperature, be decomposed, yielding ultimately carbon, hydrogen, and a small percentage of methane.

The method adopted by the authors, which will be described in detail in a future communication, consists in admitting the pure hydrocarbon into a vacuous, glazed porcelain tube (length 60 cm., internal diameter 12 mm., capacity about 65 c.c.), nearly the whole length of which has been previously heated to about 1150° in a specially designed Fletcher furnace. The experimental tube is properly jacketed so as to prevent any diffusion of furnace gases into it. The temperature, which can be maintained practically constant for several hours, was ascertained by means of a Roberts-Austen electrical pyrometer. After the gas under investigation has been subjected to the temperature for a definite time, it is quickly pumpe into tubes over mercury.

Acetylene is very rapidly decomposed at 1150°; afte minute not more than 10 per cent., and after five mi only a mere trace of it remains. Considerable quantit a saturated hydrocarbon, which subsequent examinatio shown to be methane, are formed during the early sta the decomposition, and afterwards this methane is sl though never completely, resolved into its elem Neither benzene nor ethylene are formed at any sta the decomposition, and, after the final disappearan acetylene, the gaseous products contain hydroge methane only. Carbon is liberated during the early as "lamp-black," which doubtless arises from the decomposition of the acetylene, but afterwards it i deposited on the inner surface of the tube in a form resembling "gas carbon."

The following figures show the percentage comp of the gases obtained in a series of experiments in the time of heating varied from one minute to three h

Time	1 min.	5 mins.	15 mins.	$1\frac{1}{4}$ hours
Acetylene	10·0	trace	nil	nil
Methane	16·0	21·5	16·0	7·75
Hydrogen	74·0	78·5	84·0	92·25

Methane is resolved into its elements at 1150 rapidly than would be generally supposed. The de sition, however, only occurs at the surface of the coa tube, where the carbon is deposited in a form m sembling "gas-carbon" in appearance. At no stage decomposition was it possible to detect the forma acetylene, ethylene, or any other unsaturated hydro A careful examination of the gas left after 15 m heating has shown that it contains no other sa hydrocarbon than methane. The following figures the percentage composition of the gas obtained at of 5, 15, and 30 minutes respectively, leaving out reckoning any small amount of nitrogen it containe

Time	5 mins.	15 mins.	3
Methane	37·5	12·25	
Hydrogen	62·5	87·75	4

Carbon Dioxide ; Decomposition of ——, when sub Electric Discharge at Low Pressures. J. N Proc. Chem. Soc. 1901, **17**, [240], 168.

During some experiments that were being mad relative resistance of carbon dioxide in a vacuum the electric spark from an induction coil, it was that the resistance varied considerably. At the sa the colour of the incandescent gases at the nega trode was seen to change. In order to ascert changes had taken place in the composition of the sparking, the contents of the vacuum tube were out and analysed. It was found that considerabl position had occurred into carbon monoxide and $2CO_2 = 2CO + O_2$. A series of experiments following results. When carbon dioxide at 5 mm. is sparked in an ordinary vacuum tube for 10 63 per cent. of the gas is decomposed, and whe for 5, 3, $2\frac{1}{2}$, 1, and even $\frac{1}{2}$ a minute, as much as 58 cent. decomposition occurs. In 15 seconds one ex showed that 48 per cent. was decomposed, whils others when the gas was sparked for 10 seconds and 1 mm. pressure, 32, 55, and 65 per cent. re were decomposed. Most of these experiments w with platinum electrodes. Aluminium electrode rather higher amount of decomposition, whilst electrodeless tube only 50 per cent. suffered deco after one minute's sparking.

Another interesting observation was that if the electrodes be allowed to become red-hot, recomb once occurs between the carbon monoxide and the gas which remains, instead of containing the of decomposition of 60 to 70 per cent. of the carbo is almost pure carbon dioxide.

Under electrical strain, therefore, at low pressures, carbon xide is a very unstable gas, but when the products of omposition come in contact with red-hot platinum e recombination occurs. Carbon monoxide, even after minutes' sparking, seemed almost unchanged, and gave y a faint turbidity with baryta water. When a mixture carbon dioxide and hydrogen is sparked at reduced ssures, small quantities of gas which seems to be methane formed, but under no conditions could formaldehyde be ected. It is probable that the methane is formed by the on of hydrogen on carbon monoxide.

ydrogen; Determination of ——, in Gas Mixtures. F. C. Phillips.

See under XXIII., *page* 752.

PATENTS.

hracite Briquettes; Manufacture of ——. P. R. de ucheux d'Humy and R. McKenzie, both of Liverpool. g. Pat. 8503, May 8, 1900.

briquettes are formed by adding to anthracite coal dust xture obtained by heating together pitchy or oily combles, alkali, and a vegetable absorbent material. The e is then moulded into shape. The materials used consist of anthracite coal dust, pitch, mineral oil, saponaceous matter, with or without the vegetable bent material.—R. S.

tificial Fuel. L. A. Maingard, London. Eng. Pat. 15,087. Aug. 23, 1900.

DIFIED molasses, with or without admixture of other ustible materials, is employed as a fuel. Ordinary sses is evaporated and partially calcined. It is then l with suitable porous vegetable or mineral materials, oulded, pressed, or rolled into blocks. The blocks rotected by a suitable waterproof covering.—R. S.

es or Furnaces, Electric ——. J. Weiss, Vienna. Eng. Pat. 13,951, Aug. 3, 1900.

distinctive feature of the electric furnace is that the is enclosed in an outer casing consisting of two us adapted to be readily disconnected when required posing the muffle.—G. H. R.

ectric Furnaces. [Crucible.] P. Jurie, Brussels. Eng. Pat. 3192, Feb. 14, 1901.

rucible, which is oval, and in one or several parts longitudinal sides, is made of an infusible substance, is also a good conductor of electricity, and is sured by a casing of fire-proof clay, or other suitable nce, which in turn is coated with magnesia and lime y other suitable substance to prevent loss of heat by on) the whole being contained in a metal jacket made pieces and bolted together. Two crowns are arranged the crucible, between which the hot gases circulate to e mass to be melted in the crucible, whilst the latter the fusion of a charge. The furnace is provided with lar recuperator, supplied with heat from the crucible, rves in the manufacture of glass to receive the liquid tic mass from which the balls or lamps are taken in al manner. Flues carry the gases and heat of the e chamber into the recuperator, on leaving which de of carbon and other gases are consumed by means ixture of air effected at the entrance to the space o the two crowns of the arches, where the mixture is previous to fusion. The crucible, connected to a by a suitable conductor, is brought to a state of scence by the electric current, or, according to stances, is used simply as a conductor of the current immediately passes through and melts the mass ed in it.—G. H. R.

orisers or Carburetting Apparatus. A. Firth and ckson, Altrincham. Eng. Pat. 6170, April 3, 1900.

paratus consists of a container, in the top of which rided apertures closed by caps, to which are attached cal pieces of suitable perforated material serving to support circular wicks, which dip into the hydrocarbon contents of the vessel. Tubes passing through the caps extend downwards inside the wicks until near the surface of the hydrocarbon and except for a perforated diaphragm, are open at the top. By means of a special three-way valve in the top of the container, the engine or other consumer can be supplied with either hydrocarbon vapour alone, vapour and air, or air alone, according to requirements. The container is fitted with a coiled pipe for utilising the waste heat of the engine to vaporise the hydrocarbon when necessary.—C. S.

Drying, Roasting, or Smoking of Malt, Hops, Hams, or other Alimentary Matters. B. E. R. Newlands. Eng. Pat. 3194, 1901.

See under XVIII. A., *page* 736.

Combustible Gases from Peat, spent Tan, and Similar Substances; Process and Appliances for Production of ——. R. Harrison, Sligo, Ireland. Eng. Pat. 3429. Feb. 21, 1900.

THE peat, spent tar, or the like, is placed, while in a naturally moist state, or with the addition of moisture, upon an incandescent bed of fuel in a suitable furnace or gas producer, and the distillates, gases and steam driven off are caused to pass through the same or a separate incandescent body of fuel, the resulting gases being then collected. After the carbonisation of the peat, &c., a current of air or air and steam is passed through the fuel bed, generally in the reverse direction to that taken by the gases. The gases given off at this stage are utilised for raising steam. When the fuel has become sufficiently incandescent, another charge of peat, &c. is introduced. Heavy oils or other suitable hydrocarbons in a finely divided state may be introduced into the gas producer with the peat or at other times. To carry out this process, a pair or pairs of furnaces or chambers are used, each provided with a charging box or hopper, closed by a cover. Valve-controlled openings for admitting air, or steam and air are arranged above and below the hearth, while exhaust openings for the combustible gases are placed below the level or near to the bottom of the fuel bed, and communicate with a flue for leading off the gases. There are also provided an exhaust opening near to the upper part of the producer for the escape of gases produced by blowing up the fuel, a passage connecting the flues, a receiver, and a gas flue, common to both producers or to all the producers, when there are more than one pair, flues connecting the upper and the lower parts of the two producers with the receiver and common gas way, a passage connecting these flues, dampers or valves for directing the course of the gases, and hydrocarbon inlets and injectors.—R. S.

Gas and Coke; Manufacture of ——. J. Y. Johnson, London. From The Deutsche Continental-Gas-Gesellschaft, and J. Bueb, Dessau. Eng. Pat. 13,814, Aug. 1, 1900.

To produce a good illuminating gas and also coke equal to that produced in coke ovens, gas retorts are charged with ground and moistened coal.—R. S.

Inflammable Gas and Hydrocarbon Vapours and Air for the Production of Light and Heat; Apparatus for Mixing and Burning ——. G. Bower, St. Neots. Eng. Pat. 10,432, June 7, 1900.

FOR incandescent gas or vapour burners, the supply of inflammable gas or vapour, the supply of air to be drawn in and mixed with the gas or vapour, and the amount of surface of the mantle or the like to be rendered incandescent, are all regulated by one movement. For Bunsen burners, the amounts of gas or vapour and of air are similarly simultaneously regulated. Various methods of carrying out the invention are illustrated.—R. S.

Gas Generators. H. Gerdes, Berlin. Eng. Pat. 13,205, July 21, 1900.

THE generator is intended for the supply of gas engines, and to be adapted for installation below living rooms, &c.

Air is brought to its base from the open through a pipe with valve, and a similar pipe leading from its upper part to the open, carries off products formed while the heat is being raised, or the use of the gas is interrupted. The gas engine draws off the gas as required, through a pipe which traverses a water cooler, and is provided with a safety device. The heated water from the cooler passes away to a tank beneath the grate of the generator, and is there utilised for producing gas. The safety device comprises a branch pipe which passes into a sealed bell contained in an outer casing, from which a pipe leads into the open. In the event of the pressure becoming excessive, the gas blows the seal of the bell, and escapes from the casing to the open.
—J. A. B.

Gas Producers. W. Garrett and J. C. Cromwell, both of Cleveland, Ohio, U.S.A. Eng. Pat. 6698, March 30, 1901.

Air is blown into a central box, with perforations on its upper sides, and into two lateral wind boxes, on the same level as the central box. It passes from the boxes upwards through the bed of fuel. The ashes and refuse produced, fall through the spaces between the boxes, into the free space below, which extends also beneath the central box. The cross-sectional area of the producer is thus greater beneath than at the level of the boxes, and consequently, clogging of ashes and refuse are said to be avoided.—J. A. B.

Gas; Manufacturing ——, and Apparatus for Use in Practising the same. C. A. Allison, London. From A. A. Bronson, New York. Eng. Pat. 6726, March 30, 1901.

Coal or other organic material is pulverised and wetted with from, say, 20 to 30 per cent. of its weight of water, and carried by an elevator into an overhead hopper. From this it is delivered by a worm conveyor, which traverses the upper part of the brick work of a bench of retorts, so that it is maintained at a temperature of about 500° C., into a generating retort, in which it is distributed by a jet of highly superheated steam. The gas produced, passes through a second retort, in which coke is maintained in a state of incandescence, where it is highly superheated, and then through a third retort, containing no coke, but maintained at a very high temperature, for final superheating. The feed of the gas making material may, if necessary, be facilitated by introducing steam in the conveyor chamber. The material is preferably mixed with about 1 lb. of chloride of lime, about 1 lb. of caustic alkali, and about 30 lb. of unslaked lime per 1,000 lb of material, at or before its introduction into the hopper. These chemicals are said to facilitate its decomposition and act as a flux. The whole of the carbon of the coal or material is stated to be converted into gas. The illuminating value of the gas made may be diminished, and its volume increased by increasing the amount of steam injected into the generating retort. If merely good fuel gas be required, it is said that the volume of gas obtained from a ton of coal compares favourably with the volume of producer gas obtainable per ton, while the gas is free from the 60 per cent. or thereabouts of nitrogen present in producer gas. The pulverisation of the material, and the continuous feed are stated to result in a far greater make of gas in a given time per retort than is obtained with ordinary coal gas retorts. If a rich gas be required, petroleum may be run into the retort with the pulverised material.—J. A. B.

Gas; Apparatus for use in the Manufacture of ——. J. P. Johnston, Oak Park, Illinois, U.S.A. Eng. Pat. 11,426, Aug. 11, 1900.

In a water gas plant, comprising generating, carburetting, and superheating chambers, oil is sprayed intermittently into the carburetting chamber by means of an oil-feeder. In order to remove the oil-feeder, when not in use, from the destructive action of the intense heat in the upper part of the carburetting chamber, the patentee connects it with the lever of the stack valve at the top of the superheating chamber, so that when the stack valve is opened, the oil-feeder is automatically lifted out of the carburetting chamber into a superposed cavity, where it remains until the stack valve is shut and the feed of oil is again requi The shutting of the stack valve automatically lowers oil-feeder into the carburetting chamber.—J. A. B.

Acetylene Gas; Apparatus for the Production of — C. Hennings, Waltershausen, Germany. Eng. 14,138, Aug. 7, 1900.

A square generating chamber containing water, is div by a partition which does not extend to the bottom, dips in the water, into two compartments, in each of w a carbide holder, having a movable bottom, is suppo The holder is charged with carbide through open provided with screw plugs, and the carbide is discha into the water by pulling a rod, which thereupon withd the movable bottom of the holder. On pushing the back the bottom of the holder is replaced. The car falls on to a grating supported beneath the water i generating chamber. The gas evolved, passes to a holder, the bell of which floats in a tank, the lower of which is annular.—J. A. B.

Acetylene Gas Generators. G. R. Bond, A. C. Buell C. D. Washburn, all of Springfield, Mass, U.S.A. Pat. 6344, March 26, 1901.

A generating chamber contains water, into which ca is discharged from a superposed holder in quan determined by the pressure of gas in the chamber. pressure acts on a flexible diaphragm in an adj passage, and the diaphragm controls the movements valve in the passage by which the carbide falls int generating chamber. Water is expelled from the into one or more relief chambers, which are narrowe higher than the generating chamber, by the gas ev until it has fallen below the level of the outlet fro latter chamber, whereupon the surplus gas begins to into the relief chambers and thence into the open.
—J. A

Gas Lighting Torches. J. G. Glover, London. Eng 11,766, June 28, 1900.

Within the head of the torch are arranged the us container, wick tube, and wick, for a permanent Inside the shaft of the torch is a rod, extending f ring or knob (situated at that part usually held b lamplighter), up to near the head of the torch, wh is attached to a spring wire, or ribbon. To the upp of the wire is attached a cap, provided on its unde with a piece of sponge or other absorbent material. sponge rests normally in a spirit container, which is near the permanent flame. When the lamplighter upwards the rod within the shaft, the sponge is lift of the spirit and, owing to a "sett" in the spring passed laterally out through a door in the head torch. During this motion the sponge comes into c with the permanent flame and the spirit is ignited. sponge carrying the burning spirit projects some d from the torch head, it is unnecessary to tilt the t an angle within the lamp, and the danger of breaki mantle or chimney is avoided. When the lamp pulls down the rod, the sponge returns to the spir tainer and the cap acts as an extinguisher. The o and closing of the door in the torch head is effecte secondary rod within the shaft, which is actuated same ring or knob as controls the rod above referred
—I B

Combustible or Incombustible Aeriform Fluids f Purposes of Heat, Light, or Power; Appara Carburetting and Increasing the Pressure of — A. S. Bower, St. Neots. Eng. Pat. 10,514, June

The carburetting liquid is vaporised (without gasifi in a retort which is heated by a burner, the su inflammable fluid to which is automatically regul such a manner that the amount of liquid gasified, on the consumption of finished gas. The vapour ge in the retort drives a continuous motor, which act compressor dealing with the aeriform fluid to be e the vapour issuing from the said motor then mixi the compressed aeriform fluid, which therefore b carburetted and is delivered into the holder as such.-

as; Governor and Enricher of ——. W. E. A. Jennings, East Twickenham. Eng. Pat. 15,712, Sept. 4, 1900.

HE receptacle for the enriching material is provided with governor consisting of two valves, situated in line, the one ove and the other below their respective seats, each being ljustable by the aid of screw spindles terminating in handheels outside the apparatus. The valve spindles are fitted th intermediate springs, to assist in regulating the action the valves.—C. S.

as; Appliances for Producing Perfect Combustion of ——. F. M. Bonnett and J. O. Fowler, jun., New York, U.S.A. Eng. Pat. 1703, Jan. 24, 1901.

IE chief features in the (29) claims are the provision of burner enclosed in a cap which is provided with a rality of horizontal steps or ledges, the upper ledge ing constructed to throw the air against the flame at ght angles to the point of combustion. The next lower lge is of larger diameter than the upper one, and the p is also provided with an integral stepped horizontal imney holder. The burner contains a perforated plate with justable apertures, and is provided with means for imrting rotary motion to the admitted air, and for heating air and mixing it with the gas in the proportions uring complete combustion.—C. S.

s for Power Purposes; Generation and Supply of ——. J. Pintsch, Berlin. Eng. Pat. 4522, March 2, 1901.

E claim is for a gas-power plant "working at a pressure ow that of the atmosphere," and with gas generated by combustion of coke, coal, or the like, the generator ng connected directly to the engine by a pipe fitted with ressure regulator so that air and steam are drawn into generator, by the suction action of the engine, in icient quantities to produce the requisite quantity of to feed the engine.—C. S.

s; Apparatus for Manufacturing ——. C. J. Johnson, t. Louis (Mo.), U.S.A. Eng. Pat. 8881, April 30, 901.

E apparatus comprises a gasoline reservoir, an engine, air pump, means for connecting the several parts, a ice for transmitting motion from the connecting rod veen the engine and air-pump to a pump situated hin the reservoir, by means of which pump the gasoline ised to the upper part of the reservoir and there sprayed r a layer of absorbent material resting on a perforated ition. The air, forced into the reservoir by the air ip, is compelled to pass through this absorbent material, gasifying the gasoline. The pressure of the gas in upper part of the reservoir acts upon a diaphragm, ning the cover of same, and imparts motion to a train mechanism controlling the admission of water to the ne, thus automatically regulating the production of gas the maintenance of constant pressure within the rvoir.—C. S.

Ignition of Gas; Apparatus for the ——. H. rescher, Vienna. Eng. Pat. 11,506, June 25, 1900.

object of this invention is to provide an igniter which be automatically removed from the direct action of the gases when the burner is in use. Two plates of mica joined together at an angle to each other, and the d edges are arranged to hinge upon, and parallel to, a zontal pivot. An extension beyond the pivot carries a terpoise weight, so that but little force is required to e the mica plates to swing up and down. The pivot be fixed to a cap at the top of the lamp chimney, or be suspended above the burner in any other suitable

When the gas is turned off, the upper mica plate, to under side of which an igniting body is attached, rests horizontal position, the lower plate hanging downwards e chimney. When the gas is turned on, it is lit by the r, and the draught at once causes the two plates to upwards upon the pivot, the lower plate then protecthe igniter from direct contact with the hot gases. The r may be still further protected, by the provision of two mica side-wings on the under side of the upper plate. There is a claim for the manufacture of igniters by dipping platinum threads into a mixture of platinum black and an indifferent organic binding material, or coating them with a soluble platinum salt.—H. B.

Mantles [Fabrics] for Incandescent Lighting; Manufacture of ——. H. Hill, Nottingham. Eng. Pat. 13,259, July 23, 1900.

THE claim is for a fabric for an incandescence mantle, made of threads or fibres of two or more different textile materials, such, for instance, as cotton and rhea.—H. B.

Incandescent Gas and Vapour Burners. W. Hooker, Woodside, Surrey. Eng. Pat. 8942, May 15, 1900.

In Eng. Pat. No. 19,055 of 1888 (this Journal, 1889, 273), a perforated platinum thimble is described for use in incandescence gas lighting. The patentee finds that, to obtain satisfactory results, the perforations should number 2,500 per square inch, and the diameter of each perforation should be about 0·0137 inch. A suitable burner, for use with the thimble, consists of an outer tube having a core arranged centrally within it, so as to leave an annular passage for the gas and air mixture. The flame is thus produced within the thimble in the form of a hollow cylinder. The proportion of air must be such as to produce complete combustion without the assistance of the atmosphere outside the thimble.—H. B.

Incandescent Bodies, and the Method of Manufacturing same. G. Kohl, Budapest. Eng. Pat. 827, Jan. 12, 1901.

THIS describes a process of manufacturing mantles without cerium, consisting in preparing a solution of the nitrates of thorium, ammonium, barium, strontium, indium, gallium, and samarium, and of double cyanide of platinum and barium, adding thereto solutions of nitrates of uranium, lanthanum, zirconium, and didymium, and preferably also of nitrate of zinc, tin, bismuth or calcium, or of borax, or of two or more of these salts, and then impregnating fabrics with the mixture and burning off as usual.—H. B.

[Mantles] Incandescent Gas Lighting. A. M. Plaissetty, Paris. Eng. Pat. 9088, May 16, 1900.

IN the manufacture of mantles, the salts of the rare earths are dissolved in a little water and the solution is evaporated till it weighs the same as, or in certain cases less than, the original amount of the salts taken. To the melted mass a small quantity of alcohol is added, drop by drop, till the evolution of nitrous vapours ceases. The syrupy liquid is then mixed with a binding material, such as "gelatine, collodion, or nitrocellulose, in acetate of ethyl or other solvent," and the resulting product is drawn out into threads, after which they are soaked in an ammonia bath, dried, and woven into mantles. The process is claimed. —H. B.

Electric Arc Light of Refractory Oxide Arc Lamps. E. Rasch, Nürnberg, Bavaria. Eng. Pat. 7608, April 24, 1900.

A METHOD of producing electric arc lights is described, in which the arc is formed between previously heated electrodes composed of conductors of the second class, instead of between electrodes that conduct at ordinary temperatures. A potential in excess of the normal potential of the lamp is used for the purpose of striking the arc between refractory oxides that are moderately good conductors at ordinary temperatures, and the use of electrolyte electrodes which permit of a reduction in the required excess of potential in consequence of the admixture of metallic salts, fluxes, or slags, and by reason of their structure influenced thereby, or by fusion.

Further, the use of electrolyte electrodes is claimed, which serve for producing the light. These are previously heated by an arc formed between auxiliary electrodes of relatively better conducting material, arranging one or more of them on the worse conducting electrolyte electrodes in such a way that they conduct the electric current to the consumption ends of the electrolyte electrodes, and thereby limit the incandescence of the electrolyte electrodes locally to the nearer ends thereof. Or, as an alternative, the heating are may be struck between the auxiliary electrodes by spark discharges.—J. C. R.

Filaments for Electric Incandescence Lamps; Manufacture of ——. V. Thomas, Paris. Eng. Pat. 10,703, June 12, 1900.

The filaments are made from a solution of 15 parts of nitro-cellulose in 85 parts of glacial acetic acid. The collodion, to which is added from 0·2 to 5 per cent. of aluminium acetate or nitrate, is "spun" from small orifices under water in the form of a filament. The filament, after a suitable treatment with ammonium hydrosulphide, is carbonised in the usual manner. The finished product consists of an intimate mixture of graphitic carbon and aluminium oxide.—J. F. B.

Electric Incandescent Lamps; Method of Increasing the Economical Efficiency of ——. E. Bushe, London. Eng. Pat. 7959, April 18, 1901.

A small cylindrical tube of well annealed glass is filled with spherules of incandescent material so as to form a double row in it, and arranged to prevent contact between the spherules of the same row. A band of conducting material maintains contact with the spherules, and has a wire attached to convey the current. A vacuum is formed, and the tube is sealed and mounted as desired.—G. H. R.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

[*Petroleum*]; *Kerosene Distillates; Preliminary Neutralisation of* ——, *before Refining.* K. Charitschkoff. Petr. Ind. Tech. Rev. **4**, [115], 469.

The distillate to be refined, contains the acids present in the original crude oil, and those formed, by oxidation, during distillation, all of which the author proposes to remove by the aid of quick-lime, or milk of lime, before subjecting the distillate to the usual acid treatment in refining. That this treatment will result in a considerable saving of alkali, has been shown by an experiment wherein two equal samples of distillate were both treated with the same quantity of sulphuric acid, the one having been first neutralised in the proposed manner, the other not. This latter required 3·9 c.c. of decinormal alcoholic KHO to neutralise 24 c.c., whereas the neutralised sample only consumed 1 c.c. of this reagent.

To reduce the distillate to a suitable temperature for the refining process the author employs an air blast, which is turned on after the distillate and lime have been agitated together for about an hour.—C. S.

PATENT.

Tar; Manufacture of Soot from ——. A. Bente. Eng. Pat. 8995, May 1, 1901.

See under XIII. A., *page* 728.

IV.—COLOURING MATTERS AND DYESTUFFS.

Brasilin and Hæmatoxylin. J. Herzig and J. Pollak. Monatsh. für Chem. 1901, **22**, [3], 207—214. See also this Journal, 1900, 40, 528.

By reducing brasilein with zinc dust and glacial acetic acid, then adding sodium acetate and acetic anhydride, and boiling, filtering, and precipitating with water, the author obtained the tetra-acetyl derivative of the compound $C_{16}H_{12}O_4$. It is obtained from glacial acetic acid in white leaflets, which melt at 210—211° C. The substance $C_{16}H_{12}O_4$ could not be obtained pure, and brasilein could not be obtained by re-oxidation. The above reaction is not a simple reduction, since the acetyl derivative could not be obtained by acetylation followed by reduction. By treating brasilin in exactly the same manner, the known tetra-acetylbrasilin was produced.

When the action of acetic acid and anhydride upon brasileïn in the presence of sodium acetate and zinc dust is modified to some extent, a different compound is produced, which is also derived from a reduced brasileïn.
—A. C. W.

Nitro Compounds; Electro-Chemical Reduction of —— *to the corresponding Amines.* R. Elbs and F. Silbermann.

See under XI. A., *page* 725.

Benzidine; Electrolytic Production of ——. W. Löb Zeits. für Elektrochem. 1901, **7**, [45], 597—603.

In previous communications (this Journal, 1900, 1005, an 1901, 133) the author described the electrolytic preparatio of benzidine. In the present paper he gives the results o experiments made to ascertain the best conditions for th electrolytic reduction of azoxybenzene in hydrochloric aci to which was added a small quantity of stannous chlorid (compare this Journal, 1901, 259). Details of th individual experiments are given, but the highest yield c benzidine was obtained under the following conditions:—

Electrolyte: 2 grms. of azoxybenzene, 1·5 grm. ($SnCl_2$, and 70 c.c. of HCl.

Strength of acid: 25·75 per cent, (sp. gr. 1·13).

Temperature: 80° C.

Cathode: Nickel gauze stirring cathode (this Journa 1900, 1022) exposing a surface of 23 sq. cm. (The tot surface of the gauze was assumed to be equal to that o one side of a plain sheet of the same dimensions.)

Current: 1·05 ampère.

E.M.F.: 3 volts.

Ampère hours consumed: 2·1.

Ampère hours theoretically required: 1·2.

Yield of benzidine: 70 per cent.

The electrolysis was performed in a divided cell, platinum spiral acting as anode. The strength of t hydrochloric acid, which is the most suitable acid, shou be as above; but good results were sometimes obtain with a 17·2 per cent. acid. The temperature should 60° C. or higher. In calculating the yield of benzidi and the theoretical number of ampère hours required, was assumed that the reduction proceeded according to t equation—

$$(C_6H_5)_2N_2O + 2H_2 + H_2SO_4 = H_2O + (C_6H_4NH_2)_2.H_2SO$$

although this is practically impossible, owing to the sim taneous production of diphenyline and aniline. T cathode is preferably made of nickel (or platinum), but is of importance that the nickel should be free fr impurities, otherwise it is acted on and colours the elect lyte green. The current density may vary between 0 5·0 ampère per 100 sq. cm. without influencing the resu

The best reduction was obtained by adding from 1 1·5 per cent. of stannous chloride to the electrol Attempts to diminish the formation of aniline by addition of sulphuric acid were unsuccessful.

Azobenzene reduced in a similar way gave 72—74 cent. of the theoretical yield of benzidine, together w about equal amounts of diphenyline and aniline.—J. S.

Ketones; Electro-chemical Reduction of ——. K. E Zeits. für Elektro-chem. 1901, **7**, [47], 644.

The electrolytic reduction of ketones is easily effecte lead cathodes in a slightly alkaline or (sulphuric) solution. Lead plates were employed as anodes in a solu of sodium carbonate or 10 per cent. sulphuric acid. cathodes were in the form of perforated lead cylind whilst the cathode compartment was charged with a m or less dilute alcoholic solution of the ketones to which added either 2 per cent. of sodium acetate or 1 per cen sulphuric acid. The cathodic current density varied betw

·5—1·5 ampère per square dcm., the temperature being 0°—90° C.

In weak alkaline solution the fatty ketones and the mixed atty and aromatic ketones yielded alcohols and pinacones hilst the pure aromatic ketones gave a high yield of the econdary alcohols. In weak acid solution mixtures of lcohol and pinacone were obtained from fatty ketones, hilst pinacones, together with only a small quantity of lcohol were produced from the pure aromatic ketones. inacones which readily undergo change are converted into e corresponding β-pinacoline.

The electro-chemical method of reduction is recom-ended for the preparation of benzhydrol (diphenylcarbinol) $_6H_5)_2CH(OH)$.—*J. S.*

niline; Oxidation of ——. E. Börnstein. Ber. 1901, **34**, [7], 1268—1274.

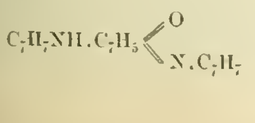
IE oxidation of aniline hitherto has resulted in products which the amino group has been attacked, yielding, for ample, azo-, azoxy-, nitroso- and nitrobenzene, phenyl-droxylamine, aminophenol, and finally quinone. The thor oxidises aniline salts in neutral solution at a low nperature, and a certain concentration preferably with d peroxide. A 20—25 per cent. yield of aminodiphenyl- inonediimine $H_2N.C_6H_3(NC_6H_5)_2$ is obtained which, on re energetic oxidation is converted into Azophenine $H_2(NHC_6H_5)_2(NC_6H_5)_2$. The conversion of the amino-inoneimine into Azophenine can also be shown by solving the former in an excess of aniline and warming solution for a short time with some aniline hydrochloride zinc chloride. For the preparation of aminodiphenyl-nonediimine, aniline hydrochloride or sulphate is dis-ved in 20—25 times its weight of water, and oxidised h one and a half to twice its weight of lead peroxide O_2] in the form of paste in the cold. The magenta ured filtrate contains a dyestuff of no particular value, the residue after drying is extracted with benzene and ited with light petroleum spirit which precipitates a tarry due. The solution on standing deposits crystals, which ystallised from alcohol separate in blackish-red nodules. residue insoluble in alcohol consists of Azophenine, ting at 246° C., against the 237° C. of earlier investigators. inodiphenylquinonediimine melts at 167° C., and is very table towards acids. Reduction with ammonium sulphide ds a colourless substance melting at 83° C., which gives icetyl compound corresponding to the formula—

$$C_6H_3(NHC_2H_3O)(NHC_6H_5)_2$$

melting at 171° C.—T. A. L.

Paratoluidine; Oxidation of ——. E. Börnstein. Ber. 1901, **34**, [7], 1274—1284.

1880 W. H. Perkin, by the action of potassium romate on *p*-toluidine sulphate, obtained two oxidation ucts, having the formulæ $C_{21}H_{21}N_3$ and $C_{28}H_{27}N_3$ ectively. The latter compound was investigated by workers, its constitution being determined by A. G. n (this Journal, 1894, 143), who showed it to be an oditolyl-*p*-toluquinonediimine. The author has applied xidation with lead peroxide in a similar manner to that oyed above (see preceding abstract), and obtains, ding to the conditions, one or other of Perkin's ounds. As in the case of aniline, oxidation in very solution leads to the formation of the compound with carbon atoms, whilst in concentrated solution the ict obtained is the one of higher molecular weight. s not, however, possible, as in the case of the aniline ound, to convert aminoditolyl *p*-toluquinonediimine ilowsky's base) into *p*-tolylaminoditolyl-*p*-toluquinone-ne (Perkin's base), the action of *p*-toluidine and its chloride on the former yielding a product having the la $H_2N.C_7H_3(NC_7H_7)_2(NHC_7H_7)_2$. Perkin's base, on nent with dilute alcoholic sulphuric acid, readily de-osed into toluidine and a compound—

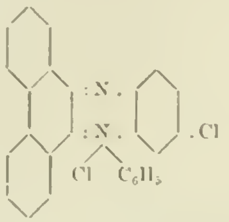


$$C_7H_7NH.C_7H_5\begin{matrix}\nearrow O\\ \searrow N.C_7H_7\end{matrix}$$

By oxidising *p*-toluidine hydrochloride or sulphate with lead peroxide ($2\frac{1}{2}-3$ times the weight of the hydrochloride) in a dilution of 10—60 times, in the former case Perkin's and in the latter Barsilowsky's base is obtained. A 6 per cent. yield of the latter is produced by dissolving 100 grms. of *p*-toluidine in one litre of water, together with just the necessary quantity of hydrochloric acid, and oxidising with 587 grms. of manganese peroxide paste (15 per cent.) There were recovered 4 grms. of *p*-toluidine and 9·6 grms. of peroxide, so that 96 grms. of toluidine or 128 grms. of the hydrochloride required 78 grms. of manganese peroxide, or in the proportion of 1:0·6. No Perkin's base was obtained, but 6 grms. of Barsilowsky's base and a considerable amount of azotoluene. An 18 per cent. yield of Perkin's base was obtained by dissolving 218 grms. of *p*-toluidine and 98 grms. of sulphuric acid in 6·5 litres of water and adding 294 grms. of potassium bichromate in $3\frac{1}{2}$ litres of water. After 24 hours the dark brown precipitate was filtered off, dried, and extracted with benzene, which, after evaporation, yielded the mixture of bases. On boiling with 20 times the weight of absolute alcohol, 39 grms. of Perkin's base remained behind, whilst only 0·2 grm. of Barsilowsky's base was formed. In another preparation, 267·5 grms. of *p*-toluidine gave 54 grms., or 20 per cent., of Perkin's base, and 3 grms. of Barsilowsky's base. The latter melts at 235° C. and dissolves in concentrated sulphuric acid with a pure blue colour. As already stated, on boiling this base with *p*-toluidine and its hydrochloride in alcoholic solution it is converted not into Perkin's base, but into the hydrochloride of the product $C_{35}H_{35}N_5$, which crystallises in brassy yellow plates, melting at 282° C. The base separates from dilute alcohol in orange-red plates melting at 251° C. Perkin's base, or tolylaminoditolyl-toluquinonediimine, melts at 183° C., and dissolves with a violet colour in concentrated sulphuric acid, which turns green, blue, and then violet red on dilution with water. The compound is basic and dissolves with a violet-red colour in hydrochloric acid, but the salts are easily decomposed. On treatment with 20 times its weight of 5 per cent. alcoholic sulphuric acid and standing 24 hours, the purple red solution passes through violet to pure blue. On saturation with ammonia and recrystallisation from ethyl or methyl alcohol, brownish-red shining needles melting at 181° C., and having the constitution $C_7H_7NHC_7H_5(:O)(:NC_7H_7)$ are obtained, the yield being 75 per cent. of the theoretical. The solution in concentrated sulphuric acid is green, becoming more and more reddish on standing and turning deep orange-yellow on dilution with water.—T. A. L.

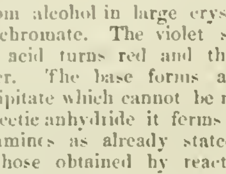
Azonium Dyestuffs; Chloro Derivatives of —— *I.* F. Kehrmann and W. Hiby. Ber. 1901, **34**, [7], 1085—1095.

By reducing Laubenheimer's 5-chloro-2-nitrodiphenylamine $1.4.6.NO_2.Cl.C_6H_3.NH.C_6H_5$ with stannous chloride and hydrochloric acid, the authors obtain the corresponding amino derivative from which they have prepared a number of chloro-azonium derivatives. All these have the chlorine atom in the benzene ring para to the azine nitrogen and readily replaceable by an amine radicle. The syntheses thereby rendered possible have solved certain questions of constitution and on the other hand the effect of the presence of a chlorine atom in the dyestuff has been studied. Thus the dimethylisorosinduline obtained by the action of chloro phenylisonaphthophenazonium and dimethylamine is identical with the dyestuff from phenylisonaphthophenazonium and the same amine. Of special interest are the chloro-rosindulines obtained, since these exchange chlorine for an amino radicle yielding derivatives of naphthophenosafranine which are very strong blue dyestuffs. The effect of the presence of chlorine in the molecule is generally to cause a shifting of the maximum absorption towards the red end of the visible spectrum, whilst in other cases there is a distinct brightening in the blue so that the chloro derivatives of the golden yellow substances Phenylisonaphthophenazonium and Flavinduline are orange dyestuffs and the chloro-rosindulines are generally bluer than the original derivatives. 3-Chloroflavinduline is obtained in quantitative yield by condensing 10 grms. of 5-chloro-2-aminodiphenylamine hydrochloride with 8·2 grms. of phenanthraquinone in 80 c.c. of glacial acetic acid at the ordinary temperature in about 24 hours. The chloride has the formula—



and separates from alcohol in large crystals of the colour of potassium bichromate. The violet solution in concentrated sulphuric acid turns red and then orange yellow on adding water. The base forms a yellowish green voluminous precipitate which cannot be recrystallised. On boiling it with acetic anhydride it forms the acetate. The reaction with amines as already stated yields dyestuffs identical with those obtained by reaction with different amines on Flavinduline (Ger. Pat. 97639). 3-*Anilinoflavinduline* from aniline and chloroflavinduline chloride in alcoholic solution in presence of sodium acetate, separates from alcohol in coppery needles and is identical with the product obtained from Flavinduline and aniline according to Ger. Pat. 97,639. The chloride of the *p*-aminosalicylic acid condensation product forms violet needles. This substance was sulphonated by dissolving in fuming sulphuric acid of 10 per cent. strength (SO_3), and allowing the solution to stand for two days. The melt was then diluted with water and the sulphonic acid dissolved in ammonia. The dyestuff gives a greenish blue shade on an aluminium and a green on an iron mordant.

The condensation of the chloro-aminodiphenylamine with *β*-naphthoquinone in alcoholic solution in presence of dilute sulphuric acid yields on salting out with sodium nitrate the nitrate of 3-chlorophenylisonaphthophenazonium, having the formula—



and crystallising in brownish red granules soluble in water and alcohol with an orange-red colour. On warming with aqueous dimethylamine in slight excess in alcoholic solution, the chlorine atom is replaced by $N(CH_3)_2$ and the nitrate of the dyestuff formed, which separates in dark blue coppery crystals, is identical with that already obtained from phenylisonaphthophenazonium and dimethylamine (Ber. **30**, 2629; this Journal, 1898, 144). The condensation product formed with *p*-aminosalicylic acid gives with fuming sulphuric acid a soluble blue sulphonic acid which dyes blue on an alumina and green on an iron mordant.

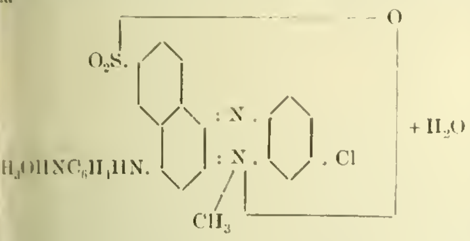
Dyestuffs of the 3-chloro-rosinduline series are formed more or less completely by condensing 5-chloro-2-aminodiphenylamine with substances of the 4-anilino-*β*-naphthoquinone type. For instance 3-chlorophenylrosinduline chloride is obtained by warming together in 50 c.c. of alcohol, 3 grms. of 5 - chloro - 2 - aminodiphenylamine hydrochloride and 2·8 grms. of 4-anilino-*β*-naphthoquinone, and finally boiling with 2 drops of hydrochloric acid. The product which is formed with a yield of at most 65 per cent. separates from alcohol in dark green prisms soluble in water, alcohol and glacial acetic acid with a violet magenta coloration. The green solution in concentrated sulphuric acid becomes violet red on dilution. The homologous compound from *p*-toluidino-*β*-naphthoquinone separates in bronzy needles, dissolves with a bluer shade and is more soluble than the phenyl derivative. Similarly the condensation product from *β*-naphthylamino-*β*-naphthoquinone forms a reddish brown crystalline powder sparingly soluble to still bluer solutions in alcohol and glacial acetic acid. A condensation product easily soluble in water belonging t
this series is produced from chloroaminodiphenylamin
hydrochloride and *m*-tolylenediamino-*β*-naphthoquinone i
alcoholic solution. A yield of 70 per cent. is obtaine
and the substance separates from alcohol in metallic gree
crystals readily soluble in water and alcohol with a viole
colour. The action of amines on the 3-chlororosindulin
leads to derivatives of naphthophenosafranine the chlorin
being replaced by an amine radicle. The products ar
bright bluish violet to indigo blue dyestuffs approximatio
in some cases to Crystal Violet and Triphenylrosanilin
Owing to their insolubility they are of little technical utilit
By boiling chlorophenylrosinduline with 5 times its weight
aniline, crystals of diphenylnaphthophenosafranine chlorid
separate out in bright coppery granules. The product
scarcely soluble in water, soluble in boiling alcohol, ar
easily soluble in glacial acetic acid with a violet blue colou
It dyes wool and silk somewhat bluer shades than Cryst
Violet. The solution in concentrated sulphuric acid is gree
becoming blue on adding water, when the sulphate is pr
cipitated. The base crystallises from a mixture of alcoh
and benzene in greenish brassy needles and from its analy
($C_{34}H_{24}N_4$) must be represented as an inner anhydride. T
homologous compound from chloro - *p* - tolylrosinduli
chloride and *p*-toluidine forms bronzy crystals somew
more soluble than the phenyl derivatives. The green sol
tion in concentrated sulphuric acid turns blue on dilutio
The dyestuff gives almost pure blue shades on wool a
silk.—T. A. L.

Azonium Dyestuffs; Chloro Derivatives of ——.
F. Kehrmann and H. Müller. Ber. 1901, **34**, [
1095—1101.

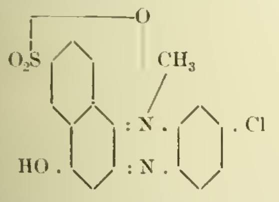
In place of the 5-chloro-2-amino-diphenylamine employ
above, a similar series of chloro-azonium derivatives
be obtained from 5-chloro-2-amino-methylaniline in wh
methyl is attached to the azonium nitrogen in place
phenyl. Laubenheimer's 1.2.4-dinitrochlorobenzene
converted by the action of methylamine into 1.2.4.nit
methylaminochlorobenzene, which on reduction, yie
chloromethyl-*o*-phenylenediamine(5-chloro-2-amino-meth
aniline) [$1:2:4 = NH_2:NHCH_3:Cl$]. By condensat
with quinones of the 4-hydroxy-*β*-naphthoquinone
4 amino-*β*-naphthoquinone type, a number of dyestuffs
obtained which are derivatives of methyl-naphthophen
nium. The substitution of methyl for phenyl renders
easy the substitution of the chlorine atom by amines, an
sulphonic groups be also present, no substitution takes pl

For the preparation of 5-chloro-2-nitro-methylanil
dinitrochlorobenzene is treated in concentrated alcoh
solution with methylamine solution, and finally boiled.
nitro-condensation product crystallises from alcohol
orange-red needles melting at 105° C., and yields on re
tion with stannous chloride in concentrated hydrochl
acid, the corresponding base, the hydrochloride of wh
separates in colorless leaflets on adding concentrated hy
chloric acid to its ethereal solution. The hydrochlo
so obtained was used for the following syntheses.
readily oxidises in the air, and on adding ferric chlo
yielding a reddish brown dyestuff of the anilinoaposafra
class. On boiling equal weights of the above hydrochl
and 4-amino-1.2-naphthoquinone in alcoholic solution
the brick-red quinone particles have disappeared, the
product separates as a metallic green crystalline pow
The dyestuff crystallises from alcohol in shining red pri
readily soluble in water, less so in alcohol, with a yello
Eosine colour, and a fiery red fluorescence. The solutio
concentrated sulphuric acid is dark-bluish green, beco
red on adding water. The product dyes silk and tann
cotton bluish scarlet shades fast to soap and acids.
nitrate forms vermilion needles almost insoluble in w
containing nitric acid. On boiling the chloride with a
and aniline salt, the chlorine is replaced by the a
radicle, forming 3-anilino-6-amino-methylnaphthophe
nium, which is a reddish violet safranine, sparingly so
in water, and giving bright, somewhat violet, ma
shades on tanned cotton. When 4-anilino-*β*-nap
quinone and the chloromethyl-o phenylenediamine h
chloride are suspended in alcohol and boiled until a co

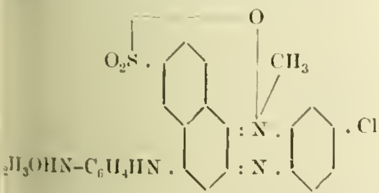
ion is obtained, the condensation product can be pitated by ether. The 3-chloro-6-anilinomethyl-thophenazonium chloride forms aggregates of dark-red les soluble in water with partial dissociation to a blood-olution. The green solution in concentrated sulphuric turns blood red on dilution. The condensation between amine hydrochloride and the sodium salt of 4-sulph-10-β-naphthoquinone-6-sulphonic acid (from sodium anilate and potassium 4-6-β-naphthoquinonedi-onate in aqueous solution) gives a quantitative yield of loro-6-sulphanilinomethylnaphthophenazonium-8-onic acid. The sodium salt is readily soluble in ·, and is precipitated in shining golden-red crystals by chloric acid. The solution in concentrated sulphuric is yellowish green, water precipitates the sulphonic n red flocks. An isomeric sulphonic acid is obtained eating 3-chloro-6-sulphanilinomethylnaphtho-zonium with cold fuming sulphuric acid of low per-ge. By condensing the amine hydrochloride with the ne aniline obtained by the action of *p*-aminoacetanilide potassium salt of β-naphthoquinone-4.6-disulphonic wo products are obtained; the less soluble having the la—



arating in violet-brown shining crystals very sparingly to a violet solution in water, readily soluble in carbonate solution with a red colour. The solution entrated sulphuric acid is green, becoming violet on water. The second product which separates from ·her liquor on standing has the formula—

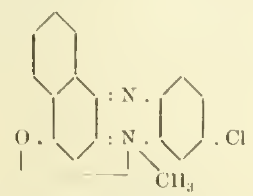


vidently a decomposition product of—

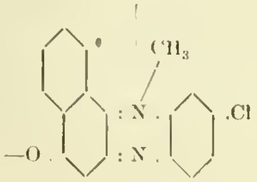


ike other isorosinduline derivatives containing an dicle in the position 9, loses the amine radicle in e for the hydroxyl group under the action of hydro-cid. The product forms a brownish-red crystalline sparingly soluble in water with a yellowish-red The solution in concentrated sulphuric acid is , becoming yellowish-red on dilution with water.

milar manner the condensation between 5-chloro nethylaniline and 4-hydroxy-β-naphthoquinone in nt. alcohol yields two products which are separated tion with benzene containing alcohol. The more osindone derivative dissolves with an orange-red nd a brick red fluorescence, whilst the prasindone remains behind in almost black crystals. The parates from benzene in garnet coloured golden soluble in water, sparingly soluble in alcohol or benzene, more readily in a mixture of the two. The 3-chloromethyl rosindone has the formula—



The solution in concentrated sulphuric acid is red, turning orange-yellow on slight dilution, whilst much water throws out the rosindone derivative as a flocculent reddish precipitate. The second product, 3-chloromethyl prasindone has the constitution—



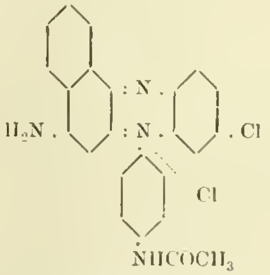
The hydrochloride forms shining black needles, whilst the base crystallises in dark blue needles. Concentrated sulphuric acid dissolves the product with a yellowish-green colour, which, on dilution with water, turns first bluish-green and finally magenta.—T. A. L.

Azonium Dyestuffs; Chloro Derivatives of ——. (Isorosinduline No. 14) ——. *III.* F. Kehrmann and S. Krazler. Ber. 1901, **34**, [7], 1102—1108.

This paper is more particularly an extension of Kehrmann and Hiby's (*vide supra*), and relates to the rosinduline derivatives from chloro-*p*-tolyl-*o*-phenylene diamine, $1.4.6.H_2N.Cl.C_6H_3.NH.C_6H_4.CH_3(p)$, and from chlorodiaminodiphenylamine—

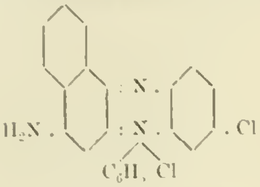
$$1.4.6.H_2N.Cl.C_6H_3.NH.C_6H_4.NH_2(p).$$

The latter gives, with 4-amino-β-naphthoquinone, chloroaminorosinduline. The acetyl derivative of this compound—



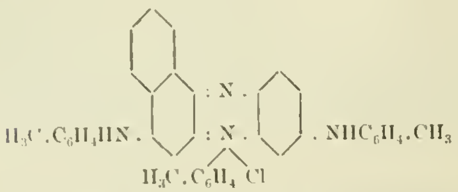
from which the amino group can be removed, yields the chloro derivative of the hitherto unknown Isorosinduline No. 14.

By condensing Laubenheimer's 1.2.4 dinitrochlorobenzene with *p*-toluidine in presence of sodium acetate on the water-bath, and subsequent recrystallisation from alcohol and light petroleum spirit, the authors obtain 5-chloro-2-nitrophenyl-*p*-tolylamine, which separates in brick-red needles melting at 126° C. On reduction this yields 5-chloro-*p*-tolyl-*o*-phenylene diamine. From the same chlorodinitrobenzene and *p*-amino-acetanilide they obtain yellowish red needles of 5-chloro-2-nitro-t′-acetaminodiphenylamine melting at 221° C., which on reduction with stannous chloride under simultaneous hydrolysis yields 5-chloro-2.4′-diaminodiphenylamine. When chlorophenyl *o*-phenylene diamine and 4-amino-β-naphthoquinone are heated together in alcoholic solution, shining garnet-red crystals of 3-chlororosinduline chloride are obtained having the formula—

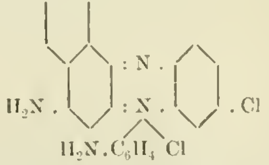


The product dissolves in water and alcohol with a rosinduline-red colour and a brick-red fluorescence. The solution in concentrated sulphuric acid is blackish-green, passing through pure green to red on dilution. The shade is bluer than that of rosinduline.

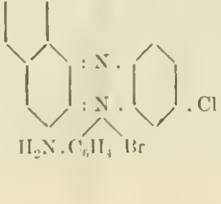
When chloro-*p*-tolyl-*o*-phenylene diamine hydrochloride is boiled in alcoholic solution with rather more than an equimolecular weight of *p*-toluidino-β-naphthoquinone, the chloride of the condensation product crystallises from alcohol in four sided greenish metallic prisms, scarcely soluble in water, readily soluble in alcohol and glacial acetic acid. The solution in concentrated sulphuric acid is yellowish-green, becoming magenta on dilution. On boiling with three times its weight of *p*-toluidine, it yields a safranine having the formula—



which separates from boiling alcohol in shining bluish golden crystals, insoluble in water, soluble in alcohol and glacial acetic acid, with an indigo-blue colour. The solution in concentrated sulphuric acid is green, becoming violet-blue on dilution. By boiling together chlorodiamino diphenylamine hydrochloride with 4-aminonaphthoquinone in alcoholic solution, shining bronzy crystals of 3-chloro-6.13-diaminophenylnaphthophenazonium chloride—



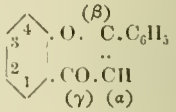
are obtained. The crystals are sparingly soluble in cold, easily in hot water and in alcohol, with a dark red colour, the solution in the latter solvent showing a faint brownish-red fluorescence. The green solution in concentrated sulphuric acid turns yellowish-red on dilution and bluer on neutralisation. When mixed with acetic anhydride, to make a thin paste, and allowed to stand 12 hours, it is converted into the acetyl compound having the formula given above. This product after crystallisation from alcohol forms shining brassy granules, readily soluble in water, and sparingly soluble in alcohol, with a red colour and brick-red fluorescence. The sulphuric acid solution is green, turning red on dilution. On treatment with nitrous acid and alcohol, and subsequent hydrolysis with sulphuric acid and separation as bromide, the product is converted into 3-chloro-13-aminophenyl-naphthophenazonium bromide—



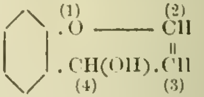
This salt crystallises from water in thin orange-yell plates or in dark metallic green granules or prisms. T solution in hot water is brownish orange-yellow, in alcol yellowish-brown. Both solutions taste distinctly bitter a show no fluorescence. Concentrated sulphuric acid d solves the salt with a reddish-violet colour, turning oran yellow on dilution and brownish-yellow on neutralisatic The shade of the dyestuff differs very slightly from that the unsubstituted phenylnaphthophenazonium. This another confirmation of the law that the introduction amino radicles into the phenyl attached to the azoni nitrogen has little effect on the shade of the azonium p duct. In this particular instance the effect is modifi though only to a slight extent, by the presence of chlor in the benzene ring.—T. A. L.

1.4-*Benzopyranol, the Parent Substance of a New Cl of Dyestuffs; Derivatives of* ——. *I.* C. Bülow H. Wagner. Ber. 1901, **34**, [7], 1189—1210.

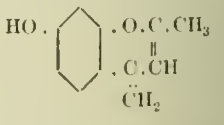
The parent substance of a number of natural dyest such as Apigenin (oxychrysin), Chrysin, and Luteolir Flavone (β-phenyl-benzo-γ-pyrone) having the c stitution—



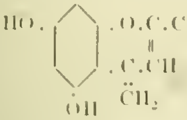
If the α hydrogen atom be replaced by hydro Flavanol is obtained, of which dyestuffs such as Fis Kaempferide, Quercetin, Rhamnetin, Isorhamnetin, Rh nazin, Morin, and Myricetin are derivatives. Reduc products of benzo-γ-pyrone (which v. Kostanecki t chromon) in which the ketonic oxygen is replaced : (H.OH) or by : (H₂) have not been produced hith by ordinary hydration processes from chromon derivat The authors, by condensing phenols with 1.3-diketone 1.3-aldehydoketones in presence of dehydrating ag obtain various derivatives of substituted [1.4-be dyranol] or 1.4-chromanol which is the name they to the parent substance, having the formula—



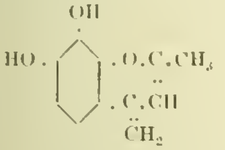
whilst [1.4-Benzopyran] or 1.4-chroman denotes a duct in which the CHOH group in the formula just is replaced by CH₂. In the present paper products described obtained from acetylacetone and resorcinol, ph glucinol, and pyrogallol, together with certain reactio these substances. For example, when resorcinol acetylacetone are treated in glacial acetic acid with hydrochloric acid gas in the cold for 45 minutes, anc melt, after standing, is stirred into alcohol, the h chloride of anhydro-2.4-dimethyl-7-hydroxy-[1.4-b pyranol] is precipitated. The salt is insoluble in and other organic solvents, but soluble in acid, alcoho water with a chrome yellow colour. It dissolves in centrated sulphuric acid to an almost colourless sol which, when dilute, exhibits an intense green fluores The base separates from an aqueous solution of the h chloride on adding sodium acetate as an orange amorphous precipitate having the formula—



When boiled with 10 per cent. potash lye it is d posed into resacetophenone and acetone which co the above constitutional formula. The product co with an equimolecular proportion of picric acid, and h boiled with acetic anhydride and glacial acetic a presence of fused sodium acetate yields an acetyl deri h, in concentrated sulphuric acid solution, shows only y faint fluorescence. No methyl derivative could be ned A similar series of compounds is produced from lacetone and phloroglucinol yielding anhydro 2.4-thyl 5.7-dihydroxy-[1.4-benzopyranol] having the ula—



e hydrochloride, $C_{11}H_{10}O_3HCl$, dissolves in sulphuric with a yellow colour showing no fluorescence. On nent with 10 per cent. potash lye it is decomposed acetone, acetic acid, and phloroglucinol, so that mably the 2.4.6-trihydroxyacetophenone first formed sequently decomposed into the two latter products. icric acid compound forms small yellow prisms, whilst iacetyl derivative is a yellowish-white amorphous r. On condensing acetylacetone with pyrogallol, athors obtain anhydro-2.4-dimethyl-7.8-dihydroxy-enzopyranol], of which the constitution is—



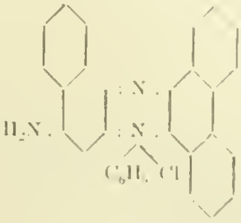
hydrochloride crystallises with 1 mol. of water in -red needles, and dissolves to a lemon-yellow solution hurie acid showing no fluorescence. The base es as a violet-red amorphous powder readily soluble nol, ether, and pyridine, sparingly soluble in benzene er, insoluble in light petroleum spirit. The products mposition with 10 per cent. potash lye are acetone llacetophenone, whilst the picric acid compound es in needles and the diacetyl product forms a sh-white amorphous powder. All these 1.4 benzo- derivatives yield leuco compounds, which are oxidised to the original colour bases. They all dye fibres, this property being most marked in the case yrogallol condensation product.—T. A. L.

nd Amino-Flavindulines ——. F. Kehrmann and . Eichler. Ber. 1901, **34**, [7], 1210—1217.

ING to Ger. Pat. 97,639, dyestuffs are obtained by ion of different amines on Flavinduline and on flavinduline. As already shown (Kehrmann and *de supra*), the amine radicle enters the benzene ring the trivalent nitrogen, and in the case of Naphthoine it is the naphthalene nucleus which is sub- forming derivatives of phenanthrorosinduline. hors have also studied the nitration of Flavinduline phthoflavinduline, reduced the nitro compounds and compared the green dyestuffs produced with eviously obtained from mono- and di-nitrophen-inone (Kehrmann and Kikine, Ber. **32**, 2633 ; this 1899, 1116). The action of fuming nitric acid on line for 5—10 minutes yields at least three different o derivatives, one of which, hitherto unknown, has ated in a pure state, and gives on reduction a new vinduline. The mixture contained in the nitration liquor was also reduced, and yielded a relatively ble amount of an aminoflavinduline already by Kehrmann and Kikine (*loc. cit*).

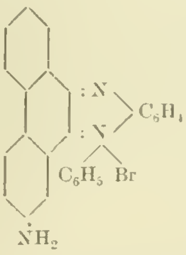
ction of piperidine on Flavinduline chloride in solution yields 3.piperidinoflavinduline. The of this product separates from water in dark-blue eedles, very easily soluble in water and alcohol to e non-fluorescent solutions. Concentrated sul-id gives a magenta solution, which on dilution orange-yellow, then green, and finally dark blue. uff gives indigo blue shades on tannined cotton fast to soap and acids, but is of no technical interest owing to its fugitiveness to light.

When phenanthraquinone is condensed with phenyl-*o*-naphthylene diamine hydrochloride in glacial acetic acid at the ordinary temperature, it yields Naphthoflavinduline chloride, which by the action of ammonia and air in alcoholic solution is converted into phenanthrorosinduline.

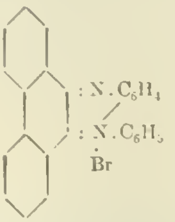


The substance crystallises from alcohol in long dark-red prisms with a characteristic bronze, sparingly soluble in cold, more so in hot water and readily soluble in alcohol to a magenta solution showing a faint dark-red fluorescence. The sulphuric acid solution is violet-blue, which becomes brownish-yellow and then red on dilution. The action of aniline at the ordinary temperature in alcoholic solution on Naphthoflavinduline chloride yields phenanthrophenylrosinduline in which one hydrogen in the amino group in the previous compound is replaced by phenyl. The product forms large coppery dark-violet crystals almost insoluble in water, soluble in alcohol, and in glacial acetic acid to violet solutions. Concentrated sulphuric acid dissolves the substance with a dirty blue colour which turns green on the addition of a small quantity of water, whilst an excess throws out the insoluble sulphate as a violet-blue precipitate leaving the solution colorless.

As already stated, the action of highly concentrated nitric acid on Flavinduline yields a mixture of nitroflavindulines, one of which separates as the nitrate from the alcoholic solution of the product of nitration in straw-yellow shining prisms. The nitrate is decomposed by boiling with water and dissolves in concentrated sulphuric acid with a dirty blood-red colour which becomes lemon-yellow on dilution. On reduction with stannous chloride, a yellowish-grey crystalline precipitate of the leuco tin double salt is obtained, which, on oxidation with ferric chloride, gives a precipitate of the ferrous chloride double salt of the dyestuff in shining greenish-black prisms. After treatment with sodium acetate and precipitation with sodium bromide, it forms shining dark-green prisms of the bromide. The product shows great similarity to the diaminoflavinduline of Kehrmann and Kikine (*loc. cit.*), and also to the Isorosinduline obtained by nitrating and reducing phenylisonaphthophenazonium (Ber. **33**, 1546 and 3277 ; this Journal, 1900, 654, and 1901, 115). It therefore probably has the formula—



It dissolves in water and alcohol with a yellowish-green colour, and in concentrated sulphuric acid with a cherry-red colour, becoming lemon yellow on dilution and yellowish green on neutralisation. The mother liquor from the above nitration on reduction gave a mixture of amino-flavindulines, of which the more readily soluble leuco product after isolation as the bromide, proved to be identical with the aminoflavinduline obtained from nitrophenanthraquinone and *o*-aminodiphenylamine (Ber. **32**, 2635 ; this Journal, 1899, 1116). The great similarity between this product and the Isorosinduline No. 13 (this Journal, 1901, 116) leads to the view that it probably has the formula—

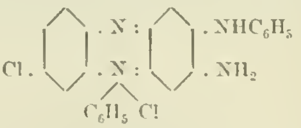


With regard to the sparingly soluble leuco tin double salt, of which only a small quantity is formed, it is to be noted that this is easily converted into a bromide, the solutions of which have a bluish-green colour.—T. A. L.

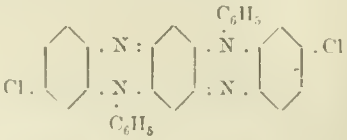
Fluorindines. F. Kehrmann and B. Guggenheim. Ber. 1901, **34**, [7], 1217—1221.

Although the Fluorindines hitherto known are well characterised, not only on account of the fine shades they give and their good crystallising properties, but also by their stability at high temperatures, still technically they have not found much employment, owing to their insolubility and their instability towards acids and soap. These properties are connected with the absence of basic or acid groups from existing Fluorindines, and the introduction of such groups should lead to the production of more valuable dyestuffs. Kehrmann and Hiby (*vide supra*) have already shown that the halogen in the azonium compounds from Laubenheimer's chloro-amino-diphenylamine is easily replaceable by aromatic and aliphatic amine radicles, and it was expected that a similar synthesis applied to Fluorindines obtained from chloro-*o*-phenylene diamine might lead to the desired result. Although the derivatives obtained do possess in a higher degree than the Fluoridines hitherto known the qualifications necessary, still these are not sufficiently marked to render the new products technically valuable.

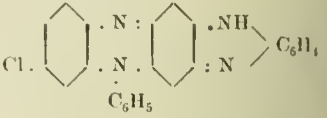
The authors start from chloroanilinoaposafranine chloride—



which they obtain by oxidising chloroaminodiphenylamine with ferric chloride in cold alcoholic solution, in the same way that anilino-aposafranine is obtained from *o*-aminodiphenylamine. The base separates from alcohol in pitch-black shining plates. The chloride crystallises from alcohol containing hydrochloric acid in greenish metallic needles sparingly soluble in cold water, readily soluble in hot water, and in alcohol with a blood-red colour. The solution in concentrated sulphuric acid is brownish-red, becoming reddish-violet on dilution with water. On heating the chloride with half its weight of Laubenheimer's diamine and 10 times its weight of benzoic acid to the boiling point of the latter, a pure blue melt is obtained from which dichlorodiphenylfluorindine was isolated either as mono- or di-hydrochloride.



The hydrochlorides (the mono, brassy needles, the dihydrochloride coppery scales) are almost insoluble in water, but readily soluble in alcohol, with a pure blue colour and a red fluorescence. The solution in concentrated sulphuric acid is cornflower blue. The base, insoluble in most solvents, separates from alcohol on adding ammonia to the hydrochloride in violet-grey needles. If Laubenheimer's diamine in the above synthesis be replaced by *o*-amino phenylamine, the resulting product is monochlorodiphen fluorindine, of which the dihydrochloride forms copp crystals, whilst the monohydrochloride is brass colour The mother-liquor contains a dyestuff belonging to isofluorindine series (Ber. **31**, 2442; this Journal, 1 32). The dihydrochloride is very sparingly soluble water, but dissolves readily in hot alcohol to a pure solution. On adding ammonia the colour turns mage with an intense brick-red fluorescence. The base crys lises from nitrobenzene and benzoic ester in reddish vi needles melting above 360° C. The condensation of chl aposafranine chloride and *o*-phenylenediaminehydrochlo yields chlorophenylfluorindine—



which gives only a monohydrochloride, crystallising metallic green matted needles, almost insoluble in w soluble in pure alcohol with a greenish-blue colour. base separates as a dark-red crystalline powder, spari soluble in alcohol, with a red colour and a strong brick fluorescence.

When dichlorodiphenylfluorindine hydrochloride is b with aniline and aniline salt, the two chlorine atoms replaced by aniline radicles yielding dianilinodiph fluorindine. The hydrochloride separates from bo alcohol in bronzy plates, insoluble in water, spar soluble in cold alcohol, with a Malachite Green colour. neutralisation with ammonia the solution turns a fine with a brick-red fluorescence, and, when sufficiently centrated, dark-blue crystals of the base separate The colour of the solution in concentrated sulphuric a ultramarine, with a red fluorescence. In a similar m anilinodiphenylfluorindine is obtained from chlorodiph fluorindine. The hydrochloride is insoluble in wate sparingly soluble in hot alcohol, with a pure green c The addition of ammonia changes the colour to violet with a fiery purple-red fluorescence. The sulphonat both these derivatives are crystalline substances, solu water with a bluish-green, and in alkalis with a cornfl blue colour, both solutions showing a strong fier fluorescence. The shades on wool are of no value, to their instability to acids and alkalis.

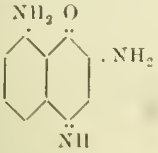
The authors have also attacked the problem allu at the commencement, starting from the nitro-, mono diphenylfluorindines, by adding potassium nitrate cold solutions of diphenylfluorindine and of pheny indine (this Journal, 1896, 536) in concentrated sul acid, and allowing the mixture to stand 12 hours. Th is then poured on to ice, the sulphate neutralised ammonia, and the base, after well washing with wa recrystallised from nitrobenzene, and finally washe alcohol. Nitrodiphenylfluorindine separates from nitrobenzene, in which it dissolves, with a dark-blue and a red fluorescence, as a greenish grey cry powder. The solution in concentrated sulphuric greenish blue, which remains unchanged on di Nitrophenylfluorindine separates from boiling nitrob in brownish-red golden scales. The solution in benzene is magenta coloured, that in concentrated su acid dark blue. The nitro group probably ente fluorindine nucleus, and not the phenyl group, si simplest fluorindine, triphenyldioxazine, gives simila derivatives, and, moreover, the entry of the nitro gr a considerable effect upon the shade, changing, respe violet-red into greenish blue and fiery red into mage

—T.

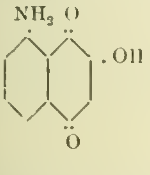
Isorosinduline No. 8 and some Derivatives of Tri Naphthol OH : NO_2 : NO_2 : NO_2 = 1.2.4.1'., *(tion of* ——. F. Kehrmann and E. Misslin. Ber **34**, [7], 1224—1233.

Having prepared aminorosindones from the 1.3.1 the 1.3.3'.4-trinitronaphthols (Ber. **33**, 3280; this

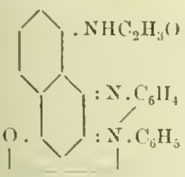
15), the authors have now investigated the 1.3.4′.4-naphthol obtained by Graebe and by Friedlaender 899, **32**, 2879 and 3530). The product on reduction new diaminonaphthoquinoneimine—



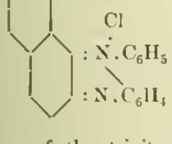
on boiling with ammonia, gives a mixture of -α- and -β-naphthoquinone, and on boiling with oda lye is converted into aminohydroxynaphtho-—



cetyl derivative of this substance condenses with diphenylamine to form 10-acetaminorosindone—



identical with the product formed by the action of soda lye on the acetyl derivative of the substance by nitrating and reducing phenylnaphthophen-(Ber. **32**, 2630; this Journal 1899, 1116). Hence iline No. 8 is 10-Aminophenylnaphthophen-and has the constitution of the above product after . Thus, with one exception, all the Isorosindu-now known, in which the amino group is present ond benzene nucleus not directly connected with ring. The missing isomeride is—



reduction of the trinitronaphthol (Ger. Pat. ie same method was employed as with the someride (Ber. **33**, 3281, 3287; this Journal,). The new 2.1′-diamino-1.4-naphtho-de has a yellowish blood-red colour, whilst that kstrand-Merz naphthopicric acid is cherry red, and he naphthopicric acid melting at 145° C., is dirty boiling with water the product loses ammonia, 'erted into a mixture of α- and β-diaminonaph-s, the latter predominating. The other two yield exclusively α-quinone. By boiling with a s of soda lye until ammonia is no longer evolved, hydroxy-1·4-naphthoquinone is obtained. This forms long, metallic, shining, greenish, dark-les, sparingly soluble in hot water, easily in acetic acid with a ponceau colour, and has well-d properties. It does not condense directly with ienylene diamine, but previous conversion into rivative rendered this possible, and the resulting ter hydrolysis, forms dark-red shining needles water, tolerably readily soluble with a yellowish lour in alcohol, benzene, and glacial acetic acid. lic solution shows a faint yellowish-red fluor-ilst the concentrated sulphuric acid solution is golden yellow, becoming red on strong dilution. On treatment with acetic anhydride it is converted into 10-acetaminorosindone, which separates from a mixture of alcohol and benzene in reddish-brown plates insoluble in water, sparingly soluble in alcohol and ether. The sulphate separates as a crystalline garnet-red precipitate. The same product is obtained by acetylating Isorosinduline No. 8, and hence the position of the amino group in this product is determined.

The mixture of the diaminonaphthoquinones above mentioned can be separated by means of the diacetyl derivatives. For this purpose the mixture is reduced with stannous chloride, treated with acetic anhydride, and finally oxidised with chromic acid mixture. The two diacetaminoquinones separate in brick-red plates interspersed with golden-yellow needles. Hot alcohol dissolves the α-quinone with a golden-yellow colour, whilst the β-compound remains undissolved. The latter is finally recrystallised from boiling glacial acetic acid. The two products differ considerably in their behaviour towards *o*-diamines, the β compound reacting as an *o*-quinone, yielding azines or azonium compounds, whilst the α-quinone, which melts at 225° C., behaves as a *p*-quinone and is indifferent. The 6.10-diacetaminonaphthophenazine obtained by condensing the diacetamino-*p*-quinone with phenylene diamine hydrochloride in alcoholic solution forms thin golden-yellow needles insoluble in water, very slightly soluble in hot alcohol, glacial acetic acid, and benzene, but soluble in boiling nitrobenzene, giving lemon-yellow, almost non-fluorescent, solutions. The orange-yellow colour in concentrated sulphuric acid turns brick-red on dilution with water. On hydrolysis with 50 per cent. sulphuric acid, the sulphate of the monacetyl derivative is obtained as an intermediate compound. The 6.10-diaminonaphthophenazine forms yellowish-red, shining, brassy needles insoluble in water, somewhat more soluble in boiling alcohol, glacial acetic acid and benzene with an orange-yellow colour and a very faint fluorescence. The greenish-yellow solution in concentrated sulphuric acid turns vermilion-red on dilution, and dirty violet-red on neutralisation. Diacetamino-*p*-naphthoquinone also condenses with *o*-aminodiphenylamine forming two azonium compounds which have not been completely investigated. The aminohydroxynaphthoquinone mentioned above also gives a condensation product with *o*-phenylenediamine. Its unexpected properties, however, suggest that it does not possess the formula of a hydroxyaminonaphthophenazine.

—T. A. L.

PATENTS.

Colouring Matters [Orange-red, Bluish-green] of the Anthracene Series, and of Intermediate Products relating thereto; Impts. in the Manufacture and Production of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 9081, May 16, 1900. (Second Edition.)

According to Ger. Pat. 112,115, amino-anthraquinone derivatives, when treated with formaldehyde in presence of sulphurous acid, yield sulpho-methylene-aminoanthraquinones. These products, on treatment with halogens, yield dyestuffs giving orange-red shades on wool from an acid bath. They are, however, of more importance as intermediate products in the formation of bluish to green dyestuffs, which are obtained by condensing these halogen derivatives with aromatic amines and subsequently sulphonating the condensation products. The following is an example of the method employed. A mixture of 100 kilos. of a 10 per cent. paste of 1.4′-diaminoanthraquinone, 300 litres of water, 10 kilos. of a 40 per cent. solution of formaldehyde, 27 litres of a 40 per cent. sodium bisulphite solution, and 47 litres of fuming hydrochloric acid (33 per cent.) is heated to 50°—60° C. until a red solution is obtained. After filtering from any unaltered diaminoanthraquinone, the dyestuff is salted out with sodium or potassium chloride. 100 kilos. of a 10 per cent. paste of this product is then stirred into 1,500 litres of water, mixed with 45 kilos. of bromine and stirred at the ordinary temperature until the whole of the bromine is taken up. The intermediate product formed is salted out with sodium or potassium chloride, after filtering the solution. This new [illegible] is soluble to a reddish-yellow solution in water, [illegible] a red precipitate with dilute caustic soda lye. The solution in concentrated sulphuric acid is green. The dyestuff gives orange-red shades on chrome mordanted or on unmordanted wool. In order to obtain a bluish-green dyestuff from it, 10 kilos. are dissolved in 100 kilos. of *p*-toluidine and boiled for 3—4 hours, when the melt becomes bluish-green. After cooling, the excess of *p*-toluidine is removed by means of alcohol, and the condensation product is sulphonated in order to convert it into an available dyestuff by heating with 10—20 times its weight of concentrated sulphuric acid (96 per cent. H_2SO_4) for about 12 hours to 50° C. The melt is then poured into water, the dyestuff filtered off and washed with brine until neutral. It gives bluish-green shades on unmordanted or on chrome-mordanted wool.—T. A. L.

Colouring Matters [Bluish-green, Green] of the Anthracene Series, and of Intermediate Products relating thereto; Impts. in the Manufacture and Production of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 10,316, June 5, 1900. (Second Edition.)

The method described in the preceding specification (Eng. Pat. 9081 of 1900) is applied to the mono alphylino-anthraquinone mono-sulphonic acids (in place of the sulphomethylene amino-anthraquinones) obtained according to Eng. Pat. 25,080 of 1899 (this Journal, 1900, 1102). The new dyestuffs are bluish-green to green, and dissolve readily to green solutions in water, which remain almost unaltered on adding sodium carbonate or caustic soda solutions.—T. A. L.

Dyestuff [Brown] containing Sulphur, and Material for Use therein: The Manufacture and Production of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 12,517, July 11, 1900.

When 1.4.2.6-dichlorodinitrobenzene is condensed with *p*-aminophenol, or with the sodium salt of *p*-aminophenol *o*-sulphonate in presence of sodium carbonate or acetate, a new dinitrochloro-*p*-hydroxy-diphenylamine or the sodium salt of its sulphonic acid is formed, which, on heating with sulphur and an alkaline sulphide, yields a dyestuff giving fast brown shades on unmordanted cotton. For example: 75 kilos. of *p*-aminophenol hydrochloride and 136 kilos. of sodium acetate in 800 kilos. of alcohol are mixed with 120 kilos. of 1.4.2.6-dichlorodinitro-benzene, the whole being cohobated for about two hours. On cooling, crystals of chlorodinitrohydroxy-diphenylamine separate out, readily soluble in alkalis, and precipitated from this solution by acids. The product crystallises from alcohol or benzene in ruby-red needles, melting at 175° C. The corresponding sulphonic acid, prepared preferably in aqueous or aqueous alcoholic solution, is soluble in water, and can be salted out as a reddish-brown precipitate. For the preparation of a dyestuff, 100 kilos. of the condensation product from 1.4.2.6-dichlorodinitrobenzene and *p*-aminophenol, 200 kilos. of sulphur, and 500 kilos. of crystallised sodium sulphide are slowly heated in an iron vessel at 140°—150° C., until the melt becomes dry, when it can at once, after grinding, be employed for dyeing. The product so obtained is soluble in water to a brownish-red solution, and separates as a brown flocculent precipitate on adding acids or ammonium chloride.—T. A. L.

Azo-Colouring Matters [Violet, Blue], and Material for use therein; the Manufacture and Production of ——. J. Y. Johnson, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 12,819, July 16, 1900.

The dyestuffs hitherto obtained by combining diazo compounds with 1.1′-naphthylene diamine sulphonic acids have no technical value, since they undergo some change on boiling in acid or alkaline solution or, in some cases, even on dissolving the sodium salt in hot water. The patentees find that much more stable compounds can be formed by first treating the naphthylene diamine sulphonic acids with acetone in dilute acid solution, and then combining them
with one or two molecular proportions of a diazo comp
The same result is obtained by treating with acetone
mono or disazo dyestuffs prepared in the usual manu
else a monazo dyestuff prepared from 1.1′-naphth
diamine sulphonic acid and a diazo compound, is t
with acetone and then combined with a further mole
proportion of a diazo compound. For example, a sol
of 170 kilos. of 1.1′-naphthylene diamine 3.3′-disul
acid sodium salt in 1,500 litres of water is slowly
at 60°—70° C. with 30 kilos. of acetone. When the re
is complete, the solution is cooled to 0° C. and treated
the diazo compound from 60 kilos. of *p*-nitraniline
dyestuff, which separates as a dark-blue precipitate,
violet shades on wool. The combinations may be perf
in the reverse order if desired, the dyestuff from diaz
p-nitraniline and 1.1′.3.3′ naphthylene diamine disul
acid being dissolved in sodium acetate solution an
treated with acetone. The disulphonic acid aceton
densation product combines with one molecular prop
of diazotised *a*-naphthylamine and one of *p*-nitranil
form a greyish-blue wool dyestuff, whilst with two mo
proportions of diazotised *p*-nitraniline a blue dyes
obtained.—T. A. L.

Amido-ammonium-azo-Dyestuffs [Yellow, Orange,
Violet]; Manufacture of ——. C. D. Abel L
From The Actiengesellschaft für Anilin-Fabri
Berlin. Eng. Pat. 11,922, July 2, 1900.

Basic azo-dyestuffs which dye tannined cotton
acids are obtained, according to the specification, b
bining diazo compounds with dimethyl-*m*-tolylene
1.2.4.$C_6H_3.CH_3.NH_2.N(CH_3)_2$ and converting the
stuffs so formed into ammonium derivatives by the
of alkylhalides or other alkylating agents at the c
temperature. Basic azo dyestuffs fast to acids ha
obtained hitherto according to the methods describe
following specifications: Eng. Pats. 22,572 of 18
Journal, 1893, 1023); 4545 of 1898 (this Journa
133); 14,491 of 1895 (this Journal, 1896, 587); 9
27,896 of 1896 (this Journal, 1897, 436 and 1011).
Ger. Pat. 90,310. *Dimethyl-m-tolylene diamine* is
by nitrating dimethyl-*p*-toluidine and subsequent r
of the nitro compound. It is soluble in most organic
and separates from light petroleum spirit in ag
of needles melting at 52° C. Equimolecular pro
of this product and of diazo benzene are combin
usual way and treated with sodium carbonate. A
of 25·4 kilos. of the well-dried product in 100
nitrobenzene is treated at the ordinary temperat
13 kilos. of dimethyl sulphate, when the new
separates as a thick crystalline mass. The nitr
is driven off with steam, and the solution is made
with sodium carbonate, filtered, and allowed to co
orange-coloured crystals of benzene-azo-amino-p
methyl-ammonium carbonate separate out. The
is readily soluble in water to a yellow solution, a
yellow shades on tannined cotton. The diazo ben
be replaced by other diazo, tetrazo, or diazo-azo co
yielding different shades.—T. A. L.

Black Azo-Dyestuffs for Cotton; Manufacture
O. Imray, London. From the Farbwerke vorm
Lucius und Brüning, Hoechst a/Main, Germa
Pat. 12,804, July 16, 1900.

Diazotised *p*-nitraniline or *p*-aminoacetanilide is
with the technical mixture of 1·3′- and 1·2′-napht
sulphonic acids, reduced with sodium sulphide
hydrolysed, and converted into the diazo comp
nitrous acid attacking the amino group in the ben
The diazo compound is then added to an alkalin
of aminonaphthol sulphonic acid G, and the dyes
out. It gives a violet-black shade on cotton from a
bath, and when diazotised and developed on the fi
a dark fast black. These products can also
outside the fibre by diazotising the dyestuff above
with one molecular proportion of nitrous acid
bining with one molecular proportion of a *m*-dia
this reaction the *β*-amino group of the G acid is
and not that of the *a*-naphthylamine sulphonic ac

dyestuffs may also be obtained by combining *p*-diazo- e-azo-α-naphthylamine sulphonic acid in an alkaline n with a Chrysoidine formed from equimolecular tions of diazotised aminonaphthol sulphonic acid G *m*-diamine, the azo group entering the G acid s. The dyestuff gives deep-black shades on unmor- cotton from an alkaline bath.—T. A. L.

mine Sulphonic Acids; Manufacture of New ——. nray, London. From The Farbwerke vorm. Meister, us und Brüning, Hoechst a/Main, Germany. Eng. 14,879, Aug. 20, 1900.

ETRIC diethyl rhodamine (from diethyl-amino- y-benzoylbenzoic acid and *m*-aminophenol) of Eng. 85 of 1895 (this Journal, 1895, 567), and methylated etric Diethyl-rhodamine of Ger. Pat. 109,883, from the cid and o-amino-*p*-cresol, when treated with fuming ic acid, are converted into sulphonic acids. For e, 10 kilos. of asymmetric diethyl rhodamine or of rochloride are gradually stirred into 60 kilos. of sulphuric acid (25—35 per cent. SO_3) at a tem- e below 40° C. After standing 12 hours the melt is into ice-water and the sulphonic acid salted out. duct has a metallic crystalline appearance, is some- ficultly soluble in water, but readily in alcohol and . It gives bluish-red shades on wool, the bath being austed.—T. A. L.

EXTILES: COTTON, WOOL, SILK, Etc.

Materials; Drying of ——. G. R. Smith. J. Soc. yers and Colourists, 1901, **17**, [5], 111—119.

drying apparatus the factors which influence the lrying are (1) the varying absorptive power of the to its degree of saturation, temperature, and ; (2) the flow and distribution of the air amongst erial; (3) the heat required for vaporisation of the the material; (4) the heat lost by conduction and ion from the walls of the drying chamber. It is o bring the heated air into close contact with the without losing much heat in other directions, for ast of air is strong, its time of contact with the is very short, as it only impinges on the material, place where the air impinges is over-dried before of the material has lost more than a small percent- moisture. On the other hand, if the blast is too penetrative effect is not great and the amount of carried off is small.

; is carried out at present at any temperature 80° and 160° F., and with great variation in cost. t as high a temperature as the character of the will permit is on the whole the best from an al point of view.

ctice, in drying material spread on a creel, it is nomical to blow air on to the upper side and force it downwards through the material, than to under the creel and upwards through the material. atter case there is a tendency for the air pressure e the passages of exit and find an easy means of hereas if the air be forced down through the there is a tendency to close such passages and air through the body of the material, with the t drying proceeds more quickly.

xperiments carried out on a large scale with the pes of drying machines practically employed, the ncludes, (1) that the most usual form of piece entering) machines are probably worked under possible conditions; (2) continuous warp drying are not economical from a heat-efficiency point (3) unsized warps are best dried in a stove with a liberal supply of air to cause the warps to ly on the poles; (4) in the stoves employed for ng, the front rows of hanks are usually dry long se at the air-exit end of the room. This defect bably be lessened by increasing the distance he rows of hanks; (5) the laundry type of drier efficient from a heat-cost point of view. In this ir heated by means of coke is driven through pipes under the wire net-covered table on which the material is spread.

Heating Air.—Assuming that the boiler pressure is 70 lb. per sq. in., each pound of feed-water will require about 1,150 units of heat (pound-degree Fahrenheit units) to convert it into steam, and considering that 1 lb. of coal supplies 12,000 units, each pound of coal will produce about 7 lb. of steam, or, when the boiler is fed with condensed water from the air-heater of the drying apparatus, about 9 lb. of steam. This last quantity of steam will part with 8,100 units of heat, which will raise the temperature of 540 lb. of air through 60° F. or 324 lb. through 100° F. The volume of 324 lb. of air at 60° F. is 4,200 cb. ft., and a fan passing this amount of air per minute through the air-heater would require, to run it, 600 lb. of coal per day of 10 hours.

The hot air may, however, be obtained practically without cost by drawing air through two or more rows of pipes placed in the boiler tube. An extended trial gave the following result:—Average temperature of furnace gases, 580° F.; temperature of the outflowing air at the rate of 1,000 cb. ft. per minute, 213° F. With furnace gases at the low temperature of 360° F. the temperature of the air would be about 110° F.

The author considers that in each works in the textile industry, including dyeworks, enough heat can be abstracted from the waste furnace gases to do all the drying required, except that kind which is done on steam-heated cylinders.

—R. B. B.

PATENTS.

Nitrocellulose Compounds; Preparation of Non-inflammable ——. A. M. Plaissetty, Paris. Eng. Pat. 9087, May 16, 1900.

THIS invention consists in mixing nitrocellulose with anhydrous salts of aluminium [chloride or nitrate], dried by heat, and, if desired, dissolved in alcohol. The aluminium salt may be applied directly to the nitrocellulose, or may be introduced with the solvent. The addition of these salts enables the nitrocellulose to be stored without risk, and effects a considerable economy in the quantity of camphor or other solvent required. The "aluminium-nitrocellulose" may also be used for the manufacture of artificial silk, and the process of denitration may be dispensed with; further, by subjecting the filaments to the action of ammonia or ammonia vapour, a fine lustre is obtained, and the filament is mordanted for dyeing.—J. F. B.

Mercerising Yarns; Apparatus for Use in ——. J. M. Ross, Glasgow, and J. Schneider, Galashiels. Eng. Pat. 9505, May 24, 1900.

THE apparatus consists of a large tank containing several compartments for the various liquors. Over each compartment grooved pulleys are geared, one set above the other in the liquor. The hanks are fed on to these pulleys, and a continuous tension is kept up. Between each compartment the material passes through gripping rolls to express the excess liquor.—C. M.

Mercerisation of Yarn; Apparatus for Use in ——. H. H. Lake, London. From K. Weldon, Amsterdam, Montgomery, U.S.A. Eng. Pat. 7480, April 11, 1901.

A CIRCULAR frame is provided round its circumference with means for screwing pairs of sleeves, on which the yarn to be mercerised is placed. The frame revolves horizontally, and the sleeves are automatically made to separate, thus stretching the yarn. During their passage round the frame they are sprinkled with the mercerising and washing fluids, and at the end of the cycle the tension is relieved and fresh yarn can be put on.

(See also this Journal, 1898, 149, 240, 345, 452, 573, 756, 840, and 1141; 1899, 36, 136, 267, 490, 680, 911, and 1122; 1900, 43, 144, 240, and 321; 1901, 469.)—C. M.

Textile Materials; Apparatus for Testing ——. H. Grandage, Bradford. Eng. Pat. 10,500, June 8, 1900.

A MACHINE in which the strength and elasticity of cloth, hanks or single threads, is tested by placing them between ws at a gradually increasing the load on them till they break. Devices are described for accurate measurements of the stretch and load producing the same. There are also devices for measuring the twist and stretch, at the same time or separately.—C. M.

Textile Materials; Manufacture of Lustrous and Variously Coloured Threads and Strips of ——. J. Imray, London. From Herberlein and Co., Wattwyl, Switzerland. Eng. Pat. 3861, Feb. 22, 1901.

Compound threads, consisting of proportions of cotton, artificial or natural silk, ramie, or mercerised cotton, variously coloured to suit the required purpose, are united by transparent agglutinants, such as gum, gelatin, collodion, dextrin, cellulose solution.

The threads are united by passing them, side by side, through the agglutinant and then squeezing out the excess. —C. M.

Cotton-seed Hulls; Treatment of ——, *and obtaining Certain Useful Products therefrom.* J. C. W. Stanley, London. Eng. Pat. 22,954, Dec. 15, 1900.

The process claimed consists in finely disintegrating the hulls from which most of the kernel has been removed, and separating the hulls, cotton, and residual kernel by successive dividing and sifting operations. The seed is first cracked, threshed, and screened to effect a rough separation. The hulls and cotton are next treated in a carding machine, and the residue on the screen ground to a fine meal and sifted. The fragments of hulls and cotton which have passed through the screen are also separated from the kernel by means of a sieve. The oil is then extracted from the meal and fibrous material by means of a suitable solvent.

Separate claims are made for the extracted cotton-hull meal and extracted cotton fibre thus prepared.—C. A. M.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, AND BLEACHING.

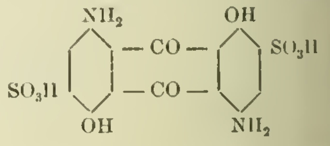
Lactic Acid; Application of —— *in Dyeing Aniline Black.* Report by A. Scheurer and A. Schoellkopf on a Sealed Note deposited by M. Goldovsky. Bull. Soc. Ind. Mulhouse, 1901 [March], 102—104.

M. Goldovsky proposes to replace, in dyeing Aniline Black, tartaric acid by lactic acid, on the grounds that its action is better, and that it does not tender the fibre. The authors have dyed two similar pieces of calico with (1) a black containing aniline, hydrochloric and lactic acids, sodium chlorate, copper sulphate, and ammonium chloride; and (2) a similar mixture in which lactic acid is replaced by tartaric acid. The pieces, after padding, were dried, oxidised, chromed, washed, and dried. Dynamometric trials were then made, and the fibre was found to have lost, in the case of the lactic acid black, 37 per cent. of its original strength, and the tartaric acid black, 40 per cent. Portions of the two pieces, and of similar calico undyed, were then boiled in carbonate of soda, 10 grms. per litre, for half an hour, and again tested. The white piece had now lost about 13 per cent of its strength, but the two blacks only an additional 2·3 and 1·7 per cent. respectively. This is accounted for by a fact of general observation, that certain operations, *e.g.*, steaming, or a passage through an alkaline bath, tend to reduce the tenacity of the fibre, but that, when this has once occurred, a second operation has little further effect. In the case under notice the operations of the dyeing process have determined this loss of tenacity for the blacks, and the alkaline bath for the white calico. The measure of the real tendering produced by dyeing black should be deduced from the second series of trials, and this would give for the lactic acid black 31 per cent., for the tartaric acid black 34 per cent. The two blacks do not differ in tone to an appreciable extent.—R. B. B.

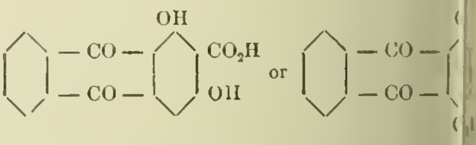
Dyeing of Oxide Mordants. C. Liebermann. Ber. 1901, **34**, [8], 1562—1565.

In the "Revue Générale des Matières Colorantes," 1901, **5**, 99, Buntrock takes exception to the Liebermann-Kostanecki rule (Chem. Ind. **6**, 724—726) regardi applicability of anthraquinone derivatives to the dye textile fibres impregnated with basic mordants. objections are, however, due to a misconception as scope of the generalisation. The rule simply state the dyestuffs which can be applied to indifferent veg fibres (cellulose), mordanted with iron oxide or al must contain at least two hydroxyl groups situated ortho-position with respect to one another; it inclu reference to the dyeing of unmordanted animal fibres

The examples cited by Buntrock support rathe disprove the rule. The dyestuffs produced by cond Quinizarin with 1 and 2 mols. of aniline yield sul acids which, when applied to wool, give practical same shades of colour whether the fibre is morda not. This result seems to indicate that there is no nation between the dyestuff and the mordanting oxi hence this case has no bearing on the validity generalisation. The application of diaminoanth disulphonic acid—



and diaminochrysazindisulphonic acid to cotton mo with chromium oxide or alumina corresponds v dyeing of this mordanted fibre with xanthop carboxylic acid (mujistin)—

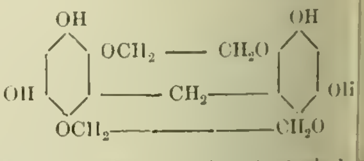


already noticed by Kostanecki and the author (l in the first case the sulphonic groups, and in the the carbonyl radicles are in the ortho positions ad the hydroxyl groups. These experiments show rule may be expressed in more general terms following manner. A dyestuff containing two radicles situated in the ortho position with re one another is capable of yielding a lake on i fibres mordanted with basic oxides.

The sulphonic group is, however, less effectiv respect than carbonyl or a second hydroxyl, owi greater solubility of the sulphonates. The above-n disulphonic acids, for example, yield only weal with alumina, the results obtained with the o thorium, zirconium, and beryllium being somewha — G.

Mordant for Basic Dyestuffs; A New ——. (F Bull. Soc. Ind. Mulhouse, 1901, April, 124—

When an excess of formaldehyde acts on reso presence of a small quantity of any mineral acid, m resorcinol is formed, a body which, according to Go (Chem. Zeit. 1900, **24**, 145; this Journal, 1900, the constitution—



This substance is capable of fixing the basic dy vegetable fibres.

Methylene-resorcinol is also formed by heating hours a dilute solution of resorcinol in formaldeh reaction is accelerated by the presence of any the addition of certain metallic salts, notably the c nitrates, bisulphates, thiosulphates, sulphocyan phides, permanganates, bichromates, and tung m and potassium. Its appearance varies according to ode of preparation ; when little acid is present it is , but with excess of acid, pink, and with metallic salts,). Prepared in the presence of a fibre or by simply g the solution it is brown-orange. It is readily fixed e fibre, and the shades are fuller than with tannin nt; the fastness to soap is superior to that of tannin s and the fastness to light about the same.

apply the mordant ,a solution is prepared, containing ns. of resorcinol, 800 c.c. of water, 200 c.c. of sodium bite 30° B., and 125 c.c. of formaldehyde 11° B. After ng for one hour the goods are padded in the solution en allowed to remain rolled up for about 30 hours dark, then rolled in the reverse direction and left other 30 hours, after which they are washed and dyed. lour is taken up very quickly, and it is advisable to r some time in the cold before raising the temperature.

n the mordant is used for printing, the colour is resorcinol and formaldehyde, and the fabric is sly prepared with sodium carbonate (10 grms. per Compared with tannin colours the shades are r and often fuller, similar in fastness to soap, but in fastness to light. Certain of the printing colours stable.—R. B. B.

nt for Basic Colouring Matters ; Report on *'avre's Process* (*see preceding Abstract*). H. Bourry. Soc. Ind. Mulhouse, 1901, April, 128—129.

LENE-RESORCINOL as usually prepared, is an orange- mass insoluble in all reagents. The time of ting depends on the strength of the bath employed. ernative method is to pad the fabric in a solution of resorcinol and sodium bisulphite and then expose for some minutes to the vapour of formaldehyde. C. Favre's improved mode of applying the mordant is to use 2·5 grms. of resorcinol, $\frac{1}{40}$ litre of water, $\frac{1}{40}$ litre of neutralised sulphated oil, and $\frac{1}{160}$ litre of caustic soda, and to add gradually $\frac{1}{32}$ litre of formaldehyde ; after 15 minutes the solution is diluted to 1 litre. The goods are padded, dried on the hot flue, passed through 1 per cent. sulphuric acid, washed and dyed. The depth and fastness of the colour are in proportion to the amount of resorcinol employed ; the shades are a little fuller than with tannin, but, except with Rhodamine, less bright, and they are very fast to soap.

The results in printing with Favre's mordant are very good, and the colours are fixed by a 10 minutes' steaming. The shades are as bright as with tannin, but less fast, and the instability of the printing colours is an objection.

—R. B. B.

Diazo Compounds ; Action of —— on Wool. J. Brandt. Bull. Soc. Ind. Mulhouse, 1901, April, 120—124.

WHEN wool is printed with a thickened solution or padded with an aqueous solution of a diazo compound, shades are produced varying from yellow to brown according to the nature of the diazotised amine employed. The monamines of the benzene series give, as a rule, yellow colours, whilst naphthalene derivatives yield browns. These colours are very fast to water and to soap, and are fixed by a simple drying ; steaming deepens the shade a little.

The nature of these colours on wool is best demonstrated by studying the action upon them of acids and alkalis. Dilute caustic soda and hydrochloric acid respectively bring about the following changes :—

Diazotised Base.	Colour obtained on Wool.	Action of HCl.	Action of NaOH.
....	Pale yellow	No action	Orange.
uidine	"	"	Orange-yellow.
idine		Orange-red	No action.
dine	"	Bright red	"
dine	"	Yellow	
obenzaldehyde..	"	No action	Orange yellow.
raphenylenediamine	Very pale yellow	"	No action.
raniline..	Yellow	"	Red.
aniline..	"	"	"
aniline	Deep yellow	"	Violet-red.
e	"	"	Brownish-red.
ne..	Yellow	"	"
toluene	"	"	"
ylamine	Brown	Violet-brown	No action.
ylamine	Brownish yellow	No action	"

lours changed by soda are restored to their original hydrochloric acid and *vice versâ*. The most ristic reaction, and one from which the nature of lours may be deduced, is that with the derivative itraniline, which forms a red-violet salt with caustic This is known to be a property of dinitrodiazo- ozene, and the author concludes that in the of the wool fibre, paranitrodiazobenzene is partially ted into paranitraniline, upon which the excess of body reacts to form dinitrodiazo aminobenzene, a ble substance absolutely insoluble in water. In se where the colour is affected by soda the on of the reaction is similar.

ylidines and naphthylamines show the inverse being changed by acid. It is well known that thylamines do not give diazo-amino derivatives e same conditions as the amines of the benzene it that there is an immediate formation of an o derivative. The brown shade obtained with phthalene is α-amino-azonaphthalene, the hydro- of which is violet-brown. With the corresponding nd, however, the hydrochloride is immediately d by water. With the xylidines the reaction is he diazo-aminoxylenes are almost instantly trans- nto amino-azo derivatives. The hydrochloride of o-*p*-xylene is red, whilst that of the assymetric ve is yellow.

esence of diazo-amino compounds on the fibre onfirmed by Witt's reaction. The dyed wool is steeped in an alcoholic solution of *m*-toluylene diamine and then treated with acetic acid, when the characteristic colouration of Chrysoidine is observed with paranitraniline, benzidine, dianisidine, &c., *i.e.*, with derivatives substituted in the *p*-position.

It thus appears that in the formation of colours of this kind on wool, the fibre only intervenes in the reaction as a feebly "reducing" (reconverting) substance. A similar reconversion may be brought about in solution by the addition of albumin, gelatin, or urine, but not by starch, glucose, &c.

Dinitro diazo-aminobenzene might well be used as an indicator in volumetric analysis, and about 1 c.c. of a 1 per cent. solution in alcohol gives a definite reaction. Its sensitiveness is quite equal to that of phenolphthaleïn, and the change from red-violet to yellow is sharply marked. The compound is readily prepared on a large scale, in fact it is often formed in fairly large amounts in a badly conducted diazotisation of paranitraniline, and is a frequent cause of trouble in printworks.—R. B. B.

Alizarin Blue Resist under Paranitraniline Red. M. Richard. Bull. Soc. Ind. Mulhouse, 1901, [March], 97—99.

A STEAM Alizarin blue colour containing bisulphites of chromium and sodium serves as a resist for Paranitraniline Red and in this way may be produced fast blue patterns on a red ground. After padding with alkaline *β*- naphthol the goods are dried in the hot-flue and printed with the above-mentioned resist suitably thickened. They are next passed through the ageing machine, after which the red is developed in the ordinary diazo bath; finally the pieces are aired, washed, soaped, and again washed. Certain dyestuffs which require after-chroming may be mixed with, or substituted for, the Alizarin Blue and in this case the pieces are chromed after the airing which follows the development of the red. this chroming does not affect the red.

The blue produced in this manner is very fast, it is not injured by boiling with soap for 1—1½ hours.

When blue and white on red are required, a resist containing potassium sulphite is printed in addition to the Alizarin Blue resist.

If the pieces are topped with a direct pink dyestuff, *e.g.*, Brilliant Geranine the red approaches a Turkey red in tone and the blue becomes fuller and brighter. This topping is carried out in the jigger at 80° C. in a colour solution containing 2 grms. per litre.

In place of the bisulphites of chromium and sodium may be employed potassium sulphite and chromium acetate or potassium sulphite and chromium sulphite. These two mixtures posess the advantage that they do not give off sulphur dioxide, a gas which is very injurious to Paranitraniline Red.

Most dyestuffs which are capable of being fixed by means of chromium can be similarly employed for resists under Paranitraniline Red. From certain other dyestuffs a coloured resist can be prepared containing sodium bisulphite together with an appropriate mordant. In one or other of these ways may be produced in fast colours a variety of effects in imitation of Turkey red discharge styles. —R. B. B.

Resists under Paranitraniline Red; Fast ——. M. Richard. Bull. Soc. Ind. Mulhouse, 1901, [March], 99—100.

The nature of these resists has been indicated in a previous paper (see preceding abstract). Experiments have been made to ascertain what dyestuffs will yield fast coloured resists comparable in brilliancy with tannin resists, and several such dyestuffs have been found. For green, Fast Green for steaming, can be used (Thaon); for yellow, Persian berries; for dark blue, Alizarin Blue and Chrome Violet (Bayer); and for pale blue, Chrome Blue (Bayer). Suitable mordants, *e.g.*, chromium or stannous acetate, are added to the printing colour, which also contains potassium sulphite and thickening. For white, a thickened solution of potassium sulphite alone is employed, and for black a thickened mixture of Fast Green for steaming, "Mordant for green," and Violet 90; a mixture which can be printed as an outline for the white without being discharged by the latter. The operations subsequent to printing have been described in connection with the Alizarin Blue resist. —R. B. B.

Resists under Paranitraniline Red. Report by L. Baumann on the work of M. Richard (see two preceding abstracts). Bull. Soc. Ind. Mulhouse, 1901, [March], 101—102.

The author has repeated the experiments of M. Richard, and has obtained satisfactory results. The fastness of the colours produced by this process is superior to that of the basic dyestuffs fixed by a steaming of equal duration; they withstand even the action of prolonged and energetic soaping. In brightness, however, they can scarcely compete with tannin or stannous chloride resist colours.—R. B. B.

Azo Colours; Application of [in Calico Printing] ——, on Manganese Brown. F. Binder and C. Zundel. Bull. Soc. Ind. Mulhouse, 1901, [April], 131—132.

The fabric is dyed with a ground of Manganese Brown by the usual methods, and is then padded in Sodium-β-naphthol. A resist is now printed containing stannous chloride, and in addition, tannin colours, if coloured resists be desired. By a passage through a hot chamber the brown is discharged; steaming must be avoided or the fibre is tendered and the naphthol volatilised. The fabric is dyed in diazotised paranitraniline or other diazo solution, soaped, and well washed.

The decomposition products of the diazo solution a tendency to soil the white and coloured resists, but may be entirely avoided by an addition to the bath o alkali bichromate in the proportion of about 20—25 g per litre.

The depth of the brown ground may be increased i finished goods by means of solutions of salts of aro amines, *e.g.*, aniline or benzidine; this treatment, how tends to dull the brighter colours. By reducing the b by means of stannous chloride or sodium bisulphit effect of the remaining colours of the design ma heightened.—R. B. B.

Azo Colours; Application of ——, on Manganese B Report on the Process of F. Binder and C. Zundel preceding abstract), T. Stricker. Bull. Soc. Ind. house, 1901, April, 130.

The author has obtained very satisfactory ground c and clear designs by the method described above. addition of a bichromate to the diazo bath is an esp useful improvement, and had been previously used b author in the production of discharged Paranitraniline The process of Binder and Zundel is to be recomm whenever the number of operations is not consider obstacle to its employment.—R. B. B.

PATENTS.

Bleaching or otherwise Treating Textile and other Mat Kiers for ——. C. L. Jackson, Bolton, Lancs. Pat. 14,174, Aug. 8, 1900.

With the object of regulating and controlling the circ of the bleaching liquor with greater efficiency and ec than in the ordinary arrangements, a cylindrical or vessel is divided vertically into two compartments, th of which is fitted with a coil of steam pipes, while th is connected near the bottom with two or more o low-pressure kiers placed preferably at a lower lev the heating vessel. Each kier at the bottom is co by a pipe to the receiver of a centrifugal pump co on the discharge side with the outer compartment heater.

When the pump is set in motion the bleaching li forced into the outer compartment of the heater. It heated until it overflows into the inner compartment it is conducted to the kiers and distributed evenly u goods, finally returning to the receiving side of the which again raises it into the heating vessel.

In some cases the steam coil might be placed inner compartment and the outer compartment co with the kiers; or coils might be placed in each comp of the heater.—R. B. B.

Bleaching; Appliances to be Employed in the Pr ——. F. Taylor, Doagh, Co. Antrim; A. Co B. W. D. Montgomery, Belfast; and The Process Bleaching Co., Ltd., Cornholme, Lancs Pat. 3518, Feb. 19, 1901.

A number of vats are employed, across the open which are rollers to carry the hanks to be b Mounted on one end of the rollers are worm wheel engage with and are driven by worms on a shaft the entire length of the apparatus. The rollers are a so that they are easily lifted out of gear with the wor Beneath the series of vats is a trough or pipe co to each vat by an open neck, which can be clo plug, and the trough is connected to a pump, which the liquors to a settling tank and past means for re where the chemicals to renew the vats are added, to trough above the vats. From the upper trough into each tank a pipe, the opening of which can closed by a plug. These plugs are pneumatic, an of a hollow cylinder containing a piston and piston handle, and on the hollow cylinder is a flange, wh on the pipe-neck or valve-seat, and below this fla hollow cylinder continues and terminates in a smaller flange capable of passing into the nec portions of the cylinder between the two fla perforated, and the flanges are covered by a piece bing, thereby forming an elastic chamber communicating th the hollow cylinder, so that by forcing down the piston, 1en the plug is loosely in the neck, air will be driven into is chamber and cause it to expand, forcing the rubber ainst the side of the opening. To retain the pressure so erted, the piston-rod handle may be held down by a ain.

Between two adjacent upper troughs are rubber gates or iices. The lower trough is provided with a waste opening, ised by a sluice gate, which carries on its inside face a bber bag, provided with a valve, so that when inflated the g closes the waste opening.—R. B. B.

eing Skins, Fabrics, Cotton, Wool or other Substance; Machine for and Method of Dipping and ——. W. Rut-enau and C. Hahlo, Ashton-under-Lyne. Eng. Pat. 13,027, July 19, 1900.

e primary object of this machine is to dye skins or hides ating the grain side only and leaving the flesh side cetically clean. The machine is stated to be also appli-ble to the dyeing of fabrics when one side only is to be ed.

The skins are suspended over carriers or arms attached the lower end of a rod, to which a vertical motion can be parted. The carriers with the skins are alternately ered into and raised from the dye-vat below, and the ving speed of the machine may be regulated to suit required duration of immersion in the dye liquor.

—R. B. B.

yeing of Textile Fabrics. L. Schreiner, Barmen Rit-rshausen, Germany. Eng. Pat. 14,518, Aug. 14, 1900.

e apparatus described, is intended as an improvement on "jigger," a machine with reciprocating motion for ing cloth in the open width, and it is designed to further penetration of the material by the dye liquor and to ble additions of concentrated dyestuff solutions to be le during dyeing, without risk of unevenness.

he improved jigger is furnished with a fluid motor, nged outside the dye-vat, together with suitable con-ing pipes between the motor and the vat, and an tional pipe for the additions of dyestuff opening into supply pipe. The dyeing solution is circulated in the aratus in alternate directions. If it circulate so that addition of concentrated solution enters the suction pipe ie motor, the two will be sufficiently mixed in the latter re entering the jigger. To prevent any contact of the ls with the unmixed fluids when the circulation is rsed, a heating pipe is introduced into the longer pipe ie motor, then acting as a pressure pipe, and the dyeing ion flows in between the motor and the heating pipe.

order to prevent any overflowing of the dyeing solu-the bottom of the jigger vat is formed like a pipe, slots for the passage of the articles, the pipe consisting, example, of a trough with a cover, which is almost ely closed.—R. B. B.

ng Gloves and the like; Process for ——. J. Müller, ologne, Germany. Eng. Pat. 2182, Jan. 31, 1901.

gloves are stretched and cleaned with petroleum spirit e usual manner and are then treated in, or brushed a solution of coal-tar dyestuff. Only such dyestuffs e employed as give with fatty acids compounds soluble etroleum spirit. The colouring bath is prepared by g a solution of 15 parts of the dyestuff in 1,000 parts rined petroleum spirit intimately with a mass made 10—15 parts of soap powder and 40—60 parts of ol, and heating in a water-bath to ensure solution. dyeing, the gloves are dried while being continuously d with the hand.—R. B. B.

g Cotton Slubbings and Rovings when wound upon bbins or Tubes; Method of and Apparatus for ——. E. Heys, Manchester. From J. Schmitt, Paris. nce. Eng. Pat. 6591, March 29, 1901.

slubbing is wound on hollow perforated bobbins, at one end, and mounted at their open ends in the plate of a closed chamber which communicates with vated reservoir. The closed chamber is immersed in the dyeing or mordanting bath, and air is exhausted from the reservoir, causing the solution to pass through the cotton and the bobbins to the chamber, and thence to the reservoir. When an air valve in the reservoir is opened, the liquid flows back, under the action of gravity, through the cotton into the vat. These operations are repeated as often as required.

It will be found convenient to have three vats in a series since it is frequently necessary to employ three baths in dyeing.

The cotton is wound on the tubes in such a manner that coned ends are formed. To prevent uneven dyeing, due to the varying thickness of the layer of cotton, a particular perforation of the tubes is employed. From the base to the apex of the cone the holes are made, step by step, smaller and less numerous in proportion as the cotton layer diminishes in thickness.—R. B. B.

Dyeing Black; [with Sulphide Colours], Process of —— A. G. Green, A. Meyenberg and The Clayton Aniline Co. Ltd., Manchester. Eng. Pat. 15,413, Aug. 29, 1900.

The tendering of cotton dyed with the sulphide blacks is generally considered to be due to sulphuric acid formed by the oxidation of finely divided sulphur deposited on the fibre during dyeing (Chapuis, J. Soc. Dyers and Colourists, 1900, 84; this Journal 1900, **19**, 439).

According to the present invention this tendering action is prevented either by adding a substance capable of removing the sulphur, or preferably by entirely avoiding the presence of sulphur or sulphides in the dyebath. The first condition is secured by adding to the bath just sufficient normal sodium sulphite to combine with the sulphur present and to produce innocuous sodium thiosulphate.

The presence of sulphur is avoided altogether by employing a mixture of glucose, caustic alkali and normal sodium sulphite, the two former to bring about reduction and the last to dissolve the dyestuff. It is inadmissible, however, when using glucose to employ a dyestuff which contains an admixture of sulphides, as is usually the case with the commercial sulphur dyestuffs prepared by the melt process, and the colour should be employed in the free state as obtained by purification of the crude colour melts. For the same reason the glucose process is especially applicable to the class of sulphur dyestuffs which are prepared by means of thiosulphate without the employment of sulphur or sulphides, and which are consequently pure products.

—R. B. B.

Calico Printing [with Sulphide Colours]. A. G. Green, A. Meyenberg, and The Clayton Aniline Co., Ltd., Manchester. Eng. Pat. 15,414. Aug. 29, 1900.

A process by means of which black, brown, and other colour prints can be readily produced with certain of the sulphide dyestuffs, especially the particular class of these in which the sulphur is introduced by means of thiosulphuric acid., (Eng. Pats. 21,832 and 22,460 of 1898, 5039 and 18,658 of 1899; this Journal 1899, **18**, 909; 1900, **19**, 141 and 816). The dyestuff (insoluble in water), for instance "Clayton Fast Black," is dissolved in a strong, boiling solution of sodium sulphite. The solution is thickened, *e.g.*, with starch, and, when cold, is mixed with glucose and a caustic alkali. This paste is printed on the goods, which are then steamed and washed, and the colour is fixed if necessary in a solution containing a copper salt, or a chromate, or a mixture of both. Instead of adding glucose to the printing paste, the glucose may be applied to the material by a preliminary padding and drying. The last method is specially suitable when Indigo is to be printed simultaneously with black according to the Schlieper and Baum process, and in any case when the duration of the steaming is very short.

It is claimed that the prints obtained by this process are remarkably fast to washing, soaping, and light, and that the blacks, when fixed with copper salts are as fast as Aniline Black, and have the advantages over the latter that they do not tender the fibre and are ungreenable, also that they can be applied when Aniline Black is excluded, as for instance in printing together with Indigo or Paranitraniline Red.

R. B. B.

Polychromatic Printing; Compounds and Machines to be employed in ——. W. G. White, Anerley, and R. A. A. White, Rotherhithe. Eng. Pat. 13,145, July 20, 1900.

This invention relates to the well-known polychromatic printing, in which solid blocks or sheets of composition containing the colouring matters are employed. The composition consists of stearic acid, 30 parts; pela (vegetable wax), 20 parts; pale boiled linseed oil, 15 parts; clear resin dissolved in turpentine, 25 parts; and anhydrous sodium carbonate, 10 parts. The first four ingredients are mixed and well melted together, and, after partly cooling, the soda is added and mixed by grinding. To 30 parts of this mixture are added 20 parts of Fuller's earth or French chalk. The dyestuffs, which are usually Alizarins, are mixed with acetate of chromium and the above composition, the whole well ground together, and passed through fine wire sieves.

The colour composition so formed is cut in the designs required according to the lengths of the repeats. The blocks of colour are made from 2 to 6 ins. thick, and these blocks are split horizontally into sheets of the required thickness. The sheets are placed on slabs of wood covered with glazed cloth, and lowered on to the top of the cylinder of the printing machine. The cylinder is made to slowly rotate, and the colour composition is transferred to the cylinder in the form of an endless band 6 yds. in circumference.

Before passing to the cylinder, the fabric passes over a damping roller, by means of which it is damped with turpentine, and it then passes between the printing cylinder and pressing rollers.

Improvements are described intended to regulate the speed of the cylinder and the pressure on the fabric. The apparatus for these purposes consists of a toothed wheel co-axial with the cylinder, a series of pinions gearing with the wheel, plates fixed to the sides of the pinions, a series of pressure rollers arranged round the cylinder and pivotted to the plates eccentrically to the pinions, a pinion driving the wheel, a ratchet wheel fitted to the pinion, a weighted arm free to rotate about the axis of the pinion, and a pawl pivotted to the arm and engaging with the ratchet wheel.—R. B B.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphur Industry in Sicily. M. E. Jungfleisch. J. Pharm. Chim. 1901, **13**, [11], 497—506.

"Gill's" method of sulphur recovery has now been largely adopted in Sicily, and has the great advantage of not being intermittent in its action, whilst economy of sulphur is effected. Gill's apparatus is composed of four separate elements, consisting of high cylindrical furnaces terminating in spherical heads. They are arranged in a square, close together, and communicate by a series of pipes provided with dampers. The arrangement is such that the gases, after having passed through the first furnace, pass into the second, and thence into the third and fourth. By regulating the dampers, each furnace can in turn be made the first Under these conditions, when the first furnace has its charge exhausted of sulphur, it can be disconnected from the series, emptied, recharged, and made the end furnace. Each furnace has a shaft 2—3 m. high, by which the gases can escape when the furnace forms the end of a series. The combustion of a portion of the sulphur furnishes the gases partially deprived of oxygen, with sufficient heat to burn the sulphur in the second furnace, also heating the material in the third and fourth. The molten sulphur is tapped off at the base of the furnaces. Before charging the furnaces, the mineral is made into a dough with a little clay, and moulded into briquettes, which are rapidly dried in the warm air over the furnaces.

Several other methods have been attempted. Solvents, as carbon bisulphide, have been employed, but not successfully. Dubreuil attempted the extraction of sulphur by treating the mineral with a hot solution of calcium chloride of such a strength that its boiling temperature exceeded
that of molten sulphur; but the loss of saline solut
very great, due to retention by the exhausted minera
The only method not involving the production
phurous gases consists of extraction of sulphur by tr
with steam under pressure. This operation is cond
sheet iron cylinders, mounted on trunnions, and fitt
steam-tight covers. The cylinders are charged
vertical position, then, after fitting on the cover, t
turned to the horizontal, and connected to the steam
When the operation is sufficiently advanced, a
opened, the sulphur being forced out by steam
into moulds. When the operation is finished, the c
are inverted, thus emptying the charge. This me
only applicable to rich minerals, and not to min
which the sulphur is in a finely divided condition.—

Sulphuric Anhydride; Apparatus for the Produ
——. Badische Anilin und Soda Fabrik, Ludwig
on-Rhine, Germany. Ger. Pat. 119,059 July 2
From Zeits. angew. Chem. 1901, [17], 422—423.

Referring to the production of sulphuric anhydri
Journal, 1901, 360—362), a means is described fo
buting the catalytic material in the reaction cha
that each particle of gas must pass through a large
catalytic material permanently maintained in a l
porous condition.

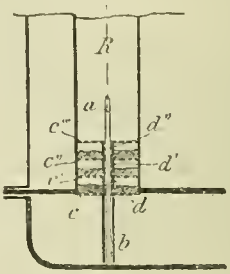


Fig. 1.

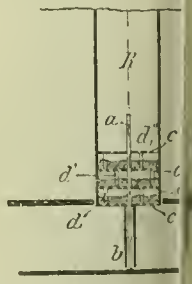


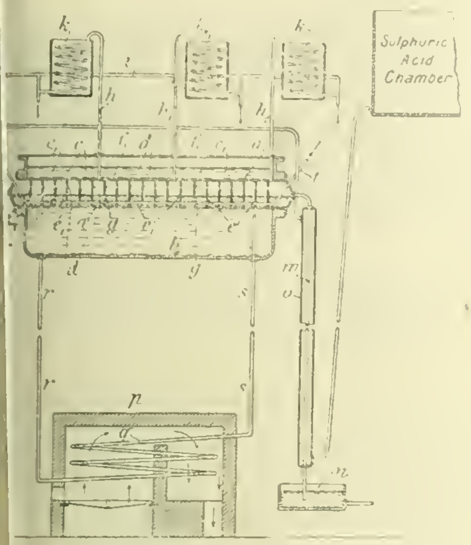
Fig. 2.

The method of distribution is shown in the accon
blocks. A guide rod, *a*, passes through the chamb
rests on the lower cover. In charging the chan
tube *b* is first slipped down the rod. This is follow
perforated plate or tray c, on which is then spread
contact material to cover the perforations, and
annular space between the periphery of the tray
tube R. A short length of pipe, *d* (Fig. 1), or
d (Fig. 2), is passed down the guide rod, and
tray introduced, charged, &c.—J. S.

Sulphuric Acid; Apparatus for Concentrati
G. Krell, Bruchhausen, b. Hüsten i. W., German
Pat. 118,880, Jan. 4, 1900. From Zeits. angew
1901, [17], 423—424.

The chamber acid, after passing through the he
changer o, enters the lead concentrating pipe *a*,
heated in the oil-bath *b*. The concentration tak
in vacuo, the pipe *a* being connected with the vacu
i through *h k*, h_1 k_1, &c. In order to prevent the c
the concentrating pipe *a*, it is strengthened by p
lead discs *c* and c_1, alternating with each other. T
perforations *d* are provided for the escape of th
whilst the lower perforations, *e* and e_1, allow th
flow along the tube, and at the same time alter the
of the flow. By means of the discs, *f* and f_1, th
chamber is divided into three parts, and the
escaping from these are condensed in three co
k, k_1, and k_2, giving acids of different strengths. H
to hasten the evaporation, are forced through the
means of the perforated pipe *t*. Chamber acid e
concentrating apparatus at 50° B. and leaves it at 64
through the fall tube *m*, which must be at least 5

, and the lower end of which dips into the reservoir
ie oil-bath is maintained at the proper temperature



as of the heating coil q and the circulating pipes
S.

ng Liquor; Electrolytic Preparation of ——. Consular Reports, June 1901, **66**, [249], 265—

nited States Consular Agent at Eibenstock, Ger-
escribes the apparatus of Oettel and Haas and Stahl
preparation of a hypochlorite bleaching liquor by
trolysis of sodium chloride solution. The electro-
h consists of a trough or box of slate mounted on
is in a suitable frame; the electrodes are placed at
ends of the trough, which is provided with an inlet
brine and an outlet for the sodium hypochlorite
. Thermometers are suspended in the trough near
t and outlet, and it is stated that the readings
the strength of the hypochlorite solution, every rise
corresponding to 1 grm. of available chlorine per
bleaching liquor containing 3 grms. of available
per litre can be prepared in 10 hours from brine of

g the advantages claimed for the solution prepared
bove method over ordinary bleaching liquor are :—
s cheaper and possesses a higher decolorising or
g power, owing, it is stated, to the presence of free
rous acid. (2) It has no injurious action on the
he latter only lose about 2 per cent. in weight, as
3 per cent. by ordinary treatment. (3) Salts of
magnesia are not deposited on the goods during
g.—A. S.

sation from Complex Salt Solutions at Constant rature, with Special Reference to the Natural Deposits. J. H. van't Hoff. Zeits. angew. Chem. **14**, [22], 531—537.

hor discusses the behaviour of a solution containing
salts, such as occur in the Stassfurt salt deposits,
aporated at a constant temperature. From the
obtained it is then shown how the coexistence of
minerals in natural deposits can be explained.
—J. S.

Carbonate; Formation of ——. Contributions to eory of Technical Processes. G. Bodlaender and ull. Zeits. angew. Chem. 1901, **14**, [16], 381— d [17], 405—413.

ur illustrates in detail the modern conceptions of
chemistry, by reference to the principal reactions
mmonia-soda process.

The free energy of the reaction, $HCl + NaHCO_3 = NaCl + H_2O + CO_2$, calculated by two independent methods, for a temperature of 20° C., and for the carbon dioxide at half an atmosphere pressure, was found to be 38,180 Joules or 51·88 horse-power seconds, whilst a direct electrometric measurement gave the value 38,472 Joules or 52·27 horse-power seconds.

During the reaction, 4,020 Cal. are absorbed, whilst indirect estimations place the value at 6,200 Cal. From the negative value of the heat of reaction and the positive value of the free energy, the temperature co-efficient of the latter was calculated to be 0·001925. Direct measurement showed that the E.M.F. of the cell, platinum | H_2 and CO_2 | 0·12 normal HCl in saturated NaCl solution | saturated solution of NaCl and $NaHCO_3$ | H_2 and CO_2 | platinum, was 0·3985 volt at 20° C., with a temperature co-efficient 0·00205.

The solubility of sodium bicarbonate at 20° C., in solutions of sodium chloride and in the presence of carbon dioxide under one atmosphere pressure is given in the following table :—

Specific Gravity.	1 Litre Solution contained $NaHCO_3$.	For each 1,000 grms. of Water, the Solution contained :			
		NaCl.		$NaHCO_3$.	
	Grm.-Mol.	Grm.	Grm.-Mol.	Grm.	Grm.-Mol.
1·0582	1·092	0	0	94·92	1·130
1·0584	1·045	5·859	0·1000	90·98	1·083
1·0604	0·99	11·73	0·2008	86·10	1·025
1·0646	0·859	29·49	0·5045	74·30	0·8845
1·0731	0·672	59·54	1·019	58·83	0·7003
1·0969	0·428	122·75	2·082	38·04	0·4528
1·1548	0·1905	254·8	4·360	17·63	0·2099
1·1948	0·1210	358·6	6·130	10·76	0·1280

It was found that the concentration of the ions in strong salt solutions is not an accurate measure of their relative active masses, which are often much greater. The free energy of formation of some compounds has been calculated by the authors, who point out that this must first be ascertained for all compounds, before it will be possible to predict what reactions may take place, and the most suitable conditions to be observed.—J. S.

Alkali; Investigations on the Electrolytic Production of ——. G. Adolph. Zeits. für Elektrochem. 1901, **7**, [44], 581—589.

An electrolytic process has been described (this Journal, 1898, 1147) for producing alkali without the aid of a diaphragm. The dense causticised alkali chloride is formed at the cathode outside a bell-shaped vessel containing the anode.

The author describes in detail the result of laboratory experiments in which potassium chloride was electrolysed, using, 1st, a platinum anode; 2nd, a carbon anode, contained in a tall, narrow bell jar; and 3rd, a carbon anode in a low, wide bell jar. The current efficiency in the first two cases ranged between 99 per cent. and 85 per cent. respectively. In order, however, to produce alkali practically, the third method must be adopted. One experiment, lasting seven days is described, the details of which are as follows :—

The cathode compartment consisted of the lower part of a bottle 19 cm. in diameter, which was provided with an overflow aperture 11 cm. above the bottom. Inside the cathode compartment was suspended a bell jar 13 cm. in diameter, containing a flat carbon anode exposing a surface of 54 square cm. to the electrolyte. The top of the bell jar was provided with a cork containing a leading tube for carrying off the chlorine gas, and also a tube for the admission of fresh electrolyte. The electrical connection to the anode, which was suspended 7 cm. above the lower edge of the bell jar, also passed through the cork. The cathode consisted of a ring of iron wire 8 mm. in thickness, encircling the bell jar, and suspended 1 cm. above the lower edge.

The first charge of the cell was $2\frac{1}{2}$ litres of potassium chloride solution, containing 27·52 per cent. of KCl. After electrolysing for two days, with a current strength of two res, the liquor in the neighbourhood of the cathode contained caustic potash equivalent to a double normal KOH solution. When this stage was reached, a continuous stream of fresh electrolyte was admitted into the upper part of the anode electrolyte at the rate of 1 litre per day, whilst the causticised chloride overflowed at the opening provided in the cathode chamber.

The neutral stratum or interface between the denser caustic liquor and the slightly acid liquor in the neighbourhood of the anode, was at first about 4 cm. above the lower edge of the bell jar. During the first 24 hours it was displaced upwards by about 0·5 cm., but as soon as the addition of fresh electrolyte was begun, it gradually fell to its original position, and then remained there during the rest of the run. The constancy in the position of the interface indicates an approximately constant concentration of the caustic potash running off.

The chlorine gas and the caustic liquor were tested from time to time, the results being as tabulated below:—

Copper deposited in copper voltameter	386 grms.
Total KOH produced	559·34 grms.
Current efficiency	82·10 per cent.

E.M.F. of Cell.		Impurities in the Chlorine.		
After	Volts.	After	CO_2.	Oxygen.
			Per Cent.	Per Cent.
2 hours	4·00	8 hours	2·5	0·6
24 „	4·08	24 „	3·2	1·0
48 „	4·29	32 „	4·0	3·0
49 „	4·08	48 „	10·2	7·3
53 „	4·00	53 „	3·6	1·8
72 „	4·00	72 „	2·0	1·6
7 days	4·00	7 days	2·0	1·4

The caustic potash liquor contained hypochlorite equivalent to 0·22 per cent., and chlorate equivalent to 2·49 per cent. current efficiency. The average amount of undecomposed potassium chloride in the causticised liquor was 17·5 per cent.

In order to maintain the uniform current strength of 2 ampères, the tables show that it was necessary to raise the E.M.F. during the first 48 hours. At the same time the impurities in the chlorine gas gradually increased. As soon, however, as the addition of fresh electrolyte was commenced. the E.M.F. fell to and remained constant at its original value. The impurities in the chlorine also rapidly diminished to a fairly low amount, which is, of course, dependent on the nature of the carbon anode employed. At the conclusion of the experiment the strength of the potassium chloride immediately underneath the carbon anode was 20·52 per cent. of KCl.

The origin of the hypochlorite in the caustic liquor finally obtained, is due to the presence of dissolved chlorine in the electrolyte descending from the anode, and its presence was found to be desirable rather than otherwise. Owing to disintegration of the anode the caustic liquor was slightly brown in colour, but, on evaporating this liquor for the purpose of separating the potassium chloride, it became colourless, since the organic matter present, was oxidised at the expense of the hypochlorite.—J. S.

Potassium Persulphate; Action of Anhydrous Sulphuric Acid upon ——. A. Bach. Ber. 1901, **34**, [8], 1520—1522. (See also this Journal, 1900, 172, 278 and 777; 1901, 578.)

The liquid obtained by the action of strong sulphuric acid upon potassium persulphate reacts energetically with a solution of permanganic anhydride in sulphuric acid; when the liquid is titrated with the permanganic anhydride solution, it is found that the whole of the active oxygen of the persulphate is evolved, and that the volume of oxygen obtained exceeds that calculated from the relation Mn_2O_7 : 5O (active) by about one-third. This excess of oxygen is not due to a catalytic decomposition of persulphuric acid (Ber. **33**, 3111). The author has now carried out similar experiments, using anhydrous sulphuric acid through the results are practically identical with those quoted ab Thus the presence of water is without influence on reactions involved.

The product of the action of anhydrous sulphuric upon potassium persulphate gives the peroxide reac with titanic acid also dissolved in anhydrous acid, w the persulphuric acid solution, when diluted with w (cooling with ice), does not give the titanic acid reac and acts but slowly on permanganate. Persulphuric does not react with titanic acid. Thus, in the actio anhydrous sulphuric acid upon potassium persulpha compound is produced, which behaves towards titanic and permanganate in a similar manner to hyd peroxide.—A. C. W.

Chlorates; Decomposition of ——. *IV. The Sup "Mechanical" Facilitation of the Decompositio Potassium Chlorate.* W. H. Sodeau. Proc. Chem. **17**, [239], 149.

The supposed analogy between the decompositio potassium chlorate and the boiling of water, in respe the facilitating action of certain powders, is invalidat the fact of the former not being appreciably facilitat reduction of pressure to 1 mm. (Trans. 1900, **77**, There would seem to be a possibility of chemical actio all substances known to produce a marked effect on th of decomposition of potassium chlorate.

From an experiment in which 1 per cent. of b sulphate was added and a 500 per cent. increase o observed, Veley concludes that "chemically inert" po facilitate the decomposition (Phil. Trans. 1888, **179**, 270).

The author has studied the effect of adding 1 per ce barium sulphate, and finds that the average increa rate amounts to only 16 per cent There is evidence formation of a little barium chlorate by double deco tion, and this would appear to account for the facilitation observed.

It is concluded that the supposed ability of chem inert solid particles to facilitate the decomposition of sium chlorate is unsupported by experimental evidenc if actually existent, is inadequate to explain even a fraction of the effect of the oxides of manganese cobalt, nickel, and copper. The action of these substances would, therefore, appear to be entirely ch

Ammonium and other Imidosulphites. E. Divers an Ogawa. Proc. Chem. Soc. 1901, **17**, [240], 16

The authors have already called attention to the occ of ammonium imidosulphite amongst the products decomposition of ammonium amidosulphite, and have some account of the salt (Proc., 1900, **16**, 113). Th separate it by dissolving it out with warm 90 pe alcohol, after having used 95 per cent. alcohol to some other crystalline matter and the red substanc working in this way, the imidosulphite is obtained a almost pure, requiring only to be washed with alcoh forms minute, very thin, glistening prisms, somewh liquescent, neutral to litmus and of mild sulphurou Heated in the dry state, most of it decomposes, but occurs in the sublimate along with pyrosulphite. residue left on heating it up to 150° consists of s sulphate, and imidosulphate. The salt is very sol water, and slowly decomposes in solution. Boiled with chloric acid, it yields sulphur, sulphur dioxide, and sulphuric acid, the sulphur and sulphur dioxide rep ing, no doubt, decomposed thiosulphate, 2NH(SO N OH_2 = $2NH_2SO_3NH_4$ + $S_2O_5(NH_4)_2$. Ammonium sulphite gives a barium precipitate soluble in hydr acid. Potassium imidosulphite and barium am imidosulphite have been prepared, and are cry soluble salts.

Perchlorates; Electrolytic Production of F. Winteler.

See under XI. A., *page* 725.

PATENTS.

uric Acid; Manufacture of Concentrated ——. A. mer, Laeken, Bruxelles, Belgium. Eng. Pat. 7999 ril 18, 1901.

invention is concerned with the concentration of sul- acid that has already attained a density of 60°–62° B., 66° B., by placing it in pans mounted in the flues for ses discharged from the roasting furnace, either directly pyrites furnace, or between that and the Glover tower chamber. The pans may be arranged in series, so that id of 60° B. may enter the least heated pan, and then sively the other pans in a direction opposite to the f the gases. The pans are preferably of cast iron, with sheets or films of platinum or gold; or with roof porcelain The acid may be brought to a density B. in the lined pans, and be then further concen- in unlined pans. The pans are covered with suitable having outlets for the escape of aqueous and acid s into the Glover tower or chamber. E. S

n Salt (Chloride of Sodium), Obtaining ——, in a e State from Rock Salt or Impure Salt. A. W. ton, New York, U.S.A. Eng. Pat. 3866, Feb. 28, 0.

npure salt is placed on the hearth of a closed furnace, at one side an opening for admission of a "gaseous lame," and of air to support combustion under re; and at the opposite side a channel leading to a er which receives the volatilised salt, which is brought ntact with cool air or gas, "whereby granular-like es of pure salt are formed and deposited." The r over the hearth of the furnace is provided with ning secured by a door, through which opening the salt is charged in.—E. S.

n Hydrate, Production of ——; and Apparatus for. W. Schulthess, Zürich, Switzerland. Eng. 12,182, July 5, 1900.

paratus consists essentially of a steam-jacketed sheet- linder, having at one end a large hopper with ting lid, containing a shaking screen, and at the e to the cylinder a sheet-iron box mounted on a pivot, ith some such non-heat conducting material as saw- horizontal shaft traversing the lower part of the r, on which mixing and conveying blades are d; a valved water pipe in the upper part, from the which the charge may be sprayed; an outlet shoot, l by a steam-tight box door; and an opening with a alve between the cylinder and its jacket, besides ry features.

finite charge of lime (always the same quantity) is on the sieve of the hopper, and a portion of the ed quantity of water required for the whole charge. kled upon it; the hopper is closed, and after a time er-mounted sieve is operated; the remaining lumps in moistened and the process is repeated. The cylinder being then closed, steam is admitted to the and the mixing and conveying blades are set in whereby the lime is spread out. The remainder of r is then sprayed in, and the steam evolved passes jacket, there being no condensation of water within nder. Dry steam is admitted, and at intervals the apparatus (which can operate to and fro) is worked. he slaking is complete, the slaked lime is discharged ed.—E. S.

Treatment of ——. W. P. Thompson, London H. P. Dodge, Toledo, Ohio, U.S.A. Eng. Pat. April 9, 1901.

r burnt lime is finely powdered and sifted. A s taken to determine by experiment the proportion r needed for hydration, and the lime is then well with that proportion, or slightly more, to allow for steam. When cold, the slaked lime is finely sifted. —E. S.

Soda and Chlorine by the Electrolysis of Chloride of Sodium; Apparatus for Production of ——, the Invention being also Applicable for the Production of Potassium, Sodium, Aluminium, or other Metals of the same Class. H. A. Cohn and E. Geisenberger. Eng. Pat. 6312, 1900.

See under XI. A., *page* 726.

Cyanides; Manufacture or Production of ——. J. Y. Johnson, London. From The Stassfurter Chemische Fabrik vormals Vorster and Grüneberg of Stassfurt, Germany. Eng. Pat. 9350, May 21, 1900.

In the process for obtaining cyanides by passing ammonia into a mixture of carbon and powdered alkali, heated to redness, the production is stated to be unsatisfactory. According to the present invention, coarsely powdered charcoal is steamed, boiled in water or in weak alkaline lye until gases are expelled, and then, after decanting the water, a strong solution of the "required alkaline salt" is caused to circulate in the vessel until the carbon is saturated. The carbon is then dried with exclusion of air, and placed in a vertical retort to be acted on by ammonia as the retort is externally heated.—E. S.

Cyanides; Production or Manufacture of ——. J. Y. Johnson, London. From Stassfurter Chemische Fabrik vormals Vorster and Grüneberg of Stassfurt, Germany. Eng. Pat. 9351, May 21, 1900.

In the production of cyanides by synthesis, the product obtained is systematically lixiviated in closed vessels, with exclusion of air, the yield being thus stated to be increased, as compared with the yield by the ordinary process, by from 20 to 30 per cent.—E. S.

Cyanate of Potassium; Manufacture or Production of ——. J. Y. Johnson, London. From Stassfurter Chemische Fabrik vormals Vorster and Grüneberg of Stassfurt, Germany. Eng. Pat. 9352, May 21, 1900.

The invention relates to the treatment of the by-product occurring in the "synthetic cyanogen process," containing potassium cyanate, cyanide, and carbonate in variable proportions. The refuse salt mixture is made into a mash with a limited quantity of water at a temperature not exceeding 66° C., whereby the carbonate of potash is dissolved, whilst the cyanide and cyanate remain practically unaffected. The mixture of cyanide and cyanate is treated with a limited quantity of water at a temperature not exceeding 5° C., but not below −18°, when the cyanide dissolves, leaving a residue of potassium cyanate.—E. S.

Cyanogen; Manufacture of the Haloid Compounds of ——. H. F. Kirkpatrick-Picard, London. Eng. Pat. 9710, May 26, 1900.

In this process a sulphocyanide is employed as the cyanogen raw material. For instance, sodium sulphocyanide and sodium bromide are treated with an oxidising agent to obtain cyanogen bromide, the reaction being expressed by the formula, $NaBr + NaCNS + O_4 = Na_2SO_4 + BrCN$. The process may be conducted as follows: a mixture of the two salts named, in molecular proportions, is fed into a mixture of sulphuric acid with nitric acid, so diluted as to contain 20 per cent. of HNO_3, and the mixture is kept at a temperature of about 100° C. in a still to which a receiver is adapted for collection of the cyanogen bromide evolved. The nitrogen dioxide simultaneously evolved may be recovered in the usual way after condensation of the cyanogen bromide. The process may be made continuous by the use of serially connected stills. The invention relates mainly to the production of cyanogen bromide, for use in the extraction of gold, but the process, with obvious modifications, may be applied to the production of cyanogen chloride or iodide.—E. S.

Alkaline and other Amalgams; Apparatus and Method of Decomposing ——. W. P. Thompson, London. From The Firm of Litzelmann and Tailfer, Paris. Eng. Pat. 10,925, June 15, 1900.

The object of the invention is to bring the amalgam into a state of fine mechanical division, in order to accelerate the oxidising action of water or any desired solution upon the [illegible] The sodium or other amalgam is fed into a rapidly revolving cylinder, perforated in the sides with minute holes, and enclosed as completely as possible within an iron steam-jacketed casing. Water or steam, or any desired solution, is also fed into the cylinder through another pipe. As the centrifugal action drives the amalgam and solution through the holes, they impinge against the sides of the casing, and an intimate mixture of very small particles is produced, leading to the formation of caustic soda or potash solution, as the case may be. Below the revolving cylinder, a circular dead-plate, made of some non-conducting material, is secured, a certain space being left between its edge and the casing, through which the mixed amalgam and solution pass to the bottom, where they are submitted to the action of an electric current, in order to expedite the oxidation of the metal. The mercury is withdrawn by a vertical pipe descending from the bottom of the casing, the pipe being guarded at the top from entrance of the solution, which has outflow through another pipe. An apparatus is also shown, adapted for a large installation, in which the casing, below the revolving cylinder, is divided into a series of superposed chambers, each provided with an electrical arrangement, and so contrived that the amalgam and solution are treated successively from the first to the last.—E. S.

Cupric Oxide from Natural Sulphates or Carbonates of Copper; Production of ——. S. R. Adcock, St. Helens. Eng. Pat. 11,678, June 27, 1900.

Natural sulphate or carbonate of copper is dissolved, the former in water, the latter in dilute sulphuric acid, the insoluble residue is separated, and the solution is concentrated and crystallised; the crystals are collected, dried, and roasted to obtain cupric oxide.—E. S.

Silico-Fluorides: Improved Treatment of Calcium Fluoride or Fluorspar for the Production of ——. W. C. Sellar, London. Eng. Pat. 11,753, June 28, 1900.

Fluorspar is fused with about twice its weight of anhydrous calcium chloride, the cooled mass is finely ground with an excess of precipitated silica, and the mixture is heated in a closed vessel with an excess of strong hydrochloric acid. When cool, the acid liquid is filtered and set aside to be again used as acid. The residue is washed with water, and the solution, after filtration, is treated with any suitable salt, such as potassium chloride or barium chloride, to precipitate a salt of silico-fluoric acid, from which a fluoride may be obtained by known means.—E. S.

Alkali Chromates and Bichromates; Manufacture of ——. A. Shearer, Manchester. Eng. Pat. 14,021, Aug. 4, 1900.

A nearly saturated solution of sodium chromate, such as may be obtained by lixiviating the product obtained by furnacing a mixture of chrome ore with sodium carbonate and lime, and "as free as practicable from lime and magnesia," is treated with ammonia, preferably in such proportion that for each 100 parts of CrO_3, 25 parts of NH_3 be added. The solution is then heated to about 50° C. (maximum, 70°), but not under 30° C., and carbon dioxide is passed in as long as sodium-hydrogen carbonate separates, the process being preferably conducted in a series of connected vessels. The solution, after cooling, is freed from the bicarbonate precipitate, and it now contains sodium chromate and ammonium chromate. This solution may be utilised for mordanting, or it may be boiled to expel ammonia, with production of sodium bichromate. There is also claimed "the preparation of bichromate of potash by the addition of chloride or sulphate of potassium to a solution containing sodium and ammonium chromate, in which about one-half of the chromic acid is combined with soda, removing the ammonia by heating above 70° C., and separating any chloride or sulphate of sodium produced, and so obtaining bichromate of potash."—E. S.

Oxide of Chromium: Means employed for the Extraction of ——, *from its Ores, and its Subsequent Treatment to Obtain Soluble Salts.* W. H. Wheatley, London. From The Clyde Chemical Company, Ltd., Sydney, Australia. Eng. Pat. 5239, March 12, 1901.

Powdered chrome ore is incorporated with hydrate or carbonate of lime in about equal proportions, and the mass is rendered plastic by water or with a solution of ar carbonate or sulphate, and then moulded into blocks, are calcined in a suitable kiln. The calcined bloc ground and mixed with the proportion of sodi potassium sulphate or carbonate indicated as nee analysis, and again moulded as before for kiln-heati the powder may be furnaced at a temperature too fusion, but high enough to convert the mixture into chromates. The powdered product is lixiviated to the soluble chromates in solution, from which s sodium or potassium chromate or bichromate obtained by ordinary means.—E. S.

VIII.—GLASS, POTTERY, ENAMEL

PATENTS.

Printing or Transferring upon Glass and other Surfaces. F. W. Gauntlett and J. H. Lloyd. Eng. Pat. 11,197, June 20, 1900.

Printed or other single or multi-coloured matter h printer's ink foundation is first transferred to a te support of paper or other suitable material, one which has been previously coated with a substance gelatin. From this support the matter is transferr opal, glass, or other hard, smooth or matted surfa viously prepared with a binding film of gelatin, & transferred matter is ultimately treated by subje the action of tannic acid, alum, or formaldehyde, the gelatin is rendered insoluble. Finally, a co spirit varnish may be applied. At no stage of the is the application of intense heat necessary.—R. B.

Brass, Copper, and other Metallic Objects, Enca other Tiles or China or Porcelain Ware; Colo Decorating ——. D. Sinclair. Eng. Pat. 10,977

See under XI. B., *page* 727.

IX.—BUILDING MATERIALS, CLA MORTARS, AND CEMENTS.

Wood: Economical Saturation of ——, *with T* F. Seidenschnur. Zeits. angew. Chem. 1901, 1 488—495.

A nutritive medium is protected against *Pe glaucum* if it contains 0·9 per cent. of zinc ch 0·3 per cent. of tar oil; against *Mucor mucedo* if it 0·6 per cent. of zinc chloride or 0·1 per cent. of and against the black bacillus if more than 1 per cen chloride or more than 0·3 per cent. of tar oil is pre

The coal-tar oil employed distilled as follow 150° C., 0·5 per cent.; 150°—235° C., 21 per cent 355° C., 94 per cent.; it contained about 1 per matter soluble in caustic soda of 1·15 specific gra

Penicillium glaucum was repeatedly isolated from wood, together with various bacilli, among which wa the black bacillus; threads of the mycelium of t were also found traversing the cells of the wood. that the decay of wood is solely due to moulds appear to accord completely with fact, it seems to by the co-operation of moulds and bacilli, the forme ing and retaining the water which provides a suitab for bacilli. Thus, if the growth of moulds be preve development of bacilli is restricted or hindered, e latter are not destroyed by the sterilising agent.

The disinfecting power of the coal-tar oil is at l times as great as that of zinc chloride. In practice of a solution containing 0·85 kilo. of solid zinc chl regarded as sufficient for a pine sleeper. Since th practically impenetrable, these 35 kilos. are con the sap-wood, which amounts to about one-thi weight of a sleeper weighing 68·6 kilos. Thus, wood contains 3·7 per cent. of solid zinc chloride; to the relative powers of zinc chloride and tar o would be equally protected by 1·2 per cent. o uniformly distributed through the saturatable pa analyses of a sleeper saturated with a 15 per cent.

oil, however, showed that 5·3 per cent. of oil was in the least saturated portions. On the average, cent. of tar oil was found in the youngest sap-wood, the middle, and 11·7 per cent. in the oldest sap- corresponding respectively to 73, 58, and 39 times imum safe quantity.

tar oil, introduced as an emulsion with soda rosin n only be withdrawn in slight amount by repeated and drying; when exposed to the tropical sun the latile portion of the oil evaporates from the exterior deeper, whilst that in the interior remains unaltered. no danger that the oil would evaporate before the was worn out by mechanical action.—A. C. W.

PATENTS.

ne, Artificial; Manufacture of ——. H. H. Lake, on. From Wachtel and Co., Berlin. Eng. Pat. 8, July 11, 1900.

nanufacture of artificial sandstone, the sand is dried ng it to 100° C. or over, and while hot is mixed in proportions with previously slaked lime.—J. W. H.

Artificial; Manufacture of ——. T. Mathieson-, Wood Green, and A. C. Oakes, London. Eng. 3.467, July 26, 1900.

ention relates to the manufacture of artificial lime- m burnt lime by recarbonation. The blocks, after , are subjected to the action of carbon dioxide, nder a pressure of 30 lb. per square inch, gradually the pressure to maintain a temperature in the 90° F. to, say, 350 lb. per square inch —J. W. H.

rtificial; An Improved Method of Making ——. ougaard, Copenhagen, and James Evans, Man-. Eng. Pat. 7081, April 4, 1901.

composed of glue, 2 parts; alum, 4 parts; gum parts; water, 100 parts; and burnt gypsum to onsistency is spread on a smooth level surface to of 2 cm., allowed to set, and removed for drying; en canvas may be inserted to give greater cohesion, ent may be added to tint the mass.—J. W. H.

Materials; Manufacture of ——. F. Boas. acinthe, Quebec, Canada. Eng. Pat. 8282, April 1.

of magnesium (added as olivine, chrysotile, serpentine, &c., or formed *in situ*), is claimed as ag agent in the manufacture of artificial stone, ng used to bring about the change.—J. W. H.

nd other Porous Substances, and for Fixing thereon; Improved Process for Hardening ——. Kessler. Clermont-Ferrand, France. Eng. Pat. Feb. 28, 1901.

or plaster mixtures are hardened and rendered ble to a greater or less depth by means of a of sodium or potassium silicate containing an alkali. Several methods of using the solution are —J. W. H.

for Metal, Stone, Wood, and other Objects; ls Suitable for Use as a Waterproof Protective C. L. V. Zimmer, Hamburg, Germany. Eng. 8, March 22, 1901.

4 parts of cotton oil and 1 part of bitumen are h sufficient caustic soda solution to effect hydrolysis, the reaction is complete, the temperature of the ised to about 200° C. This degree of heat is l for 40 or 50 hours, air being led into the a; or if air enriched with oxygen be employed, treatment may be reduced to from 4 or 10 hours. t is finally diluted with turpentine or other uid. It is claimed to be free from brittleness, to ent expansion and contraction of the object to s applied, to be capable of resisting acid and uors, and to take fire only with difficulty.

—F. H. L.

Kilns and Appliances for Calcining, Heating, and Drying Mineral Substances. Meldrum Bros., Ltd., and J. S. Oston. Eng. Pat. 11,852, 1900.

See under I., *page* 694.

Phenols; Treatment of ——, *to Render them Soluble in Water.* J. Wetter. Eng. Pat. 7719, 1901.

See under XVIII. C., *page* 739.

X.—METALLURGY.

Pyritic Smelting. H. Lang. Eng. and Mining J. 1901, **71**, [19], 589, [20], 617.

The author compares pyritic smelting with ordinary matte smelting, and also discusses the best conditions for working successfully with the former process. The following is a summary of the conclusions drawn:—

(1) The essential difference between cold blast pyritic and ordinary matte smelting consists in the composition of the smelting mixture.

(2) More acid slags can probably be produced by the ordinary process than by pyritic smelting.

(3) According to present experience, more basic slags can be produced by matte smelting than by the pyritic method.

(4) The proportion of silica governs the concentration of pyritic charges; mixtures deficient in silica cannot be properly concentrated by the pyritic process.

(5) Mixtures deficient in sulphides cannot be successfully treated by pyritic smelting, because they would produce no matte.

(6) Matte may be concentrated by fusion in the pyritic stack but not in the ordinary.

(7) Iron probably passes into pyritic slags as singulo-silicate, and lime, partly or wholly, in the form of bi-silicates.

(8) The application of hot blast in pyritic smelting leads to an economy of fuel, and an increase of the daily capacity of a furnace, but the process is still subject to the same limitations as regards the proportion of silica necessary. (See also this Journal, 1900, 748.)—A. S.

Metals; Extraction of ——, *by Means of Calcium Carbide.* O. Frölich. Chem. Zeit. 1901, **25**, [39], 418—419.

The author had done much work in this field when Neumann published his paper (see this Journal, 1901, 46) using the mixed chloride and oxide for the reduction ($MCl_2 + 2RO + CaC_2 = M + 2R + CaCl_2 + 2CO$, practically the same equation as that quoted by Neumann). Copper and lead compounds gave the strongest reaction, requiring no extra heat, but themselves evolving, on ignition, sufficient heat to bring about the complete fusion of the whole mass. Nickel was also reduced readily, requiring but little added heat, whilst in the cases of tin, zinc, and manganese, the reaction was incomplete. Zinc chloride begins to react at 500° C., whilst the reduction of the oxide is only completed at a much higher temperature. By employing the chlorides and oxides of different metals, alloys are readily made, cupro-nickel being almost as easily produced as metallic copper; the reaction is stronger with $CuCl_2$ and NiO than with CuO and $NiCl_2$. German silver is very readily made, using $CuCl_2$, $ZnCl_2$, CuO, and NiO, and brass with $ZnCl_2$, $CuCl_2$, ZnO, and CuO. $CuCl_2$ and SnO_2, when slightly warmed, give a silver-white regulus. More extraneous heat is necessary to produce manganese and aluminium bronze, whilst strong heating is required for copper-chromium and copper-calcium alloys. PbO and $ZnCl_2$ react very energetically, yielding a regulus of lead and (usually) zinc dust; PbO and AgCl also react well. PbO and NaCl, or $PbCl_2$ and NaOH, give some lead-sodium alloy, but most of the sodium burns off. Neumann described the use of sulphates and carbonates in place of chlorides, but the author questions the accuracy of his equations. These oxidised salts function as oxides, not as chlorides, and it is better to use them in place of the oxide in accordance with the general equation:

$MCl_2 + RSO_4 + CaC_2 = M + R + CaCl_2 + SO_2 + 2CO$. S[illegible] sulphide of copper results if a copper compound be treated. If lime or other strong base be used, sulphate is formed and sulphur dioxide is not liberated ($MCl_2 + 2RSO_4 + 2CaO + CaC_2 = M + 2R + 2CaSO_4 + CaCl_2 + 2CO$).

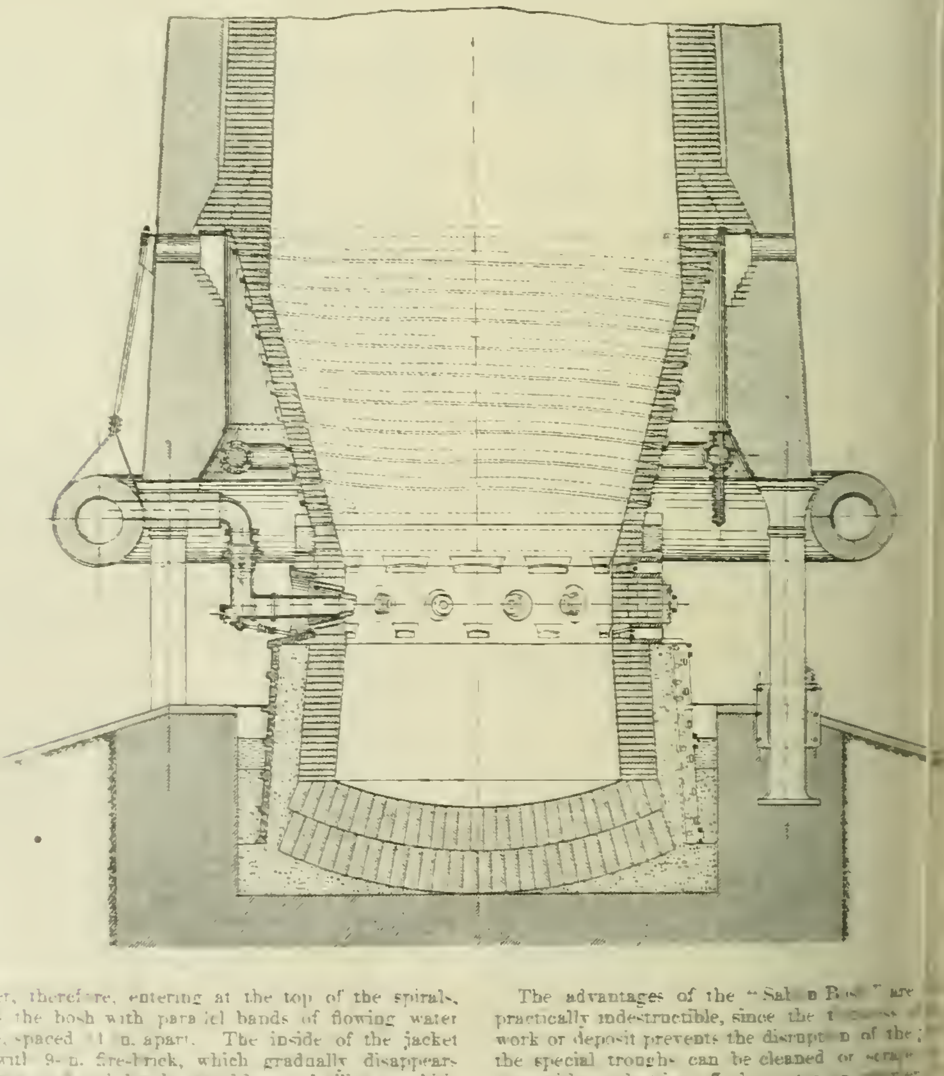
The author takes a more hopeful view than does Neumann of the application of the reaction to the industrial extraction of metals. Copper may be extracted from rich pyritic ores by roasting to oxide, avoiding sulphating; a part of the roast is next chloridised, and the resulting cuprous chloride, mixed with a suitable proportion of oxide, is then treated with CaC_2. Raw copper results, the gangue-stuff and iron passing, for the most part, into the slag. The process may be practically continuous, and the crude product, may, if necessary, be refined electrolytically. Poor copper ores must be submitted in part to a sulphating, and in part to a chloridising, roast; each product is then leached, the solutions are evaporated and the dried salts treated with calcium carbide. To produce 1 ton of copper from $CuCl_2$, 0·34 ton (or from Cu_2Cl_2, 0·25 ton) of CaC_2 should theoretically be necessary. Lead zinc ores may be similarly treated by submitting them to an oxidising roast first, and then chloridising a portion of the charge, and afterwards mixing oxides and chlorides with $CaCl_2$.

The use of calcium carbide is likely to be p
beneficial in districts where ore is abundant and f
as it is itself a concentrated fuel, and will ther
the cost of transport for some distance from ceo
water- or other power is available. Again t
calcium carbide reduction is most valuable for
soldering of iron masses.—W. G. M.

Blast-Furnace Bosh; A Water-cooled ——.

Iron and Steel Inst., Spring Meeting, May.

The author describes, with the aid of the acc
drawing, his new form of bosh, which has succes
built and used at Millom, in Cumberland. It c
a plate shell in the shape of an inverted frust
outside of which are riveted two open troughs i
of spirals from the top of the bosh to a circular
trough at the base. The jacket is made of
plates with flush joints strapped on the inside
riveted. It is supported on the furnace walls
by a circular rim of angle bar, and is attached
to the steel water-trough. The two spiral t
pitched at an incline of about $\frac{1}{2}$ in. to the fo
made up of $1\frac{1}{2}$-in. square steel bars for the b
8-in. by $\frac{1}{4}$-in. steel plates for the outside wall, t
distance from bottom to bottom of the spirals b



The water, therefore, entering at the top of the spirals, surrounds the bosh with parallel bands of flowing water [illegible] in. wide, spaced [illegible] in. apart. The inside of the jacket is lined with 9-in. fire-brick, which gradually disappears and becomes replaced by the usual layer of silico-graphitic material characteristic of the application of an energetic external cooling action to the interior heat.

The advantages of the "Sal[illegible] B[illegible]" are
practically indestructible, since the [illegible]
work or deposit prevents the disruption of the
the special troughs can be cleaned or scra
time without shutting off the water [illegible]
working of the furnace; that it can be ada
British low column furnaces, whereby it is b

in the economical modernising of old furnaces; and it is less than half the cost of the boshes cooled with ze boxes. It is probable that the thickness of the l jacket may be advantageously reduced from ½ in. to , or even $\frac{5}{16}$ in. No head of water is required, and e is no cracking, burning through, breaking, or incrust- as is usual with the forms of cooling hitherto used.

—A. W.

st-Furnace Gases; Dust in ——. A. Greiner. Iron and Steel Inst., Spring Meeting, May, 1901.

eraing, owing to the comparative freedom of the gases dust (0·25 to 0·50 grms. per cb. m.) the 200 horse- r engine worked by blast-furnace gases has now run hree years, day and night, without being stopped to the cylinder. At Differdingen, however, where the from the oolitic ores impregnates the gas to the extent om 4 to 5 grms. per cb. m., a new 600 horse-power e had to be stopped after three weeks' running. As st could not be separated by long passages or large bers, a new means of cleaning was devised, based the centrifugal throwing together the gas and a spray er. The apparatus is an ordinary centrifugal fan, metre in diameter, running at 900 revolutions per e, through which the whole of the gas is passed after drawn in through the central aperture. The water pied through a small pipe opening into the axial part fan. It becomes charged with dust at the periphery, led off by a pipe from the lower part of the fan . the washed gas being driven out through the fan rge The quantity of the water used varies with the ness desired; thus 10,000 litres per hour reduces the o 0·30 grms., and 15,000 litres to 0·20 grms. per —A. W.

ron for the Acid Steel Processes; Economical ificance of High Silicon in ——. A. Sahlin. Iron Steel Inst., Spring Meeting, May, 1901.

thor fails to see any advantage in the demand for 2 per cent. of silicon in pig iron for acid steel making, is enforced by British manufacturers, and thinks it is letrimental in many ways. In the first place it s the outturn of the furnace by necessitating a hearth, since with a large hearth the silecon in the n does not rise above about 1·2 per cent. Con- tly, furnaces cannot produce 400 to 600, and ually, 700 tons a day as some of the modern an furnaces do with their low silicon products, but t down to an average of less than 250 tons. Fur- fuel consumption is increased, and siliceous ores, require large additions of basic flux, have to be l and employed, everything tending to retard the orking of the furnace. Any attempt, therefore, to on cheaply on American principles is hampered and ed by the above impost, with the result that a steel made from low silicon iron is being poured rkets hitherto controlled by the British makers.

necessity for this high silicon in the acid Bessemer does not really exist, as with a sufficient tuyère wide converter bottom, ample blast pressure and orking, a 1·20 per cent. silicon iron can be con- y a blow of about 13 minutes, and a fair amount of rked in as well. With high silicon the blow is the charge better, and the wear on the furnace whilst above a certain point, the metal is of poorer In the Siemens' open-hearth process, the silicon stly fuel. Producer gas can be used with more for heating the bath, especially if the regenerators e enough and efficient, whilst it is less costly to add o obtain the covering of slag than to oxidise the t of the iron. The author strongly urges British turers to adapt their plants and views to meet each equirements for combined economical production, if h to hold their own in the coming struggle. (See rett's paper, page 722.)—A. W.

d Steel from the Point of View of the Phase- ine. H. J. von Jonstorff. Iron and Steel Inst., Meeting; May, 1901.

to the contradictory nature of Roozeboom's theories ove subject, the author reviews some of the facts made use of in support of the doctrine, more especially those bearing upon the state of equilibrium between martensite and graphite. There is much contradictory evidence as to the saturation point of carbon in iron, especially in connection with the process of cementation, but whilst the experimental results differ in the extreme, the investigators are in accord as to the fact that the carbon is present in the cement steel in the combined form alone, after the first heating, and that it is only after the second or prolonged heating that the formation of graphite occurs. This would indicate that within the temperature under consideration, 1,000° C., graphite is not the more stable "form of carbon compound." The absorption of carbon by iron at this temperature, therefore, must be assumed to be accompanied by the formation of martensite, with the establishment of an apparent equilibrium. Where the martensite does not come into contact with carbon, the cementite separates, producing a state of equilibrium between the martensite and cementite. Whether the carburisation can be actually continued until the equilibrium between the graphite and cementite is reached is open to question, but is theoretically possible. Saniter has shown that the carbide dissociates with increasing temperatures, so that there is no doubt that above 1,000° C., at which point the transformation of graphite with martensite into cementite occurs, the graphite has a greater stability than cementite, and its formation in slowly cooled iron seems to confirm this point. If this be true, then the line *a*E indicating the separation of graphite in Roozeboom's curves (this Journal, 1900, 1016) must cut the cementite curve at the point E.—A. W.

Iron; Heat of Formation of Carbides and Silicides of ——. E, D. Campbell. Iron and Steel Inst., Spring Meeting; May, 1901.

The author has carefully examined the heat reactions when dissolving iron or steel, in both neutral and acid solutions of ammonium and potassium cupric chlorides. Whilst so doing, he found that crystallised carbide of iron was practically unacted on by both of the neutral solutions, and that the fineness of division affected the solubility. With less than 1 per cent. of free hydrochloric acid, the carbide always dissolved, even when coarsely crystalline, within two minutes. He then criticises the calculations and conclusions of Jüptner von Jonstorff, based upon the results obtained by Osmond, who employed neutral ammonium cupric chloride in his calorimeter. The wide variation in those results would appear to be due to incomplete solution, and not, as hitherto assumed, to the absorption of heat for the decomposition of the iron compounds. Osmond's results, therefore, are possibly without value, and all theoretical deductions therefrom useless.

The reason why silicon displaces carbon in its compounds is explained by a consideration of the values obtained for the heat of formation of carbide and silicide of iron, which shows that the complete conversion of carbide into silicide would result in the evolution of 17,642·5 calories.—A. W.

Manganese and Iron; Crystals of Carbo-Silicide of ——. J. E. Stead. Iron and Steel Inst., Spring Meeting; May, 1901.

The author has examined some crystals found in a cavity of the sandstone foundation of a blast furnace, about 12 ft. below the hearth. They are orthorhombic (holohedral) and are coated with an adherent layer of oxide. The analysis, after deducting the oxygen, shows the constituent elements to be in the following proportions:—Manganese, 54·56; iron, 37·71; silicon, 3·82; and carbon, 3·91 per cent., which approximate to the empirical formula $(FeMn)_3SiC$. The crystals probably consist of a homogeneous mixture of carbo-silicide of iron and carbo-silicide of manganese, forming a double carbo-silicide of iron and manganese. The furnace had been used for making spiegel and ferro-manganese, and no silico-spiegel nor ferro-silicon had been made in it. It would appear as if the crystals were $(MnFe)_3C$, in which a portion of the carbon had been replaced by silicon, the result of the fusion of the manganiferous metal in contact with siliceous materials. An experiment, in which ferro-manganese was heated with ganister sand, showed the silicon was absorbed into and that graphite was thrown [illegible] the metal. This explains why the so-called "bears" in the hearth of furnaces making manganiferous alloys, contain so much silicon and why they are accompanied by large quantities of graphite. The manganese attacks the siliceous bricks, and the silicon enters the highly carburised metal to partially decompose the carbides and throw out a portion of the carbon as graphite. It would appear that the above crystals were formed slowly from some of the metal which had percolated through the solid hearth, and that after their formation the remaining liquid metal had flowed away, leaving them protruding in a cavity, the subsequent action of air, steam, or other gases forming the superficial coating of oxide.—A. W.

Steel Castings; Properties of ——. Part 1. J. O. Arnold. Iron and Steel Inst., Spring Meeting; May, 1901.

This paper is the first instalment of the results of researches commenced six years ago, and still under progress, in the steel works and laboratories of the Sheffield University College. The original object was to systematically produce and examine irons and steels of definite compositions under various conditions of thermal and mechanical treatment, in the hope of throwing light upon the extraordinary discrepancies met with in metals which from their composition and preparation should behave identically.

The present contribution deals chiefly with the influence of the chemical composition, and the effect of annealing on the microstructure and mechanical properties. The castings in these experiments consisted practically of iron and carbon, the silicon, manganese, sulphur, and phosphorus being kept as low as possible, this alone being the basis from which the effect of other elements can be definitely ascertained. Two other series, in which silicon and manganese are separately introduced into the iron and carbon, are under preparation and will form the subject of future papers.

The castings were made in composition moulds containing a group of four bars 1¼ inch round with a central head, the whole weighing about 28 lb. Two of the bars were treated as cast, and two were annealed and tested. The carbon in the 17 types of metal produced varied from 0·06 to 1·95 per cent., and some selected typical results are described and illustrated by micrographs. In the first place, the specific gravity does not throw any light upon the subject, and shows no correlation with the mechanical properties, although, as a rule, there was a slight rise upon annealing.

One of the discrepancies is shown by two practically pure irons, containing only 0·07 and 0·06 per cent. of carbon respectively. In the structure of the cast specimens there is little or no difference, but upon annealing in quicklime for 70 hours at 950° C., and very slow cooling over 100 hours, the one iron was to all intents and purposes equal to forged dead mild steel, and showed a large and very close structure revealed only by deep etching, whilst the other gave greatly inferior mechanical results, and revealed a completely different and intensely crystalline structure. The only explanation the author can suggest is a variation of the initial temperature of the casting, which may result in a structure which would survive the drastic annealing. This view can only be proved when the temperature of molten steel under practical conditions can be accurately determined. The mechanical discrepancies of the metal containing about 0·4 per cent. of carbon were as follows:—*In the cast metal*—elastic limit, 13·3 to 17·2 tons per square inch; maximum stress, 21·8 to 24·6 tons; elongation on 2 ins., 5 to 8·4 per cent.; contraction of area, 5·9 to 12·3 per cent.; and bending angles 32° to 90°.—*In the annealed metal*—elastic limit, 9 to 12·2 tons; stress, 20·8 to 24 tons; elongation on 2 ins., 12·5 to 24·5 per cent.; reduction of area, 16 to 29 per cent., and all bent double without flaw. The microstructure gives no indication of the cause of these variations. Other and varied examples are given, from all of which the author draws up a practical summary:—that iron with carbon only is not a suitable material for modern requirements; that the ductility could be easily ensured, but not in correlation with the required tenacity; that the latter property could be obtained, but at the expense and the almost complete loss of ductility; that, therefore, with the exception of the nearly pure iron, all the series of these carbon-iron castings have small manufacturing inte
The results, however, form a basis for the developmen
the researches into the effect of silicon and manganes
steels.

The author finally points out that, as a general rule
mechanical properties of annealed castings are much inf
to forged steels of similar composition, even after the s
microstructure has been produced in them. Tables
given showing the higher elastic limit and tenacity, an
superior ductility of the rolled steels, the superiority
coming more and more emphatic as the carbon incre
Annealing, however, whilst beneficial to castings, seri
injures rolled steel. It appears, also, that annealing
slightly affects the compressibility, so that a cause
produces weakness in tension may have relatively
effect on the compression.—A. W.

Rolling Mill [Steel] Practice; Comparison bet American and British ——. W. Garrett. Iron Steel Inst., Spring Meeting; May, 1901.

In dealing with the above subject the author bl
British manufacturers for not adopting modern and eff
rolling appliances, such as are used in America, and b
evidence to show that their loss of trade is mainly d
this neglect. He discusses each class of work separ
and maintains that if British iron and steel makers d
combine and manufacture their respective materials b
best and most economic methods, and at advanta
points of shipment, the manufacture of iron and stee
become a lost art in Great Britain. Especially doe
apply to the making of steel rods for wire-drawing.
as regards tin-plate bars, the United States imported
300,000 to 350,000 tons of tin-plate from Britain an
for years previous to 1892, or 75 per cent. of the
production, which would thus require, every year,
550,000 tons of tin-plate bars. Yet, with a total
duction of this amount, no improved method for m
these was adopted, and the result is that the United S
whose best machines for rolling steel are used for m
tin-plate bars, are now pushing their bars right int
British tin-plate districts from a distance of 3,500
The high cost of rolling in England is attributed t
ploying machines which are not the best, and to not w
them at their fullest efficiency.—A. W.

Steel Rails and Plates; Influence of Copper on J. E. Stead and J. Evans. Iron and Steel Inst., Meeting; May, 1901.

Some practical experiments were carried out by the a
to confirm the recent results as to the non-prejudicial
of copper on steel, and to break down the stipu
against the presence of copper which engineers still
in. Ladles of steel were divided into two parts, to o
of which the copper was added in different quantitie
the cupreous metal and ordinary steel were the
rolled, and subjected to identical tests in each ca
amounts of copper ranging from 0·5 to 2·0 per ce
each parallel case the steels containing copper rol
perfectly as those without it, with the exception of t
containing 2 per cent., which was afterwards found t
been over-heated. From this it would appear that
containing a high proportion of copper, although n
short in the ordinary sense, will not bear the same
of heat as the same metal without copper, thus showi
the effect of the latter resembles carbon, and not s
in this respect.

The cupreous samples stood severe percussive tests
as the normal metals. The tensile tests showed a
increased breaking weight, generally a higher elasti
less elongation and, with one exception, less contra
area in the copper steels. Bending tests showed pra
no difference, whilst the copper does not appear t
the welding. One experiment with an open-heart
containing 0·46 per cent. of copper seemed to indic
its presence, instead of producing red-shortness,
effect of changing red-short steel into metal which
without cracking. Certainly the results show that
does not possess the character of making steel re
which it has been so long supposed to have, and pr

n-existence of its other supposed deleterious effects, first inted out by Ball and Wingham, and afterwards by lby, Lipin, Arnold, and others.—A. W.

on Rods; Measurement of Young's Modulus for —— by Tension and by Bending. H. E. Wimperis. Iron and Steel Inst., Spring Meeting; May, 1901.

DIFFERENT value for Young's modulus across the fibres iron, which had been through the rolling mill, to that asured along them should indicate the presence of slag other impurity which had been drawn out into long ations or thin layers by rolling, since the layers in ding would slip relatively to one another. A lower ne for E in the latter case than in the former would ost confirm this, and the author tried three specimens rods, &c. In a specimen of Low Moor iron the values ered only by one part in a thousand, which difference is egligible one. In a Swedish iron which had been close-ealed after cold rolling there was a difference of one in ut 300, which indicates internal sliding. A Swedish which had been cold rolled after annealing showed a ergence of one in 70. The conclusion, therefore, is that presence of slag does have at least some slight effect, a small amount of sliding does occur in the manner gested, but the effect is practically destroyed by ealing.—A. W.

l; Medal struck in ——. B. H. Brough. Iron and Steel Inst., Spring Meeting, May, 1901.

author describes a steel medal which was struck in l dies originally made for striking a gold medal to Mr. , Ljungberg, of Sweden, by whom it has been presented e Iron and Steel Institute. It is the first steel medal essfully struck, and is 2¼ inches in diameter and ⅛ inch , with an inscription on either side. It is a soft Bessemer steel containing,—Carbon 0·05, manganese , silicon 0·007, phosphorus 0·002, and sulphur 0·005 ent.—A. W.

minium and Tungsten; Alloys of ——. L. Guillet. Comptes Rend. **132**, [13], 1112—1115.

first instalment of results of attempts to prepare alloys uminium by mixing the powdered metal with the oxide e metal with which it is to be alloyed, and igniting by s of a mixture of aluminium and barium dioxide. esults were found to depend on the quantities used, he fineness of division. Usually, with a volatile oxide, rystallised alloy was left in the crucible; with a non-le oxide, a metallic button remained, from which weak r alkali dissolved out the excess of aluminium, leaving loy behind.

using tungstic anhydride, three alloys have been ed; according to the proportions of aluminium and xide, the alloy has the composition AlW_2 (slightly ed by strong acids), Al_4W (lamellar crystals, easily ed by strong acids), or Al_3W (slightly affected by acids). All of these alloys are decomposed by g water.—J. T. D.

lic Copper and Oxygen. C. Heyn. Mitt. aus den tech. Versuchsanst. zu Berlin, 1900, **18**, [6], 315.

is a continuation of the author's investigations on neral subject of the relation of metals to gases. The esults of the present investigation are summed up as :—Oxygen in metallic copper necessarily takes the f cuprous oxide. The oxide is soluble in the fluid nd on solidifying passes completely out of solution. opper has a definite solidifying point, viz., 1,103° C. e eutectic alloy of metal and cuprous oxide (3·4— r cent.) has a definite solidifying point, viz., 1,084° C. mixtures show a range of less definite melting points. wering of the melting point calculated as a molecular enon (Raoult) shows a close agreement with the d.

optical investigation of samples of metal corre-g with these physical variations, the author ishes (*a*) copper free from oxide, as spheroidal ites; (*b*) crystallites of cuprous oxide which are harder than copper, blue in reflected light and red in transmitted light; (*c*) eutectic mixtures of *a* and *b*, the point of equilibrium being at 3·4—3·5 per cent. Cu_2O). As a result of these observations it appears to be possible to substitute for the analytical estimation of the oxide a more rapid estimation by observation under the microscope, which gives a fair approximation to the quantity present, and of course throws important light on the distribution of the oxide.—C. F. C.

Zinciferous Precipitates obtained by the Cyanide Process; Determination [Au Ag] of the ——. C. H. Fulton and C. H. Crawford.

See under XXIII., *page* 749.

Copper; Electrolytic Determination of ——. T. Smith.

See under XXIII., *page* 750.

PATENTS.

Melting or Smelting Furnaces. A. Gibb, Liverpool. Eng. Pat. 11,301. June 21, 1900.

THE furnace consists of a gas-fired cupola, surmounting a hearth or crucible, and is heated by means of one or more gas producers with air-supply pipes controlled by valves whereby the flame can be rendered reducing, neutral, or oxidising.—J. H. C.

Crucibles for Smelting; Impts. relating to. W. S. Mather, Newark, N.J., U.S.A. Eng. Pat. 9124, May 2, 1901.

A FORM of crucible shaker for refilling crucibles is described. To the jaws of the crucible lifting-tongs are attached plates, shaped to fit the pot; these plates are lined with asbestos, and together (when closed) encircle the crucible. A stand is provided for the latter with a ring of short pins projecting upwards and slightly outwards, so that the gripping plates just fit into it. Slots are provided in the stand to pass the projecting ends of the tongs. A modified form of the arrangement is also described. A special form of funnel for charging the pot is specified.
—W. G. M.

Kilns and Appliances for Calcining, Heating, and Drying Mineral Substances. Meldrum Bros., Limited, and J. S. Orton. Eng. Pat. 11,852, 1900.

See under I., *page* 694.

Sulphide Ores; New or Improved Process for eliminating Sulphur from. A. Gutensohn, Southend-on-Sea, and H. H. Price, London. Eng. Pat. 13,263, July 23, 1900.

CRUSHED sulphide ore, or iron pyrites (or a mixture of the two), is mixed with crushed carbon and sodium sulphide (or a sodium salt which, under the conditions of the work, will yield sodium sulphide), and the mixture is heated for a short time to a temperature below that of an incipient red heat. On subsequent exposure to air, with rabbling if necessary, the oxidation of the sulphur proceeds with great rapidity, the mass quickly becoming red-hot. The time of preliminary heating varies with the ore, say, from a few minutes to half-an-hour, and the whole charge may be dead-roasted in, say, from one to two hours, even in the case of ores which, by the ordinary process require 24 hours. The proportions of added matter necessarily vary, but carbon to the extent of about one-fifth of the total sulphur present, with dry sodium sulphide equal to one-fifth the weight of the carbon, has been found in many cases to give good results. After the reaction the sodium will be present as sulphate, and the carbon will have been burnt off. The reaction can, with advantage, be used in chloridising roasting.—W. G. M.

Briquettes from Comminuted or Pulverulent Ore, including Purple Ore; Process of making ——. A. Ronay, Budapest. Eng. Pat. 4696, March 5, 1901.

FINELY divided oxide of iron is moistened and moulded into briquettes, which are then dried and superficially converted into ferrous carbonate by heating them to a temperature of 380°—700° (preferably 380°—500° C.) in an atmosphere containing oxides of carbon. The best proportion of CO to CO_2 in the gas depends upon the nature of the oxide under treatment. If the compound be mainly ferrous oxide, the gas should be chiefly CO_2; but if it be ferric oxide, carbon monoxide is useful to reduce the Fe_2O_3 to FeO, in which condition it is capable of combining with CO_2. Pyrites residues may be employed in admixture in these briquettes. It is chiefly necessary in any case to see that the temperature does not rise to the point at which $FeCO_3$ cannot be formed under the conditions used. The oxides so coated with carbonate are found to resist fritting or sintering until they have passed down to the reducing zone of the furnace. A form of carbonating kiln is described.—W. G. M.

Refractory Ore into Free Milling Ore; Process and Means for Converting ——. A. J. Boult, London. From "The Honneus Sulphide Company, Limited," Western Australia. Eng. Pat. 7,534, April 12, 1901.

The ores are mixed with small proportions of sulphur and saltpetre or other nitriferous substance and then roasted, placed in kilns with alternate layers of firewood or coal, and fired.—J. H. C.

Steel Process; New Open-Hearth ——. J. L. Smith, R. Bedford, Eaglecliffe, and The South Durham Steel and Iron Company, Limited, Stockton-on-Tees. Eng. Pat. 13,299, July 24, 1900.

The furnace hearth is divided into compartments separated by dams; charges of pig-iron and other ingredients are placed in the smaller of these compartments and raised to a suitable heat. Molten metal from a blast furnace or converter is then run into the larger compartment, which already contains molten steel from a previous charge; the whole mixing together is then allowed to flow into the bath containing the oxides of iron and scrap. This causes a vigorous boil, after which the charge is worked in the usual way by fresh additions of iron ore and lime until the requisite purification and reduction have been effected.—J. H. C.

Steel; Improvement in the Manufacture of ——. H. H. Lake, London. From the Soc. Forderia Milanese d'Acciaio, Milan. Eng. Pat. 13,952, Aug. 3, 1900.

In order to enable steel to be made in very small converters, air enriched with oxygen (or in some cases even undiluted oxygen) is passed through the fused cast iron. In this case the blast must enter just below the surface of the metal; if it entered at the bottom, more carbon monoxide would be formed, and hence more oxygen would be used, and the metal would be proportionately cooled. A charge of 50—100 kilos. can thus be treated, and a cast iron relatively low in silicon or phosphorus may be used.—W. G. M.

Steel; Manufacture of ——. W. H. Wheatley, London. From The "Société Général des Aciers fins." Eng. Pat. 6,655, March 29, 1901.

Steel in a state of fusion is caused to flow on to a mixture of finely powdered chrome iron and powdered aluminium, which is placed in the bottom of the casting ladle.—J. H. C.

Zinc; Process for Extracting ——, *and Apparatus therefor.* J. A. Bate and A. Ziegart, Paris. Eng. Pat. 10,915, June 15, 1900. (Under International Convention, Nov. 30, 1899.)

The zinc ore mixed with coal and carbonate of soda is heated in a special retort whereby the zinc is extracted in one-third of the time previously required. The retorts employed consist mainly of a long outer tube of any convenient kind of refractory clay, furnished with an inner tube of thin iron, the free space between these being filled with a mixture of pure calcined magnesia and well-burnt lime.—J. H. C.

Raw Zinc, and other Metals, excepting Iron; Method of Means for Casting and Simultaneously Refining. Herter, Beuthen, Silesia, Germany. Eng. Pat. 8, April 20, 1901.

The zinc from the furnace is run (fused) into a ladle l with refractory material, with a lip at one side, and wi teeming-hole at the bottom, worked by a swan-neck or c suitable arrangement; the whole ladle is surrounded an outer jacket, which is kept filled with coke or c fuel. Fire-bars are arranged in the lower part of the ja and an annular cover is provided to the latter. The w is supported on trunnions at the end of a long horiz support mounted on a travelling carriage. The zinc be allowed to remain as long as may be required at desired temperature, so that the separation of the contained in it may be practically complete.—W. G. M

Lead; Refining of——. H. H. Lake, London. From Betts, New York. Eng. Pat. 1758, Jan. 25, 1901.

The lead alloy as anode is subjected to an electric cu in a lead fluosilicate solution, whereby the lead is ele deposited on the cathode, which consists of a metallic of comparatively great strength, coated with lead deposited lead is then compacted by mechanical pres and subsequently stripped off in sheets.—J. H. C.

Aluminium; Manufacture of Sheets or Plates of——,*co with Silver on one or both Surfaces.* E. Martin, Eng. Pat. 11,602, June 26, 1900.

The ingots of aluminium are cleaned and electrolyt covered with copper; they are then slightly heated, r and a coating of silver is electrolytically deposited them. The coated ingots are then heated to a su temperature, sheets of silver of the same dimensions heated at the same time. The ingots and sheets are placed together, and again rolled while hot, thus eff a mechanical soldering.—J. H. C.

Aluminium or Aluminium Alloys; System for the Im ment of——. W. H. Hyatt, Gunnersbury. Eng 8801, May 12, 1900.

Ordinary brands of aluminium are melted in suitabl cibles and reducing gases (carbonic oxide, carbon di &c.); oxidising gases or halogens (chlorine, br fluorine, &c.) are introduced into the molten me proportion to the foreign substances present.—J. H.

Alloy, and Process for the Production thereof. Lake, London. From J. E. Hewitt and C. T. Coe York. Eng. Pat. 7316, April 9, 1901.

The alloy consists of lead and copper in substa equal proportions, with small percentages of phos and tin. The copper is melted, and the surface is c with a mixture consisting of equal quantities of pul charcoal, argol, nitre, and limestone. A small perc of phosphor-tin is then added, and the whole well after which the lead in small pieces is gradually adde the mass constantly stirred in order to thoroughly c the metals.—J. H. C.

Alloys; Manufacture of Metallic——. R. B. Whe London. Eng. Pat. 8097, April 19, 1901.

An alloy of 66 parts of copper with 50 parts of zinc prepared; to it are then added varying proportions of more of the following:—85 parts of copper with 15 of either ferro-manganese (spiegeleisen), ferro-nic ferro-tungsten; or 85 to 80 parts of copper with 15 parts of aluminium; or 40 parts of copper with nickel and 10 of tin. The addition of from 1 to 2 p of tungsten in the form of phosphide is useful, tungsten tends to impart a gold-like colour to th and to reduce its liability to tarnish. A good alloy made by mixing 116 parts of the copper-zinc mixtu 20 of the copper-aluminium, 3 of the copper manganese, and 2 of the nickel-tin-copper alloy.—W *ys and Processes for the Production thereof.* H. H. ike, London. From W. E. Simonds, Canton, Connecti- t, U.S.A. Eng. Pat. 8904, April 30, 1901.

ensure uniformity of product in the manufacture of ganese steel, or manganese-iron alloys, and to produce, uired, a combination of toughness and hardness, the -manganese should be melted before mixing with the and should be kept in the fused condition for at least ir, and preferably for from 2½ to 5 hours. It is then d with the melted iron or steel and at once poured into ds, as usual. The proportion of manganese must exceed : cent. but may reach 20 per cent.; that of carbon range from 0·35 to 0·95 per cent., the proportion of onisation usually increasing with the percentage of ganese. The iron or steel should be melted in the open h, the ferro-manganese should be kept fused under a cover of slag and at the lowest temperature possible. —W. G. M.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

and Sodium dissolved in Liquefied Ammonia; Con- tivity of ——. E. Legrand. Ecl. Élect. 26, 88—98.

article is composed of extracts from a dissertation ited to the Faculty of Sciences of Paris, June 22, 1900. author made experiments as to the conductivity different salts (especially chlorides, iodides, and s) dissolved in liquefied ammonia. The method d consisted in passing a current through the liquefied nia solution in series with a megohm resistance, and ring the potential difference at the terminals of the nce with that near the two electrodes of the electrolytic or the latter "calomel electrodes" were used with l in place of water to prevent freezing. The electrolyte ooled by adding solid carbon dioxide to a bath of e. It was found that the resistances of the solutions ositive temperature coefficients similar in magnitude se observed with aqueous solutions at about 51° C. olecular conductivities do not show any tendency to a limiting value with increase of dilution, and cannot culated as the sum of two quantities representing the tivity of two ions.

author also determined the conductivity at −30° C. ures of ammonia and water in different proportions. conduction observed with solutions of sodium in d ammonia is probably electrolytic, since, although the passes without any marked deposition on the les, without liberation of gas, and with only slight polarisation, yet the conductivity increases with the iture.—A. S.

Sulphate and Sulphuric Acid; Electrolysis of a ure of ——. H. J. S. Sand. Phil. Mag. 1901, [1], 79.

thor shows that hydrogen is set free from a not too rated acid solution of copper sulphate by compara- w current densities, and he proves that this is in nce with the theory that hydrogen is not evolved ch a solution until the concentration of the copper tically fallen to zero at the electrode.

mula is given which has been deduced for the con on at the electrode in a solution of a single salt from he metal is being deposited under the conditions: the solution is contained in a cylindrical vessel by the electrode; (2) that no convection currents and (3) that the diffusion of the salt obeys Fick's transport values being constant. This formula can the basis of a method for roughly determining co-efficients.

nula cannot be given in the case of mixtures, but r the concentration may be calculated from the —

$$c = c_o - \frac{1\cdot1284}{96540}\, i\,(1 - n^c) \sqrt{\frac{t}{K}}$$

where c and c^o are the concentrations at times t and o, i being the current density in ampères per sq. cm., n^c being the transport value of the cation Cu in the solution, and K being the diffusion coefficient of the salt. The author's experiments show that (1) hydrogen always appears at the electrode in an acid solution of copper sulphate, in which no currents of liquid are flowing, between the limits of time calculated for the concentration to fall to zero; and (2) the time when it appears differs only slightly from that calculated from the above equation. The ratio of the two constituents given off at the electrode is influenced to a very considerable extent by convection currents, effective stirring in one case causing the disappearance of hydrogen, where it would otherwise have presented over 60 per cent. of the equivalents carrying the current from the solution to the electrode.—A. S.

Perchlorates; Electrolytic Production of ——. F. Winteler. Zeits. für Elektrochem. 1901, 7, [47], 635—642.

Sodium chloride solution was electrolysed by various methods, but a primary formation of perchlorate could not be observed so long as a large quantity of chloride was present in the solution. This applies both to hot and cold solutions.

Solutions of sodium chlorate were submitted to electrolysis in order to ascertain the influence of concentration of the electrolyte, current density, temperature, and nature of the electrode.

The experiments showed that the concentration of the chlorate has no important influence on the current efficiency, provided that the concentration does not fall below a minimum value, namely, 8 per cent.

The influence of current density on the yield of perchlorate with a 20 per cent. solution of sodium chlorate was determined with the following results:—

Temperature.	Ampères per Square Decimetre.					
	1.	2·5.	5.	10.	20.	40.
° C.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
0	50	68	78	90	..	..
20	20	..	70	..	92	..
50	5	..	..	40	70	..
80	5	..	..	5	22	35

The yield of perchlorate is greatly diminished by rise of temperature. Between 20°—50° C. the diminished yield of perchlorate is probably due to the instability of the chloric acid produced at the anode.

Using platinum anodes it was found that a lower yield was obtained when the anode was covered with a deposit of platinum black. With a current density of 5 ampères at 20° C., a bright anode gave a yield of 70 per cent., whilst with a platinised anode the yield fell to 50 per cent. Similarly, at 80° C., the yield with a polished anode was 35 per cent., and with a platinised anode 7 per cent.—J. S.

Nitro Compounds; Electro-chemical Reduction of ——, *to the corresponding Amines.* K. Elbs and F. Silbermann. Zeits. für Elektrochem. 1901, [44], 589—591.

With reference to the patents of Boehringer und Soehne (this Journal, 1901, 893—894, and 1901, 118 and 259), the authors describe their own work on the same subject.

By substituting dilute alcohol as the solvent for nitrobenzene, they find that a very good yield of the simple amines is obtained, and that by-products such as benzidine can be avoided. By simple evaporation of the cathode liquor (or by distilling off the alcohol) the sulphates can be prepared in an almost pure condition.

As an example they quote the preparation of aniline sulphate from nitrobenzene. A lead sheet is employed as anode in a solution of sulphuric acid of 1·1 sp. gr. The cathode consisted of a perforated lead plate, 20 × 25 cm., contained in a solution composed of 20 grms. of nitrobenzene, 150 c.c. of alcohol, and 125 c.c. of dilute sulphuric acid of 1·2 sp. gr. The cathode current density was 3—6 ampères per sq. dcm., the temperature being between 60° C. and the boiling point. The initial E.M.F. of 10 volts sank finally to 5 volts.

By titration with sodium nitrite a yield of about 90 per cent. of the calculated amount of aniline was obtained after 26—27 ampère hours had been supplied. After distilling off the alcohol, and by further evaporation, if necessary, 19·5—20·5 grms. of crystallised aniline sulphate, corresponding to a yield of 86—87 per cent. of the theoretical, was obtained.

Ortho- and meta-nitrotoluene behave in a similar manner.—J. S.

Electrolgtic Phenomena at the Interface between two Solvents. E. H. Riesenfeld. Zeits. für Elektrochem. 1901, 7, [47], 645—647.

Phenol containing a coloured electrolyte, namely, potassium iodide solution saturated with iodide, was placed in the bend of a U tube. The limbs were then charged with an aqueous solution of the same electrolyte, and a current passed through the system by means of two platinum wires dipped into the aqueous solution. The colour became darker at one interface and lighter at the other. By measuring the change of concentration in the electrolyte surrounding the cathode, the transport number for KI in phenol can be ascertained. The result obtained was 0·81.—J. S.

Carbon Dioxide; Decomposition of ——, when submitted to Electric Discharge at Low Pressures. J. N. Collie.

See under II., *page* 696.

Alkali; Electrolytic Production of ——. G. Adolph.

See under VII., *page* 715.

Bleaching Liquor; Electrolytic Preparation of ——.

See under VII., *page* 715.

Ketones; Electrochemical Reduction of ——. K. Elbs.

See under IV., *page* 700.

Benzidine; Electrolytic Production of ——, W. Löb.

See under IV., *page* 700.

PATENTS.

Water or other Liquid; Extraction of ——, from Mineral, Vegetable, and Animal Substances. [Electro-osmose.] G. B. Schwerin, Munich. Eng. Pat. 12,131, July 10, 1900.

The material in a state of suitable disintegration is kept in close contact with both electrodes, while under the action of the current, and the fluid is made to discharge from the negative electrode. The apparatus consists of a box subdivided or not, in compartments, and provided with a bottom permeable to liquid, and constructed with a conductor of electricity to serve as a negative electrode, the positive electrode being constituted by a metal plate or plates, chain or chains, and the like, placed upon the material filling the box. For continuous working two co-axial metal cylinders are arranged on each other, and serve as positive and negative electrodes, the latter of which is, and the former may be, permeable to liquid. A rotary conveyor, consisting of a feeding screw provided with obliquely arranged deviating plates, is placed in the annular space between the electrodes, to cause the substance to pass through it from the inlet opening to the outlet one. —G. H. R.

Soda and Chlorine by Electrolysis of Chloride of Sodium; Apparatus for the Production of ——, the Invention being also applicable for the Production of Potassium, Sodium, Aluminium, or other Metals of the same Class. H. A. Cohn, Paris, and E. Geisenberger, Chêne-Bourg, Switzerland. Eng. Pat. 6312, April 4, 1900.

The caustic soda is separated from a mixed solution of caustic soda and chloride of sodium produced by electrolysis, by crystallising it out directly as produced in the electrolysing tank by cooling the solution either before, during, or after the electrolysis. Means are provided for effecting removal of the caustic soda as fast as produced, and eliminating the chlorine without contact with the caustic so Potassium, sodium, or even magnesium, aluminium, or ot metals of the same classes may be produced by so lowering the temperature as to render them passive, prevent oxidation or entry into other combinations with prejudicing the electrolytic action.—G. H. R.

Nitrogen Compounds [NO_2, N_2O_3, &c.] from Atmosph Nitrogen; Manufacture of ——. [Electric A J. Y. Johnson, Glasgow. From the Atmospheric I ducts Company, Jersey City, U.S.A. Eng. Pat. 8 April 22, 1901.

Compounds of nitrogen and oxygen are produced by posing a mixture of the gases to the action of an elec arc in sufficient volume, and with sufficient rapidity renewal, to carry away the products of the arc and prevent dissociation. The arc is maintained at minimum volume sufficient to prevent its breaking, an repeatedly interrupted and re-established, which sets u the circuit, induced counter electromotive forces w resist rapid increase of current. The combination of gases is effected in a receiver in which are terminals, means are provided for passing a current of the mixed g through it, and for delivering an electric current of l potentials at the terminals to form an arc of mini volume which can be automatically elongated unti breaks. There is an electric energising circuit adapte deliver increased current in response to decreased re ance, and a plurality of nitrifying devices are connecte it through induction devices, including terminals b which arcs are established by the energy of the circuit, which can be repeatedly elongated and interrupted. A the air has been exposed to the electric arc, the m gases are cooled sufficiently to condense the resu nitrogen tetroxide, which is separated and collected, which the remaining gases are further cooled to cond the nitrogen trioxide, which is then also separated collected. The apparatus for this process comprises m for refrigerating and removing moisture from the a nitrifying apparatus and supply connections to it fron refrigerating means, delivery connections from the nitrif apparatus, and a cooler connected to both supply delivery connections adapted to cool the nitrified ai means of the refrigerated air.—G. H. R.

Secondary Batteries discharging Heavy Currents; struction of Plates for ——. J. Garassino, T Italy. Eng. Pat. 10,375, June 6, 1900.

A plate for electric accumulators is claimed, having form of a box made of highly antimonious lead, prod by melting and remelting, and subsequent rolling. plate is pierced all over with small holes and bent to ribs, and is closed at the top and bottom. The box is with dry granulated protoxide of lead, which is transfo into metallic lead under the influence of the electric cu —J. C.

Electric Battery Compounds, Impts. in ——. H. menberg, Jun., Wakefield, State of New York, U Eng. Pat. 11,571, June 26, 1900.

A compound is claimed, composed of a chloride chlorate of the metals of the alkalis or alkaline earth sulphate of aluminium.—J. C. R.

Accumulators, Impts. in ——. G. de Roussy de and F. Gueugnon, Paris. Eng. Pat. 19,686, Nov. 2,

The claims are (1) for an electrode formed of a supp frame of aluminium enveloped with a thin sheet of le such a manner as to form a diaphragm, such diapl being perforated and provided upon both faces with forming a brush, which is coated with lead oxide and rolled; (2) the combination of an electrode, as des above, with a perforated box of ebonite, celluloid, or insulating material; (3) a cathode formed of an alun tank suitably divided into compartments and coated inside with a layer of "porous or other lead"; (4) be rated aluminium insulated the one from another to nt detachment of oxide; and the use of sawdust or powder for the purpose of rendering the liquid olyte immobile.—J. C. R.

ating and Steam Packing Substance, which is also e-, Water-, and Acid-resisting, and Process of nufacturing same. J. Stocker and H. Zander, both Berlin. Eng. Pat. 5336, March 13, 1901.

laim is for "a process for making a substance which tes against electricity and heat, and is fire-, water-, and damp-resisting, by the use of caustic potash, calcined magnesia, and soapstone, characterised by , chloride of calcium, and a greasy material (pre- y carnaüba wax) being added to the above-named nces in such a way that the borax is added to xture of caustic potash solution and ground soap- in order to fully dissolve the latter, and after the e has been allowed to stand a long time with exclu- f air, the alum and magnesia are added, and the e allowed to dry, chloride of calcium and grease then mixed therewith, and finally the mass heated ressed." The material is stated to be capable of worked into various forms, as plates, tubes, bars, ons of granite, marble, slate, and the like, and into ed compounds.—E. S.

: Apparatus for Use in the Purification of ——. I. Lake. From J. M. A. Lacomme and W. Lauder. Pat. 7,806, 1901.

See under XVIII. B., *page* 739.

(*B.*)—ELECTRO-METALLURGY.

trolytic Refining in the United States. T. Ulke. Elect. Rev. 1901, **38**, 85 and 101—103.

are now 11 electrolytic copper refineries in the United with an estimated total output of 579 tons per day. ted that 19,400,000 oz. of silver and 174,000 oz. of r annum are recovered from the slimes of the copper vats. At the Raritan Copper Refinery, Perth- , automatic machinery is used for moulding the and the costs of refining have been reduced to less lols. per ton of anode copper.

Moebius process for the electrolytic refining of doré carried on at three works, the total output being d at 160,000 oz. of silver per day; the cost of does not amount to more than 20—30 c. per 100 oz. silver. Electrolytic refining of gold bullion by the ll process is being carried on at the U.S. Mint, phia, the output being estimated at 1,000 oz. per .. S.

ctrolytic Copper Refining Plant at Anaconda. Engineer, 1901, **37**, 186—187.

IPTION of the plant in use for the refining of crude n the form of anode plates containing 99·6 per cent. The refining is carried on in 1,400 lead-lined vats, which measures 8 × 5 × 3½ feet deep, and holds res of copper sulphate solution. The solution is d continually through the vats by means of pumps, naintained at a suitable temperature by means of eating vats. The condition and strength of the te are checked by daily chemical tests. The vats in series of 200, the positive bus-bars of one vat ntinued as negative bus-bars over the vat next in s. Each vat contains 19 sets of anode plates and f cathode plates, and requires an E.M.F. of 0·3 a current of 4,000 ampères; the current density ères per square foot of anode area. The electrodes d 2 inches apart, and the vat, when charged, 8,200 lb. of anode copper; the anodes are renewed days. The cathode sheets are prepared by g copper electrolytically upon copper sheets coated hite and paraffin. After 24 hours the sheets are rem the backing, and are used as cathodes in the ats.—A. S.

PATENTS.

Brass, Copper, and other Metallic Objects, Encaustic or other Tiles or China or Porcelain Ware; Colouring or Decorating ——. D. Sinclair, Coalbrookdale. Eng. Pat. 10,977, June 16, 1900.

IRIDESCENT or colour effects are formed on metallic, fictile, or other objects capable of withstanding a considerable degree of heat, by forming a chemically conducting clean metallic surface on them, if that be other than cupreous, coating it with a cupreous layer, placing it on the anode of an electrolysing bath having for the electrolyte a mixture of caustic alkali, litharge, and water, to which has been added a solution of copper, and submitting it to the electric current until the requisite thickness of layer is obtained, and then drying and heating. Portions of the articles may be protected with varnish during the electrolytic process, whereby two or more different tints are obtained on the same pattern, and a translucent coating of oxide of lead (or oxide of lead and copper) of varying thicknesses is formed.
—G. H. R.

Aluminium; Process for the Purification of ——. W. B. Johnson, Liverpool. From the Pittsburg Reduction Co., Pittsburg, Pa., U.S.A. Eng. Pat. 8153, April 20, 1901.

THE aluminium is supported, in the fused condition, in a carbon tray, in a bath of fused sodium fluoride or other suitable material. The aluminium is then connected up as an anode in the bath, whilst the walls of the containing-vessel form the cathode, a current of 20—30 ampères per square inch of aluminium anode-surface being used for electrolysis. When the process is properly conducted, impurities such as iron and silicon remain at the anode, whilst the more electro-positive impurities, such as magnesium, dissolve at the anode, but are not re-deposited at the cathode.—W. G. M.

Metals or Alloys for Lithographic Purposes; Process of Electrolytically Preparing ——. O. C. Strecker, Darmstadt, Germany. Eng. Pat. 6701, April 10, 1900.

THE inventor refers to his U.S. Patent No. 516,328, of March 13, 1894, wherein he has described a process of preparing aluminium plates for lithographic printing by treatment with acid. The objectionable feature of the invention, *viz.*, the liberation of hydrogen gas on subjecting the plates to acid or other corrosives, is relieved in the present invention, the characteristic feature of which consists in employing the electrolysis of aqueous salt solutions for the production of insoluble salts in the form of a facing upon metal plates. The object of this facing is to attract and retain water on the cleaned metal provided with a lithographic transfer or drawing.

The first claim is for a process of coating metal printing plates of the lithographic system (including plates made of alloys) with a water-retaining layer, before or after the application of the drawing, and removing water-retaining layers from such plates, for cleaning purposes, characterised by the employment of electrolysis in such a manner that the plate to be treated constitutes one electrode, and the electrolyte is formed of a substance, the ion of which going to the electrode is capable of producing with the metal of the plate a layer which may directly serve as a water-retaining layer, or which may be converted into such a layer by further chemical treatment, the electrolysis being capable of reducing or partially dissolving the substance of the water-retaining layer.—J. C. R.

XII.—FATS, OILS, AND SOAP.

Walnut Oil from Juglans Nigra, L. L. F. Kebler. J. Franklin Inst. 1901, **151**, [5], 394—395.

OIL of walnuts is chiefly used by artists for paints, as it dries into a varnish, which is less liable to crack than linseed oil varnish. Pure cold-pressed black-walnut oil is limpid, of a straw-yellow colour, possesses a pleasant agreeable walnut-like odour and taste, becomes turbid at 12° C., has a specific gravity of 0·9215 at 15° C.; saponification value, 190·1—191·5; acid value, 8·6—9;

Hehner value, 92·77; Reichert-Meissl value, 15 c.c.; iodine value, 141·4—142·7; melting point of fatty acids, o C.—C. T. T.

Fat; Apparatus for the Determination of——.
H. J. Wheeler and B. L. Hartwell.

See under XXIII., *page* 753.

Vegetable Oils, Heated; Detection of——in other Oils.
M. Tortelli and R. Ruggeri.

See under XXIII., *page* 753.

Sesame Oil: Modification of Milliau's Reaction for——.
G. Armani.

See under XXIII., *page* 752.

PATENTS.

Soap: Manufacture of——. A. Merry, Liscard, Chester, and J. H. Noble, Liverpool. Eng. Pat. 2372, Feb. 6, 1900.

According to this patent a solution of an alkali salt is electrolysed, and the liberated alkali received by an emulsion of oil or fat, with water or steam, the resulting soap paste being afterwards boiled in the usual way. Special claim is also made for a submerged electrolytic cell in connection with this process. In this the electrolyte (solution of a salt) and anode are contained in a porous cell, whilst the cathode, consisting of a pervious material, such as wire gauze, surrounds the porous cell. The whole is suspended, either partially or wholly immersed, in the soap pan, in which the contents are brought into a state of emulsion by mechanical agitation or by means of a jet of steam or air. Means are provided for collecting the liberated halogen, and for circulating and renewing the electrolyte.—C. A. M.

Deodorising, Washing, or Bleaching Agent; Process of Manufacturing——. M. Depangher, Trieste, and V. U. Pontini, Trieste. Eng. Pat. 20,023, Nov. 7, 1900.

The compound claimed, is prepared by allowing a saturated aqueous solution of "soda" (sodium carbonate) to crystallise, and adding, during the crystallisation, a solution of rosin in a mixture of cresol and ether, in certain specified proportions.—C. A. M.

Soap; New and Improved——. C. Allworth, London. Eng. Pat. 11,053, June 21, 1900. (Under sec. 2, Pat. Act, 1888.)

Claim is made for the use of from 1 to 25 per cent. of potassium permanganate with the ordinary ingredients of soap. —C. A. M.

Cotton-seed Hulls; Treatment of——, and obtaining certain Useful Products therefrom. J. C. W. Stanley. Eng. Pat. 22,954, 1900.

See under V., *page* 710.

Food for Animals; Treatment of Cotton Pods or Shells for the Manufacture of——. M. Phillips and O. Müller. Eng. Pat. 9649, 1900.

See under XVIII. A., *page* 738.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

Zinc White; Use of —— in Place of White Lead for Oil Painting. A. Livache. Comptes Rend. 1901, **132**, 1230.

In compounding an oil paint from a unit weight of pigment, the total quantity of oil taken (*i.e.*, the oil in the "ground" product *plus* that added in "mixing") should be in inverse proportion to the specific gravity of the colouring matter. This rule being observed, there is no difference in covering power between zinc white and white lead; for both calculation and experiment show that as the weight of pigment laid on a given surface with such a paint varies directly
with the density of the pigment, it occupies the same v
on the surface however it be composed. Addition of
cent. of a siccative will cause a zinc-white paint to
the time that is practically desirable, without permitti
pigment to become in the least yellow in appearanc
suitable drier is the resinate of manganese, which is
powerful, and dissolves completely in cold oil.

The chief agents in producing plumbism among pa
are lead stoppings and primings, which remain in c
with the flesh for a long time, and sometimes have
rubbed down (pumiced) dry, yielding much dust. I
paring such materials the above rule holds: the prop
by volume of the solid matter in the compositio
constant. The adhesiveness of a stopping depends
on the porosity of its pigment, and the solid matter i
employed as an excipient for the oil. Whiting is de
in porosity, but precipitated chalk is exceptionally
and finely divided; therefore without the assistance
or zinc it makes a perfect stopping. Zinc white
substituted for white lead in a stopping with co
success, provided the proportion of pigment is s
adjusted.

Similar remarks apply to primings, which are esse
the same in composition, but thinned with turpent
suit the brush. There does not seem to be any disadv
in using zinc white on the score of expense; in dur
it is identical with white lead, even for external pu
owing to the higher proportion of oil, which rend
film more elastic and less liable to injury during cha
temperature.—F. H. L.

PATENTS.

Heat-insulating Paint. J. Hommel, Los Angeles
fornia, U.S.A. Eng. Pat. 19,871, Nov. 5, 1900. (
Internat. Conv., June 26, 1900.)

Eight lb. of alum and 4 lb. of glue are dissolve
gallons of strong boiling vinegar, and when cold
of powdered asbestos and 12 lb. of saltpetre are mi
One or more coats of this composition are appl
means of a brush to any substance, such as well-se
wood, which it is desired to protect from chan
temperature, decay, and danger of fire.—F. H. L.

Colouring Matters; Impts. in the Manufacture o
A. Haagen, Cologne, Germany. Eng. Pat. 7560, A
1901.

The patentee obtains ferro-chrome colouring matt
reacting with iron compounds on chromic acid or its
alkaline solution, or by adding to these compounds an
alkaline earth (including magnesia), ammonia, or al
The products obtained are basic double salts similar
iron alums in composition, the whole or part of the sa
acid being replaced by chromic acid. For insta
precipitating potassium bichromate with sulphate of
presence of potassium carbonate, a product is o
having a composition corresponding to the formula—

$$4K_2Cr_2O_7 \cdot 3Fe_2SO_6 . 14H_2O,$$

only a trace of chromium remaining in the s
According to another example, by reacting with
chloride on potassium bichromate mixed with
carbonate, the resulting compound has the formula—

$$3K_2Cr_2O_7 \cdot 5Fe_2O_3 2CrO_3 . 8H_2O.$$

The yellow chrome iron colour obtained, when mix
blue colours, yields a variety of green shades.—T. A.

Soot from Tar; Process and Apparatus for the
facture of ——. A. Bente, Cologne, Germany.
Pat. 8995, May 1, 1901.

A continuous process for producing soot from tar c
in passing a regulated quantity of tar, and of air
incomplete combustion thereof, into a cylindrical,
horizontal rotary furnace provided with an internal
conveyer, whereby the tar is continuously moved
the manufacture and a temperature of between 300
C. is not exceeded. In addition to the soot, p
simultaneously produced, and is delivered throu
outlet tube into water.—R. S.

(*B.*)—RESINS, VARNISHES.

ıri Bush Copal. A. Tschirch and B. Niederstadt. Archiv. der Pharm. **239**, 145--167.

ɔllowing is found to be the percentage composition resin of *Dammara australis.* The portion soluble ¦a solution, comprising 73 to 75 per cent. of the contained kaurinic acid, $C_{10}H_{16}O_2$, 1·5 per cent.: ¦ β- kaurolic acids, $C_{12}H_{20}O_2$, 48 to 50 per cent.; olic acid, $C_{17}H_{34}O_2$, and kauronolic acid, $C_{12}H_{24}O_2$, ɜr from 20—22 per cent. Kaurinic acid is crystalline mbines with ammonium carbonate. The other resin ıre amorphous. α- and β- kaurolic acids are soluble um carbonate, while kaurinolic and kauronolic acid solved in potassium hydrate. The portion insoluble ium hydrate solution consists of 12·5 per cent. of ꜝ oil, 12·2 per cent. of indifferent resene, and 0·5 to ꜝent. of bitter principle. The essential oil has the ꜝ gravity 0·835 at 15° C., the greater portion ıg between 156° C. and 160° C.; it has a pleasant like odour, and, when freshly distilled, is neutral, exposure to the air becomes acid and quickly es.—J. O. B.

ı of Pinus Sylvestris. A. Tschirch and B. Niederstadt. Archiv. der Pharm. **239**, 167—181.

ɜrcentage composition of the oleoresin of *Pinus is*, obtained from Finland is found to be:—Silveolic $_4H_{20}O_2$, 1·5 per cent.; α-silvinolic acid, $C_{15}H_{26}O_2$, ilvinolic acid, $C_{14}H_{24}O_2$, together, 58 to 60 per cent. ıcids are all removed from the ethereal solution of ·resin by shaking out with caustic soda, but not with potash. Only silveolic acid is crystalline; the ꜝids are amorphous. The former was isolated by sation from alcoholic solutions. The two amorcids remaining in the mother liquor were separated tment with alcoholic basic lead acetate solution; salt of α-silvinolic acid is insoluble in alcohol, ıat of β-silvinolic acid is soluble. Silveolic acid basic.

ortion insoluble in soda solution contained 15 per ' volatile oil, and 20 to 21 per cent. of resene. ·f bitter principle and of succinic acid were present. tile oil boils between 155°—160° C. It has the gravity 0·840 at 15° C. It is soluble in alcohol, rm, and ether in all proportions. When first it is neutral, but becomes acid on exposure to the O. B.

Walnut Oil. L. F. Kebler.

See under XII., *page* 727.

PATENTS.

Ɔil Varnishes]; *Process for Producing* ——. iukelmann, Hamburg. Eng. Pat. 9048, May 16,

ɛss for producing lacs from hard resin, in which ed resin, such as copal, amber, or the like, is by dissolved in sebacic acid or "oil-acids"), and for the same, a drying medium, such as drying oils, luting medium, such as turpentine oil, are added. posed to dissolve any hard resin in palm oil or, y, spermaceti oil by agitation at a moderate tembefore adding the linseed oil, &c.—a process ılds a pale and brilliant varnish, because high and l heating of the resin is avoided.—F. H. L.

Vire; Manufacture of ——. G. E. Parker, Boston, U.S.A. Eng. Pat. 20,948, Nov. 20, 1900.

ꜝification describes a composition and apparatus ɔg wire with a protective varnish which is y flexible to allow the wire to be cut into short r to be bent into small articles, such as boot-button tc. The apparatus consists of a set of guide lipping bath, and a sloping, heated, drying chamber, vhich the wire passes, uncoiling from one bank ıg up on another. The coating is prepared by two parts of copal in one of linseed oil and one of turpentine, grinding one part of bone-black into eight parts of varnish, and finally diluting one part of the black liquor with about 20 parts of varnish. In the apparatus, provision is made for the periodical introduction of nonpigmented varnish into the dipping bath, as otherwise its contents would gradually become too concentrated, and the coating on the wire be too thick.—F. H. L.

Electrical Conductors and the like; Insulation of ——, *and Compounds therefor.* H. H. Lake, London. From O. T. Hungerford, New York, U.S.A. Eng. Pat. 9211, May 3, 1901.

The composition consists (approximately) of rosin, one part; silica, or powdered kaolin, eight parts; rosin oil, one part. While this is liquid, it is used to saturate felt, and the felt, so treated, is either wound upon the conductor or, preferably, "made" upon it. The claim is specially for a flexible, non-striated insulating material.—F. H. L.

Colophony and other Soft Resins; Process for Hardening ——. J. Wetter, London. From the Elektrizitäts-Aktienges. vorm. Schuckert and Co., Nürnberg, Germany. Eng. Pat. 7625, April 13, 1901.

Colophony, with or without the addition of a drying oil, and with or without a specific drier, is melted and submitted to the action of a current of air or oxygen. This treatment hardens the rosin, and makes it a better substitute for amber or copal.—F. H. L.

(*C.*)—INDIA-RUBBER, &c.

PATENT.

[*Insulating*] *Material or Composition applicable for Various Purposes.* A. Nixon, Manchester. Eng. Pat. 18,543, Oct. 17, 1900.

This is a mixture of black sulphide of antimony, 4 lb.; asbestos powder, 6 lb.; india-rubber dough, 90 lb. It is moulded into discs, rings, sheets, &c.; and finally vulcanised as usual.—F. H. L.

XIV.—TANNING, LEATHER, GLUE, SIZE.

Tanning Material; A New ——. Leather Manufacturer, **12**, [5], 82.

Extract of the bark of the than tree has been used for adulterating cutch in Burmah for some considerable time. The fact that this material contains considerable quantities of tannin has until recently been overlooked; recent tests made at the Imperial Institute have, however, shown that it contains quite a large percentage of tannins.—M. C. L.

Tanning Liquors; Purifying ——. Leather Manufacturer, **12**, [4], 73.

A method of clarifying tanning liquids (Amer. Pat. 671, 570), by Albert Thompson and Emile Blin, consists in treating the tanning liquid with a vegeto-alkaloid, preference being given to the cinchona alkaloids.

The tanning solution, after evaporation to a density of 3 to 4 degrees Baume, is allowed to cool, when a solution of the salts of the alkaloids of quinquina is added, and the mixture strongly agitated for five minutes; the foreign colouring and organic matters, together with a certain proportion of the tanning matter, are precipitated together with the alkaloid, leaving a clear solution; this precipitate, which contains the major portion of the alkaloid, is separated and treated with water acidulated with hydrochloric acid; the liquid is then filtered and treated with a solution of 10 grms. of quicklime dissolved in 1 litre of hydrochloric acid, the alkaloids being precipitated with the excess of lime; this precipitate is collected and washed, when it is treated with water acidulated with sulphuric acid; the liquid is filtered, and decolorised with animal charcoal, again filtered, and neutralised by the quinine or one of the other alkaloids precipitated by carbonate of soda in a portion of the liquid.

The inventors show that mineral acids precipitate salts of lime and destroy certain properties of the tanning liquor, bringing about discoloration. These acids have a disastrous effect in the tanning process, since they favour oxidation. Tanning liquors clarified by means of mineral acids are therefore prejudicial.—M. C. L.

Lactic Acid ; Bleaching Skins with ——. Leather Manufacturer, **12**, [4], 70.

It is necessary, in order to obtain clear level dyeing, to bleach the leather with a solution of acid before dyeing. Sulphuric acid is usually employed for this purpose: there are, however, many objections to its use, and lactic acid has been generally substituted.

The skins are immersed in a 2 per cent. solution of lactic acid which is slightly warm; if the leather has to be dyed with acid dyestuffs they may be applied immediately after this treatment; it is generally preferable to wash the skins before dyeing with most basic dyestuffs; some of these, however, dye fuller shades if the leather is not washed free from acid. Sheepskins, if at all greasy, generally require washing in a dilute soda solution and then in water before this treatment; a little alum added to the lactic acid solution is useful. If desired, the lactic acid may be applied to the leather with a sponge.
— M. C. L.

Sheepskins : Liming ——. Leather Manufacturer, **12**, [4], 76.

Sheepskins intended for manufacturing gloves are given a much longer liming than other classes of goods, in order to produce an elastic fibre; this elasticity of fibre in the sheepskins, as at one time manufactured, was adverse to their use for boots and shoes. The sheepskin tanned by the chrome process is now largely used for vamps in shoes. The New Zealand sheepskin is fine pored, clear grained, and free from barbed-wire scratches, often found in other sheep.

The liming of these skins is a short one, being only sufficient to loosen the hair and plump the skin; the lime is removed by means of acids, in preference to a manure bate, in order to retain the natural plumpness of the skin and tension of the fibre. After tanning by the chrome process, the goods are lightly oiled, dyed, and hung up to dry, after which they are damped and softened by perching; the process of "staking" making these goods too soft and spongy; the goods are now dried out and nailed on boards in order to remove excess of stretch.—M. C. L.

Sheepskins : Coloured ——. Leather Manufacturer. **12**, [3], 45; **12**, [4], 65; [5], 85.

The soaking of skins to be dyed, should be done in clean water; neglect of thorough soaking often causes unevenly coloured grain, hard spots, and an appearance of pin punctures on the grain surface of the leather. After first soaking for a few hours, the goods should be removed, drained, and placed in a second soak. Stale soaks should never be used, as they cause a loss of hide substance and sometimes damage to the grain; soft water must be used in the soaking; if, however, this cannot be had, a little borax or sodium sulphide should be added to the hard water. Salted skins usually require 24 hours, dyed skins 48 to 96 hours soaking.

Sheepskins are usually limed with a mixture of lime and sulphide of sodium or arsenic, the liming operation commencing with a weak lime, the goods being moved daily into a slightly stronger lime, until they have had from six to eight days' liming. Strong limes used at the commencement have a tendency to raise the grain from the flesh; skins intended for glove leather require a slightly longer liming.

After liming, the skins require a thorough drenching in order to remove the whole of the lime; any lime left in the skins causes them to be hard and close grained.

The bran drench is largely used for removing the lime, and gives good results when carefully watched. Lactic acid may also be employed, in which case the skins are paddled in a solution of the acid, using one gallon dissolved in 100 gallons of warm water, for one hour; they are then worked over the beam to remove dissolved lime, &c., and are treated with a fresh solution of lactic acid of the same strength as before; they are now ready to be pickled.

The pickling is done with a mixture of sulphuric and salt, using about five times as much salt as ac practical formula being $2\frac{1}{2}$ quarts of acid and 50 lb. o for each 100 skins. Pickled skins make softer leather skins not so treated, the operation also removing th traces of lime. The goods are now ready for tanning.

The materials employed for tanning depend upon th to which the leather has eventually to be put; the ch method is largely used when the leather has to be emp for shoe and glove purposes. For light soft leathers " metto" is sometimes used, this material tanning very rap for bag lining and fancy leathers, quebracho or ga is usually employed, or a combination of two or materials.

Sheep skins are difficult to dye, because of their g nature, but the leather itself, owing to its porous m is readily penetrated by the dyestuffs. Skins tanned gambier, quebracho, and similar tannages are dried after tanning and allowed to lie for some weeks in that they may become softer and mellower; before d they need washing, which is best performed in a using warm water to which a little borax has been add

Chrome tanned skins before dyeing require morda which is done by washing them in a warm borax sol and then treating with warm sumach liquor; they are given a bath of tartar emetic solution, washed, an ready to be dyed; fustic extract or a mixture cont fustic extract and sumach may be used as a mordant, goods are to be dyed a dark shade.

The firmness of sheep skins may be increased by tr with a solution of potassium ferrocyanide. Skins of av size require 2 to 3 oz. of dyestuff per dozen.

Vegetable tanned skins do not require mordanting dyeing, the tannin in the leather acting as a morda is customary however to clear the leather by treatmen a solution of acid; sulphuric acid is often used fo purpose though, unless used in very dilute soluti injures the strength of the leather and alters the of colour; oxalic acid lightens the colour of dark t leather and removes all cloudy spots and streaks; acid tones down the colour and helps in producing a shade. The colour of very dark tanned leather is imp by passing it through a warm sumach liquor several and then leaving it therein for several hours. Lacti of about 10 per cent. strength may be used to cle grain surface from grease and to slightly open the fil as to allow the dyestuff to penetrate. If basic dy are to be used, it is necessary after this treatment to the leather free from acid before dyeing.

The skins may be dyed by simply paddling or dru them in the dye bath, or by applying the dye to the side of the leather with a brush; when the paddle is employed, the goods should be paddled for 30 minutes in each solution; in the case of the method the goods should be tumbled for 15 minutes mordant, and for the same length of time in the d solution.

Colours may be fixed on leather by treatment solution of 2 lb. of potassium bichromate, $\frac{1}{2}$ gallon o acid, dissolved in 50 gallons warm water, this s giving a fuller and more level appearance. C chrome leather is lightly fat liquored with a mixture and oil, to which, after boiling, and cooling to 75° F., egg yolk is added; the goods may be fat liquore 1 pint egg yolk, $\frac{1}{2}$ pint olive oil, to each dozen ski skins being drummed in the mixture for 20 immediately after dyeing.

After dyeing, the goods are oiled with a little ne oil and are then dried out, moistened, staked, tac boards, and seasoned. The grain of the skin freeing from greasy matter before applying the sea This may be done by well rubbing into the leather of water, 1 gall. of apple vinegar, together with the of a few ounces of bichromate of potash, and the le dried before seasoning. The following seasoning liqu be recommended: 2 galls. of egg albumin, 2 pints of acid, $\frac{1}{2}$ oz. of potassium bichromate, and a small qua oil dissolved in 10 galls. of water. After the first the following liquid is used: 10 galls. water, 6 galls vioette. Two or three coats of the seasoning are d, the leather being dried before glazing, which is complished in a dark room, a strong light causing the lo fade.—M. C. L.

eather ; Improved Treatment of——. Leather Manufacturer. **12.** [5], 89.

DING to a method patented in France by M. Arthur ns after tanning by one of the ordinary processes d after splitting or buffing, and treated in a drum nixture of 2½ kilos. of alum, 2 kilos. of chalk, 1 kilo. of d 3 litres of water, for about 4 hours; they are then and treated with 5 kilos. of asphaltum, ½ kilo. of bber, dissolved in 9 litres turpentine or napththa, h is added 6 kilos. of paraffin and 6 kilos of bees- solved in boiled linseed oil; the goods are drummed nixture for 4 hours, and are then exposed to the air —M. C. L.

Leather ; A theory about Bating——. Leather Manufacturer. **12.** [4] 75.

ather when placed on the soles of shoes will wear the fibres are soft and pliable.

der to remove the hair by the sweating process, the to be brought to a certain degree of decomposition, this purpose bating is done: thus a hide bated, ning, is in a similar condition to one after sweating. es should be treated like upper leather hides and irly low; after all the lime has been removed they the same condition as sole leather hides after ; they should then be swollen in a sour liquor, acids being preferable to inorganic acids for pose. Such a leather, on account of the fibres astic and soft, should maintain its solidity after nd be much improved in colour.—M. C. L.

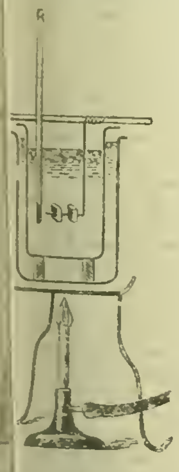
Leather ; A Grease Polish for Dull Black ——. Leather Manufacturer, **12,** [4], 64.

of hog's lard, 2 lb. of yellow wax, 5 lb. of tallow, and bone oil are melted, together with the addition of a rosine; the mixture is applied to the grain surface ott woollen cloth, and the leather is finally wiped a piece of clean, dry rag.—M. C. L.

pparatus for determining the Melting Point of tions of——. N. Chercheffsky. Chem. Zeit., , **25,** 413.

paratus consists of a 250 cc. beaker filled about rters full of some indifferent liquid such as refined il Across its mouth lies a glass rod on which the coiled end of a brass wire is slipped, the other end of the wire depending into the liquid, and being curved horizontally to hold little cubes of the gelatin jelly, the melting point of which has to be determined. A thermometer hangs with its bulb as close as possible to the brass wire. The jelly is usually prepared from equal weights of gelatin and water; when it has solidified, it is cut into blocks about 5 mm. long and wide. These are threaded on to the wire without touching, and the melting point arrives when they lose their rectangular form. For exact work the beaker may be supported on pieces of cork other beaker, as illustrated; the interspace being water. The same apparatus may be used for g the melting points of wax and fats, charging beaker with a suitable liquid such as water.

—F. H. L.



PATENTS.

Spent Tan, Peat, and Similar Substances ; Production of Combustible Gases from——. R. Harrison. Eng. Pat. 3429, Feb. 21, 1900.

See under II., *page* 697.

Skins, Fabrics, Cotton, Wool, or other Substance ; Machine for a Method of Dipping and Dyeing. W. Ruttenau and C. Hahlo. Eng. Pat. 13,027, July 19, 1900.

See under VI., *page* 713.

Artificial Leather ; Improvements in the Art of Making ——. Marks and Clerk, London. From G. S. and C. F. Falkenstein, Philadelphia, Pennsylvania, U.S.A. Eng. Pat. 3062, Feb. 12, 1901.

Two sheets, one, the backing, being a textile material, the other, the facing, a loosely matted or felted cellulose material, are passed together through pressure-rolls into a tank where they are caused to adhere by an acid spray consisting of sulphuric acid of sp. gr. 1·83 (2 parts), and hydrochloric acid of sp. gr. 1·16 (1 part). The composite sheet is then sprayed with dilute alkali to remove excess of acid, and passed into a tank containing a liquid filling material composed of glycerin (30 parts), linseed-oil (100 parts), flour (10 parts), dégras (5 parts). Any excess is removed by brushes, and the web is then passed over rolls, through a dyeing tank, thence over a heated drying cylinder, and finally over calendering rolls where various effects may be produced on the facing which will now have acquired a leather-like consistence. The operations are continuous.—R. L. J.

Leather and other Fabrics ; Device for Testing [*for Porosity*]. J. E. Kennedy, Boston, U.S.A. Eng. Pat. 4884, March 7, 1901.

The sheet of leather is clamped between the two halves of a split hollow metal sphere, so as to divide the interior into two chambers. To the one side, coal gas is led under pressure; at the other some device, such as a small (lighted) burner, is fixed in order to measure or estimate the quantity of gas forcing its way through the leather diaphragm.—F. H. L.

Tanning ; Improvements in——. F. W. Howorth, London. From L. B. Traut, G. Soldani, and P. V. San Martin, Buenos Ayres, Argentine Republic. Eng. Pat. 9025. May 1, 1901.

The solution obtained by mixing together wrought iron (20 kilos.), sal-ammoniac (ammonium chloride) (1½ kilos.), refined sugar (2 kilos.), nitric acid of 40° B. (10 litres), soft water (2½ litres), is diluted with more water (50 kilos.), allowed to settle and strained. The hides are immersed in an aqueous bath containing about 50 per cent. of the above fluid, kept in motion for three hours, and then left until tanning is complete. After removal, they are drained for two hours, and placed in a second bath of the following composition:—Commercial acetic acid and magnesium sulphate (½ kilo. each), water (10 litres). Any of the constituents of the first bath, except nitric acid, may be omitted as desired.—R. L. J.

XV.—MANURES, Etc.

Fertilisers ; Rate of Nitrification of some ——. W. A. Withers and G. S. Fraps. J. Amer. Chem. Soc., 1901, **23,** 318–326.

Any form of combined nitrogen when applied to soil, is converted first into ammonium salts, then into nitrites and finally into nitrates, in which form it is assimilated by the plant. A determination of the relative rates with which nitrogenous fertilisers, not directly utilisable by plants, are converted into nitrates gives an idea of the relative values of the fertilisers. The results of the authors' experiments in this direction lead to the following conclusions: 1. The nitrification of blood takes place more rapidly when it is mixed with a large quantity of soil than with a small quantity. 2. The order of nitrification in the soil used was, dried blood (most nitrified), dried fish, tankage, bat guano, bone, ammonium sulphate. Excluding the ammonium sulphate, this is the order of availability, as measured by vegetation tests and solubility in potassium permanganate. 3. When calcium carbonate was added to the soil, the nitrification was greatly accelerated and the order became, dried blood, cotton seed meal, dried fish, bat guano, tankage, ammonium sulphate, bone. 4. When ammonium sulphate is used as a fertiliser in most cases it would be advisable to add calcium carbonate in some form also. 5. The low rate of nitrification of ammonium sulphate is probably due to the presence of organisms which nitrify organic compounds in preference to ammonium salts. The presence of the ammonium sulphate may also hinder the activity of the nitrifying organisms. The acids formed may also be a hindrance when no base is present to neutralise them. All three of these causes may be in operation at the same time. —T. H. P.

Soda for Potash in Plant Growth; Substitution of ——. W. H. Jordan and G. C. Jenter. Bull. New York Agric. Exp. Station, Dec. 1900, [192], 333–350.

From the results of experiments extending over two years, as to the possibility of substituting soda for potash in plant growth, it appears that soda can be substituted for potash in quantity, but not in function. In other words, plants to which the necessary supply of potash is not available will take up more soda than when potash is present in abundance, but the soda taken up has not the same value as potash, for if the supply of the latter be deficient, the growth of the plant will be greatly depressed, even in the presenc abundant supply of soda.

Some of the results obtained appear accordingly t that the real need of plants for certain essential constituents may not be even approximately measu the proportions of the constituents which the plant shown to contain on analysis.—A. S.

Fertilisers; Determination of the Availability of
Nitrogen in ——. J. P. Street.

See under XXIII., *page* 751.

Distillery Refuse known as Burnt or Pot Ale; Tr for Fertilising Purposes of the ——. T. Storer McAlley. Eng. Pat. 9514, 1901.

See under XVII., *page* 737.

PATENT.

Phosphoric Acid (Soluble in Citric Acid) in Ba Powder, Availability of the Molybdate Me Estimating the ——. O. Foerster.

See under XXIII., *page* 751.

XVI.—SUGAR, STARCH, GUM, Et

Beetroots; Composition of some varieties of — Pagnoul. Bull. de l'Assoc. des Chim. de Sucr. et 1901, **18**, [10], 751. (Quoted by Sidersky on C Control of Agricultural Distilleries.)

——	Sugar Beetroots.				Globe
	1.	2.	3.	4.	
Average weight in grms.	700	962	775	815	1
Density of juice at 15° C.	6·6	7·3	7·6	8·3	3
Sugar per 100 c.c. of juice extracted	14·37	16·71	17·33	19·13	4
Sugar per 100 grms. of this juice	13·48	15·57	16·10	17·68	4
Sugar per 100 of beetroot, direct	12·55	14·55	15·15	16·70	5
Coefficient	93·10	93·43	94·06	94·44	110
Dry matter per 100 of beetroot	19·34	20·96	21·85	23·20	10
Water	80·66	79·04	78·15	76·80	89
Dry matter per 100 of juice extracted	15·73	17·70	18·30	19·64	7
Water	84·27	82·30	81·70	80·36	92
Insoluble per 100 of beetroot	4·48	4·08	4·40	4·60	2
Total juice	95·52	95·92	95·60	95·40	97
Sugar per 100 grms. of total juice	13·13	15·17	15·84	17·50	5
Apparent purity of juice extracted	82	86	86	87	52
Real purity	85·6	88	88	90	55
Nitrogen per 100 of dry beetroot	0·95	0·84	0·91	0·67	1
Nitrogen per 100 of beetroot not dried	0·184	0·176	0·199	0·155	0
Nitrogen per 100 of sugar	1·46	1·21	1·31	0·92	2
Potash per 100 of dry beetroot	1·442	1·250	1·016	0·918	3
Potash per 100 of beetroot not dried	0·279	0·262	0·222	0·213	0
Potash per 100 of sugar	2·22	1·80	1·46	1·27	0
Phosphoric acid per 100 of beetroot not dried	0·062	0·082	0·067	0·072	0

The above results were obtained in 1897 at the agricultural station of the Pas de Calais. They show that as the saccharine richness increases, the nitrogen and the potash decrease. In the juice of such beetroots, the alcoholic ferment does not find sufficient nourishment and cannot develop conveniently, while the juice of beetroots of medium richness containing a greater proportion of nitrogen and potash per cent. of sugar, furnishes an excellent medium for the cultivation of yeast. The sugar works avoid the non-sugar which contributes to the formation of molasses, whilst the distiller welcomes it, as being necessary to the alcoholic ferment.—L. J. de W.

Mucedinæ; Utilisation of —— *for the Manufacture of Glucose.* A. Calmette. French Pat. 301,424; through Zeits. Spiritusind. 1901, **24**, [21], 223.

Crushed maize or whole rice is boiled with twice its weight of water and 5 per cent. of its weight of hydrochloric acid for three hours, increasing the temperature from 100° to 110° and 120° C. from hour to hour. When no blu tion is obtained with iodine, the mash is dilut concentration corresponding to about 25 kilos. o per hectolitre, and passed into a special closed resembling the fermenting vessel in Collette and process. It is partially neutralised with sodium ca sterilised by steaming for 20 minutes, cooled to and sown with a young culture of the mucedinæ spores. Several species of mould fungi are ap the *Aspergillus* group being the most active. W tinuous agitation, the conversion of dextrin and into glucose at 35°—38° C. will be considerably after 24 hours. At this stage alcoholic ferm must be suppressed, either by cooling the liquor to a temperature of 10°—15° C., or by heating In both cases the effect is to stop the multiplica the fermentative activity of the organisms, with venting the continuation of the saccharifying wo enzymes. The whole process occupies about 3 h iquor is then filtered through a filter-press, the cakes luble matter being utilised for fodder; the saccharine decolorised, preferably by electrolysis, filtered over nd treated with sulphite and evaporated in a vacuum The crude glucose so produced is said to contain less per cent. of dextrin, and the yield is 97 per cent. of oretical. If desired, the preliminary acid boil may laced by a malt-mashing process, and the glucose anufactured, may be passed direct to the brewery an.—J. F. B.

organisms in the Manufacture of Beetroot Sugar.

chöne. Zeits. Ver. Deutsch. Zuckerind, 1901, **51**,], 453—468.

rious products of four sugar factories were examined logically from the beetroot chips to the massecuite e samples being taken in December, near the end of son and in the middle of the week. The raw juice e diffusers was diluted 2,000 times, the limed juice ed, and the samples from the vacuum were diluted terile water. Cultivations were then made on and agar containing dilute beetroot juice peptone d faintly alkaline, and incubated at 22° and 40° C. vely. The growth on all the plates was luxuriant. hest number of organisms per 1 c.c. of juice being 0, counting after 24 to 48 hours. The agar plates throughout a smaller number than the gelatin, many bacteria developing less at 40° than at 22° C., and iety was less also, many plates being quite pure .

o cases the beetroot chips caused liquefaction of tin, the others showed 860 and 4,200 organisms m. of chips.

evelopment in the second diffuser was less than in and freshly-mashed diffuser, which appears to be nt on the chips for its bacterial development, while ase in the last diffuser of the battery where fresh added, appears to show contamination from the

med juice was found sterile only to a small extent, lopment being almost entirely due to spore forming d illustrating the resistance of the resting forms to l chemical action. Filtration over wood pulp nsiderable diminution, whilst the increase in the s due partly to concentration and partly to infection t, water, &c.

ganisms were found which produced characteristic ermentation. Only solitary cases of the lactic vere met with, although almost all bacteria produce ic acid from sugar.

all others *Leuconostoc mesenteroides* is to be as the bacterium of sugar juice. It was found in factories, but no disturbance from formation of observed. In factory III. it was found in the l in the vacuum pan. The reason why disturbances occur from this cause is to be found in the fact al conditions of work are unfavourable to the of the jelly, temperature and content of salts to play a part. When these conditions are not occurs as a *streptococcus,* or mostly as *diplococcus.* r *streptococci* were found which formed mucus, ced acidity and development of gas. Both had a ximum temperature of development than Leuco- Several isolated *coccus* forms were found, but are rded as accidental.

ms in five varieties occurred, three motile, decep- lar to the typhus and coli groups. They attack ngly, forming alcohol, carbon dioxide, hydrogen, The volatile acids found were acetic and formic, olatile, lactic and succinic, the latter in greater The maximum temperature favourable to their nt is 45° C., although they develop well at the emperature. As these bacteria develop in con- sugar solutions and at a high temperature they ely destructive in the sugar factory. On the l as they do not form spores they are sensitive emperatures.

of the *mesenteroides* and *subtilis* groups were ll points, a fact doubtless due to the resisting power of their spores. That they are not harmless is shown by their development in concentrated sugar solutions, which they invert, producing alcohol and acetic, valerianic and lactic acids. Mucus is also produced, both in solutions and in rod cultures.

Other forms met with were *Bacterium prodigiosum,* a bacillus, producing fluorescence, various coccus and rod forms, torulas, true and spurious yeasts, and two monilia moulds. Although these are only occasional forms, their presence is connected with loss of sugar.

The means for diminishing or removing micro-organisms are filtration, antiseptics and heat. Of antiseptics, fluorides or hydrofluoric acid appear to be most suitable and efficient, although the cost is great. Heating the juice to a high temperature would be most practical were it not attended with counter-balancing disadvantages.

—L. J. de W.

Sugar Solutions; Solubility of Lime in ——, at different Temperatures.

H. Pellet and J. Weisberg. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**, [10], 773—778 and 778—780.

The authors confirm the statement of Weisberg (Bulletin Nov. and Dec. 1900) that quicklime is more soluble in sugar solutions than hydrate of lime, and the latter more soluble than milk of lime. They find that quicklime appears to be soluble, according to some observers, in the same percentage proportions of sugar independently of the concentration of the solution; others, on the contrary, state that sugar dissolves less lime according as the solution is more dilute. The solubility of lime diminishes rapidly with increase of temperature, but solutions saturated at a given temperature by agitation and prolonged contact may be raised to a higher temperature without precipitation of lime. Consequently solutions saturated in the cold and raised to 80°—90° C. and filtered, show a solubility higher than that obtained directly by mixing lime and sugar solution at the latter temperature and agitating to obtain saturation. An analogous effect is observed when a solution of sugar is cooled in presence of lime. At the moment when sugar begins to precipitate, the addition of lime in powder confers a much greater solubility than is obtained when lime and sugar solution are mixed at the same temperature. Other conditions being equal, the amount of lime dissolved per given weight of sugar is the same, whether the sugar be in the state of diffusion juice or molasses. However, if the proportion of lime present be altered, an increase in its solubility may be obtained. In consequence of the influence of the various factors, principally temperature and quantity of lime, it is difficult to give absolute figures for the solubility for lime.

Weisberg, while not regarding the figures given in his tables as final, contends that under the conditions of his experiments the solubility of lime, even at a temperature varying from 80° to 90° C. is very considerable, and higher than that given by Lamy.

For dry lime, the solubility varies with the conditions of concentration from 27 to 28°. Thus, a solution of lime and sugar at 15 to 16° C., containing 10 to 16 per cent. of sugar would be considered unsaturated if it contained less than 27 parts of lime per 100 of sugar, whilst if it contained over 28 parts, it would not be regarded as stable.

—L. J. de W.

Gum Tragacanth.

C. O'Sullivan. Proc. Chem. Soc. **17**, [239], 156—157.

The proximate constituents of the gum have been isolated, and the following were described:—

Cellulose.—The constituent insoluble in boiling water and cold dilute acid and alkalis. Treated with boiling dilute sulphuric acid, it yields arabinose and a residue of a cellulosic nature still. This residue, on further treatment with ammonia and bromine, gradually dissolves, leaving no residue of normal cellulose.

Soluble Gum.—A series of gum acids, of the nature of the geddic acids, was prepared. These acids are lævorotatory however, the rotation being about as much to the left as that of the geddic acids is to the right. The acids are shown to be polyarabinan-trigalactan-geddic acids, the chief of them being $11C_{10}H_{16}O_8$, $3C_{12}H_{20}O_{10}$, $C_{23}H_{36}O_{20}$, H_2O. The optical a .vity of this acid is [α]ᴰ = − 88°. On sulphuric acid hydrolysis, it should yield 71·7 per cent. of arabinose. Quantities varying between 72 and 76 per cent. of moderately pure arabinose were obtained from the mixed gum acids.

Granules.—The granules, apparently starch granules, are coloured blue by iodine, and on treatment with diastase, yield dextrose, but not maltose.

Nitrogenous Matter.—No attempt was made to purify this substance. It is of much the same nature as the nitrogenous matter described in dealing with the geddic gum (Trans. Chem. Soc. 1891, **59**, 1061), but it does not give the same proteid reaction as that substance does.

Bassorin was not completely purified, but it was found to be an acid having [α]ᴅ = + 98°. Under the action of excess of alkalis, it yields two acids, α- and β-tragacanthan-xylan-bassoric acid. The nature of this transformation will be described on a future occasion.

α-Tragacanthan-xylan-bassoric Acid.—Its preparation and purification were described: it is soluble in cold water. Its analysis led to the formula $C_{24}H_{34}O_{20}$, H_2O. [α]ᴅ = + 138·6° − 138·2°; D = 1·12 − 4·13°.

Digested for 20 minutes at 98° with 5 per cent. sulphuric acid, it yields a lævorotatory pentose, *tragacanthose*, [α]ᴅ = − 30° approx., and *xylan-bassoric acid*, [α]ᴰ = + 200°. The equation

$$C_{24}H_{36}O_{21} + H_2O = \underset{\text{Traga-canthose.}}{C_5H_{10}O_5} + \underset{\text{Xylan-bassoric acid.}}{C_{19}H_{28}O_{17}}$$

represents the hydrolysis.

Xylan-bassoric acid is almost insoluble in cold water, the alkali salts are soluble, salts of the alkaline earths and most heavy metals are insoluble. Acted upon with 5 per cent. sulphuric acid, *xylose* and *bassoric acid* are obtained.

$$C_{19}H_{28}O_{17} + H_2O = \underset{\text{Xylose.}}{C_5H_{10}O_5} + \underset{\text{Bassoric acid.}}{C_{14}H_{20}O_{13}}$$

Bassoric acid is almost insoluble in cold water; in alkaline solution its optical activity was found to be [α]ᴅ = + 255°.

β-Tragacanthan-xylan-bassoric acid is left behind as a crumbly mass, when the α-acid is dissolved out by cold water. The barium and calcium salts, as well as most of the salts of the heavy metals, are of very low solubility. Treated with sulphuric acid, it yields the same products as the α-acid.

Sugar; Rapid Determination of ——, in Beets. R. S. Hiltner and R. W. Thatcher.

See under XXIII., *page* 754.

Sugar Beet; Apparatus for Extracting the Cane Sugar from ——, for Polarisation. A. Herzfeld.

See under XXIII., *page* 753.

Beet Juice; Experiments relating to the Krause Method for Determining the Purity of ——. F. Ehrlich.

See under XXIII., *page* 754.

Sugars from Cellulose. H. J. H. Fenton. Proc. Chem. Soc. 1901, **17**, [240], 166.

See under XXIV., *page* 757.

Sugar Reaction; New ——. T. Sollmann.

See under XXIII., *page* 753.

Glucose; Analysis of Commercial ——. Determination of Cane Sugar in Presence of Levulose, Dextrose, and Dextrin. H. Pellet.

See under XXIII., *page* 754.

Massecuites and Syrups; Rapid Method for Determining the Purity of ——. Arnauld.

See under XXIII., *page* 755.

Mannose in Cane Sugar Products; Detection ad
Determination of ——. H. Pellet.

See under XXIII., *page* 754.

Bagasse as Fuel; Approximate Value of —
F. N. G. Gill.

See under II., *page* 695.

PATENTS.

Sugar (Dextrose); Improved Process for C
Cellulose into ——. A. Classen, Aix-la-Chapel
Pat. 4199, Feb. 27, 1901.

The process described, is an improvement on that
in the Eng. Pat. 259 of 1900 (see this Journal,
and 1028). Instead of being treated with sulph
the moist disintegrated wood, sawdust, or the lik
jected to the action of sulphur trioxide vapours.
may be mixed with sulphur dioxide and the vap
be caused to act on the woody material at a te
of about 100° C. Another modification consists i
the mass in closed vessels to about 125° C. aft
been treated with the vapours as above. The p
the reaction is washed and the solution boiled
vessels. This process necessitates the use of
quantity of sulphuric acid, besides dispensing
mixing of the materials and with the disintegrati
product.—T. H. P.

Waste Liquids from Sugar Manufacture;
Treating ——. I. Fischel, Vienna. Eng. I
April 2, 1901.

This is a process of converting molasses, osmos
syrupy liquids, &c., into dry and easily portable
by allowing the liquids to be absorbed by inacti
substances, such as sawdust, cotton waste, beetr
crushed or ground cereals, kieselguhr, coal dust,
or the like, the mass thus obtained, being dried ei
air or by heating at temperatures up to 120° C.—T

[*Molasses*] *Artificial Fuel.* L. A. Mainga
Eng. Pat. 15,087, Aug. 23, 1900.

See under II., *page* 697.

XVII.—BREWING, WINES, SPIRITS

Yeasts; Sporulation of ——. A. Guillierm
Comptes Rend. **132**, [19], 1194—1196.

A histological paper. When development be
yeast cell contains a nucleus in which no definite
can be discerned, attached to a vacuole conta
grains. During sporulation, a kind of solution
grains seems to take place, for they disappear,
vacuole becomes of a uniform pink colour. The
stance apparently forms a store of reserve fo
whole process of sporulation is analogous to that
in the higher *Ascomycetes.*—J. T. D.

Alcoholic Fermentation without Yeast Cells. Te
munication. E. Buchner and R. Rapp. Ber.
[8], 1523—1530.

The authors communicate various further observ
the cell juice expressed from Munich bottom ferr
beer-yeast. The extracts, evaporated *in vacuo* a
fully dried over sulphuric acid, have now been
12 months without appreciable loss of fermentati
The presence of small quantities of neutral salts of
considerable retarding influence on the activity of
Adding certain salts to the expressed extracts, th
find that 1 per cent. of sodium or ammonium chlor
slight but marked effect; 1 per cent. of sodium, a
or magnesium sulphate is still more harmful, a
2 per cent. of the chlorides. The addition of 1 pe
calcium chloride has a very strong retarding i
whereas barium chloride has hardly any effect at 1
and only a moderate one at 2 per cent. concentration

obably explained by its high molecular weight ; the same so true for borax. The presence of electrolytes seems nodify the colloidal condition. The authors confirm blewski's observation that the addition of nitrites to the causes an evolution of nitrogen by interaction with amino constituents. Preliminary investigations have made with a view to the determination of the by-pro- of cell-free fermentation (glycerin and succinic acid). the fermentation of 100 grms. of cane sugar, 1,250 c.c. east-extract were required, and the impurities thus duced, caused great difficulties in the separation of the oducts. The fermentation was effected in presence senite (potassium metarsenite), but the development ast-cells was not entirely prevented. The results ned indicated a yield of 50·4 grms. of alcohol, 0·5 grm. cerin, and 0·3 grm. of succinic acid per 100 grms. of sugar fermented. These numbers for glycerin and ne acid are probably higher than the truth, but they are lerably lower than with cell-fermentation.—J. F. B.

ses ; Fermentation of the ——. A. Schöne and Tollens. J. f. Landw. **49**, 29—40. Chem. Centr. 1, **1**, [20], 1098.

ACTS of jute and of brewers' grains were inoculated ger-beer yeast and also with pure culture yeast. In es, but to a greater degree with the beer yeasts, there served with the formation of little alcohol, a consi- diminution of the pentoses and glucoses, and a not derable formation of acetic and lactic acids; the t of alcohol formed, was not sufficient to account for ount of glucoses destroyed. Pure arabinose suffered ration with yeast even under favourable conditions, h an organism isolated from sour milk, the formation hol and acids was observed.

formation of acids can be explained when lager-beer as used ; in the case of the pure yeast, on the other freedom from contamination was guaranteed by , and confirmed by the microscopic examination, omplete sterilisation or the introduction of foreign ts during inoculation is not probable. The author re concludes either that the arabinose and xylose in e of other glucoses and abundant nutrient material some decomposition, or that the fermentation is ed not with the true pentoses (arabinose and xylose), the accompanying substances, which also yield on distillation with hydrochloric acid.—A. S.

Fermentation. A. Preyer. Der Tropenpflanzer, 5 ; through Woch. für Brau. 1901, **18**, [21], 277.

acao beans contain considerable quantities of bitter s which are removed by a process of fermentation, s being steeped under water for some time. The ganisms first attack the husks and the embryo is the soluble matters and enzymes diffuse out through l tissue. Fermentation is stopped when the outer loosened so as to be readily removable in the nt washing process. In the mucus, which is n a certain layer of cells of the husk, active yeast predominant, bacteria and mould fungi being also

juors contain, besides alcohol, a certain proportion ic acids, principally lactic. Since a bad product ed when acid fermentation takes place, the author nted on pure cultures. He isolated from the vat f Ceylon cacao fermentations, a budding fungus or hich somewhat resembles *S. ellipsoideus*, Hansen, *embranæfaciens*, and which he describes as a new *S. Theobromæ*, Preyer. It takes the form of l ellipsoidal cells, almost cylindrical at the middle, in short chains or masses, and with dimensions 6·1 × 3·1 μ. The cells of the sediments are l, whilst those of the surface films are very long, ded ends. When deprived of nutrition, the cells spores in 18—20 hours at 25° C. ; the spores are l and numerous.

ltivations are made in a decoction of fermented us : the yeast does not grow nor set up fermentation ns of cane sugar ; when sown in these solutions it passes into degenerate forms and then dies. Films appear on the surface of the culture liquids in about two days ; they are white at first and afterwards grey with red edges. This yeast produces alcoholic fermentation in cacao pulp. The employment of pure cultures in cacao fermentation had the effect of avoiding the objectionable acid fermentation and of yielding the best products. Low temperatures are better than high ; above 38° C. the results are very inferior. But little is known of the chemistry of cacao fermentation.
—J. F. B.

Ferment Processes ; Theory of ——. C. Oppenheimer. Münch. med. Wochensch. **48**, [16]. Chem. Centr. 1901, **1**, [22], 1207.

THE author criticises Bredig's definition of "inorganic ferments" (see this Journal, 1901, 376), and arrives at the following conclusions :—Bredig has shown that the catalytic action of organic substrata ("organischer Substrate") does not essentially differ from that of finely divided platinum. It does not, however, follow that the ferment actions themselves in these processes are also similar, for : (1) the catalytic action of organic substances is distinct from the true ferment action ; (2) the ferment processes do not follow exactly the laws of catalysis ; (3) in accepting this view, the essential point is overlooked, namely, the preliminary sterile combination of the ferment on the substratum. Moreover, apart from these objections, the name "inorganic ferment" should be opposed on the ground that it disregards an essential part of the theory of ferments, *viz.* the conception of the ferment as a secretion product.

The ferments have a peculiar and characteristic action, depending upon an original sterile combination on the substratum, and subsequent splitting off. Ehrlich's side-chain theory gives an adequate theoretical explanation of this peculiar action for one group of ferments, but for the majority of true ferments it affords, up to the present, only certain prospects, which must be submitted to very critical scrutiny.—A. S.

Cider ; Production of Normandy ——. Diplomatic and Consular Reports, No. 552, 1901, 1—7.

THERE are numerous varieties of apple trees suitable for making cider, and, as the fruits ripen at different seasons, they are divided into three classes :—(1) Those of which the fruit ripens in August and not later than the middle of September. (2) Those of which the fruit, while attaining maturity in October, completes in the barn its final stage of ripeness towards the middle of November. This is considered the most valuable class. (3) Those of which the fruit, removed from the tree in November, before maturity and before the frosts, only attains ripeness in the barn after remaining there for a period varying from the month of December to the month of February.

The fruit is generally crushed in a hand mill, the pulp collected into uncovered vats or tubs, and exposed to the air for 15 hours. In order to thoroughly aërate the mass, it is stirred from time to time with wooden shovels. The pulp is then placed in a screw press, and pressing conducted first slowly and towards the finish more rapidly. The first runnings make the best cider, and are generally reserved for bottling. The pulp is next taken out of the press and macerated with water, generally in the proportion of 4½ galls. of water to 22 galls. of pulp. It is allowed to stand for 15 hours, and again pressed. These second runnings form the beverage of the country. Occasionally in bad seasons a third pressing is resorted to.

The fermentation is frequently attended with difficulties. The must is placed in tubs, which are situated in cellars or vaults kept at a constant temperature of 59° F. Fermentation is completed as soon as the tub, when sounded, ceases to give an indication of the slightest effervescent action. This occurs after uncertain intervals, depending on the weather, and varying from three days to five weeks. The liquid is now clear, with a top and bottom layer of lees, and it is necessary to draw the cider off into casks without the slightest trace of lees. A secondary fermentation takes place, lasting for some weeks ; a muddy deposit forms, rendering a second drawing off necessary. Sometimes a clarifying agent is required, one of the best being catechu, used in the proportion of 2 lb. dissolved in 2 galls. of water to 352 galls of cider.

A portable mill and hand-press costs from 5*l.* to 10*l.* A fixed mill and a horse-press, such as is used in the large farms, cost 60*l.* to 100*l.*—J. L. B.

Potable Spirits; Injurious Constituents of ——. L. Brunton and Tunnicliffe. Nature, **63**, 491.

The authors show that fusel oil, which has hitherto been thought to be the chief injurious constituent of whiskey, is not present in ordinary spirits in sufficient quantity to cause any disagreeable effects. As a result of the investigation of the physiological action of furfural and other similar aldehydic bodies, which are invariably present to a greater or less extent in whiskey, and also a comparison of the action of ordinary whiskey and whiskey freed from aldehydes by distillation with phenylhydrazine sulphonate, the authors consider it probable that many of the after-effects produced by whiskey are due to the presence of furfural. This hypothesis would account for the superiority of old whiskey, since one of the effects of maturation is a diminution in the quantity of aldehydes contained in the spirit. (See also this Journal, 1891, 305, 519, and 665.)—A. S.

Taka-diastase and Reversed Ferment Action. A. C. Hill. Proc. Chem. Soc. 1901, **17**, [240], 184.

The hydrolysis of dilute starch solutions by taka-diastase ends in an almost complete transformation to glucose, as shown by the combined polarimetric and copper reduction methods of estimation; no dextrin which resists further hydrolysis is formed, and there is sufficient maltase in commercial taka-diastase to convert all the maltose to glucose.

A solution containing 35 per cent. of glucose and 6 per cent. of maltose hydrate, that is, 41 per cent. of total sugar, on treatment by taka-diastase containing maltase, was further hydrolysed until the measurements indicated nearly 39 per cent. of glucose and about 2 per cent. of maltose hydrate. A 60 per cent. solution of glucose, however, similarly treated, showed a reversed ferment action until its optical and reducing properties corresponded with those of a solution containing 58 per cent. of glucose and 2 per cent. of maltose hydrate. On diluting the solution without boiling, hydrolysis again took place. The difference in equilibrium point, in this case, from that found by the author when acting on concentrated glucose solutions with yeast extract (this Journal, 1898, 684; Trans. Chem. Soc. 1898, **73**, 634) (in the latter case the measurements at equilibrium corresponded to a mixture of 34 per cent. of glucose and 6 per cent. of maltose hydrate) is probably to be explained by the presence in the yeast extract of enzymes other than maltase and diastase, whereby other polysaccharides are formed either from glucose or maltose, such ferment actions being quite distinct from a possible formation of higher polysaccharides from maltose, which may occur also in the case of taka-diastase.

Chinese Yeast; Mucor Cambodia, a New Species of Mould Fungus. T. Chrzasez.

See under XXIV., *page* 757.

Extract from Beer Yeast, similar to Meat Extract; Preparation of ——, *from Pressed Yeast or Wine Yeast, without Auto-Fermentation.* L. Aubry and Wissenschaftliche Station für Brauerei in München. Ger. Pat. 120,346, 1899.

See under XVIII. A., *page* 737.

Arsenic; Occurrence of ——, *in Sugars, Malt, and Beer.* B. E. R. Newlands and A. R. Ling.

See under XXIII., *page* 748.

Arsenic; Influence of Selenium on certain Tests for ——. R. Rosenheim.

See under XXIII., *page* 751.

Alcohol and Extract in Beer; Tornöe's Optical Method of Determining ——. A. R. Ling and T. H. Pope.

See under XXIII., *page* 755.

PATENTS.

Fermentation Gas; Treatment and Utilisation of J. F. Wittemann, New York, U.S.A. Eng. Pat. March 14, 1900.

This process consists of treating fermentation ga impregnating beverages with it. The gas is first pressed and cooled in a refrigerator for 24 hours pressure of not less than 10 atmospheres. The comp mixture of carbon dioxide and ethers is separated fr liquid, and the separated mixture stored for a time pressure in a cold receiver. Finally the beverage treated is impregnated with the mixture under a son lower temperature and pressure. The remainder claims are for mechanical devices for carrying ou operations.—J. L. B.

German Yeast; Process for Purifying Molasses and Juices for Obtaining ——. F. R. Bramsch, Bohemia. Eng. Pat. 8305, May 4, 1900.

This process consists in mixing the molasses or juices with pulverised lignite, boiling the mixture, it to 50°—60° R. (62·5°—75° C.), and filtering filter presses. The transparent liquid thus obtai mixed with an extract prepared by heating materi in nitrogen, such as linseed cake, with dilute sulph hydrochloric acid under pressure, the liquor bein neutralised, mixed with animal charcoal, and filtered. a solution yields a white efficient yeast, capable of kept for a considerable length of time.—T. H. P.

Yeast; Utilisation of Pressed ——. G. Valentine, Eng. Pat. 9991, May 31, 1900.

According to the method described in this pate pressed yeast is heated in a boiler until all the alco been driven off. This alcohol is condensed and re The liquefied yeast in the boiler may then be fla with spices, and evaporated to a paste or to co dryness, and ground. The powder so obtained forms food. Ground cereals may be added to the above and the mixture baked and ground. An alternative is to add to the liquefied yeast in the boiler suc materials as vat sweepings, spent hops, malt co malt dust, &c, and an approximately calculated q of sulphuric acid to fix the "volatile nitrogenou pounds." The heating is increased and maintaine 400° F., until all the volatile products have distill The said volatile products are passed through a co into a closed receiver, from which the uncondense are conducted through a series of sulphuric acid and a water washer, also through lime, soda, and iron purifiers, and finally into the open air. The ac the washers may be employed in a subsequent o for fixing the free nitrogen. The residue in the ground and used as a manure.—W. P. S.

Malt, Hops, Hams, or other Alimentary Matters; or Roasting or Smoking of ——. B. E. R. Ne London. Eng. Pat. 3194, Feb. 14, 1901.

The arsenic which may be contained in fuel is fixe rendered inert by combining it with an alkali or earth so as to prevent the arsenious acid from volatilised and deposited on the material which i roasted direct, or smoked. Good results may be by admixture of 5 parts by weight of lime, magne with every 100 parts by weight of fuel. The proce be carried out by the admixture of the active reag the fuel, prior to combustion, and either in the dry in the form of a solution.—J. L. B.

Malt; Process for Producing Colouring ——. R. Vienna. Eng. Pat. 19,946, Nov. 6, 1900.

The patentee adds glycerin to the malt, either "combined with water and steam." The roasting ture is then increased from 200° C. to 240 coloured malt so produced is free from glycerin substances having a bitter burnt flavour.—J. L. B.

menting Vessels; A Mechanical Contrivance which Pumps and Rouses the Wort in ——. O. G. C. L. J. Overbeck, Grimsby. Eng. Pat. 12,131, July 5, 1900.

invention consists of an arrangement of machinery, tached to "squares" or fermenting vessels, but capable of rousing the wort during fermentation and pumping om a lower into an upper vessel. The rousing is effected series of rousers working backwards and forwards, dipping into the upper vessel, passing along its m, and capable of being lifted out if necessary. These rs are connected by horizontal bars with pumps d between the vessels, and the latter can work in n with the rousers if required. The requisite motion tained by a rocking shaft provided with suitable ections.—J. L. B.

Wort; Brewing Process for the Production of High Low Fermenting ——. A. Eckardt, Giessen, Gery. Eng. Pat. 12,459, July 10, 1900.

process consists of adding a sufficient quantity of alkalis," alkaline earths, or their carbonates to the g material or wort, to destroy the capacity for rification or fermentation. The action of the alkali e or less neutralised by an addition of mineral acid, l reaction being slightly acid, so as to allow subse- saccharification and fermentation. By these means gulable albumin is converted into uncoagulable ls, and a higher extract thereby obtained.—J. L. B.

er, and Porter or Stout; Anti-Bacteria System and iances for the Use of Brewers of ——, during the esses of Cooling, Fermentation, and Racking. . Bennett, Holywell, Flint. Eng. Pat. 12,949, 18, 1900.

entor claims the connection of different parts of and distilling plant so that the operations of cooling vort, fermentation, settling, and racking may be through without any contact with the atmosphere. er is so designed that it can hold the whole bulk ort, of whatever quantity, and its double function of nd cooling is claimed as an improvement over the ystem of shallow coolers and refrigerators.

—J. L. B.

from Alcohol, Wine, Cider, Beer, and the Like; nproved Process and Apparatus for the Manu- of ——. E. Barbe, Paris. Eng. Pat. 17,497, 1900.

ation consists of a combination of an acetifier of hape and a concave false bottom, formed of parts hate with an inclination towards the centre, the urfaces of which are provided with grooves o their edges. At intervals there are holes in es or sockets are fixed, projecting from the surface led with caps. By this arrangement the apparatus into two parts, each of which can be worked . The pipes or sockets permit the free passage id and its evacuation in the opposite direction, ecessary air for the acidification. Between the the acetifier and the false bottom, chips are false bottom supporting another layer of chips.

—J. L. B.

of Whisky, Brandy, and other Strongly Spiri- iquors; Method of Accelerating the ——. O. ondon. From Joshua Bros. Proprietary, Ltd., ne. Eng. Pat. 8363, April 23, 1901.

ss for hastening the maturing of spirits, &c. is by subjecting the material contained in wooden ts to the action of a warm atmosphere saturated saturated with moisture.—J. L. B.

Refuse known as Burnt or Pot Ale; Treatment, ilising Purposes, of the ——. T. Storer and ey, Falkirk, Scotland. Eng. Pat. 9514, May 7,

product obtained from the evaporation of dis- is powdered, placed on plates or pans, and heated to 700° F., the powder meanwhile being agitated. By this treatment the physical character of the powder is changed; it is no longer deliquescent, and can then be used as a fertiliser.—J. L. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Extract from Beer Yeast, Pressed Yeast or Wine Yeast, Similar to Meat Extract; Preparation of ——, without Auto - Fermentation. L. Anbry and the Wissenschaftliche Station für Brauerei in München. Ger. Pat. 120,346, 1899. Zeits. angew. Chem. 1901, **14**, [24], 595—596.

A PROCESS is described for obtaining the nutrient constituents of the yeast cells in the form of a syrupy extract, soluble in water and possessing a meat-like flavour. The crude yeast is sifted from impurities, any acidity is neutralised by treatment with a 1 per cent. solution of ammonium carbonate, and the yeast is then subjected to pressure. The pressed yeast, containing 70—75 per cent. of water enclosed in the cells, is intimately mixed with at least 5—10 per cent. of its weight of common salt. Liquefaction soon takes place, the common salt penetrating the cell membranes, and exerting a solvent action on the albuminous constituents of the yeast. The liquefied yeast is preferably allowed to stand for some time in a cold place, then digested for 2—3 hours at about 50° C., and finally rapidly heated to boiling. To expedite the heating to boiling, the mass may be introduced into its own bulk or twice its bulk of boiling water. After boiling for from one to, at most, two hours, the mass is pressed whilst still hot, the residue washed with hot water, and the solution evaporated on the water-bath till a skin forms on the surface. The liquid is then allowed to stand in open vessels, and is finally filtered. It is stated that by long standing in contact with the air, the pleasant taste of the extract is appreciably increased.—A. S.

"Nori" from Japan. Kintaro Oshima and B. Tollens. Ber. 1901, **34**, [8], 1422—1424.

"NORI" is an edible sea alga (*Porphyra laciniata*) used as food in Japan. It consists of greenish, thin, paper-like sheets, insoluble in water and almost tasteless. Examination for pentosans and methyl pentosans, by distillation with hydrochloric acid, yielded furfural and methylfurfural to the extent of 2·15 per cent. of phloroglucide on the "nori." Oxidation with nitric acid in the official manner yielded 6·73 per cent. of mucic acid; saccharic acid was also identified in the filtrate. On testing for fructose and other ketoses by the resorcinol reaction, a fine red coloration was obtained, showing the characteristic spectrum.

Large quantities of "nori" were hydrolysed with 5 per cent. sulphuric acid (eight hours in a water-bath), and the resulting sugars were precipitated as hydrazones. After purification the hydrazones (one of which melted at 159°—160° C., and the other at 195°—196°) were decomposed with benzaldehyde. The sugar obtained from the former hydrazone was identified as inactive galactose, also obtained by Winterstein from chagual gum. The sugar from the hydrazone, melting at 195°—196° C., was found to be *d*-mannose. No fucose could be isolated from the products of hydrolysis, but the production of methyl furfural indicates its presence. The syrups probably also contained pentoses and other hexoses.—J. F. B.

Vinegar; Detection of Methyl Alcohol in ——. R. Robine.

See under XXIII., *page* 753.

Butter; Purity of ——. Standard, July 8, 1901.

See under Trade Report, *page* 774.

Food Preservatives. Continental Regulations. Bull. U.S. Dept. of Agriculture.

See under Trade Report, *page* 774.

Fruit Preservation. Imp. Inst. J., July, 1901.

See under Trade Report, *page* 775.

PATENTS.

Gluten; Process of Manufacturing ——. L. A. Morel, Paris. Eng. Pat. 9283, May 19, 1900.

This is a process for the production of pure dry gluten, and consists in freezing moist gluten into thin solid sheets by passing it between rollers through which a refrigerating liquid flows. The frozen sheets, preferably after grinding to powder, are then completely dried under reduced pressure at a temperature of 30° C. to 50° C. Much of the water is removed in the preliminary rolling, and by freezing, the elasticity of the gluten is destroyed, so that it can readily be powdered.—W. P. S.

Food for Animals; Treatment of Cotton Pods or Shells for the Manufacture of ——. M. Philips and O. Müller, Cologne, Germany. Eng. Pat. 9649, May 25, 1900.

The treatment claimed, consists in grinding the pods or shells, removing the short adhering cotton fibres, and mixing the powder with molasses and substances containing nitrogenous matters and fat, such as cotton-seed flour, linseed meal, earth-nut meal, &c. The crushed pods contain about 3·39 per cent. of nitrogenous matter and 35·51 of substances free from fat and nitrogen. The pods may be roasted before grinding.—W. P. S.

Yeast; Utilisation of Pressed ——. G. Valentine. Eng. Pat. 9991, 1900.

See under XVII., *page* 736.

Food Preparations [Milk and Egg-Yolk]; Manufacture of ——. Baron von Mering, Halle a/S., Germany. Eng. Pat. 11,524, June 25, 1900.

The food claimed, is prepared by substituting the fat of yolk of eggs for the fat in milk. Yolk of eggs and skimmed milk are mixed and evaporated to dryness. Lactalbumin, obtained by carefully evaporating whey containing 15 per cent. of skim milk, may be added, together with flour of cereals and cane sugar. The high percentage of soluble salts in the whey may give the food an unpleasant taste. These salts can be removed by stopping the evaporation of the milk and whey before all the water has evaporated, and removing the remainder of the liquid, after cooling, by mechanical means from the mass resulting from the evaporation.—W. P. S.

Eggs; Preservation of ——. J. Jensen, Svendborg, Denmark. Eng. Pat. 12,676, July 13, 1900.

The eggs are first placed in a 2 per cent. solution of vinegar for 10 minutes. They are then dried, washed in running water for 10 minutes, again dried, and polished with talc. —W. P. S.

Fish for Human Food; Impts. in the Utilisation of ——. A. Danilevsky, St. Petersburg. Eng. Pat. 12,686, July 13, 1900.

The claims of this patent relate to the preservation of the flesh of fish. The raw fresh fish in its whole state is finely minced, and mixed with 2 to 3 volumes of warm water, containing from 0·5 to 1·5 per cent. of sodium carbonate. After standing for one to two hours, the mixture is boiled by the admission of steam for a further two hours. The hot mixture is then strained to remove bones, scales, fins, intestines, &c., and sufficient hydrochloric acid is then added to neutralise the sodium carbonate and to completely separate all albuminous matters, which are removed by filtration through linen. The moist mass on the linen is removed to metallic boxes heated by steam, and mixed with any suitable flour or meal in equal proportions, together with a small quantity of salt. It is then completely dried in a current of warm air (60°—70° C.), ground to a coarse powder, and pressed into cakes. The filtrate is concentrated, and, after skimming off any fat present, is added to the above albuminous product, or it may be mixed with meal, and pressed into cakes, separately.—W. P. S.

Food Products and other Substances; Preservatio Sterilisation of ——. R. Hengstenberg, Essling Neckar, Germany. Eng. Pat. 23,893, Dec. 31, 190

The claims are for a sterilising process by subjecti food or other substance to the action of electric curr high frequency and potential (Tesla currents). The to be preserved may be contained in open or closed v —W. 1

Butter and Animal Fats; Process for Preservin G. C. Marks, London. From Force, Société An Antwerp, Belgium. Eng. Pat. 7620, April 13, 19

Claim is made for the admixture of the butter or fa gum arabic (say 3 to 20 per cent.), either alon conjunction with salt or other seasoning ingredient. —C. A

Milk of Cows; Means for Humanising ——. E. C Ashford, Middlesex. Eng. Pat. 8505, April 25, 1

The special feature of this invention is the albumin cows' milk by the addition of colostrum of cows humanised milk claimed, is made up of water, $61\frac{2}{3}$ milk, 20 parts; milk-sugar, 5 parts; colostrum, $8\frac{1}{3}$ and cream, 5 parts. To each ounce of the humanis about half a grain of sodium carbonate is adde finished product is pasteurised at a temperatu exceeding 155° F.—W. P. S.

Malt, Hops, Hams, or other Alimentary Matters; or Roasting or Smoking of ——. B. E. R. Ne Eng. Pat. 3194, 1901.

See under XVII., *page* 736.

(*B.*)—SANITATION; WATER PURIFICAT

River-Water Pollution by Waste Lye of Potash Rubner and Schmidtmann. Zeits. Ver. Deutsch. ind. 1901, **51**, [544], 427—444.

In view of the great extension of the potash indus especially of the deep borings in the basin of the is of interest to examine the effect of the waste polluting rivers.

The waste lye of the carnallite process contains 300 grms. of magnesium chloride, 36 grms. of ma sulphate, 12 to 18 grms. of potassium chloride, and of sodium chloride, and its noxious character dep only upon its content of magnesium salts, but on th to which it increases the permanent hardness of riv From a sanitary standpoint the presence of salts ca regarded with indifference. Water containing 226 of magnesia per litre has a purgative action, an above lye they exceed this amount even when thousand times, and the liquid possesses a harsh, bit taste. Water containing magnesium chloride is tanneries and glue works. Glue boiled with hard afterwards difficult to dissolve. The water is also for brewing purposes, sugar factories and refiner for dyeing, since cochineal and logwood are altered and many coal-tar dyestuffs are affected by it. manufactured with the aid of such water soon sh of disintegration.

The high state of dilution of the potash wast may lead to deception, *e.g.*, in cases wherein su becomes concentrated in course of use. Magnesium attacks the iron of boilers directly, and by its deco causes further corrosion. The "self-purification" does not apply in the case of magnesium salts, potash works on a river is inimical to the ones bel —L. J.

Organic Matter in Drinking Waters; Importan of Error in the Kubel-Tiemann (Permanganate for the Determination of ——. Duyk.

See under XXIII., *page* 756.

PATENTS.

n's Sewage and other Waste Liquids; Treatment of —. E. Burmeister, Hamburg, Germany. Eng. Pat. ,016, June 18, 1900.

sewage is treated consecutively or simultaneously with mate of lime and slaked lime. Instead of fresh car- e of lime, the calcareous mud obtained from a previous ation may be used.—L. A.

r; Apparatus for Use in the Purification of ——. H. Lake, London. From J. M. A. Lacomme and Lauder, New York, U.S.A. Eng. Pat. 7806, April 16, 1.

pparatus consists of a section of water main covered e with insulating material, and made up of two or pairs of electrodes. Each electrode is insulated from hers, and there are two induction coils, each electri- connected with an independent source of electricity, th one pair of electrodes, whereby cross currents of city are completed in the water of the main, and are to flow diametrically through it, and at right angles 1 other. Sparking rods pass through the electrodes, e insulated from them, the diametrically opposite or ting rods being connected with the same source of city, and the intermediate rods with another source. —G. H. R.

(C.)—DISINFECTANTS.

PATENTS.

ctant Pocket Handkerchief, and Process for the uction of the Same. A. Just, Mannheim, Germany. Pat. 11,339, June 22, 1900.

ndkerchiefs are suspended in an air-tight chamber, osed to the vapour given off by heating the following : Menthol, 10 parts; "terbinol," 20 parts; euca- 20 parts; creolin, 5 parts; alcohol (96 per cent.), . They are then removed, folded, and packed air being previously perfumed if desired.—L. A.

cting, Sterilising, or Odorising, and for other like oses; Improved Process of and Apparatus for ——. Blackmore. Mount Vernon City, New York, U.S.A. Pat. 5888, Mar. 20, 1901.

ED vessel containing a volatile liquid, such as oil containing formic aldehyde, or a volatile solid camphor or naphthalene, and furnished with an e for admitting air to the bottom of the vessel and tube connected to the flushing pipe of a w.c. or so arranged that every time the closet or urinal, is a certain amount of air, impregnated with the f the disinfectant, is drawn down the flushing pipe water.—L. A.

: Treatment of ——, to Render them Soluble in . J. Wetter, London. From Aktiengesellschaft eer- und Erdöl-Industrie, Berlin. Eng. Pat. 7719, 15, 1901.

solutions of the salts of the sulphonic and disul- cids of phenanthrene and similar hydrocarbons arbazol are stated to possess the property of dis- esols; the solutions are then miscible with water orming a deposit. The solution of phenanthrene ric acid is allowed to flow into a saturated solution on salt, the crystalline mass is redissolved and ed from water. Without drying, it is then mixed roper quantities of cresol and water. In the case nc salt, which is especially useful for the im- 1 of timber, "the finished mixture produced by ion is caused to flow into commercial 50 per cent. zinc chloride, and the crystalline paste . . . and redissolved." The processes and aqueous phenols, as described, are claimed.—A. C. W.

XIX.—PAPER, PASTEBOARD, Etc.

"Mechanical" Wood Pulp and Normal Papers. W. Herzberg. Mitt. k. Techn. Versuchs-Anst. zu Berlin. 1900. **18**, [6], 279.

In the "Conditions of Sale" (par. 9) agreed by the German Papermakers' Association in Nov. 1900, it is laid down that a paper sold as free from woody fibre ("holzfrei") shall contain no added mechanical pulp, but may contain traces of lignocelluloses as an incidental impurity. Many trade disputes having been referred to the Institute for settlement involving the point left in some ambiguity by the above definition, the author has communicated with representative firms to ascertain whether any well defined trade convention exists as to a permissible limited impurity of lignocelluloses in papers certified as "holzfrei." Analysing the results of some 75 direct inquiries addressed to makers and dealers, it appears that no convention exists, and proposals were received for an official recognition of the admixture of mechanical pulp of various percentages up to a maximum of 5 per cent.

The author points out that rigid exclusion would be an academic absurdity, and suggests the following as a practical compromise: (1) in wrapping papers, a maximum of 3 per cent. of "mechanical wood;" (2) in writing and printing papers, 0·5 per cent.; and (3) in other papers, 1 per cent. as a maximum.—C. F. C.

Papers; Opacity of. Papier-Zeit. 1901, **26**, [31], 1159.

The quality of opacity is an important characteristic of certain special papers, and the author contributes the following notes from his practical experience: Of the sulphite pulps, the "Ritter-Kellner" is more opaque than "Mitscherlich"; "Soda" wood pulp is relatively opaque; half stuff from new rags, works, relatively more transparent than cellulose from old rags; of the "mechanical" pulps, those from the fir species are more transparent than those from the pine species.

With regard to beating, the engines should be furnished as quickly as possible; for loading, asbestos is much to be preferred. In sizing, excess of alum should be avoided.

For special effects, chemical methods must be resorted to, that is, a white precipitate must be formed upon the fibres by interaction of suitable salts.—C. F. C.

Peat-Boards and Peat-Litter. Papier-Zeit. 1901, **26**, [38], 1434.

Many attempts have been made to utilise peat for making paper and mill-board, but hitherto without much success. In Holland, where large beds of peat are available with cheap costs of production, boards are made, but they appear to be useless on account of the shortness of fibre. The writer has tested a sample consignment and finds that they can neither be grooved nor bent by the ordinary box-making machines and cannot even be used in shoemaking as a substitute for the cheapest qualities of other boards. The peat-boards are so fragile that they break on handling. They might perhaps be useful as absorbent boards for many purposes, if they were not too dusty. The best application for peat is as a fuel or stable litter; it is an excellent absorbent for stable drainage, soaking up the ammoniacal liquors almost completely and deodorising the air.—J. F. B.

Oxycellulose and Hydrocellulose. J. J. Murumow, J. Sack, and B. Tollens. Ber. 1901, **34**, [8], 1427—1434.

Oxycellulose.—In a former paper, von Faber and Tollens (see this Journal, 1899, 1014) examined oxycellulose, prepared in several different ways, by heating it with milk of lime for several hours on the water bath. In this way the oxidised portion of the product (termed by them "celloxin") was broken down into soluble products from which isosaccharinic acid and dihydroxybutyric acid were separated as calcium salts. The present authors have extended this series of observations to an oxycellulose prepared by aid of potassium chlorate and hydrochloric acid according to the method of Vignon. The soluble products were identical [illegible] with those isolated by Faber and Tollens, [illegible] soluble residue likewise possessed all the properties of cellulose.

Hydrocellulose.—According to Girard, cotton, when digested with sulphuric acid of 1·45 sp. gr. is hydrated, yielding what is termed "hydrocellulose." The authors prepared this product, but concluded that acid of this strength did not have sufficient intensity of action. They therefore increased the strength of acid to 1·52—1·54 sp gr. and the time of digestion was varied from 10 to 48 hours. According to the degree of attack, the fibres of these products were more or less brittle and powdery; they were gelatinised and partly dissolved by strong caustic soda, whilst the more strongly attacked preparations reduced Fehling's solution slightly and were gelatinised by washing with water only. The hydrolysis of the hydrocellulose preparations with milk of lime yielded apparently the same or very similar products as were obtained from oxycellulose. Isosaccharin and an amorphous calcium salt having a composition similar to that of the calcium salt of dihydroxybutyric acid, were isolated. Long boiling of hydrocellulose with dilute sulphuric acid resulted in the formation of only a small quantity of reducing sugar.—J. F. B.

Cellulose, Oxycellulose, Hydrocellulose, Pectins, and Tragacanth. B. Tollens. Ber. 1901, 34, [8], 1431—1111.

Both hydrocellulose and all crude oxycellulose preparations contain cellulose. From the action of alkalis upon these bodies the author concludes that the true products of reaction [*e.g.* celloxin] are combined with this cellulose somewhat after the manner of esters. The author divides the cellulose group into four classes :—

A. Celluloses.

B. Hydrated celluloses, *i.e.*, hydrocelluloses and hemicelluloses, bodies which are non-reducing, but readily hydrolysed to reducing compounds.

C. Celluloses with acid, *i.e.*, carboxyl groups ; this class includes the pectins, &c.

D. Celluloses with both acid (carboxyl) groups and aldehyde or ketonic groups; this class includes the oxycelluloses, which are cupric reducing bodies.

The more highly oxidised classes C and D are distinguished from A and B by elementary analysis, the ratio of H:O being 1:8—9, instead of 1:8, as in the A and B classes.

Bumeke and Wolfenstein (see this Journal, 1899, 940) described a product of the action of hydrogen peroxide on cellulose, which they termed "hydralcellulose." They assign a H:O ratio of 1:8 to this body, but the author points out that their analyses might be equally within the limits of error for a body of the oxycellulose type with a ratio of 1:8·3. Judging from the undoubted oxycellulose properties of "hydralcellulose," the author regards it as belonging to class D, and sees no reason for modifying the view that oxycelluloses are true oxidation products of cellulose.

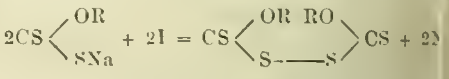
The acid cellulose derivatives and pectins are gelatinous bodies containing an excess of oxygen corresponding to the presence of carboxyl groups; aldehydic or cupric reducing groups are absent. The natural members of this class often contain, besides the C_6 cellulose aggregates, groups which yield pentoses on hydrolysis. The author also includes gum tragacanth in class C. Although Hilger and Dreyfus (this Journal, 1900, 677) came to the conclusion that the acid properties of tragacanth and oxybassorin could not be due to carboxyl groups, the author, taking into account the inconclusive nature of the elementary analyses in this respect, prefers to regard both bodies as containing excess of oxygen over the normal carbohydrate 1:8 ratio, owing to the presence of carboxyl groups.—J. F. B.

Cellulose-Xanthogenic Acid. C. F. Cross and E. J. Bevan. Ber. 1901, 34, [8], 1513—1520.

In the preparation of sodium cellulose-xanthogenate [viscose], alkali-cellulose is treated with carbon bisulphide according to the proportions $C_6H_{10}O_5:2NaOH:CS_2$.

The proportion of alkali here indicated is doubl theoretically required for the formation of the com $Na.SCS.O.C_6H_9O_4$, but it is found to be abso necessary in practice for the preparation of a s product. Again, in the preparation of cellulose ben from alkali-cellulose (according to Baumann's g reaction) it is found that under no conditions is a benzoylation than a di-benzoate obtainable.

Hence the authors argue that two of the hydrox the C_6 cellulose molecule [acid-hydroxyls] ha specific affinity for alkali, and that alkali-cellulose, in the hydroxyls are in an enhanced state of reactiv probably a definite combination in these proportions. extensive series of analyses of viscose preparations practical scale has thrown considerable light o chemical nature of the products. In the first pla authors record the observation that cellulose-xanth acid (which has not been isolated in the free state) acid of relatively high affinity. The solutions of its s salt [viscose] are not decomposed by weak organic *e.g.*, acetic or lactic. The alkaline by-products (carb thiocarbonates, and sulphides) are decomposed addition of acetic acid, leaving the sodium cel xanthogenate in solution. Consequently, a diffe titration with mineral acid hot, on the one hand, an acetic acid cold, on the other, affords an indication alkali in combination with the cellulose-xanthogenic Again, if the sodium cellulose-xanthogenate be i in the pure state by means of neutral dehydrating ag titration with iodine also shows the proportion of co alkali according to the equation—



$$2CS\left\langle\begin{matrix}OR\\SNa\end{matrix}\right. + 2I = CS\left\langle\begin{matrix}OR\quad RO\\S\text{———}S\end{matrix}\right\rangle CS + 2$$

The authors have also followed the process of prog reversion which the cellulose-xanthogenate underg keeping. Analyses at various periods of the "life" viscose show three more or less well-defined stages. the maximum degree of reaction has been obtain using excess of carbon bisulphide for a long time, evidence of the production of the compound—

$$Na.SCS.O.C_6H_9O_4,$$

termed the C_6 xanthogenate. This is not precipit salt, even after acidification with acetic acid. A hours at the outside, it reverts to the C_{12} xanth which forms the basis of the ordinary industrial The C_{12} xanthogenate is soluble in water after acidi and precipitation with brine. If no excess of causti be present, the solution sets to a solid mass after 6— and the product is then found to have the compositi C_{24} xanthogenate. This compound is insoluble in but is readily soluble in caustic alkali and can be se from its alkaline solutions in the pure state by acidi and washing. On further keeping, the C_{24} xanth gradually reverts to a cellulose hydrate. It is poi that none of these changes take place suddenly, intermediate products and mixtures may be encou The remarkable influence of excess of caustic alkali solubility and viscosity of the xanthogenate prep at all stages of their existence, indicates the particip the second reactive hydroxyl of the alkali-cellulose production of soluble derivatives.—J. F. B.

Cellose; A Biose obtained from Cellulose.— Z. H. Skraup and J. König. Ber. 1901, 34, [7],

The authors have saponified the crystallized obtained by Franchimont's method (*ibid*, 12, 1 the action of acetic anhydride on cellulose in pre sulphuric acid. The acetate is saponified by alcohol and the biose is easily isolated in the crystalline exhibits slow dextro-rotation, rising from $[\alpha]_D = +$ ten minutes after solution, to + 33·7° after 15 hour

On inversion it yields ordinary glucose, but it is determined whether accompanied by any other sug

—C.

PATENTS.

'lulose Articles; Manufacture of Hollow ——. E. G. P. 'homas, London, and J. Bonavita, Paris. Eng. Pat. 1,663, June 27, 1900.

specification relates to apparatus for shaping films of scose" [cellulose thiocarbonate] whilst in the gelatinised dition after washing with brine, into a hemispherical n. The circular disc of viscose film is clamped down on sheet of caoutchouc, which is then distended, together the film, by the application of a fluid pressure from erneath. The film then assumes a hemispherical form a flange; in this state it is rendered insoluble in water, placed upon a suitable mould, on which it dries and iks. Two such hemispherical films, cemented together heir flanges, then constitute the hollow articles claimed. —J. F. B.

ulose Articles; Manufacture of Hollow ——. E. G. P. 1omas, London, and J. Bonavita, Paris. Eng. Pat. ,664, June 27, 1900.

inventors manufacture hollow articles of cellulose by ng a film of "viscose" [cellulose thiocarbonate], in its inised condition, washing it in brine, cutting to the ed shape, and immersing it in a dilute solution of zinc ate or chloride or lead acetate. This has the effect of ing the film except at its edges. When the internal ces are separated, by forcing fluid between them to id the film, a hollow article, such as a tube or sphere, duced.—J. F. B.

l-Cellulose; Manufacture of ——. L. Lederer, lzbach, Bavaria. Eng. Pat. 11,749, June 28, 1900.

laims provide for the production of acetyl-cellulose by rting cellulose into hydrocellulose and adding the latter etic anhydride in the presence of sulphuric acid. ocellulose prepared according to Girard's method, by g cellulose with dilute sulphuric acid, pressing, drying ating for 3 hours at 70° C., is treated direct with four its weight of acetic anhydride, when reaction occurs, panied by rise of temperature. If the hydrocellulose pared by another process without sulphuric acid, it is ary to add 0·25 – 0·5 per cent. of the latter to the anhydride employed.—J. F. B.

id; Improved Method of Producing ——. E. Zühl, Berlin. Eng. Pat. 11,751, June 28, 1900.

ventor claims the employment of naphthyl acetate lid solvent for nitrocellulose in the manufacture of d, to replace the whole or a part of the camphor lly used.—J. F. B.

id; Manufacture of ——. J. N. Goldsmith, Bran-, Suffolk, and British Xylonite Co., Brantham and End, Essex. Eng. Pat. 13,131, July 20, 1900.

ventors claim to substitute for the whole or part of nphor usually employed in the manufacture of d, one or more of the following substances:—Acetin, any of the acetic esters of glycerin, acetochlorhydrin, , that is, the benzoic esters of glycerin, phthalic or esters of the aliphatic alcohols, pulegone, as found pennyroyal, thujone, as found in thuja oil, and he condensation products obtained by combining oils with benzaldehyde or with acetaldehyde or hyde. Although the above substances are mostly pensive than an equal quantity of camphor, the is counteracted by the lower volatility and the fficiency of their solvent action.—J. F. B.

l-like Substance; Manufacture of a ——. E. Zühl, Berlin. Eng. Pat. 8072, April 19, 1901.

nol and naphthol esters of inorganic acids as well ganic acids, have the property of forming suitable es for camphor in the manufacture of celluloid; the former class of esters also retard the combustion of the product.

The present invention provides for the employment of the phosphoric esters of phenols and naphthols in place of part or the whole of the camphor usually employed in the manufacture of celluloid. Triphenyl phosphate and trinaphthyl phosphate are quoted as examples.—J. F. B.

Metallised Paper; Impts. in ——. F. Haerle, Munich, Germany. Eng. Pat. 17,048, Sept. 25, 1900.

As a substitute for expensive tinfoil for packing-paper, the inventor claims the use of parchment paper or other water- and fat-proof paper coated or painted on one side or both sides with a layer of bronze or other metal. The invention is intended to relate especially to the so-called "Pergamyn" paper, which is prepared by working "cellulose in the rag engine with glue and alum until it has the consistency of gelatin."—J. F. B.

Nitrocellulose and Similar Compounds; Process for Making ——. D. Bachrach, Baltimore, U.S.A. Eng. Pat. 2339, Feb. 4, 1901.

The claims provide for adding to nitrocellulose or similar compounds a sulphate to the extent of 30 per cent. or more by weight of the solid constituents. The sulphate best adapted for the purpose is calcium sulphate, which may be produced by adding calcium carbonate and then sulphuric acid. Stated generally, the claim resolves itself into the addition of a neutral or an anti-acid substance to the nitrocellulose, and then a salt-producing acid in the proper proportions. The object of the invention is to produce a nearly or perfectly non-combustible mixture. —J. F. B.

Pulp Strainers; Upward Flow ——. W. P. Thompson, London. From A. Woge, Alfeld, Germany. Eng. Pat. 7986, April 18, 1901.

The claim is for a flat pulp strainer, in which the material to be strained passes upwards from below, characterised by two perforated beater arms or wings suited to the surface of the slotted plates, appertaining thereto, and arranged beneath two slotted plates being set in oscillation in such a way that when one of the beaters swings downwards, causing an interruption of the passage of the material through the respective strainer plate, all the lumps adhering to the latter are sucked off, and are brought into a somewhat protracted downwardly directed current, and in the next upward movement of the wing or beater, causing an increased passage of the material through the strainer plates, these lumps pass through the holes of the wing or beater downwards, and are thus removed out of reach of the strainer plates.—J. F. B.

Sulphite-Cellulose Waste Liquors; Treatment and Utilisation of ——. A. G. Brookes, London. From W. Trippe, Essen, Germany. Eng. Pat. 8088, April 19, 1901.

According to this process, the waste liquors are concentrated by evaporation until the sulphur compounds which they contain become decomposed and escape in the gaseous state, whilst the residue remains behind in the form of a dry substance. Towards the end of the evaporation a frothing may occur, or a skin is liable to be formed over the surface of the liquor and prevent the escape of the gaseous products; it is therefore proposed that substances, such as carbohydrates, albuminoids, albuminates, terpenes, resins, tar products, organic acids, or esters, shall be added at this critical stage to prevent the occurrence referred to, and to reduce the hygroscopic properties of the residue without diminishing its adhesiveness. The employment of solutions of resin in benzene or petroleum, is specially claimed. If desirable, the mineral constituents, such as calcium and magnesium compounds, are separated from the liquors. The employment of the residue as a substitute for pitch or resin, and as a manure, is claimed.—J. F. B.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Ferric Salts in Solution; Physical and Chemical Alteration of ——. E. Schaer. Archiv der Pharm. **239**, [4], 257—283.

The author has investigated the influence of dilution, temperature, the presence of haloid salts, also of oxidising and reducing agents, on the colour and chemical reactions of aqueous and alcoholic solutions of ferric salts. He finds that in the case of ferric chloride the colour of the solution moves along the spectrum from orange to yellow, that is, towards the violet end, when a strong solution is gradually diluted. In solutions of from 10 to 1 per cent. of iron, the relative intensity diminishes regularly, but with the more dilute solutions, 1 to 0·005 per cent., only a small decrease is to be observed, so that a solution with 0·05 per cent. of iron has nearly the same colour zone on the Radde's International Colour Scale as a solution of 0·01 per cent. Only hydrolytic dissociation into acid and ferric hydrate can be considered to be the cause of this. The influence of heat was to move the colour more towards the red end of the spectrum, and in the case of comparatively concentrated solutions containing 0·5 to 10 per cent. of iron, the colour went back again on cooling. This is explained by the ions reuniting after their dissociation. As the reversion of colour does not take place in the case of the dilute solutions, it must follow that no reuniting takes place. The author agrees with Schoenbein that the effect upon the ferric salt of raising the temperature is to loosen and make more active the oxygen atoms. Ferric sulphate solutions behave in the same way as those of the chloride; ferric nitrate dissociates more readily on diluting or warming. The acetate, and solution of dialysed iron also act similarly. The same salts were examined in alcoholic solutions, and found to have stronger colours, but otherwise agreeing. Since the reactions with potassium ferricyanide, salicylic acid, thiocyanate, tannin, guaiacum, and potassium iodide with starch will not take place with ferric oxide, therefore the ferric salts answer to these tests in proportion as they are more or less dissociated. The effect of alcohol is to intensify the reactions, except in the case of the acetate. The effect of adding a little sulphurous acid is simply to increase the coloration, and largely to increase the activity of the oxygen atoms, especially in their rate of decolorising indigo.—J. O. B.

Mercurous Nitrite. P. C. Ray. Annalen, 1901, **316**, [2], 250—256.

Mercurous and mercuric nitrites are the products of the action of cold nitric acid on an excess of mercury. The former salt is obtained by adding sufficient mercury to form a ring at the bottom of a beaker containing nitric acid of sp. gr. 1·041. From time to time the crystalline crust is removed from the surface of the metal by inclining the beaker. The product is sufficiently pure for most purposes; it contains minute drops of mercury and a little mercurous nitrate. It is purified by boiling for some time with a considerable quantity of water, when about 18 per cent. is decomposed to metal and mercuric nitrite, filtering through a hardened paper, violently stirring the filtrate and drying the crystalline meal on a porous plate. It should be kept in the desiccator; traces of water provoke decomposition, with evolution of oxides of nitrogen.

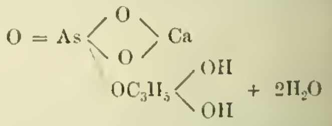
Ethyl nitrite is obtained by boiling mercurous nitrite with ethyl iodide; the yield is small because the nitrite agglomerates to lumps, which remain unattacked by the ethyl iodide. The residue, on heating in the oil-bath, gives nitro-ethane, and on further heating at 190°—210° C., a sublimate of pure mercurous iodide is formed, varying in colour from lemon and orange-yellow through orange-brown to blackish-brown.

If sodium chloride be added to a solution of mercurous nitrite, calomel filtered off, and the filtrate allowed to evaporate spontaneously, an orange-coloured crystalline precipitate is first formed and then leaflets resembling iodine. Both substances are oxychlorides $HgCl_2.2HgO.\frac{1}{2}H_2O$. They do not lose water at 100° C. On further heating give sublimates of mercurous and mercuric chlo leaving orange-yellow oxide. On treating with ca soda, the dark variety passes into that of the orange-y colour. A similar oxychloride, but anhydrous, *viz.* H 2HgO, has been obtained by Volhard (Annalen, **255**, and others.—A. C. W.

Calcium Glycero-arsenate. M. Pagel. J. Pharm. Cl **13**, [10], 449—452.

The author has prepared a glycero-arsenate of cal analogous to the glycerophosphate by the follo method:—

A mixture of glycerin with arsenic acid, in suitable portion, is warmed for several days, when the mi becomes slightly brown; it is then diluted with its volume of water, and neutralised with milk of lime, fil evaporated, and treated with 95 per cent. alcohol very light precipitate of glycero-arsenate is forme standing, which is washed several times with alcoho finally with ether. The product is a granular powd soluble in water and alcohol, but easily soluble in solutions of citric acid. The arsenic in it cann detected by ordinary reactions. Warmed with amm molybdate in nitric acid solution, it does not form cipitate of arsenio-molybdate of ammonium, nor does a precipitate with sulphuretted hydrogen, even on prol boiling. The analysis shows that it crystallises 2 mols. of water, and has a composition correspond the formula—



The author also gives physiological and clinical ob tions.—C. T. T.

Ethyl Nitrite Solutions; Causes of Instability in T. F. Harvey. Chem. and Druggist, 1901, **58**, [833—835.

The author made a series of experiments with a v separating and defining the effect of each of the influences that combine in causing decompositi alcoholic solutions of ethyl nitrite. The results investigation may be briefly stated as follows:—Th in strength of alcoholic solutions of ethyl nitrite is three causes:—

(1.) *Simple volatilisation,* chiefly into the air spa partially filled bottle. This loss is greater than that by the occasional removal, for a few seconds, of th or stopper from the bottle.

(2.) *Action of light.*—This is very strong, and, not diminished by the use of blue or green glass, is entirely prevented by using bottles of amber-coloured

(3.) *Oxidation,* even when light is excluded author states that this action appears to be connect hydrolysis, and he adduces several facts in support theory, which is, that in 90 per cent. alcoholic sol minute quantity of nitrous acid is first formed, suffic establish a state of equilibrium in the absence of but which, in the presence of the latter, is slowly to nitric acid, and so affords opportunity for the formation of nitrous acid. It is suggested that it m found possible to preserve pure ethyl nitrite in 90 p alcoholic solution, provided both substances were p neutral.

In collecting samples under the Food and Drug the author states that it is of high importance t following conditions should be observed:—All ins bottles intended to receive *spt. æth. nit.* should be (1 (2) of suitable size, so that they are completely (3) of amber-coloured glass, or else wrapped in paper and sealed; (4) securely closed. If corks they should be of irreproachable quality.

The sample should not be put in a warm place.—

rpholine ; *Preparation of* ——. W. Marckwald and M. Chain. Ber. 1901, **34**, [7], 1157—1159.

rholine is the anhydride of diethanolamine ; it is a of the formula $NH(CH_2.CH_2)_2O$ (Knorr, Annalen, 1 ; Ger. Pat. 95,854, 1897). By the action of onia on ethylene oxide, primary, secondary, and ry bases are formed, so that this method of producing anolamine is very costly. The following is the best od the authors have been able to find (compare Ger. 119,785 and 120,017, 1900) :—Bromethyl-β-naphthyl is obtained by the action of 2 mols. of ethylene ide on 1 mol. of sodium β-naphtholate. This ether ols.) is boiled with 1 mol. of *p*-toluene sulphamide lcoholic potash (1 mol) until the reaction becomes t neutral; $\frac{2}{3}$ mol. of potash is then added, and , when this has been used, the remaining $\frac{1}{3}$ mol. lcohol is distilled off and the residue extracted with ; *p*-toluenesulpho-di-β-naphthoxyethylamide remains ; recrystallised from glacial acetic acid it melts at . This compound is quantitatively decomposed on g with hydrochloric acid of 25 per cent. strength in tubes for 5—6 hours, or on boiling with 70 per cent. ric acid ; toluene, sulphuric acid, β-naphthol, and oline are formed. The solution is diluted, the ol filtered off, the liquid made alkaline, and the base d over in steam.

ldige states that in the action, even of excess of nia on bromethylphenyl ether, the secondary base $H_2.CH_2.O.C_6H_5)_2$ is alone formed (J. prakt. Chem., 242). The authors find that the primary base is ed in the greater amount ; its hydrobromide (melting 192°—193° C.) is, however, readily soluble, whilst the onding salt of the secondary base is soluble with y.—A. C. W.

nine ; *Transformation of the Haloid Acid Addition pounds of* ——, *into Bases free from Halogen.* I. Skraup. Monatsh. für Chem. 1901, **22**, [3], -288. (See this Journal, 1901, 499 and 500.)

the haloid acid is removed from hydrochloro-, rome-, or hydriodocinchonine by means of caustic or silver nitrate, bases isomeric with cinchonine are ncipal products ; δ-cinchonine, which contains one atom less (this Journal, 1901, 499), is formed h smaller quantity. It is not yet known whether none is produced by hydrochlorocinchonine. The des of cinchonine produced by these reactions fall into sses—bases almost insoluble in ether and in 50 per cohol, and bases soluble in these solvents, of which chonine is the chief ; δ-cinchonine also falls in this The principal insoluble base is allocinchonine, with ccur still more insoluble bases, similar to cin- ; in fact, cinchonine itself is formed from hydriodo-ine. Tautocinchonine is a mixture containing able quantities of cinchotine (this Journal, 1901,).

camining quantitatively the removal of the haloid ly two estimations were made :—the bases with diffi-uble in ether or in dilute alcohol, and α-isocincho- he percentages of these two products vary with the three addition compounds, according as the is removed by caustic potash or silver nitrate ; the of the insoluble bases is always smaller with the eagent than with the latter, and the proportion of honine is always larger with caustic potash than er nitrate. Hydrochlorocinchonine, whether de-d by caustic potash or silver nitrate, produces a aller quantity of insoluble bases and much more honine than does hydriodocinchonine by similar t. Hydrobromucinchonine occupies an intermediate The cause of the varying proportions of insoluble d α-isocinchonine produced from the different compounds is not that the latter are mixtures, since s in their method of preparation, also recrystallisa-luced no change in the ratio of the products of composition. The cause also does not lie in constitutions of the three addition compounds. he conditions of the experiments cinchonine and allocinchonine are not altered by alcoholic potash. Ostwald regards the transformation of cinchonine to α-isocinchonine as a spontaneous process, occurring with loss of free energy (Zeits. phys. Chem. **32**, 183), and only accelerated by the presence of acids. Wegscheider has shown that the transformations under the influence of acids are effected by the undissociated part of the haloid acid (Monatsh. für Chem. **21**, 361). Cinchonine, α- and β-isocinchonine, and allocinchonine may be changed one into the other by various methods (this Journal, 1901, 499). These bases may be regarded as members of a metastable series, in which the position of allocinchonine is doubtful.
—A. C. W.

Digitalis Glucosides ; Preparation and Composition of ——. M. Cloetta. Arch. exp. Pathol. u. Pharmak. **45**, 435—446. Chem. Centr. 1901, **1**, [20], 1102.

Crystallised Digitonin.—Kiliani (see this Journal, 1891, 567) obtained from digitalis seeds a crystalline body, which he regarded as identical with Schmiedeberg's amorphous digitonin, as the two substances had the same composition, and gave the characteristic red coloration on warming with dilute sulphuric acid or concentrated hydrochloric acid. Crystalline digitonin is prepared in the following manner :—A solution of *Digitalinum germanicum* in 90 per cent. alcohol is precipitated with ether, and the mixture of amorphous and crystallised digitonin so obtained is dissolved in warm water, the solution treated with 30 per cent. (by volume) alcohol, and the mixture agitated with ether. On standing in the cold, crystallised digitonin separates out. The author points out, however, that the product so obtained is not pure, but can be purified by repeated recrystallisation in the manner described above. By continuing the purification till the evaporation residue of the mother-liquor no longer gives the red coloration with concentrated hydrochloric acid, pure crystalline digitonin is obtained, which, on warming with concentrated hydrochloric acid, gives a yellow solution, the colour of which soon changes to olive-green, but gives no trace of a red coloration. The compound is easily soluble in alcohol and hot water, slightly soluble in cold water ; the solution is precipitated by tannic acid and lead acetate and ammonia, but not by magnesium sulphate and ammonium sulphate. It does not give Keller's reaction (this Journal, 1898, 186). Analyses correspond to the formula, $C_{28}H_{47}O_{14} + H_2O$ (?). The pure, crystalline digitonin can be obtained, in exceedingly small quantities, from digitalis leaves.

Amorphous Digitonin (*Schmiedeberg's*).—This was prepared from the evaporation residue of the mother-liquors from crystallised digitonin, by dissolving in 90 per cent. alcohol and precipitating with ether. The body was purified by dissolving in a mixture of equal parts of alcohol and chloroform and precipitating the clear solution with ether. It forms a white, very hygroscopic powder, very easily soluble in water. The solution is precipitated by tannic acid and lead acetate and ammonia, and also, contrary to crystalline digitonin, by magnesium sulphate and ammonium sulphate. It gives a fine red coloration on warming with concentrated hydrochloric acid, and also gives Keller's reaction. Its composition corresponds to the formula, $C_{27}H_{46}O_{14}$. Amorphous digitonin is present both in the seeds and leaves of *Digitalis purpurea*. Schmiedeberg's amorphous digitonin and Kiliani's crystallised digitonin are therefore different substances.

The author was not able to distinguish whether *Digitalinum verum* was present in the leaves, but he confirms Keller's opinion that digitoxin is present both in leaves and seeds.—A. S.

Uganda Aloes. A. Tschirch and J. Klaveness. Archiv der Pharm. **239**, (4), 241—249.

Uganda aloes contain from 5—6 per cent. of ugandaloïn, $C_{15}H_{11}(OH)_2(OCH_3)O_4$, melting at 138°—139° C. Recrystallised from alcohol it forms bright yellow, doubly refractive prisms with pyramids. It is identical with capaloin. It is best extracted by the method of Léger, by shaking out a solution of the aloes in methyl alcohol with water-free chloroform, and purifying the chloroform residue, after distillation, by recrystallisation, first from alcohol-chloroform, and finally from alcohol alone. When a solution of the aloes in acetone is freed from resin by treatment with ether, and the filtrate, after concentration, is set aside in a closed vessel for several months, a deposit of orange-yellow crystals is formed, which proves to be an emodin, $C_{15}H_{10}O_5$, melting at 224° C., while the ugandaloïn has totally disappeared.

It is concluded, therefore, that ugandaloin, like barbaloïn, is converted into emodin. The resin of uganda aloes is found to be the paracumaric ester of uganda-resinotannol. On submitting a solution of the aloes in potassium carbonate to steam distillation, a minute quantity of volatile oil is obtained, which, when extracted from the aqueous distillate by ether, is isolated as a yellowish oil, with the odour of rose or balm, and which solidifies on cooling.—J. O. B.

Rose Oils (Comparison of German and Bulgarian).
Schimmel's Report. May 1901, 47—51.

German rose oil differs from that produced in Bulgaria in containing about 10 per cent. more stearoptene, and a markedly lower percentage of citronellol. This last-named constituent was determined by a process of formylation, which, although not absolutely accurate, was sufficiently so to yield results of value for comparison. 10 c.c. of the oil is heated on the water-bath with twice its volume of concentrated formic acid. By this treatment geraniol and linalool are decomposed, forming hydrocarbons, while citronellol alone is converted into formate, which can then be determined quantitatively in the usual manner.

German Rose Oil.—Two specimens of this had the following characters: Specific gravity, at 40° C., 0·8372 and 0·8304. Rotation, at 30° C., –0° 44′ and –0° 52′, at 33° C. Congealing point, +29° C. and +30° C. Stearoptene, 28·5 and 39·97 per cent. Acid number, 2·3 and 0·0. Saponification number, 4·5 and 10·4. Saponification number after acetylation, 188·4 and 171·14. Saponification number after formylation, 59·21 and 47·9. Total alcohols, 60·44 and 54·00 per cent. Citronellol, 16·49 and 13·34 per cent.

Bulgarian Rose Oil.—The characters of samples of this varied as follows: Specific gravity, at 25° C., 0·8594 to 0·8634. Rotation, –2° 20′, at 30° C., to –2° 46′, at 25° C. Congealing point, +19·6 to +20·4° C. Stearoptene, 18·49 to 20·55 per cent. Acid number, 0·0 to 2·3. Saponification number, 7·0 to 11·1. Saponification number after acetylisation, 211 to 216. After formylation, 92·9 to 101. Total alcohols per cent., 66·27 to 70·88. Citronellol, 25·88 to 28·97 per cent.

Stearoptene-free German Rose Oil.—This had the specific gravity of 0·887 to 0·886, at 15° C. Optical rotation, at 20° C., –0° 56′ to –1° 2′, and contained 90·8 to 93 per cent. of total alcohols, of which 20·8 to 22·63 was citronellol.

Stearoptene-free Bulgarian Rose Oil.—The figures obtained with this were: Specific gravity, at 15° C., 0·8862 to 0·8774. Optical rotation, at 20° C., –2° 38′ to –2° 49′. It contained from 86·63 to 87·01 per cent. of total alcohols, of which 34·9 to 35·5 was citronellol.

It is suggestive that if the admixture of 1 or 2 vols. of geraniol be made to pure German otto, the product possesses characters which approximate closely to certain Bulgarian ottos.

Incidentally it is noted that the "congealing point" is valueless as a test for the stearoptene content of otto, since a difference of 10 per cent. of that constituent was found only to affect the congealing point to the extent of 1° C.—J. O. B.

Thymoquinone in Wild Bergamot Oil. I. W. Brandel and E. Kremers.
Pharm. Rev. 1901, **19**, [5], 200—203.

The authors have examined the oils of *Monarda punctata L.* and *M. fistulosa L.*, and express the chemical relationship between the two plants, as well as their differences, by the following table containing the substances thus far iden and described:—

Monarda punctata.	Monarda fistulosa.
Cymene. Thymol. *d*-Limonene.	Cymene. Carvacrol. Limonene.

Both oils apparently contain an alcohol, possibly $C_{10}H$ From the fistulosa oil a small amount of red crystals, m at 256°—266° C., were obtained. Two other constit were also obtained, one from the phenolic portion of th which is crystalline and melts at 140°; the other, wh also crystalline, was obtained from the non-phenolic po This last was found to be thymoquinone. On purifyi non-phenolic portion with steam, yellow crystals sep in the condenser towards the close of the distillation recrystallisation they melted at 45° C. The elem composition was $C_{10}H_{12}O_2$, whilst their appearance and left no doubt as to their identity with thymoquinone. hydrochloride recrystallised from petroleum spirit at 76°—77°; the crystals were colourless. The thymoquinone and its hydrochloride have since bee pared from both thymol and carvacrol.

This appears to be the first instance in which t quinone has been isolated and identified from a volat Its dimethyl ether has been found in the oil from *A montana L.* (Sigel. Annalen, 170, 345).

The remainder of the paper gives an exposition relationships between cymene, carvacrol, hydrot quinone, and thymoquinone, and the causes of colo in essential oils.—C. T. T.

Basil Oil; A New Terpene in ——. P. van Rom
Koninklijke, Akad. van Wetenschapp. te Amst 1900; through Schimmel's Report, May 1901, 12.

The volatile oil has been distilled from three varie *Ocimum basilicum*, grown in the Botanical Gard Buitenzorg. These show but slight botanical diverg from type, but the chemical composition of the oils different. The variety known in the vernacular as " hidjan," which has light green leaves, yielded 0·2 pe of oil having the sp. gr. 0·948 at 25° C. It had a like odour, and contained methyl-chavicol. The known as "Selasih itan," with dark green leaves only a trace of oil, insufficient for chemical exami The third variety, "Selasih bezar," yielded from 0·32 per cent. of oil, the specific gravity of which from 0·890 to 0·940 at 26° C. and the optical r from – 11·25° to – 18°. This oil was interesting taining, in addition to from 30 to 40 per cent. of eug new terpene, oximene $C_{10}H_{16}$, which, from the rapidit which it absorbed oxygen, could only be isolated b tional distillation *in vacuo*. Thus obtained, it was fo be optically inactive, boiled at 73°—74° C. at 2 pressure, and had the sp. gr. 0·801 at 15° C. Its affi oxygen was very marked; it rapidly absorbs the g became resinified. It closely resembles myrcene, i by Power and Kleber from the oil of *Myrcia ac* differs from that terpene in its behaviour towards ox —J. (

Eucalyptus Oils; New Aromatic Aldehyde occurr ——. H. G. Smith.
Paper read before the Roy N.S.W., Dec. 5, 1900. Proc. Royal Soc., New Wales, **34**.

The author finds that the aldehyde occurring in a ver number of eucalyptus oils is not cumin aldehyde hitherto been supposed, but a new compound for wh proposes the name *aromadendral*. The aldehyde in greatest quantity in the oils from the true " *Eucalyptus hemiphloia, E. albens, E. Woollsiana,* & only in smaller amounts in the oils from the " which oils are rich in eucalyptol or cineol. It is pr that the natural eucalyptol in eucalyptus oils is directly or indirectly from this aldehyde. The latt not appear to be present in oils very rich in phella ı as the oils of *E. dives, E. radiata,* &c.; such oils 'aia a ketone of peppermint odour, but very little ılyptol.

he aldehyde was isolated in the following manner:— 0 c.c. of the crude oil of *E. hemiphloia* were distilled, fraction coming over above 196° C. was agitated with um bisulphite, and the crystalline mass, after standing ours, well washed with ether-alcohol, dried on a porous , decomposed with sodium carbonate, and the separated team-distilled. 33 c.c. of the aldehyde were obtained 1 litre of the crude oil. The aldehyde forms a slightly wish, very mobile liquid, with a not unpleasant odour; soluble in the usual solvents for such substances; r. at 15° C., 0·9477; b.-pt., 210° C.; optical rotation, ·6° in a 100-mm. tube at 22° C., or $[\alpha]_D = -49 \cdot 19°$. ves an oxime melting at 84° C., a hydrazone melting at C., and an alkyl-β-naphthocinchoninic acid melting at C. The results of analyses indicate the formula $_{11}$O.

oxidation with potassium bichromate and sulphuric *aromadendral* yields *aromadendric acid*, $C_{10}H_{11}O_2$, ı melts at 110° C., and is soluble in boiling water, ol, and ether. On oxidation with an alkaline solution tassium permanganate, the aldehyde forms eucalyptol n acid which melts at 259°—260° C., with formation anhydride; the latter commences to sublime at about °, but if heated somewhat rapidly melts sharply at C. By acting upon an alcoholic solution of aro- ıdral with sodium, an odoriferous oil is obtained, which bably the alcohol, *aromadendrol*, corresponding to the ·de.—A. S.

·e *Oil; (Cayenne)* ——. E. Theulier. Rev. gen. Chim. pure et appliqué, 3, 262; through Schimmel's ort, May 1901, 40.

·ood (Bois de Rose femelle) distilled by the author, l from 1·4 to 1·6 per cent. of oil, of which the rotation was − 15° 9′ to − 15° 50′ at 13° C., 0·8725 to 0·875 at 14·5 C.; solubility in alcohol r cent.), 1:2; saponification number, 1·385. The oil ed almost entirely of *l*-linalool (the licareol of Morin), ontained neither methyl-heptenone, geraniol, nor ol, all of which are constituents of Mexican linaloe . O. B.

Cedar Oil; Atlas ——. Schimmel's Report,
May 1901, 58.

l was distilled from the wood of *Cedrus atlantica*, a of *C. libani*, cultivated in the Botanical Gardens at . It was a thick, pale yellow liquid, with a balsamic the sp. gr. was 0·9517; optical rotation, + 48° 16′; ve index, 1·51487. Solubility in alcohol (90 per :3 to 4, but separating on further dilution. Acetyl- showed the presence of 16·6 per cent. of an alcohol the formula $C_{15}H_{26}O$. The yield of oil was from er cent. It has been used successfully in medicine stitute for sandal-wood oil.—J. O. B.

al Flower Perfume; Preparation of ——, by means e Ketone "Jasmone" $C_{11}H_{16}O$. Ger. Pat. 119,890, t. 19, 1899. Heine and Co. Zeits. angew. Chem. 14, [20], 499. See also this Journal, 1899, 1153.

im is for the process of preparing perfumes which ın dissolving jasmone in essential or fatty oils, solvents, or water. Jasmone is obtained by treating ion of jasmine oil boiling above 100° C. under 4 mm. , with picric acid in order to remove indole, rectify- residual oil and treating with hydroxylamine. The ime is purified by solution in dilute acids, in which rities are insoluble; they are removed by light n spirit; alkalis then separate the pure crystalline .A. C. W.

; *Isolation of ——, from Costus Root Oil.* Haar- ıd Reimer, Holzminden. Ger. Pat. 120,559. Sup- ıt to Ger. Pat. 72,840, April 25, 1893. From angew. Chem. 1901, 14, [22], 556.

ıc compound, isoirone, having the same formula perties as irone, exists in the commercial product, ot oil, which is said to be obtained either from the roots of *Aplotaxis Lappa D* or from *Carlina gummifera Lesson.* It can be extracted from the oil in the same way as irone from orris-root, by conversion into a condensation product by treatment with phenylhydrazine or some other substituted ammonia. The addition of dilute acids then separates out the ketone in the free state.—J. S.

Amphopeptone; Preparation of Pure ——. P. Mühle.
Chem. Centr. 1901, 1, [22], 1205.

The author prepared, according to Siegfried's method (Zeits. physiol. Chem. 1899, 27, 335), the iron salts of the peptones formed by the peptic digestion of fibrin. Attempts to obtain products of constant composition from the peptone solutions (prepared by decomposition of the iron compounds) by fractional precipitation with silver nitrate, mercuric nitrate, alcohol, ether, or cupric acetate, did not succeed, although in all the precipitates obtained, the ratio C:N approximated to 3. However, by means of the more recent method described by Siegfried (this Journal, 1900, 1141), of "double iron precipitation," the author succeeded in obtaining pure amphopeptone. Iron precipitate I. yielded a peptone having the composition, $C_{21}H_{34}N_6O_9$, and iron precipitate II., one with the composition, $C_{21}H_{36}N_6O_{10}$. The correct ratio of C:N in amphopeptone is consequently 3. The pure amphopeptones form white, non-hygroscopic powders of distinctly acid character. No silver salts of constant composition could be obtained, but the barium salts $(C_{21}H_{33}N_6O_9)_2Ba$ and $(C_{21}H_{35}N_6O_{10})_2Ba$, and zinc salts $(C_{21}H_{33}N_6O_9)_2Zn$, and $(C_{21}H_{35}N_6O_{10})_2Zn$, were prepared. Molecular weight determinations by Beckmann's method gave results corresponding to the above formulæ. A determination of the optical rotation showed $[\alpha]_D = -27 \cdot 24$. On hydrolysis of amphopeptone with fuming hydrochloric acid, lysin, arginin (?) and tyrosin were obtained among the products of decomposition.—A. S.

Lemon Oil; Two New Substances in ——. H. E. Burgess.
Proc. Chem. Soc. 1901, 17, [240], 171.

If 3 or 4 litres of the terpenes obtained during the distillation of the lemon oil are well shaken with a cold solution of sodium metabisulphite, a small quantity of a crystalline compound is formed which can be separated and washed with alcohol and ether. This, on being decomposed in the usual way, gives an aldehyde of which the constants are very different from those of citral:—boiling point, 80°—85° C. at 15 mm.; optical rotation, + 0° 30′ C.; refractive index, 1·4314 at 20°.

It has an odour resembling cocoanut oil. On shaking the aldehyde with hydrogen peroxide and caustic soda solution it is at once polymerised into a solid form which can be recrystallised from alcohol.

It forms an oxime melting at 35° C., and on oxidation with potassium permanganate it gives an oily acid; from the ammonium salt the silver, copper, and magnesium salts have been prepared and analysed.

Apparently the same aldehyde exists in orange oil, but it was not found in the terpenes as in the case of lemon oil.

A crystalline substance was obtained by shaking together one litre each of acetone and lemon oil and then adding about 200 c.c. of water, when it separates into two layers; the lower portion was separated and allowed to stand for 24 hours, when small crystals were formed in the globules of oil floating on the surface; these were filtered off and recrystallised from alcohol and ether.

Several such separations may be made from each quantity of oil, but the total yield from one litre was extremely small. The crystals so obtained melted at 145°. They are sparingly soluble in alcohol, the solution having a marked blue fluorescence.

Several combustions have been made of the recrystallised substance, which forms a crystalline dibromide and is oxidised to oxalic acid, carbonic dioxide and water.

1. Thymol. Displacement of Alkyls from Phenols by Nitration. A. T. Larter. Proc. Chem. Soc. 1901, 17, [240], 183.

Maldotti, in a recent note (Gazzetta, 1900, 30, ii, 365), states that trinitrothymol is formed on nitrating dinitrothymol; he was unable to analyse the product, and bases his statement solely on molecular weight determinations made by the cryoscopic method. This conclusion is in opposition to the result arrived at by Armstrong and Rennie (Chem. News, 1883, **47**, 115), who found that the so-called trinitrothymol was in reality trinitrometacresol.

The author has repeated the experiments at Armstrong's request, and his results confirm the conclusion arrived at by Armstrong and Rennie.

The melting point of the product from thymol is the same as that of trinitrometacresol, and is unaffected when the substance is mixed with the trinitro-compound prepared from metacresol. On methylation, the product affords an ether identical with that prepared from trinitrometacresol, the two substances melting at 91° C., whether singly or in admixture, and giving the same trinitrometatoluidine (m. p. 136°) when subjected to the action of ammonia.

When dinitrothymol ethyl ether is subjected to nitration, it is converted into trinitrometacresol ethyl ether—an observation of importance as proving that the displacement of the alkyl does not involve the formation of an intermediate stage of a keto-compound.

Ozone; Quantitative Determination of ——. A. Ladenburg and R. Quasig.

See under XXIII., *page* 749.

Antimonic Acid; Iodometric Determination of ——, and Volumetric Determination of Antimony in the Presence of Tin. M. Rohmer. Ber. **34**, [8], 1565.

See under XXIII., *page* 749.

Strophanthin; Determination of ——. Dohme.

See under XXIII., *page* 756.

Jalap; Determination of ——. Schweissinger.

See under XXIII., *page* 756.

Sandal-Wood, Lavender, and Thyme Oils; Physical and Chemical Examination of ——. L. F. Kebler.

See under XXIII., *page* 756.

Camphor in Spirit of Camphor; Determination of ——. O. Schmatolla.

See under XXIII., *page* 756.

PATENTS.

Prophylactic, Immunifying, or Curative Substances; Process for the Preparation of ——. A. M. Clark, London. From F. Blum, Frankfort-on-Main, Germany. Eng. Pat. 14,491, Aug. 13, 1900.

This invention is based upon the theory that certain poisons are regularly secreted in the tissues of the body, particularly in the intestinal organs, which ultimately find their way into the blood, and give rise to various kinds of disorders, and that the function of the thyroid gland is to destroy these poisons by extracting them from the blood. The process takes place in two stages; first, the poisonous substances ("enterotoxin") are arrested by the gland; in the second stage they are transformed, in combination with substances contained in that organ, into intermediate products ("thyrotoxalbumin") which are still poisonous, but which are afterwards rendered completely innocuous by the further action of the gland. The inventor has found that by introducing into the body of an animal a quantity of poisons in excess of the capacity of the thyroid gland to counteract, or by removing that organ from the body with suitable dieting, an immunifying agent may be caused to be formed in the blood, and that the blood serum of animals so treated which remain healthy or which regain their health, when injected into other animals renders them immune against diseases due to inaction of the thyroid gland.—L. A.

Suprarenal Glands; Glandular Extractive Products consisting of the Active Principle of ——, and the Process of producing the same. J. Takamine, New York, U.S.A. Eng. Pat. 1467, January 22, 1901.

The patentee claims the crystalline active principle (adrenalin) of the suprarenal glands and its crystalline salts. Adrenalin crystallises in tabular, triangular, prismatic f or in a finely acicular form. A solution of 1 in 10,000 equal strength with the fresh aqueous extract of eight of glands in 10 parts of water. The acid solution gi green coloration with ferric chloride, the alkaline sol a carmine-red coloration; it gives a red coloration iodine water and reduces silver and gold salts. Adre forms crystalline salts with mineral acids.

Also the processes for isolating adrenalin are cla which consist in making an aqueous extract of glands concentrating, adding alcohol to precipitate im albuminoids and mineral matter, filtering, concentr precipitating with ammonia, filtering, washing, and d If fixed caustic alkalis be used in place of ammoni active principle is redissolved; it is then precipitat means of ammonium chloride or carbon dioxide. processes for refining the active principle are also cla which consist in dissolving the crude product in dilute filtering, and adding ammonia, or in adding further a and ether, filtering and neutralising, or in dissolving in alkali, adding alcohol and ether, filtering and neutrali

In addition, a process is claimed for preparing a pa purified product, which consists in concentratin aqueous extract of suprarenal glands, precipitating f matter by alcohol, and evaporating off all, or a port the alcohol.—A. C. W.

Saccharin; Manufacture of ——. R. Reitmayer, L From J. Volmar, Cassel, Germany. Eng. Pat. March 28, 1901.

The patentee claims the manufacture of toluene sul chlorides from toluene sulphonic acids by means of sulphonic acid as a chlorinating agent. The sulphonic obtained by the action of fuming sulphuric acid of th position, $H_2S_2O_7$ are carefully mixed at the proper te ture with chlorosulphonic acid. After standing, w added, and the o-sulphonic chloride separated by cr sation at a low temperature.—A. C. W.

XXI.—PHOTOGRAPHY.

Ferrotype Positives; Preparation of ——, withou Mercuric Chloride. Mitth. Act. Ges. Anilin Fab **2**, 45; through Chem. Zeit. Rep. 1901, **25**, [38],

Ferrotype pictures, *i.e.*, direct positives on thin she enamelled black, have hitherto required to be finally with a bath of mercuric chloride to cause them to sl desired positive appearance. Owing to the toxicity mercury salt, this processs is objectionable. It possible to prepare such pictures on the ferrotype pla a bromide emulsion by employing a special amm developer; the plates then needing only the usual fixi washing baths. The best developers are paramino "glycin," and "metol"; the following formula bei cal: Water, 300 parts; sodium sulphite, 4; "glyc ammonia (sp. gr. 0·91), 10; 10 per cent. potassium b solution, 12 parts. Development occupies three minu the image is only visible in the high lights before it i

—F.

Ammonium Persulphate as a Photographic "R Atelier des Phot. 1901, **8**, 77; through Chem. Ze 1901, 152.

The "reducing action" (in photographic phraseol ammonium persulphate, is a process of chemical ox the metallic silver of the image being converted in oxide, which dissolves in the excess of the reage this action only proceeds in an acid solution, the will not be "reduced" unless the bath is kept aci silver oxide dissolved in the solution of the persul immediately precipitated if the liquid be diluted wit and, being in a state of extremely fine subdivision, breaks up into metal. If, then, directly after reduc negative is washed with water, an irregular precip metallic silver will be deposited in and upon the fi avoid this, it should be first immersed in a bath of sulphite or thiosulphate. As the latter is also hic reducer in presence of oxygen, the plate should be ed into the solution, rather than have the solution ed upon it.—F. H. L.

XXII.—EXPLOSIVES, MATCHES, Etc.

uncotton ; Action of Aqueous Formaldehyde on ——. L. Vanino. Ber. 1901, **34**, [7], 1128.

author finds that when guncotton is treated with r cent. solution of formaldehyde and allowed to dry, es its sensitiveness to explosion by percussion.

removing the paraform deposited in the guncotton oiling with water, or, mechanically, by beating, it es its ordinary explosive properties. No effects of position are observed in the treatment.—C. F. C.

ng Match Composition free from Phosphorus ; Pre- ation of an ——. A. Purgotti and L. Purgotti. Ger. . 119,803, 1899. Zeits. angew. Chem. 1901, **14**,], 521.

omposition claimed by the patentees contains, as its ial constituent, chromium ammonium sulphocyanide unds, that is, the salts, particularly the ammonium opper salts, of chromium ammonium sulphocyanic CNS)$_4$N$_2$CrH$_6$—R. The composition can be applied usual manner to stems of wood impregnated with n or sulphur, or of wax. It is stated to possess the advantages as the ordinary compositions containing orus, in that it withstands the action of moisture, n be ignited on any suitable surface, including cloth ; the disadvantages connected with the phosphorus sitions, particularly as regards their poisonous nature, oided. The composition is also cheaper than the orus compositions.—A. S.

XIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

ors ; Classification of ——. J. Wagner. Zeits. . Chem. **27**, 138—151. Chem. Centr. 1901, **1**, , 1214.

addition to, but partly differing from, the scheme of (this Journal, 1899, 708), the author proposes a ation of indicators, based upon their chemical The various indicators are divided into two main each with two subdivisions :—

dicators with a univalent characteristic ion :—
(1.) With a univalent characteristic anion.
(2.) With a univalent characteristic cation.
dicators with a polyvalent ion :—
(1.) With positive and negative ion (amphoteric electrolytes).
(2.) With uni- and polyvalent anion or cation.

. (1) belong those indicators which are more the weaker their acid component.

ollowing indicators belonging to this group are l in the order of the strengths of their acid uts : Iodeosin, Cochineal, Fluoresceïn, Alizarin, *p*-nitrophenol, Rosolic Acid, Tropäolin O O O, , Curcumin W, Flavescin, lacmoid, litmus, phenol- n, and Poirrier's Blue.

icators belonging to A. 2, only Methyl Violet and aminoazobenzene are known.

l belong Tropäolin O O (sodium salt of phenyl- obenzene sulphonic acid), Methyl and Ethyl Orange, Red, and Benzopurpurin. The most important is Orange, which forms in acid solution the red cation, $l_3)_2C_6H_4.N_2.C_6H_4SO_3H$, and in alkaline solution, w anion, $N(CH_3)_2C_6H_4.N_2.C_6H_4SO'_3$. The author that the intermediate colour is due not to a on, $.HN(CH_3)_2C_6H_4.N_2.C_6H_4SO'_3$, as stated by ut to the undissociated free acid, the red colour of ixes with the yellow of the anions. For the of acid solutions, strongly acid indicators are eous, as Congo Red, Methyl and Ethyl Orange, e titration of alkaline solutions, the strength of the basic properties must be considered. Sufficiently strong bases can give a distinct colour change, but with weaker bases the colour of the basic ion mixes with that of the indicator itself, and the sharpness of the change suffers, as with Congo Red, and less so with Methyl Orange.

To B. 2 belong those substances which yield different coloured ions of the same kind. The only known members of this group are acids which are coloured differently as univalent ions than as divalent ; for example, Alizarin sulphonic acid. Indicators of this class are suitable, theoretically, for the titration of weak acids alone or in presence of strong acid, but no completely satisfactory ones are known, hydrolytic action invariably interfering with the results.—A. S.

Blowpipe ; A Kerosene Oil ——. A. Richardson. Proc. Chem. Soc. **17**, [239], 151.

This blowpipe has been devised in order to utilise the combustion of kerosene oil for the production of a blowpipe flame suitable for glass-blowing and other purposes, so as to combine the advantages of a gas blowpipe while independent of a supply of gas. The need of such a blowpipe is obvious in a country like India, where gas is not always available, and where in many college laboratories not supplied with gas, blowpipe work is necessarily limited to operations with the mouth blowpipe and spirit lamp.

At first it seemed possible to use one of the vegetable oils, such as cocoanut oil, by burning it in a modified form of glass blower's "tallow lamp," but the tendency of all such oils to char at the temperature of the blowpipe flame renders them useless as a continuous source of heat, unless the wick is being constantly trimmed. As kerosene oil does not char, it was selected for this purpose ; its combustion, however, in a lamp without a chimney requires special arrangements, if it is to give a solid, steady flame, easily regulated and completely under the control of the operator, and it was only after many unsuccessful attempts that a lamp was constructed which fulfils all the requirements of the case.

As it now stands, the blowpipe consists of a metal tube, 1½ inches long and ¾ of an inch in diameter, fixed at an acute angle above the oil holder, with which it is connected by a flattened tube or wick holder. A wick about 1 inch wide is used. The wick is protected and kept in its place by a tube of iron wire gauze, projecting beyond the wick on either side. The lower end of the metal tube is closed by a perforated cap, through the centre of which the blowpipe jet passes. This is made to slide backwards and forwards on the rail, so that its position in the centre of the tube can be regulated.

A thread of asbestos, dipping in the oil, passes up the wick-holder and projects just in front of the wick at the open end of the metal tube.

To use the lamp, the asbestos thread is first lighted. This furnishes a small flame at the mouth of the metal tube. If now the bellows be worked, combustion takes place within the metal tube on the surface of the gauze. The size of the flame depends on the position of the jet, since combustion is practically limited to that portion of the wick exposed to the air current. Thus, when the jet is pushed up to the open end, a fine-pointed flame is produced ; as it is drawn back into the tube, the flame increases in size, giving a roaring flame when the whole length of the wick is exposed. On stopping the air supply the flame immediately subsides to its original size, and burns quietly at the mouth of the tube. In this way the flame is under complete control, and gives no trouble when not in use.

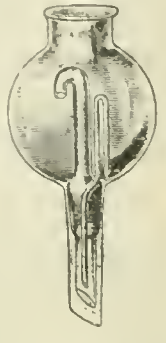
Experience has shown that the wick remains in good condition for a long time ; in one case it was found to be only superficially blackened after the blowpipe had been in use for several weeks.

The dimensions given above are those which the author has found most useful for general purposes, but with a wick 2 inches wide, contained in a tube of 1-inch bore, a much larger and more powerful flame is obtained, suitable for large pieces of glass-blowing, although it is not so easily regulated for the production of a small flame.

The efficiency of the blowpipe has been proved by long use ; with its aid all the ordinary glass-blowing which before was out of the question without gas may be done.

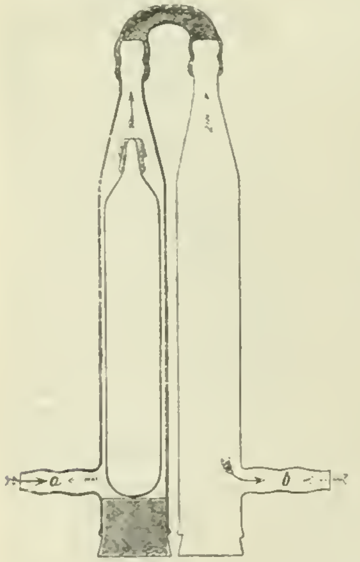
Extraction Apparatus, New. H. Sinnhold. Chem. Zeit. 1901, **25**, [39], 423.

The apparatus illustrated in the accompanying figure is less fragile than the ordinary Soxhlet apparatus with outside tubes. It has the same intermittent action, but, owing to the tubes conducting the vapour being within the bulb, there is less condensation, whilst at the same time the condensed liquid is available for extraction purposes at a somewhat higher temperature than is usual in the original tubes. The extraction under similar circumstances is found to be 1·6 times as great as with the ordinary Soxhlet tube.
—W. G. M.



Gas-Valve which prevents the Passage of Liquids ——. K. Scholvien. Chem. Zeit. 1901, **25**, [37], 397.

The valve shown in the figure consists of two glass tubes, the extremities of which are drawn out and united by means of thick india-rubber tubing. In either tube a float of thin glass is placed, the upper ends of which are closed with rubber stoppers. If, for example, a gas enters at *a* it can pass without interruption to *b*, but if a liquid enters, it raises the glass float and seals the connection between the two tubes.
—C. A. M.



Indicator for Volumetric Analysis (Dinitrodiazo-amino-benzene). J. Brandt. Bull. Soc. Ind. Mulhouse, 1901, April, 120—124.

See under VI., *page* 711.

PATENT.

Test Paper which is Sensitive to several Chemical Substances at the same Time. S. S. Bromhead, London. From The Chemische Fabrik Helfenberg, Helfenberg, Germany. Eng. Pat. 7014, April 3, 1901.

The paper to be used for the production of test papers is provided with narrow strips of paraffin, wax, lac, &c., which serve to isolate the different reagents from one another, and to prevent them from running together. It is thus possible to lay on one paper red and blue litmus near to one another, and in the same way any other reagent of vegetable or synthetic origin.—R. B B.

INORGANIC CHEMISTRY.—QUALITATIVE.

Tin; Flame Reaction of ——. O. Schmatolla. Chem. Zeit. 1900, **25**, [43], 468.

If a narrow test-tube containing water be dipped into a solution of tin in concentrated hydrochloric acid, and be then held in the non-luminous Bunsen flame, an intense blue-white coloration (which persists so long as free acid is present) is observed. The presence of antimony does not hinder the reaction, but if arsenic be present in than the equivalent proportion, there is no coloration a dark deposit on the test-tube. The test can be us the detection of tin in foodstuffs, but when present i small quantities the test-tube must be dipped repeate the solution.—E. H. T.

Phosphorus; Detection of Free ——. P. Muckerji. anorgan. Chem. **27**, 72; Zeits. angew. Chem. 19 [22], 549.

Instead of volatilising the free phosphorus in a cur steam, and observing whether any luminosity is pro the author employs nascent hydrogen. A three- Woulff's bottle is provided with a safety tube, a gas l tube, and a short wide tube for the introduction substance to be tested. Ordinary zinc and dilute sul acid are placed in the bottle, and the temperature allo rise spontaneously to 60°—70° C. An observation i made in the dark, in order to see whether the es hydrogen is free from any luminosity. Should this case the substance to be tested is introduced. The pr of free phosphorus causes an intense luminosity in t leading tube, extending sometimes back into the bottl

The presence of phosphites, hypophosphites, ni sulphuretted hydrogen, iodine, and potassium iodide interfere with the test, but oil of turpentine and prevent the luminosity from appearing.—J. S.

Arsenic; Determination of ——, *in Sugars, Mal Beer.* B. E. R. Newlands and A. R. Ling. J. Fe of Brewing, 1901, **7**, 181—189.

The method adopted by the authors for the quan determination of arsenic in glucose is as follows acidified solution of the sugar is saturated with hy sulphide at a moderate temperature and allowed to for three days, when the precipitate, consisting of and arsenious sulphide, is collected on a filter, wash hydrogen sulphide solution and treated with bromine The excess of bromine is removed by heating the liq the water-bath, after which the solution is filter filtrate made alkaline with ammonia, and the arsen cipitated with magnesia mixture. After remaining 2 magnesium ammonium arsenate separates in crystal are collected in a Gooch crucible, washed with ammonia, and dried at 100° until of constant weight. samples of glucose prepared by means of arsenic gave, by this method, 0·69, 0·56, and 0·42 grain per respectively.

The occurrence of arsenic in malt is next treated attention is called to the great importance of the d of the malt. Arsenic occurs mostly on the exterior corns, and is seldom evenly distributed through sample, so that the analyst should assure himself t portion he deals with is a representative sample. were met with by the authors containing from 1 50 grain of arsenic per lb.

During the fermentation of ordinary brewers hydrogen sulphide is formed by a reduction of the present. From experiments made with worts co 0·042 grain of arsenious oxide and 2·8 grains of po bisulphite per gallon, the authors conclude that normal fermentation such small quantities of arse not removed, either by precipitation as sulphide conversion into hydrogen arsenide or other gaseo pound.—T. H. P.

INORGANIC CHEMISTRY.—QUANTITATIVE.

Standard Hydrochloric or Nitric Acid; Prepar ——. R. K. Meade. J. Amer. Chem. Soc. 19 343—347.

The author has previously (this Journal, 1901, 392) that very accurate standard solutions of sulphuric a be prepared by the electrolysis of copper sulphate s Based on this method he now gives one for o standard hydrochloric or nitric acid. A cold sol 12·487 grms. of crystallised copper sulphate in 50 r is electrolysed by a current of 1 to $1\frac{1}{2}$ ampères ing for six or eight hours, the anode being a platinum and the cathode a cylinder of copper foil. The solution en completely transferred to a litre flask, to which is added a solution of 12·215 grms. of crystallised barium ride in a little water. As in most cases a little barium ide does no harm in the resulting acid, it is best to add ght excess of this salt. The solution is now made up e litre mark and 2·6 c.c. extra of water added to comate for the volume occupied by the precipitated barium nate. When the latter has settled the clear liquid is n off and represents exactly decinormal hydrochloric

For decinormal nitric acid the preparation is exactly ar, except that 13·076 grms. of barium nitrate are l in place of the barium chloride.—T. H. P.

e; Quantitative Determination of ——. A. Ladeng and R. Quasig. Ber. 1901, **34**, [7], 1184—1188. ompare this Journal, 1900, 776, 1146.)

previous paper (Ber. **34**, 631) Ladenburg has shown he ozone contained in ozonised oxygen can readily be ed. This process affords the safest and simplest d of estimating ozone, and has now been employed eck the iodometric method. Glass bulbs of about tre capacity, and provided with two absolutely tight were filled with dry oxygen and weighed; then ozone ed from a Berthelot's tube was passed through for nutes, and the bulb was again weighed. The increase, lied by 3, gives the weight of ozone in the bulb, if re and temperature have remained unaltered. The was next connected, by means of brass screws ted on and provided with leather packing, with two ottles entirely of glass, the first of which contained eous solution of 1 grm. of potassium iodide, the a smaller quantity of the same salt. The ozone ien aspirated through the wash-bottles by means of), its place in the bulb being taken by water. Far iodine was liberated in the second bottle when d potassium iodide was used in the first, than when al solution was employed. After adding the calcumount of sulphuric acid to the contents of the first the iodine was titrated by thiosulphate. The d iodine corresponded exactly with the weight of ne. When, however, the ozone was passed into l potassium iodide solution, about 50 per cent. too odine was liberated; and, further, in the titration e coloration continually returned, whilst, when the ad been absorbed by neutral potassium iodide, the ction with thiosulphate was reached at once. The ascribe, with some reserve, the excessive liberation ie from hydriodic acid to a catalytic action of ozone, r enabling the oxygen to liberate iodine. It may ascribed to the formation of hydrogen peroxide, $0HI + H_2O = 5I_2 + H_2O_2 + 5H_2O + 3O_2$, which i would represent almost quantitatively the relations l.—A. C. W.

e and Silicic Acids; Quantitative Separation of H. L. Wells and F. J. Metzger. J. Amer. Chem. 901, **23**, 356—358.

een recently stated by Herting (this Journal, 1901, at the ordinary method of expelling silica from acid by means of hydrofluoric acid gives inaccurate owing to the formation of a silicotungstic acid, which ile when treated with hydrofluoric acid. The have made several series of experiments, the results show that the above statement is without any n of fact, the method given being an absolutely one. At the same time they call attention to the the heating must be by means of the Bunsen flame, tic acid volatilises to a considerable extent when a blowpipe flame.—T. H. P.

c Acid; Iodometric Determination of ——, *lumetric Determination of Antimony in presence* . M. Rohmer. Ber. **34**, [8], 1565—1568.

hor has previously shown (Ber. **34**, 33) that cid is rapidly and completely reduced to the condition by sulphur dioxide in presence of hydrobromic acid, and has proposed to substitute hydrobromic acid for the ferrous chloride long ago proposed for this purpose by Emil Fischer. He now finds that antimonic acid is easily and completely reduced by the same reagents, and that the antimony can be accurately determined by titration with iodine. The details of the method are as follows: Place the hydrochloric acid solution of the antimonic compound in a globular flask, add 1 grm. of potassium bromide and a sufficiency of sulphurous acid solution, put in some angular fragments to prevent bumping, and boil till the sulphur dioxide is completely expelled. To the cooled liquid add tartaric acid, neutralise with sodium bicarbonate, and titrate with iodine solution. In doing this it is best to add about 1 c.c. of the iodine solution in excess, and to go back with sodium thiosulphate.

Stannic compounds are not reduced at all by sulphur dioxide and hydrobromic acid; but they exert, if present along with the antimonic compounds in this process, a very strong retarding influence on the reaction between the antimonious compounds and the iodine. This influence, however, is completely annulled by a large excess (10—20 grms.) of tartaric acid, so that antimony can be readily determined in presence of tin as follows: Place the mixed sulphides, as obtained in the usual course of analysis, in a round flask of 300—500 c.c., dissolve in strong hydrochloric acid and potassium chlorate, and boil off the excess of chlorine. Add 1 grm. of potassium bromide and enough sulphurous acid, boil off as above and cool. Add the requisite excess of tartaric acid, neutralise and titrate exactly as above.

If the substance for analysis be an alloy in which the antimony alone is to be determined, and the presence of the other metals will not affect the titration, it may be dissolved directly either in *aqua regia* or in hydrochloric acid and chlorate; but if it be the analysis of an arsenic-antimony-tin alloy that is in hand, it must be dissolved in hydrochloric acid and chlorate, the chlorine boiled off, and after adding sulphurous acid and potassium bromide the liquid must be distilled. The arsenic will be determined in the distillate, the antimony in the residue, by titration with iodine.—J. T. D.

Zinciferous Precipitates obtained by the Cyanide Process; Determination [*Au. Ag.*] *of the* ——. C. H. Fulton and C. H. Crawford. School of Mines Quarterly, 1901, **22**, [2], 153—162.

Experimental assays were made of a well mixed sample of gold and silver precipitate from the zinc boxes of the cyanide process, to obtain a rapid and accurate method of analysis. Scorification gave low results due to volatilisation, and so was discarded. The crucible method yielded variable results, and the combination wet and dry method gave results high in silver and low in gold, due probably to its solubility in nitrous acid as a result of the action of the nitric acid on the zinc present. To overcome this difficulty a combination method was tried, using sulphuric acid in place of nitric acid. One-tenth assay ton of precipitates was treated with 20 c.c. of concentrated sulphuric acid and 60 c.c. of water and boiled for one hour, after which the solution was cooled and diluted to 100 c.c. Normal sodium chloride solution 75 c.c., and lead acetate solution 20 c.c. were added, and the precipitate settled, filtered, washed, and dried. The paper was burnt off and the residue scorified until half covered over in the scorifier, then poured and the button cupelled. The results were good and uniform, the slag corrections being small. The gold is lower than in the crucible assay, while the silver is higher, but the results are not so erratic, and it is not necessary to make more than two assays to get a reliable figure, as is the case with the crucible method. The original sample should be assayed at once or kept from the air, as the zinc oxidises quickly, and sufficiently to alter the gold and silver values. Care should be taken that the sulphuric acid is free from nitric acid.—A. W.

Silver and Copper; Cyanogen Compounds of ——, *in Gravimetric Analysis.* O. Brunck. Ber. **34**, [8], 1604—1609.

The usual method of separating silver from copper when the metals are precipitated as cyanides, by gently warming with dilute nitric acid till the copper cyanide is dissolved, is not satisfactory; for silver cyanide is not insoluble in warm nitric acid, and the whole of that dissolved is not reprecipitated on cooling, even when an excess of potassium cyanide is present; and, on the other hand, the copper cyanide is only dissolved completely in a gently warmed solution, within a reasonable time, if the concentration of the acid is so great as to involve considerable danger of solution of the silver compound.

The electrolytic separation of the two by the method suggested by Freudenberg, of using an E.M.F. strong enough to decompose the one but not the other (the figures worked out by Classen were 1—1·4 volts and 0·03—0·09 ampère per 100 sq. cm.) is not applicable for everyday purposes because of the difficulty or inconvenience of regulating the E.M.F. and the current density so nicely as is necessary. If, however, the decomposition of the complex cuprocyanide in solution be rendered more difficult by the addition of a large excess of potassium cyanide, it becomes possible to separate completely even small proportions of silver from relatively great amounts of copper, without taking any special precautions as to the voltage of the current. The author's experiments show that for quantities varying from 0·2425 grm. of silver and 0·0858 grm. of copper to 0·0485 grm. of silver and 0·4292 of copper, complete precipitation of the silver alone was effected, by currents of 2·5 to 4 volts and 0·25 to 0·50 ampère per 100 sq. cm. Winckler's wire-gauze electrodes were used, the volume of liquid was 100 c.c., and the amount of potassium cyanide present was from 3 to 6 grms. The duration of each experiment was 2—3 hours, but as a rule no harm is done if it be left longer. Should any copper be deposited with the silver it becomes at once visible by its tint; the current is then interrupted for a few minutes till the copper has dissolved, and is then continued for a short time (with addition of more potassium cyanide if necessary) to re-deposit any trace of silver that may have dissolved too.

The copper may be deposited from the remaining solution by a stronger current; but it is better to convert it into sulphate and electrolyse that.—J. T. D.

Copper; Electrolytic Determination of ——. T. Smith. Eng. and Mining J. 1901, 71, [21], 659—660.

The author describes the electrolytic method for the determination of copper, which he has used for some years with satisfactory results. The battery used is the old style of "crow foot," which is stated to be cheaper and to require less attention than the Bunsen battery, although a larger number of cells must be used. In preparing the cells it is best to place, say, two handfuls of copper sulphate crystals in the bottom, and then pour in the water, taking care not to agitate the crystals; in this way, solution takes place slowly and the efficiency of the cell is improved. The anodes are of $\frac{1}{16}$ in. platinum wire coiled like a spring, whilst the cathodes are of the ordinary cylindrical form, 1 in. in diameter and 2¼ in. high, the stems being about 4½ in. long and $\frac{1}{16}$ in. in diameter. The anodes are freed from deposits of manganese, lead, &c., after each assay, by immersion in hydrochloric acid, and the cathodes are heated to bright redness before being used.

If the ore under examination contain arsenic, the latter should be removed by means of bromine. The methods of dissolving out the copper are as follows:—

Ores.—1 grm. is heated with 25 c.c. of nitric acid and 5—6 c.c. of sulphuric acid, until fumes are freely evolved; then, after allowing to cool for five minutes, 50 c.c. of water are added and the mixture boiled to dissolve the anhydrous sulphates of iron and copper. The solution is filtered, the residue washed, and the iron in the filtrate precipitated by ammonia. 2 c.c., or its equivalent in a water solution, of strong sulphuric acid is added, and then 2 c.c. of nitric acid; the acids should be in quantity sufficient to dissolve the hydrate of iron and leave an excess of acid present

Slags.—1 grm. of the slag, if it has been water-chilled is, submitted to treatment similar to that required in the determination of silica by dehydration with sulphuric acid. The remaining treatment is the same as with ores.

Flue Dust, Cinders, &c.—1 grm. is treated with hydrochloric acid containing a few c.c. of nitric acid; when solution is complete, sulphuric acid is added.

Mattes.—2½ grms. are treated with nitric acid a little hydrochloric acid, the solution evaporated to c.c., 10 or 15 c.c. of sulphuric acid added, and the heated till fumes are freely evolved. After co ammonia is added to the solution in a half litre flask, all the iron is precipitated. A mixture of 100 c.c. of w 10 c.c. of strong sulphuric acid, and 10 c.c. of nitric then added, the solution cooled, made up to the mark shaken, allowed to settle, and 100 c.c. of the clear withdrawn, and mixed with 25 c.c. of water.

In carrying out the electrolysis, the beaker conta the copper solution, the volume of which should not 125 c.c., is so arranged that the liquid covers the bo the cathode. The strength of the current is regulat that the whole of the copper is separated, in a reaso length of time, in the form of an adherent deposit moderately cold weather, the deposition can be hast by placing the apparatus in a closed box, in whic suspended two or more incandescent lamps. Whe whole of the copper is deposited, the cathode i connected, washed with water, then with methyl al dried and weighed.

The author states that there is no danger of a seco reaction setting in, on standing, as stated by Classen a Sperry, unless the acidity is insufficient at the start.

—A

Lead from Manganese; Electrolytic Separation of J. Moltke-Hansen. Chem. Zeit. 1901, 25, 393—394.

The author has investigated the conditions under Neumann's electrolytic method (this Journal, 1896 gives satisfactory results. He finds that if the am manganese does not exceed 0·03 grm. good results obtained with a current of 2 ampères, and an initi perature of 70° C., when 25—27 c.c. of nitric acid (1·42) or 55 to 60 c.c. of acid of 1·19 sp. gr. (corresp to 18 per cent. of the pure acid in the total vol 150 c.c.) are added. The electrolysis is complet 35—40 minutes, and, as Neumann has pointed out not be continued longer than necessary.

When the manganese is present in larger proporti to 0·04 grm. in 150 c.c.) approximately correct resu obtained by increasing the amount of nitric acid to with a current of 2 to 2·5 ampères. It is advisabl ever, to work with 25—27 c.c. of nitric acid (sp. gr. and to add a little oxalic acid when the liquid b turbid from the separation of the manganese hydroxi process of dissolving this being finally assisted addition of a few c.c. of nitric acid. The depos regularly and adheres well, but must be carefully with water. The lead is completely precipitated in 45 minutes.—C. A. M.

Phosphoric Acid in Soils; Determination of T. Schloesing. Comptes Rend. 132, [19], 1191.

The author has determined the amount of pho soluble in water in several soils, by extracting 300 g the soil with successive litres of water. The a varied from 10 to 33 mgrms. of P_2O_5, or 130 to 41 per hectare. He points out that though he use volumes of water for the extraction, yet in the act a much smaller amount of water present is sufficie the work, for the phosphates, as they dissolve, a tinually removed again by the plants, so that the free to dissolve more.

He has previously shown that after nitric acid per cent. has extracted from a soil all the phosph it can, nitric acid of 0·1 per cent. will dissolve a quantity. The amount dissolved by water seem proportional to that dissolved by the weaker aci recent researches in Hungary by Sigmond show amount of this latter is in intimate relation to the value in phosphates of the soil. Analyses of soils show a distinction between these classes of phospha

—J.

phoric Acid (Soluble in Citric Acid) in Basic Slag nder; Availability of the Molybdate Method of timating ——. O. Foerster. Chem. Zeit. 1901, **25**, 9], 421.

discrepancies between the results obtained by different ists using the molybdate method has tended to bring edit upon it. Yet with care it may be perfectly actory. The author finds that if the beaker with the ion, after adding the molybdate re agent, be placed in ter-bath at a temperature not higher than 80° C. (the t of the temperatures ordinarily specified) and be ed to remain in it until it is cool, the result will be actory. The heating of the bath is not to be continued the introduction of the beaker containing the solution. r these circumstances the co-precipitation of silica is ed to a minimum, and the yellow precipitate should ve at once to a clear solution on adding ammonia. recipitation may be effected at a temperature as low ° C. without impairing the accuracy of the result. The ity of silicic acid thrown down with the yellow itate is variable under conditions not yet understood. y happen in some cases that no appreciable quantity ca is precipitated, even at 95° C., from a slag which ier cases shows 1 per cent. of silica co-precipitated. theless, as a rule, the proportion of silica thrown with the yellow precipitate rises with the temperature ecipitation. Thus, taking the average of three ments, when the water-bath was at 55°—60° C., O_2 weighed 0·15 mgrm.; at 78°—87° C. it weighed mgrm. whilst at 85°—98° C. it weighed 0·68 mgrm. lant proof is given that a very noteworthy pro- of silica may be thrown down at 95° C.

—W. G. M.

sers; Determination of the Availability of Organic ogen in Commercial ——. J. P. Street. J. Amer. m. Soc. 1901, **23**, 330—338.

ollowing method, which is a modification of that by Hayes in 1895, serves as a means of determining imately the relative availability as fertilisers of t nitrogenous materials. An amount of the material ent to 0.075 grm. of nitrogen is weighed out into a c. Erlenmeyer flask to which is added 100 c.c. of 1·6 per cent. potassium permanganate solution. digestion on a steam-bath for thirty minutes with nal shaking to moisten any particles of the material ng to the sides of the flask, the liquid is filtered, the being thoroughly washed with from 125—150 c.c. r. The total nitrogen in the undissolved residue is etermined by Kjeldahl's method. With a series of 84 samples examined by the author in this way, it is found that the percentage digestibility varies from 95·9 for horn to 25·5 for raw leather. Steamed bone gives numbers higher than five other kinds of bone used. The results show also the variations in digestibility in materials of the same class, in the case of fish the numbers ranging from 90·2 to 69·3, and in that of "tankage" from 91·5 to 65·0; such deviations are doubtless due to the varying amounts of fatty material present. The method does not give absolute values, but distinguishes high- from low-class nitrogenous materials. A digestibility, as obtained by this method, of 60 per cent. or less indicates an inferior source of nitrogen such as hair, garbage, leather, or inferior bone.

—T. H. P.

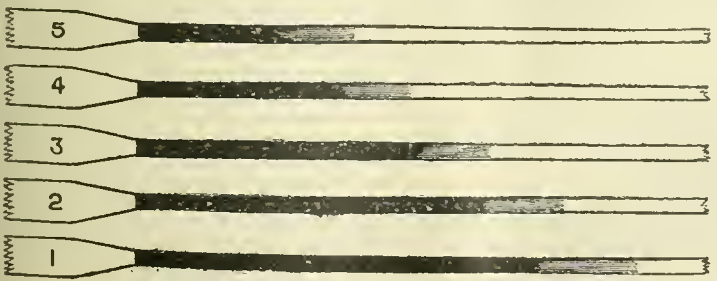
Arsenic; Influence of Selenium on certain Tests for ——. O. Rosenheim. Chem. News, **83**, [2168], 280.

The author has made a systematic study of the influence of selenium compounds on the formation of the arsenical mirror in the absence of lead acetate, and confirms observations made by L. Dawydow (Farmazheft, 1895, III., I.).

It is noted that selenium compounds have a very distinct inhibitory influence on the formation of the arsenical mirror, and under certain conditions completely prevent its formation, the influence being proportional to the amount of selenium present. This is shown by a series of experiments made under exactly identical conditions. A quantity of zinc from one stock, and a generating vessel of one size (250 c.c.) was used for each experiment, the zinc being relatively free from sulphur.

In order to control the evolution of hydrogen more exactly than by the size of the flame, and thus to obtain comparable results, a small wash bottle was used at the end of the apparatus, and the acid supplied regulated by means of a stop-cock in the sulphuric acid funnel. The time for each experiment was one hour, the tube being heated a quarter of an hour previously to make sure of the absence of arsenic in the materials used. The quantity of arsenic was 1 mgrm. in all experiments, while the quantity of selenious acid varied from 0·3 to 20 mgrms. The deposit formed on the zinc in the generating vessel in the presence of arsenic and selenium was of a dark reddish-brown colour. In the case of Experiment 9, the evolution of hydrogen was kept very slow, with the result that only the faintest deposit was obtained. For the sake of comparison, one experiment was made under identical conditions with 20 grms. of selenious acid alone, from which the usual selenium deposit was obtained. Another important observation with regard to the detection of selenium consisted in the total absence of any brick-red colour in the deposits obtained from

INFLUENCE OF SELENIOUS ACID ON THE FORMATION OF THE ARSENICAL MIRROR.



	As_4O_6. Mgrm.	H_2SeO_3. Mgrms.
9	1	20
8	1	20
7	1	10
6	1	5
5	1	2
4	1	1
3	1	0·5
2	1	0·3
1	1	—

(Original size).

admixture of arsenic and selenium in Marsh's apparatus. Just as in the formation of the ordinary arsenical mirror, so in this case a slight anterior or brownish portion followed by a metallic black portion may be observed in the first half hour of the experiment; after one hour, however, the two mirrors are united in one mirror similar to that obtained with arsenic alone.

Hydrogen selenide was reduced completely by the organic matter, when solutions containing organic and sulphur compounds were taken (*e.g.*, beer). In the presence of arsenic and selenious acid the arsenical mirror, in the absence of lead acetate, is usually deposited in the early stage of all experiments as above described, namely, in two portions, anterior reddish-brown and a posterior black one. If the quantity of arsenic be very small the mirror formation is arrested at this stage. By experiments with beer it was proved that the relative distinctness of the brown portion is due to the formation of the solid hydrogen arsenide and the quantity of sulphur organic compounds present, and is not dependent in any way on the presence of selenium, and the author concludes that when selenium is present in beer together with arsenic, no conclusion can be drawn concerning the presence or the absence of the former substance from the colour of the mirror. A portion of the reddish-brown deposit was prepared, filtered, and dried in vacuo. It was found to consist of a mixture of selenium and arsenium selenide (probably As_2Se_3) and its formation is evidently due to interaction of the small quantity of hydrogen selenide (evading complete reduction to selenium) and the arsenious acid.

In addition to the chemical explanation there is a mechanical reason for the non-formation of hydrogen arsenide in the presence of selenium in the Marsh generating flask. The zinc becomes completely covered with the selenium compound in question, and thus the evolution of hydrogen is prevented. The influence of selenium on the formation of the antimony mirror was found to be analogous to that exerted on an arsenical mirror in every respect.

With regard to the behaviour of selenium in Reinsch's test. Selenic acid is easily reduced and precipitated on copper foil in the presence of hydrochloric acid. On long continued boiling, selenium as such is deposited, not only on the copper foil, but in the liquid as well, producing a red coloration of the latter. On subjecting the blackened copper foil to sublimation in a glass tube, a small amount of the crystalline sublimate of selenium dioxide is obtained. The larger portion of the selenium is retained on the foil as copper selenide.

If a liquid containing small amounts of selenious acid be treated in the way indicated by Reinsch, replacing, however, the copper foil by polished silver foil, suspended by means of a silver wire, the silver quickly assumes a reddish and afterwards a bluish-black tint. No selenium is deposited in the liquid. This behaviour affords a convenient test for selenium in the presence of arsenic, the latter is under these conditions usually not deposited at all, or only to an infinitesimal extent. On subjecting the dry blackened silver foil to sublimation in a glass tube over a spirit burner, a sublimate is easily obtained, the silver reassuming its usual appearance. The sublimate consists, in this case, partly of selenium (producing a red tinge) and selenium dioxide. By this method a copious sublimate is obtained in 100 c.c. of the solution, containing 1—1,000,000 selenious

The chief results of the observations may be summarised as follows:—

1. Marsh's test gives no indication of the presence of selenium, if it be accompanied by arsenic.

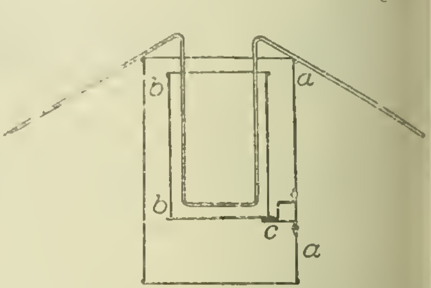
2. The magnitude of the arsenical mirror is influenced by the presence of selenium. Under certain conditions its formation is completely inhibited.

3. Reinsch's test, as ordinarily performed, is applicable for the detection of selenium, and can be used for its separation from arsenic if silver foil be substituted for copper foil.

4. None of the above methods are applicable for the quantitative estimation of small amounts of selenium, together with arsenic, in complex organic liquids, suc solutions of brewing sugars or beer.—C. T. T.

Hydrogen; Determination of ——, in Gas Mixt
F. C. Phillips. J. Amer. Chem. Soc. 1901,
354—356.

In the determination of hydrogen by oxidation palladium asbestos, condensation of the water formed w wet, the palladium which must hence be kept heated; temperature, however, must not be too high, as in this there would be danger of burning any hydrocarbons in gas. The author describes an arrangement by mean which the temperature is kept constant at about 10 In the accompanying sectional view of the apparatus is a brass cylinder, silvered and polished both insid outside, its length being 30 cm., and its diameter 18 it is open at both ends, the rims being strengthene wires; *b b* is a cup-shaped vessel 18 cm. deep and 12 wide and silvered on its outer surface; it rests on t supports, one of which, *c*, is shown. The palla asbestos is introduced into the middle of a glass 70 cm. long and about 3 mm. bore which is then bent the form shown and placed in the inner vessel filled water, the latter being kept nearly boiling by means small flame under the cup. The palladium tut connected at one end with a gas burette, and at the with a Hempel pipette. The gas to be examined is with the requisite quantity of air in the burette, the levels carefully adjusted, and the gas caused to flow s through the tube into the pipette and back again t burette, the volume of the hydrogen being ascertain the usual manner. The polished silvered surfaces d allow of sufficient radiation to impair the accuracy o gas measurements.



In the preparation of palladium asbestos, long- asbestos is alternately moistened with palladium chl solution and ignited in a bunsen flame, these oper being repeated until the asbestos has taken up 6 per cent. of its weight of palladium. To distribut metal through the asbestos it is well to roll the latter glass plate with a glass rod several times durin preparation.—T. H. P.

ORGANIC CHEMISTRY.—QUALITATI

Sesamé Oil; Modification of Millian's Reaction for
G. Armani. Annali del Laboratorio Chim. delle Ga
1900, 4, 237—248. Through Zeits. Untersuch.
und Genussm. 1901, 4 [10], 461.

The author recommends the following modification as reliable results with mixtures containing cotton see whilst giving no coloration with those varieties of oli and crucifer oil which sometimes show a reaction ordinary test: 10 grms. of the oil are saponified alcoholic potassium hydroxide, the alcohol evaporated soap dissolved in water, and the solution shaken separating funnel with 100 c.c. of ether and 30 c 10 per cent. hydrochloric acid. The ethereal solut the fatty acids is thoroughly washed, the ether evapo and the residue dissolved in alcohol which has been p by distillation, first after treatment with pota hydroxide and then with silver nitrate. This alc solution is mixed with 1 c.c. of a 5 per cent. soluti silver nitrate, and the test tube immersed in a wate at 80° C.—C. A. M.

etable Oils, Heated; Detection of ——, in other Oils. . Tortelli and R. Ruggeri. Annali del Laboratorio him. delle Gabelle, 1900, **4**, 249—280. Through Zeits. ntersuch. Nahr. und Genussm. 1901, **4**, [10], ;1—462.

n their experiments upon the effect of heating upon table oils, the authors have found that:—(1) There is ght absorption of oxygen on heating the oils for 20 minutes at 200°—250° C. (2) The substance which s the reduction in the ordinary test for cotton-seed oil or the most part, destroyed. (3) The reacting ance in the furfural test for sesame oil remains anged. (4) An addition of 20 per cent. of heated n-seed oil to other oils cannot be detected by Becchi's, ta's, or Halphen's tests, (5) The destruction of the ing substance in cotton-seed oil is not complete after nutes heating at 250° C., but can still be detected by lli's and Ruggeri's test (this Journal, 1898, 607). It ed that by means of this latter test it is possible to 10 per cent. of heated cotton-seed oil.—C. A. M.

Reaction; A New ——. T. Sollmann. Centr.- f. Physiol. **25**, 34—36. Chem. Centr. 1901, **1**,], 1245.

n of Fehling's solution, nickel or cobalt solutions used for the detection of sugar. The reagents are ed by adding 10 c.c. of a 1 per cent. solution of nitrate or nickel sulphate to a mixture of 50 c.c. f a 10 per cent. soda solution and a 5 per cent. n of Rochelle salt. The nickel solution is of an green colour, and on boiling with dextrose, becomes sh to canary yellow. The cobalt solution which rst colourless, gradually becomes bluish-green, and ling, azure blue; on adding dextrose to the boiling , the colour changes through emerald green and sh green to reddish brown. The reaction is stated more delicate than with the copper solution. ns are given by dextrose, invert sugar, lactose, se, aldehydes, and various gums. Albuminoids ve colour changes with the nickel and cobalt re- but these are quite different from the reactions y the sugars.—A. S.

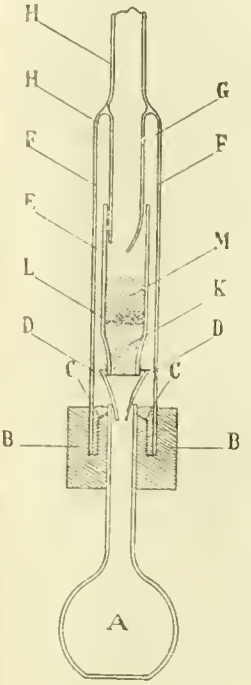
Alcohol in Vinegar; Detection of ——. R. Robine. Chim. anal. appl. **6**, 127—129. Chem. Centr. **1**, [20], 1117.

esence of methyl alcohol serves as a guide for ishing whether a sample of vinegar has been tured from denatured spirit, as the methyl present in the latter remains unattacked by *rma aceti.* For the detection of methyl alcohol, or uses Trillat's method (this Journal, 1899, 76, 1 711), but he draws attention to the fact that luction of the pure blue colour can alone be as conclusive evidence of the presence of methyl green, yellowish green, or even bluish-green as are not to be relied on, as they can be i by acetaldehyde.—A. S.

NIC CHEMISTRY.—QUANTITATIVE.

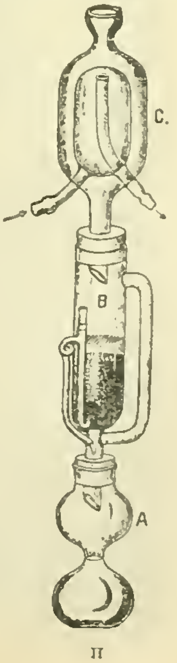
pparatus for the Determination of ——. H. J. er and B. L. Hartwell. J. Amer. Chem. Soc. 23, 338—343.

or's apparatus, which is depicted in the figure, is ation of that devised by Knorr, and is designed to ertain difficulties met with in the use of the latter. in flask of 50 to 60 c.c. capacity, having a straight a rubber cup channelled at C to carry mercury g the connection between the flask and the lower the extractor, which fits into the rubber cup at margin of the channel and forces the mercury up cover the rubber; D is a small funnel for g the ether and dissolved fat into the flask, and groove where it enters the neck of the flask so mall amount of ether accumulating between the the extractor may flow down. Resting on D is le E containing the material K to be extracted, the bottom of the thimble being covered with fat-free filter paper fastened by means of wire, the ends of which rest upon the edge of the funnel so as to leave space for the passage upward of the ether vapour. L is a layer of fat-free cotton to facilitate the distribution of the ether at the beginning of or during the extraction. M represents ether which is maintained above the substance K in considerable quantity during most of the period of extraction; this is accomplished by raising the temperature of A so that the ether may evaporate as rapidly as it filters into the flask. H is the lower part of the condensing portion of the extractor, perforated at G to permit ether vapour to pass upward and bent at an angle at the bottom so that the drops of liquid ether are delivered at the centre; this part serves as a support for the thimble, and is made sufficiently long to admit thimbles of various lengths. The rubber cup B binds the flask firmly to the extractor, thus rendering unnecessary rubber bands or devices for lowering or raising the bath below or the condensers above for maintaining connection with the flask, as are required in the Knorr apparatus. In connecting and disconnecting the flask, the latter is closed with a straight cork to prevent anything from falling into it as it passes through the rubber. A view is also given of a battery of these extractors, arranged so that without disconnecting the flasks the ether may be distilled at the close of the extraction and collected practically free from moisture; the source of heat employed is an instantaneous water heater located somewhat below and to one side of the battery.—T. H. P.



Sugar Beet: Apparatus for Extracting the Cane Sugar from ——, for Polarisation. A. Herzfeld. Zeits. Vereins deutsch. Zuckerind. 1901, [543]. 334—335.

The following apparatus and method are employed in the *Vereins Laboratorium.* The apparatus shown in the figure comprises a Soxhlet extractor fitted, above to a Soxhlet condenser, below to a receiver graduated to contain 100 c.c. at the mark between the bulbs. The extractor is of the form devised by Müller, in which the siphon is provided with a stoppered neck, through which a sample of the liquid may be withdrawn. 26 grms. of the beet, finely divided, are mixed with 3 c.c. of basic lead acetate solution and a little 90 per cent. alcohol, and transferred to the extractor, the siphon aperture being covered over with a circle of wire-gauze. The receiver is then joined on and sufficient alcohol (90 per cent.) poured into the Soxhlet to cause it to siphon over and transfer about 75 c.c. of liquid to the receiver. Extraction is carried on at such a rate that the siphon may operate once every 3—4 minutes. At the end of two hours a sample may be withdrawn through the siphon and tested for cane sugar by the resorcinol and sulphuric acid test. When extraction is complete, the liquid in the receiver is



diluted to 100 c.c. at 20° C., with alcohol, filtered, and polarised at usual.—H. T. P.

Sugar in Beets; Rapid Determination of ——. R. S. Hiltner and R. W. Thatcher. J. Amer. Chem. Soc. 1901, **23**, 299—318.

The author has developed a method based on the following considerations:—Beets, having a certain range of sugar content, say, from 8 to 14 per cent., contain an average of about 83 per cent. of water. Any beet to be examined is then assumed to contain 83 per cent. of water, sufficient of the latter being added to bring the total amount of water present up to 100 c.c. per 26·048 grms. of the beet-pulp weighed out. Taking the water factor as 83 per cent., it will be found that to every grm. of beet-pulp 3·009 c.c. of water must be added; and a table can be constructed showing, for all weights of pulp between 5 and 15 grms., the corresponding amount of water. The greatest difference in water content of any individual beet from the average of 83 per cent. will not be more than 3 per cent., and such deviation cannot make an error greater than about 0·1 in the polariscope reading. In the case of beets containing from 12 to 16 per cent. of sugar, the water factor will be more nearly 82 or 81·5 per cent., while, for unusually good beets, such for instance as have been carefully selected as mother beets for seed production, a still lower factor, 80 or 78 per cent. must be employed. For the purposes of clarifying the solution, basic lead acetate is recommended, and the addition of 3 per cent. of a solution of the acetate of specific gravity, 1·257 (54°·3 Brix), to the water used, is found to give excellent results; acetic acid, as suggested by Pellet, may also be employed. The method of working is, then, as follows:—The sample of pulp, after being rasped to an impalpable degree of fineness, is placed directly into a tared capsule, and the weight of the pulp ascertained, most conveniently on an automatic balance sensitive to one centigram. The requisite volume of the dilute basic lead acetate solution, as determined from the table constructed as above described is then run from a burette into the capsule, which is covered with a disc of wood or glass, coated with sheet rubber, so as to give a tight joint. The capsule, with the cover pressed closely on, is shaken vigorously, the cover removed, and the solution filtered. The reading of the liquid in the polariscope is carried out as usual, the percentage of sugar in the beet being obtained directly. The new method is found to give good results. The author shows how, by various devices, such as the use of a number of capsules of constant tare, the use of an automatic-filling burette, &c., a large number of beets may be examined in a short time.—T. H. P.

Beet Juice, Experiments relating to the Krause Method for Determining the Purity of ——. F. Ehrlich. Zeits. Ver. d. deutsche Zuckerind. **51**, 3. Zeits. angew. Chem. 1901, **14**, [22], 551—552.

The results of the experiments are as follows:—1. The temperature at which the digestion is made has a large influence on the quotient determination according to the Krause method, since, with increase of temperature, the density of the juice obtained rises, and the quotient decreases, whilst the polarisation remains the same. 2. The final results indicated that, with the Krause method, fine or coarse pulp could be employed with equal success. This, however, requires further investigation. 3. Increase in the time of digestion causes a gradual rise in the amount of dry residue contained in the juice, and a distinct lowering of the quotient. The introduction of a minimum or maximum time for digestion is to be recommended. 4. Compared with the old processes, the Krause method at 90° C. gives a quotient which, on the average, is 5—7 units lower. 5. On account of easy execution, and because it is unnecessary to remove the air, a volumetric process like the Sachs-Le Docte modification of Krause's method may be used with advantage in many cases.—J. S.

Glucose; Analysis of Commercial ——. *Determination of Cane Sugar in presence of Levulose, Dextrose, and Dextrin.* H. Pellet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**, [10], 769—773.

The author gives the method of Lindet (*Bulletin*, 1900, Nov. and Dec.) for the determination of dextrose and dextrin, in which it is assumed that in commercial gl there are present only dextrose, dextrin, salts, and no foreign substances, and that the non-reducing matter the same rotatory power as pure dextrin.

The total amount of carbohydrates is determined b carbon dioxide produced on combustion with cupric o From the rotatory power of a solution, taking dextri + 195 and dextrose 52·5, the proportions of dextrose dextrin are calculated. On adding the salts, the resid taken as water.

The author suggests the determination of the total by calculation from the degree Brix. of a 20 per solution. This, with the polarisation, and the formu Lindet, will give the dextrose and dextrin.

Or, instead of taking the density or the degree Brix dextrose may be determined on a 1 per cent. sol dextrin not interfering. Again, the water may be mined directly. Finally, the glucose may be comp saccharified and the total dextrose determined. The is generally from 1 to 2 per cent. short of 100, due t fact that the substance is not absolutely pure. The also certainly other organic matters besides dextros dextrin, since there is ash, and the rotatory pow dextrin is not fixed. Further, it is perfectly admi that the soluble matter not saccharified is soluble with rotatory power 215—220, and more.

Solutions of commercial glucose should be made b hot to destroy bi-rotation.

For the determination of crystallisable sugar in pr of dextrin and dextrose alone, or accompanied by lev it is sufficient to carry out an inversion by the C method under certain conditions. The dextrin i affected, and the rotation of commercial glucose sy not changed. By the difference of polarisation befo after inversion the crystallisable sugar is calculated. result is checked by a Fehling determination. The p of crystallisable sugar does not interfere with the co saccharification of the dextrin so as to obtain th reducing sugar.

Jams and jellies containing glucose were analys determining the crystallisable sugar remaining; th dextrose corresponding to the fruits employed, the g syrup added and the sugar inverted; the levulose from the sugar inverted during the preparation of t or jam; and the dextrin.

From these particulars it was possible to find the added, the proportion of fruit juice and the glucose results were verified by direct results in the factory.

—L. J. d

Mannose in Cane Sugar Products; Detection and mination of ——. H. Pellet. Bull. de l'Ass Chim. de Sucr. et de Dist. 1901, **18**, [10], 758—7

In order to be certain of the complete precipita mannose as mannose-phenylhydrazone the solution be acidified with 1 per cent. of glacial acetic acid. advisable to add the acetic acid previously, agitat to stand and filter before adding the phenylhyc Bourquelot and Hérissey advise the addition to products of two volumes of 95 per cent. alcohol to tate impurities. After filtration the alcohol is eva off. There should be an excess of the phenylhy reagent added, 10 to 25 drops to 20 c.c. of diluted or juice, the molasses being diluted with two volumes of water after treatment with acetic acid mixture should be agitated several times and set a 12 to 24 hours. The precipitate is washed on a tar with a saturated aqueous solution of mannose-phen zine, and dried at 100° C. The washing may be with similarly saturated solutions of alcohol and facilitate drying. The result multiplied by 0·666 g mannose. A correction may be made for the solul phenylhydrazine in the filtrate before washing. van Ekenstein gives the solubility as 40 to 50 m 200 c.c. of water, Bourquelot and Hérissey dou amount. Allowance should be made for ash in th pitate. The precipitate should be examined to see properties are those of mannose-phenylhydrazine, 10 to 20 mgrms. may be added to facilitate the sep and correction made for the addition.

he author finds with van Ekenstein that cane juice uld not contain mannose; but cane molasses contain 0·4 ·8 grm. of mannose per 100 grms. of molasses, in the ion of Alberda van Ekenstein and Prinsen Geerligs, to the action of alkalis aided by heat on the reducing ırs, levulose and dextrose always present in cane juice.

—L. J. de W.

ssecuites and Syrups; Rapid Method for Determining e Purity of ——. Arnauld. Bull. de l'Assoc. des him. de Sucr. et de Dist. 1901, **18**, [10], 780—782.

method of Sidersky for the rapid analysis of massecuites may be modified with advantage where, as in works z Steffen's process for washing sugar, a large number sts of the purity of syrups is required.

stead of taking 100 grms. to make up the 20 per cent. ion, only 60 grms. are taken and washed into a der which holds about 365 c.c. with a mark at 300 c.c. cylinder is without lip for greater convenience in ng with the palm of the hand when mixing the nts. It is 34 cm. high and 37 mm. in internal eter, thus allowing sufficient play for a hydrometer.

c.c. of the solution are removed with a pipette, run a 100 c.c. flask, decolorised, made up to 100 c.c. and d. During the filtration, the density and temperature aken in the cylinder, and the original Brix found from . Two Brix hydrometers only are necessary, one of 14, and one of 14 to 17.

e polarisation is read in a Pellet's continuous tube. the Brix and polarisation the purity is deduced.

e chemist in this way may make 20 determinations of ırity of syrups in an hour.—L. J. de W.

ol and Extract in Beer; Tornöe's Optical Method of ermining ——. A. R. Ling and T. H. Pope. J. . Inst. of Brewing, 1901, **7**, 170–181.

method dispenses altogether with distillation, the rements made being, first, the specific gravity of the beer at a certain normal temperature, and, secondly, the index of refraction of the beer for sodium light at the same temperature. The normal temperature has been chosen as 17·5° C. (63·5° F.), as in a warm laboratory it is difficult to keep the temperature of the liquid in the refractometer employed down to 60° F. The gravity of the beer is first determined at or near the normal temperature by means of specially accurate hydrometers which give the value to within 0·1; the observed gravity must be increased by 0·1 for each degree F. by which the temperature exceeds 63·5°. The apparatus made use of for the measurement of the refraction is a modification of Hallwachs' prism, and consists of a rectangular glass trough divided down the middle by a glass partition, the sides of which are parallel to one another, and perpendicular to the end faces. The beer is placed in one division of the trough and water in the other, and the trough is then arranged on a spectrometer stand which also supports a horizontal telescope moving round a graduated circle. Sodium light is then focussed by means of a lens on to the end face of the prism, and the position of the limiting ray which passes through from the water to the beer determined by means of the telescope. The trough is then rotated through two right angles, and the position of the limiting ray, which now leaves the trough on the other side of the partition, again determined. The dark colour of stout in no way interferes with the refractometric reading. The refractive index of the beer may be obtained by a simple calculation from the value of the angle between the two limiting rays, which must be corrected in case the beer was not at a temperature of 63·5°. To facilitate working and to avoid such calculations, however, a series of tables has been prepared by means of which the percentages of alcohol and extract can be at once read off when the gravity and the refractive angle of the beer are known. The following table contains, for a number of different kinds of beer, the gravities determined both by the Tornöe method and by the ordinary distillation method.

Table of Gravities.

Kind of Beer.	Attenuation.	Alcohol.		Extract.		Original.	
		Tornoe.	Distillation.	Tornöe.	Distillation.	Tornöe.	Distillation.
inner ale	1002·5	993·3	993·2	1009·2	1009·3	1036·6	1037·1
light ale	1004·7	992·1	992·1	1012·6	1012·7	1045·8	1045·9
X beer	1011·1	991·5	991·4	1019·6	1019·6	1056·1	1056·6
re X beer	1012·0	992·9	992·8	1019·1	1019·0	1048·3	1048·6
porter	1013·2	993·0	993·0	1020·2	1020·0	1049·0	1048·8
t England single stout	1019·6	992·8	992·8	1026·8	1026·9	1056·5	1056·9
" "	1020·8	991·9	991·9	1028·9	1028·8	1063·2	1063·1
double stout	1022·8	989·4	989·5	1033·4	1033·4	1080·4	1079·9
.ancashire ale	1021·9	989·0	988·9	1032·9	1033·2	1081·9	1082·8
m yeast press	1010·5	990·6	990·6	1019·9	1019·9	1061·1	1061·1

al of the beers examined were brewed with large ions of substitutes, and it will be seen that the obtained by the refractometric method are in all tisfactory. The great advantage of Tornöe's process saving of time effected by it, as the alcohol and in a beer can be determined in about 10 minutes.

—T. H. P.

in in Foods; Determination of —— M. H. ırnel. J. Pharm. Chim. 1901, **13**, [11], 512—515.

al method followed for the detection of saccharin, t of extraction with ether, fusion with soda to to salicylate, and colour reaction with ferric , is not applicable to the quantitative determination ıly, as when the percentage of saccharin is small, ır is too feeble for comparison. Girard's method in treating the evaporation residue of the ethereal with resorcinol and sulphuric acid, and comparing ır of the solution of fluoresceïn obtained with that ndard solution. This method, however, does not ıble results, as the personal error is too great. The author bases his method on the fact that by simple contact in the cold, saccharin combines with ammonia to form a salt, the ammoniacal nitrogen of which is liberated by treatment with alkaline hypobromite of soda solution, and can be measured.

The method of working is as follows:—250 c.c. of the liquor to be examined are strongly acidified with sulphuric acid, and extracted three times in succession with 50 c.c. of a mixture of equal parts of ether and ligroin (petroleum spirit) (a mixture which has the advantage of not dissolving certain organic acids, *e.g.*, tartaric, succinic). The ethereal solutions are united and washed with water. The water removes all foreign acids without dissolving the saccharin. The ethereal solution is then evaporated, and the residue treated with ammonia, the excess of which is driven off on a water bath. The residue is dissolved in a few c.c. of distilled water, and the nitrogen estimated in a urinometer just as urea is estimated. The volume of nitrogen, read in tenths of a c.c., divided by the factor 8·9, indicates in centigrammes the weight of saccharin contained in the sample.—C. T. T.

Organic Matter in Drinking Waters; Important Source of Error in the Kubel-Tiemann (Permanganate) Method for the Determination of ——. Duyk. Ann. Chim. anal. appl. **6**, 121—124. Chem. Centr. 1901, **1**, [20], 1113.

The author has observed that sodium chloride in acid solution interferes considerably with the oxidation of the organic matter dissolved in water. Before proceeding to the determination of the organic matter, he therefore separates chlorides by means of silver oxide.—A. S.

Strophanthin: Determination of ——. Dohme. Pharm. Rundsch. 1901, 39.

A large quantity of the strophanthus seeds is exhausted with alcohol, the alcoholic extract evaporated to dryness, the residue freed from fatty matter by treatment with chloroform, and then extracted with water. The aqueous solution, containing the strophanthin, is acidified with sulphuric acid, and heated on the waterbath for an hour. The strophanthidin formed is extracted from the solution by means of chloroform, the chloroformic extract evaporated to dryness, and the residue dried at 65 C., and weighed. The weight of strophanthidin, multiplied by 2·74, gives the weight of the strophanthin.—A. S.

Jalap: Determination of ——. Schweissinger. Pharm. Centr. 1901, **42**, 1.

10 grms. of the finely powdered drug are treated with 100 c.c. of alcohol, and the mixture frequently agitated during 24 hours. After allowing to settle, a measured volume of the clear liquid is withdrawn, evaporated to dryness, and the residual resin washed with water, dried at 100 C. and weighed.—A. S.

Sandal-Wood, Lavender, and Thyme Oils; Physical and Chemical Examination of ——. L. F. Kebler. Amer. J. Pharm. 1901, **73**, 223; through Chem. Zeit. Rep. 1901, **25**, [44], 168.

For the determination of santalol in sandal-wood oil the author weighs out 20 grms of oil in a flask provided with a reflux condenser and adds an equal volume of acetic anhydride and 2 grms. of fused sodium acetate. The mixture is boiled gently for about two hours and the product is washed, first with water, then with alkali, and finally with water. The oil is then dried with anhydrous sodium sulphate. From 2 to 5 grms. of the dried product are boiled for half an hour with excess of normal alcoholic potash and the saponified solution titrated back with normal acid. The santalol is then calculated by the formula $P = \frac{a.22.2}{S - (a.0.042)}$, where P = santalol, a = c.c. of normal alkali used, and S = weight of acetylated product taken for saponification.

The determination of linalyl ester in oil of lavender is found by saponification in the same way, the formula being $x = \frac{19 \cdot 6 \frac{y}{2}}{z}$, where x = percentage of linalyl acetate, y = c.c. of seminormal alkali required, and z = weight of oil in grms. Only a small proportion of the oil of thyme on the market is unadulterated; most samples contain oil of turpentine. Genuine oil of thyme is soluble in 1—2 volumes of 80 per cent. alcohol, the specific gravity lies between 0·900 and 0·935 at 15 C., and the proportion of phenols is from 20 to 30 per cent. The phenols are estimated in a nitrometer of 100 c.c. capacity; this is partially filled with a 5 per cent. solution of caustic soda, 10 c.c. of oil are added, shaken vigorously for five minutes and allowed to remain for 24 hours. The decrease in the volume of the oil is then read off and calculated to percentage as phenolic constituents.—J. F. B.

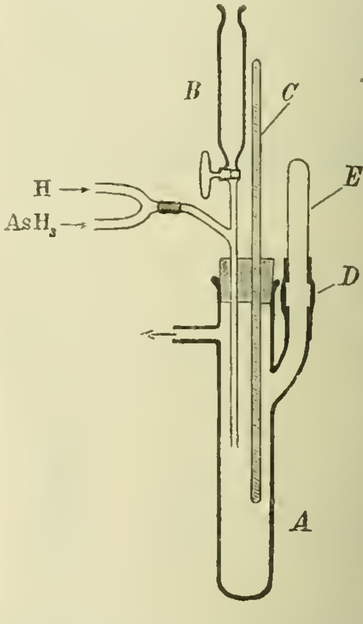
Camphor in Spirit of Camphor; Determination of ——. O. Schmatolla. Apoth.-Zeit. **16**, 290. Chem. Centr. 1901, **1**, [20], 1117.

The author proposes the following simple method, 10 grms. of the spirit of camphor are agitated with 30—35 cc. of a saturated solution of sodium chloride in a 50 c.c. burette graduated in 0·1 c.c. divisions. When the camphor collected on the surface, exactly 1 c.c. of official *Bezn petrolel* is run in, and the camphor is dissolved by gen rotating the upright well-stoppered burette. After so minutes the volume of the benzine camphor solution is r off, the volume of benzine added is deducted, and weight of camphor calculated by assuming every 1·02 to be equivalent to 1 grm. The results are stated to very accurate in comparison with those obtained by ot methods.—A. S.

XXIV.—SCIENTIFIC & TECHNICAL NOT

Arseniuretted Hydrogen on Boron Bromide; Ac of ——. A. Stock. Ber. 1901, **34**, [6], 949—956.

As in the case of ammonia, phosphoretted hydrogen fo double compounds with the halogen derivatives of the m loids, such as $2BF_3PH_3$; BCl_3PH_3, &c. The author that arseniuretted hydrogen also forms similar compou and he describes the first of these, *viz.*, BBr_3AsH_3. substance is prepared in the following way:—



In the tube A, 10 to 15 cms. of arseniuretted hydr are liquefied. The tube through which this gas ente then closed and a stream of perfectly dry hydrogen pa in. In the dropping tube B a few c.c. of boron bro are placed, this is run by drop into liquid arseni ted hydr The temper of the arseni ted hydroge kept at 8 100° C. by alcohol cooled with air. It is e tial to ha continuous of hydrogen ing through apparatus d the introd of the boron mide, othe the end o dropping becomes ins closed by th ducts of the action of bromide wi seniuretted h gen vapour. all the bromide is added, the top of the tube B is closed an excess of arseniuretted hydrogen removed by bringi contents of the tube A to the room temperature. other side of the tube A the small tube E is fix means of a piece of rubber tubing, and the new com is transferred to E by tipping the whole apparat removing it from the sides by the glass rod C. W sufficient quantity is in the tube E the rubber is clo means of a screw clip and then disconnected fro apparatus.

According to analysis the white amorphous body h composition BBr_3AsH_3. It can be obtained in a cry condition by subliming it in a closed tube, one port which is kept strongly cooled. When the substance into contact with air a violent reaction takes place panied by rise of temperature. If the air has un access, ignition takes place, the products of comb being boric and arsenious acids and hydrogen b If, however, the oxidation is regulated, the following takes place, wholly or in part:—

$$2BBr_3AsH_3 + 3O = B_2O_3 + 6HBr + 2As.$$

When kept in the dark in a sealed tube, the substance composes quantitatively according to the equation—

$$BBr_3AsH_3 = BBr_3 + As + H_3$$

is change can be hastened by warming. In the presence water this substance decomposes into boric acid, drogen bromide, arseniuretted hydrogen and a small intity of arsenic.—J. L. B.

malgams ; Alkylammonium ——. Crotogino. Zeits. für Elektrochem. 1901, **7**, [47], 648—649.

using a jet of mercury as cathode in a solution of the lic acid salts of the alkyl ammoniums, some amalgams e obtained. These were run off from the bottom of the into another vessel containing hydrochloric acid. amalgam from methylammonium gave methylamine no ammonia. The amalgam from dimethylammonium, the other hand, did not give dimethylamine, but monohylamine. Tri- and tetramethylammonium did not appear ield any amalgam.

n electrolysing hydrazine sulphate an amalgam was ied which in contact with water regenerated hydrazine pounds. From this it would appear that diammonium present in the mercury.—J. S.

rcury Iodo-antimonide. A. Granger. Comptes Rend. **132**, [18], 1115—1116.

n mercury and antimony tri-iodide are heated in sealed s to 300° C. for 20 hours (taking care that the proons are such that no unattacked mercury remains), the resulting mercuric iodide is dissolved out by sodium nite, there remains a mass of grey shining crystals, estive of stibnite in their appearance. The substance sily crushed ; heat decomposes it, mercury and mercuric e being volatilised, and antimony remaining ; chlorine omine attacks it in the cold ; hydrochloric acid has no n, but nitric or sulphuric acid decomposes it ; hot ferric ide solution dissolves it, liberating the whole of its e ; treated with zinc and sulphuric acid, it gives off e, and leaves zinc iodide and zinc amalgam. Analysis the formula $Hg_5Sb_4I_4$, which the author writes as $b_4,2HgI_2$, as his former corresponding experiments phosphorus yielded the compound Hg_3P_4.—J. T. D.

ssium Ferricyanide Solution ; Influence of Light upon ——. J. Matuschek. Chem. Zeit. 1901, **25**, 411.

sets of potassium ferricyanide solutions were pre-, (A) containing per 100 c.c. of liquid from 5·0 to grm. of the salt, the concentrations diminishing by grm. ; (B) containing from 0·45 to 0·05 grm., the ntrations decreasing by 0·05 grm. per 100 c.c. These exposed to direct and diffused sunlight for 336 hours, ien the ferric hydroxide deposited was collected and ited with permanganate. The figures obtained showed s the solutions were arithmetically weaker – the first half grammes, the second by half decigrammes—so mount of ferric hydroxide precipitated increased in ietical proportion. Identical solutions covered with r of oil and kept in the dark suffered no change, but posure to light also showed signs of decomposition ; erefore, has nothing to do with the process. Hydro-acid could be detected by the nose or with the aid er nitrate in all the altered liquids.—F. H. L.

e Yeast ; Mucor Cambodia, a New Species of Mould gus. T. Chrzascz. Centralbl. Bakt. [Abth. II.], , **7**, 326 ; through Chem. Zeit. Rep. 1901, **25**, , 170.

of rice ["ragi"] from Cambodia differ considerrom those of Java or Saigon, and the author has l a new species of mould fungus—*Mucor Cambodia.* s intermediately between the species of Rhizopus other Mucorinæ.

fungus grows best on rice-meal, nutrient gelatin, eet wort ; worst in milk-sugar and saccharose, at atures between 25° and 40° C. It sets up alcoholic tation in saccharine media, at the same time also producing acid. Gelatin is liquefied slowly ; it attacks starch, saccharifying it a little less powerfully than *M. Rouxii.*

In the latter species the false growths assumed by the sporangia, which Wehmer observed, have now been shown to be ordinary gemmae-formation.—J. F. B.

Ethylene ; Laboratory Method for the Preparation of ——. G. S. Newth. Proc. Chem. Soc. **17**, [239], 147.

By substituting tribasic phosphoric acid for sulphuric acid in the ordinary process for obtaining ethylene, this gas may be prepared in a high state of purity. Syrupy phosphoric acid is boiled in a flask until the temperature reaches 200°, when ethyl alcohol is delivered drop by drop to the bottom of the boiling liquid. At about 220°, an abundant evolution of the gas takes place. As the liquid does not char or froth up, the operation may be conducted in a small reaction vessel ; and as the gas is entirely free from carbon dioxide, and of course from sulphur dioxide, it is not necessary to wash it.

The liquid products of the reaction, consisting of water, ether, unchanged alcohol, and a small quantity of an oily liquid, are collected in a vessel cooled by ice, the ethylene passing on practically pure.

By acting in a similar manner upon methyl alcohol, the gas evolved is pure methyl ether. From propyl alcohol, propylene is produced ; in the case of the normal alcohol, a temperature about 250° is required to bring about the decomposition, whilst the secondary alcohol splits up rapidly at 210°.

Nitrilosulphates. E. Divers and T. Haga. Proc. Chem. Soc. 1901, **17**, [240], 164.

AMMONIUM nitrilosulphate cannot be obtained by the sulphonation of ammonia, for the imidosulphate which is the product of the union of sulphur trioxide with ammonia is decomposed by heat only at a very high temperature, and then is radically broken up without giving any nitrilosulphate. The sulphonation of a nitrite first into hydroximidosulphate and then into the nitrile is therefore the only way open. The ammonium and potassium salts were obtained by Fremy (1845), and a potassium sodium salt, $SO_3Na.N(SO_3K)_2$, by Raschig (1887). The ammonium salt, as it has the composition of $4NH_3 + 3SO_3$, is a very interesting salt, the existence of which had been forgotten. Sodium nitrilosulphate is so very soluble that it has not been isolated before. It can be obtained by passing sulphur dioxide into the most concentrated solution possible, containing sodium nitrite and sodium carbonate in the ratio of two molecules of the former to three of the latter salt, until the new salt begins to crystallise out. It occurs in small, sparkling, short, thick prisms containing $5H_2O$, and is exceedingly unstable. It is neutral to litmus. By dissolving the salt in concentrated, faintly alkaline solution of barium chloride, a precipitate is obtained, flocculent at first, but becoming crystalline and dense, of barium or barium sodium nitrilosulphate.

Sugars from Cellulose. H. J. H. Fenton. Proc. Chem. Soc. 1901, **17**, [240], 166.

IN several previous communications (Fenton and Gostling, Trans. Chem. Soc. 1898, **73**, 554 ; 1899, **75**, 423 ; 1901, **79**, 361, 807 ; this Journal, 1899, 404) it has been shown that various forms of "cellulose" (such as filter paper and cotton) give considerable yields of the chloro- or bromo-derivatives of methylfurfural when they are heated with dry hydrogen chloride or bromide dissolved in an appropriate solvent. It was further shown that the formation of the bromo-derivative in any notable quantity is indicative of the presence of a *ketohexose* nucleus or grouping, and the existence of one or more such groupings in "cellulose" was consequently inferred. Recent experiments indicate that the same observations apply also to the *chloro*-derivative.

After treatment of cellulose in this manner with dry hydrogen chloride and complete removal of the methylfurfural derivative by washing repeatedly with ether, a dark brown residue is left, which, in the case of filter-paper, still shows a fibrous structure and amounts to about 90 per cent.

of the material taken. If this residue is digested with warm water, a solution is obtained which gives all the reactions of *dextrose*. It is strongly dextro-rotatory, and with phenylhydrazine acetate, on heating, yields *glucosazone* (m. pt. 204°—206°. N = 15·83, theory requiring 15·64 per cent.). On evaporating the solution to small bulk in a vacuum and adding alcohol, a syrup is at once precipitated, which solidifies on standing, and the solution continues to deposit crystalline crusts after a time. Mannose appears to be excluded from the fact that phenylhydrazine gives no precipitate in the cold even after standing for several hours.

Fifty grams of Swedish filter-paper were treated in the manner above described, the solvent used being carbon tetrachloride, and the resulting chloromethylfurfural estimated by weighing the crystals. The residue was then extracted with water, and the dextrose estimated by means of Fehling's solution. The results gave chloromethylfurfural 3·1 grms., and dextrose 1·57 grms. At first sight therefore it would appear that the methylfurfural derivative is produced in excess. But it is found that when dextrose is treated in the same manner, a considerable portion is destroyed, leaving a black residue. A blank experiment was made with 5 grms. of dextrose under exactly similar conditions, with the result that the carbon tetrachloride extract weighed only 0·01 grm., and the residual sugar 2·2 grms. If it be assumed that the dextrose resulting from the action on cellulose is destroyed to a similar extent, the calculated amount of this sugar produced in the first experiment mentioned would be 3·54 grms. This, it will be seen, is approximately the quantity required (3·86 grms.) on the assumption that the chloromethylfurfural and dextrose are produced in *equal molecular proportions* (144·5 : 180).

These facts appear to be of especial interest in relation to the recent work of Skraup and König (Ber. 1901, **34**, 1115), in which it is stated that the cellulose acetate obtained by the action of acetic anhydride and concentrated sulphuric acid on filter paper is an *octo-acetyl biose*, and that this on hydrolysis yields "cellose," $C_{12}H_{22}O_{11}$.

Paraffins in Tobacco Leaf. T. E. Thorpe and J. Holmes. Proc. Chem. Soc. 1901, **17**, [240], 170.

In connection with the working of the Revenue Act, which imposes a limit upon the amount of oil which may be present in manufactured tobacco, the authors have had occasion to study the nature of the material which is extracted from tobacco by "petroleum-ether." In the extract thus obtained, they have discovered the presence of two paraffins, *hentriacontane*, $C_{31}H_{64}$, melting at 67·8°—68·5°, and *heptacosane*, $C_{27}H_{56}$, melting at 59·3°—59·8°, which are present in the leaf in about equal amounts to the extent, in the aggregate, of rather more than one part per 1,000.

In Kentucky and Virginia leaf, the mixed hydrocarbons, in three separate preparations, had the following melting points: western leaf, 63·0°—63·8°; "wrappers," 63·5°—64·0°; "fillers," 63·7°—65·0°. The authors are of opinion that the snow-white substance of satiny lustre extracted from Kentucky tobacco by Kissling (Ber. 1883, **16**, 2432), which he found to melt at 63·0° and which he regarded as probably an impure mellissyl mellisate, and the substance of similar appearance found by him among the constituents of tobacco-smoke, melting at 64·5°, but which he regarded as a hydrocarbon, are in reality the same products, and identical with the mixture of the two paraffins, the heptacosane, $C_{27}H_{56}$, and hentriacontane, $C_{31}H_{64}$, of Krafft, which the authors have found to be present in all the American tobaccos examined by them.

Metal-Ammonia Compounds in Aqueous Solution. Part IV. The Influence of Temperature on the Dissociation of Cupri-Ammonia Sulphate. H. M. Dawson and J. McCrae. Proc. Chem. Soc. 1901, **17**, [240], 178.

The distribution of ammonia between water and chloroform and between aqueous copper sulphate and chloroform has been determined at 10° and 30°. The results indicate that the copper sulphate fixes more ammonia at the lower than at the higher temperature; but no exact quantitative statement can be made as to the influence of temperature on the dissociation of the compound $Cu4NH_4.SO_4$, since w the limits of temperature at which the experiments made this influence is very small.

The same relationship between ammonia concentn and distribution coefficient has been found at 10° and 3 as that previously observed at 20° (Trans. Chem. Soc. 1 79, 496).

New Books.

Les Nouveautés Chimiques pour 1901. Nouv Appareils de Laboratoires, Méthodes Nouvelles Recherches Appliquées à la Science et à l'Industrie. C. Poulenc. J. B. Baillière et fils, 19, Rue H feuille, Paris. 1901. Price 4 frs.

8vo volume, containing 337 pages of subject-matte 213 illustrations. This includes an alphabetical index also the table of contents. In this volume all the a priate matters of interest exhibited in the Exhibition of are described. Chapter I. New Physico-Chemical A ratus: Thermometers and Pyrometers, and Apparatu determining Specific Gravities, Molecular Weights, Viscosities. II. Apparatus for Heating and Lig Producing a Vacuum, Generating Acetylene; Agit Gas-Producers. III. Apparatus for Electrolysis. Electric Furnace. IV. Analytical Apparatus gene V. Apparatus and Appliances used in Bacteriology.

Capillaranalyse. Beruhend auf Capillaritats- Adsorptionserscheinungen, mit dem Schlusskapit Das Emporsteigen der Farbstoffe in den Pflanzen. Friedrich Goppelsroeder. Emil Birkhäuser's druckerei, Basel. 1901.

This volume is dedicated to the memory of C. F. Sc bein, and is a treatise on the various parts play capillarity both in nature and art. More especially in ing with regard to chemical problems are these inve tions of Goppelsroeder's on Capillarity as appli Solutions of the Artificial Organic Dyestuffs, an Capilliary Analysis of Alkaloids; Fats and Oils; leums; Peat Products, and Acids, Alkalis, and Salt even of Milks and Foodstuffs. The work contain pages of subject-matter, and at its close are 58 table an engraving.

Select Methods in Food Analysis. By Henry mann, M.D., &c., Prof. of Chemistry and Toxicol the Woman's Medical College of Pennsylvania, & William Beam, M.D., &c. P. Blakiston's Son a 1012, Walnut Street, Philadelphia, U.S. America. Price 12*s*.

8vo volume, containing 369 pages of subject- illustrated with 53 wood engravings, an Appendix Addenda, a few tables, and a list of references, fo page plates with illustrations of principal starch leaves of trees and shrubs, and finally the alpha index. The book, the authors state in their prefa intended to be a concise summary of analytical a adapted to the needs of both practising analys advanced students in applied chemistry." Acknowle is made of indebtedness to the pages of *The Analy* also to the works of A. H. Allen, H. Droop Richmo C. A. Mitchell. The subject is subdivided as foll I. Analytic Methods: (i) Physical Data. (ii) Ch Data. II. Applied Analysis: (i) General Metho (ii) Special Methods.

Trade Report.

TARIFF CHANGES AND CUSTOMS REGULATIONS.

(From the Board of Trade Journal.)

British India.

Tariff Valuation of Alum Cake.—A Notificatio toms Circular 10 of 1901), issued by the Govern India on 27th May 1901, states that alum cake different from, and of lower value than, ordinary h is assessed to import duty at Rs. 4 : 8 : 0 per cwt., een classified and assessed, when imported into Calcutta ity *ad valorem*, under the sub-head "All other sorts of ical products and preparations," under No. 10 of dule IV. of the Indian Tariff Act 8 of 1894.

SPAIN.

emption from Consumption Duty of Gasoline.—A l Decree, dated the 19th June 1901, provides that ine, purchased by the State for use in the destruction usts, shall be exempt from consumption duty.

riff Classification of Synthetic Indigo.—A Royal e, dated the 1st June, provides that synthetic or arti- indigo shall be dutiable on importation into Spain No. 103 of the Spanish Customs Tariff, at the Con- nal rate of 15 pesetas per 100 kilos. (6*s.* 1¼*d.* per

It further appears that synthetic indigo of European is not to be subject to the surtax of 20 pesetas per los. imposed on natural indigo of European origin or ipped in a European port.

UNITED STATES.

y on Tar Oil or Carbolineum.—So-called "tar oil" arbolineum," a preparation composed of dead or te oil and chloride of zinc or chlorine gas, known rbolineum," "carbolineum avenarius," and otherwise, rding to a recent decision of the United States circuit or the Southern District of New York, in the suit of Downing et al v. The United States, dutiable at 20 per cent. *ad valorem*, under the provisions of paragraph 15, Act of 24th July 1897.

Camphor Oil or Camphor Refuse.—So-called camphor oil or camphor refuse is dutiable at the rate of 10 per cent. *ad valorem*, as a non-enumerated manufactured article under section 6 of the Tariff, and is not dutiable as a distilled oil nor as an essential oil.

Wolfram or Tungsten Ore.—Wolfram or tungsten ore is a metallic mineral substance in a crude state, and is dutiable at the rate of 20 per cent. *ad valorem*, under paragraph 183 of the Tariff. It is not entitled to free entry under paragraph 614 as a crude mineral.

THE NETHERLANDS.

Exemption from Duty of Vinegar and Ligneous Acid for Preparation of Amylic Acid.—With reference to the notice which appeared at p. 628 of the Journal for June 1901, relative to the exemption from excise and import duty, subject to certain restrictions, of vinegar and ligneous acid for use in the manufacture of amylic acid, by a Royal Decree of the 14th ult., two hectolitres have been fixed as the minimum on which exemption from excise duty will be allowed.

Exemption from Duty of Acetic Anhydride for Chemical Preparations.—A Dutch Royal Decree, dated the 14th ult., provides for the exemption from excise and import duty, subject to certain restrictions, of acetic anhydride required for use in the composition of pharmaceutical preparations.

I.—GENERAL.

PRODUCTION OF ORES AND MINERALS IN THE UNITED STATES. (FIRST PRODUCTS.)

Eng. and Mining J., June 29, 1901.

Products.	Customary Measures.	1899.				1900.			
		Quantity.		Value at Place of Production (*a*).		Quantity.		Value at Place of Production (*a*).	
		Customary Measures.	Metric Tons.	Totals.	Per M. Ton.	Customary Measures.	Metric Tons.	Totals.	Per M. Ton.
				Dols.	Dols.			Dols.	Dols.
bestos	Sh. T.	912	827	13,860	16·76	1,100	998	16,500	16·53
phaltum	„	15,060	13,662	308,130	22·55	11,140	10,106	218,520	21·62
phaltic limestone	„	10,378	9,415	54,422	5·78	3,910	3,547	16,830	4·74
uminous sandstone	„	42,104	38,196	123,229	3·23	34,277	31,096	138,892	4·47
rytes	„	32,636	29,607	137,071	4·63	41,466	37,618	161,717	4·30
uxite	L. T.	36,813	37,402	101,235	2·71	23,445	23,820	85,922	3·61
muth ore	Sh. T.	75	68	9,000	132·35	221	200	26,500	132·50
mine	Lb.	433,003	196	125,571	640·67	521,444	236	140,790	596·57
cium borate (*c*)	Sh. T.	24,068	21,834	*n*505,428	23·15	25,350	22,997	532,350	23·15
ment, nat. hydraul.	*g* Bls.	9,686,447	1,318,123	5,058,500	3·84	9,177,222	1,248,828	4,308,769	3·45
ment, Portland	*h* „	5,805,620	1,053,365	10,441,431	9·91	7,991,639	1,449,994	10,461,910	7·21
rome ore	L. T.	100	102	1,000	9·84	Nil.	Nil.	Nil.	Nil.
y products	..	..	..	74,064,628	..	..	..	78,704,678	..
l, anthracite	Sh. T.	60,622,398	54,996,279	103,753,780	1·89	57,464,235	52,131,212	102,972,596	1·97
l, bituminous	„	191,456,350	173,688,061	172,301,679	0·99	210,821,727	191,256,216	219,460,521	1·15
l, cannel	„	36,639	33,239	91,597	2·76	29,471	26,736	88,413	3·31
alt oxide	Lb.	10,200	*k*4,627	15,810	*k*3·42	12,270	*k*5,566	22,085	*k*3·97
per sulphate (*f*)	„	67,903,370	30,801	*m*3,530,975	114·64	78,218,478	35,480	*m*3,903,102	110·01
undum	Sh. T.	970	880	78,570	89·28	830	753	58,100	77·16
ery	„	3,000	2,722	150,000	55·11	4,200	3,810	189,000	49·06
dspar	L. T.	26,968	27,399	137,866	5·03	29,447	29,918	136,773	4·57
orspar	Sh. T.	24,030	21,800	152,655	7·00	21,656	19,646	114,430	5·82
ler's earth	„	13,620	12,356	81,900	6·63	11,813	10,717	70,565	6·58
net	„	2,565	2,327	72,672	31·23	3,285	2,980	92,801	31·14
hamite	„	3,150	2,858	*n*97,650	34·17	3,279	2,975	98,370	33·07
phite, crystalline	Lb.	3,632,608	*k*1,647,740	145,304	*k*0·09	4,103,052	*k*1,861,132	164,122	*k*0·09
phite, amorphous	Sh. T.	1,030	934	8,240	8·82	1,045	948	8,640	9·11
sum	„	422,061	382,891	1,155,581	3·02	484,202	439,265	1,316,255	3·00
ore	L. T.	25,291,804	25,696,473	58,171,149	2·26	25,917,393	26,332,071	77,752,179	2·95
idolite	Sh. T.	124	112	4,600	41·07	100	91	3,700	40·66
nesite (*c*)	„	2,000	1,814	7,600	4·19	2,708	2,456	11,832	4·82
ganese ore (*i*)	L. T.	143,256	145,548	306,476	2·10	218,222	221,714	461,994	2·08
, scrap	Sh. T.	6,917	6,275	*o* 50,956	8·12	5,417	4,914	*o* 42,889	8·73
, sheet	Lb.	97,586	*k* 44,265	76,926	*k*1·74	127,241	*k* 57,716	82,508	*k* 1·43
ybdenum ore	Sh. T.	18	16	900	56·25	24	22	1,200	54·55
azite	Lb.	330,000	150	18,480	123·20	908,000	412	50,680	123·01
ural gas	..	..	..	*e*18,000,000	..	..	..	*e*18,500,000	..
e (*p*)	Sh. T.	42,286	*n* 38,362	*n* 465,146	12·13	41,917	*n* 38,027	461,087	12·13
oleum, crude	*y* Bls.	57,234,304	8,007,368	64,143,890	8·01	62,538,544	8,749,458	74,246,582	8·48
phate rock	L. T.	1,663,476	1,690,092	6,350,144	3·76	1,527,711	1,552,154	5,375,956	3·46
ious stones	..	..	..	175,000	..	..	..	200,000	..
tes	L. T.	178,498	181,263	583,323	3·22	201,317	204,538	684,478	3·35
(*q*)	Bls.	19,861,948	2,522,610	5,437,941	2·16	20,738,729	2,633,967	6,439,006	2·44

For Notes, see page 761.

PRODUCTION OF ORES AND MINERALS IN THE UNITED STATES. (FIRST PRODUCTS)—*continued.*

No.	Products.	Customary Measures.	1899.				1900.		
			Quantity.		Value at Place of Production (*a*).		Quantity.		Value at Place Production(
			Customary Measures.	Metric Tons.	Totals.	Per M. Ton.	Customary Measures.	Metric Tons.	Totals.
					Dols.	Dols.			Dols.
44	Silica, brick	M.	45,000	..	850,000	..	49,531	..	916,819
45	Diatom. earth	Sh. T.	1,136	1,031	8,216	7·27	1,375	1,247	9,675
46	Flint	,,	24,305	22,049	56,481	2·56	35,915	32,582	84,400
47	Sand, &c.	L. T.	*e* 850,000	863,600	*e* 1,338,580	1·55	*e* 875,000	889,000	*e*1,312,500
48	Pumice	Sh. T.	340	308	*n* 1,700	5·52	250	227	*n* 1,250
49	Grindstones	,,	43,959	39,879	501,985	12·59	42,039	38,138	482,462
50	Whetstones	..	..	..	115,220	..	..	..	84,874
51	Tripoli	Sh. T.	2,102	1,907	4,729	2·48	1,846	1,675	3,987
52	Slate, roofing	Squares	1,098,374	332,146	3,055,988	*j* 2·78	990,036	299,385	2,885,153
53	Manufactures	..	..	..	540,434	..	..	..	502,051
54	Pigment	Sh. T.	4,911	4,455	50,338	11·30	6,617	6,003	72,787
55	Soapstone	,,	20,011	18,153	189,504	10·44	18,956	17,197	189,560
56	Soda, natural (*r*)	,,	10,500	9,526	147,000	15·43	14,100	12,791	195,300
57	Stone for building	..	..	..	*e*39,600,000	..	..	..	*e*41,400,000
58	Stone, limestone (flux)	L.T.	6,707,435	6,814,754	3,475,525	0·51	6,790,200	6,898,843	3,666,708
59	Stone, lithographic	Sh. T.	40	36	*n* 2,000	55·56	40	36	*n* 2,000
60	Strontium sulphate	,,	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.	Nil.
61	Sulphur	L. T.	1,565	1,590	*m* 33,585	21·12	4,630	*m* 4,704	102,091
62	Sulphuric acid (*f, l*)	Sh. T.	59,572	54,043	*m*1,328,456	24·59	85,000	77,111	*m*2,045,950
63	Talc, common	,,	6,671	6,052	51,763	8·55	7,770	7,049	60,217
64	Talc, fibrous	,,	57,120	51,819	272,595	5·26	45,000	40,824	236,250
65	Tungsten ore	L. T.	168	171	33,600	196·49	220	224	35,200
66	Uranium ore	Sh. T.	43	39	21,500	551·28	153	139	*e* 15,900
67	Zinc sulphate	,,	528	479	*n* 21,648	45·19	527	478	22,657
68	Zinc ore, exported	,,	27,101	24,584	725,944	29·53	42,062	38,156	1,133,663
69	Zinc-white (*s*)	,,	39,663	35,982	3,331,692	92·04	47,151	42,775	3,772,080
70	Estimated production unspecified.	..	..	..	5,000,000	..	..	..	5,000,000
	Totals	..	..	..	587,268,798	..	..	..	672,090,416

PRODUCTION OF METALS IN THE UNITED STATES.

Eng. and Mining J., June 29, 1901.

					Dols.	Dols.			Dols.
71	Aluminium	Lb.	6,500,000	*k* 2,948,381	*m* 2,112,500	*k* 0·72	7,150,000	*k* 3,243,219	*m* 2,288,000
72	Antimony	,,	2,500,000	1,137	241,250	212·18	3,200,000	1,452	301,440
73	Copper	,,	581,319,091	263,685	100,916,994	*t* 382·72	600,832,505	272,536	97,755,449
74	Ferromanganese (*u*)	L. T.	219,768	223,284	18,350,628	82·19	255,977	260,073	22,825,409
75	Ferromolybdenum	Lb.	6,000	2·7	3,000	1,102·30	11,000	5	12,100
76	Gold	Oz. (*w*)	3,391,196	*k* 105,471	70,096,021	*k* 664·60	3,781,310	*k* 117,611	78,159,674
77	Iron, pig	L. T.	13,400,735	13,615,350	234,725,754	17·24	13,533,265	13,749,797	250,184,857
78	Iridium	Oz. (*w*)	5·6	..	165	..	8	..	31
79	Lead	Sh. T.	217,085	196,938	19,407,399	98·55	275,907	250,301	24,114,272
80	Molybdenum	Lb.	30,000	*k* 13,608	37,500	*k* 2·76	32,000	*k* 14,515	46,080
81	Nickel	,,	22,500	*k* 10,205·6	*m* 8,156	*k* 0·80	9,715	*k* 4,407	*m* 4,534
82	Platinum	Oz. (*w*)	Nil.	Nil.	Nil.	Nil.	173	*k* 5·4	3,114
83	Quicksilver (*x*)	Flasks	28,879	993	1,155,160	1,163·30	27,855	967	1,288,851
84	Silver	Oz. (*w*)	57,126,834	*k* 1,776,829	34,036,168	*k* 19·16	59,561,797	*k* 1,852,564	36,576,900
85	Tungsten	Lb.	45,000	*k* 20,412	54,000	*k* 2·87	57,000	25,855	51,800
86	Zinc	Sh. T.	129,675	117,644	14,912,625	126·76	123,231	111,794	10,819,682
	Totals	..	..	..	496,057,320	..	..	..	524,432,553

SECONDARY MINERAL AND CHEMICAL PRODUCTS OF THE UNITED STATES.

Eng. and Mining J., June 29, 1901.

					Dols.	Dols.			Dols.
87	Alum	Sh. T.	27,276	24,745	845,556	34·17	20,531	18,626	615,930
88	Aluminium sulphate	,,	81,805	74,213	2,106,479	28·38	61,678	55,954	1,480,272
89	Ammonium sulphate	,,	7,051	6,397	352,539	55·11	(*b*)	(*b*)	(*b*)
90	Carborundum	Lb.	1,741,245	790	156,712	198·37	2,401,000	1,089	216,400
91	Cement, slag	Bls.*h*	244,757	44,408	360,800	8·10	190,150	48,932	622,400
92	Coke	T.	18,079,229	16,401,369	42,118,468	2·57	19,206,994	17,424,471	50,272,050
93	Copperas	,,	13,770	12,492	108,508	8·69	12,374	11,226	96,517
94	Crushed steel	,,	337	306	47,250	154·41	345	313	48,300
95	Graphite, artificial	Lb.	405,870	*k* 184,101	32,475	*k* 0·18	860,750	*k* 390,431	68,860
96	Lead, white	Sh. T.	103,466	93,864	10,812,197	115·20	97,408	87,468	9,910,742
97	Lead, red	,,	10,199	9,252	1,070,895	115·67	10,098	9,161	1,050,182
98	Lead, orange mineral	,,	928	842	139,200	165·32	825	748	100,650
99	Litharge	,,	10,020	9,090	103,206	113·53	10,642	9,491	1,067,124
100	Mineral wool	,,	7,448	6,757	85,899	12·72	6,002	5,445	60,320
101	Soda, manufactured	M. T.	..	387,622	5,925,276	15·31	..	390,000	7,000,500
102	Venetian red	Sh. T.	6,575	5,965	121,519	20·37	6,352	5,762	101,658
	Totals	..	..	..	64,416,979	..	..	..	72,720,095

For Notes, see page 761.

METALS PRODUCED FROM FOREIGN ORES AND BULLION. (*aa*)

Eng. and Mining J., June 29, 1901.

Metals.	Customary Measures.	1899. Quantities. Customary Measures.	1899. Quantities. Kilos.	1899. Values.	1900. Quantities. Customary Measures.	1900. Quantities. Kilos.	1900. Values.
				Dols.			Dols.
r	Pounds	40,659,868	18,443,195	7,058,533	62,484,290	28,342,688	10,166,194
	Troy oz.	1,423,439	44,274	29,422,691	1,948,519	60,605	40,275,883
	Short tons	76,423	69,330,491	6,832,216	103,311	93,750,340	9,032,003
el	Pounds	8,018,343	3,650,708	2,917,525	7,713,120	3,498,648	3,599,713
r	Troy oz.	40,542,858	1,261,014	24,240,575	46,619,726	1,559,624	33,291,146
Total values	..	..	..	70,471,540	..	..	96,364,939
res and minerals				587,268,798	..	..	.. 672,086,716
metals				496,057,320	..	..	.. 524,432,533
secondary products				64,116,979	..	..	.. 72,720,695
Grand total, values				1,218,214,637	..	..	.. 1,365,604,883

following notes refer to the tables on pages 759 and 760 :—(*a*) Except where otherwise specified. (*b*) Not enumerated. (*c*) Amount ue of crude mineral. (*d*) Partly estimated. (*e*) Estimated. (*f*) Includes by-product production. (*g*) Barrels of 300 lb. arrels of 400 lb. (*i*) Includes manganiferous iron ores; this is not duplicated in the report of iron ore. (*j*) Value per square, ft. lapped and laid; the weights are calculated on the basis 3 squares = 2,000 lb. (*k*) Kilograms or per kilogram. (*l*) Reduced to ct 66° B. (*m*) Average market price at New York. (*n*) Nominal. (*o*) Value before grinding. (*p*) Includes ochre, umber, sienna, ide of iron. (*q*) Includes salt used for the manufacture of alkali: the barrel of salt weighs 280 lb. (*r*) Reduced to a basis of cent. ash. (*s*) Includes a small amount made from spelter. (*t*) Average value of Lake copper at New York, less 0·25 cent per lb. cludes spiegeleisen, though the total value is reckoned as if the whole product were ferromanganese. (*v*) Average market price sburg. (*w*) Troy oz. (*x*) Flasks of 76·5 lb. (*y*) Barrels of 42 galls. (*z*) Includes a comparatively small amount made directly es. (*aa*) Not included in the preceding tables.

eviations: Sh. T., short tons (2,000 lb.); L. T., long tons (2,240 lb.); M. T., metric tons (2204·6 lb.)

UGGESTIONS AS TO FOREIGN OFFICE REPORTS.

Bd. of Trade J., June 20, 1901.

tter has been received at the Association of Chambers nmerce of the United Kingdom, from the Foreign inviting the Association to make suggestions as to subjects upon which British Consuls might be re- l to report. Attention is drawn in the letter to the ing use by British manufacturers of the information ied in the reports on the trade and industries of countries annually issued by the Foreign Office, and gestion is made that such reports would be still more e if H.M. Consular and Diplomatic Officers were equently called upon to furnish reports upon specific s. It is difficult for that Department to take the e in choosing subjects for separate reports unless ions are received from commercial men or associa- and the Foreign Office therefore requests the ation to point out to the various Chambers of Com- in the United Kingdom how valuable suggestions em might be as to special subjects of interest upon I.M. Consular Officers might be directed to report.

CHEMICAL TRADE OF BADEN IN 1900.

Foreign Office Annual Series, No. 2622.

ical Industry.—Chemical works had, on the whole, ably prosperous year, but manufacturers of heavy ls and artificial manures suffered by the higher cost and the coal-tar colour factories to some extent by ression in other branches and by the disturbances in frica and China.

BRITISH TRADE WITH EGYPT.

Foreign Office Misc. Series, No. 557.

and Manufactured Leather.—British trade in- steadily and considerably up to the year 1898, but again in 1899 to the extent of 12,000*l*.E. This s partly accounted for by a reduction in the import , which fell from 20,756*l*.E. in 1898 to 8,794*l*.E. in The boot and shoe trade remained practically y, the value of this trade being 6,522*l*.E. in 1895 56*l*.E. in 1900. On the other hand, the United a supplied most of the saddlery and the greater portion of the other leather articles, her trade under these heads in 1899 reaching the figure of 21,937*l* E. out of the total import of 36,062*l*.E. German competition in the former article has practically ceased. The total import of boots and shoes steadily declined up to 1899, the export showing a corresponding increase, although in 1900 the value of this import rose by 10,000*l*.E.

Other Animal Produce.—The import of candles from the United Kingdom has rapidly declined until it has almost ceased to exist, 354*l*.E. worth having been imported in 1899, as against 5,919*l*.E. in 1895. Belgium and France have quite driven the British trade in these articles out of the field. On the other hand, the import of grease increased from 9,227*l*.E. in 1895 to 21,732*l*.E. in 1899, the United Kingdom possessing the practical monopoly of this branch of trade. Whereas the total import under Category III. has declined considerably during the sextennial period 1895—1900, as compared with the period 1890–94, the proportion of the United Kingdom, which was a quarter of the total import in 1894, has increased to one-third in 1899, and was considerably over a quarter in 1900.

Spiritous Liquors and Oils.—The total of imports under this head reached its highest figures in 1900, being 815,000*l*.E. in that year. There was a large increase in the importation of petroleum in the years 1897, 1898 and 1900. The United Kingdom supplied an increasing quantity of beer; and the importation of vegetable oils and alcohol is well maintained. The importation of wines from British Possessions in the Mediterranean shows little fluctuation. Russia supplies almost all the petroleum consumed, her share in this respect having increased by 138,000*l*.E. in 1900 alone.

Building Materials, Glass, and Earthenware. — The United Kingdom's share of the trade under this category, which was insignificant in 1895, had become very considerable by 1899, increasing from 22,000*l*.E. in 1898 to 88,000*l*.E. in 1899, thus quadrupling in value. This great increase is due to the large quantity of cement imported from the United Kingdom for the construction of the dam at Assouan and for the works below the old Barrage. The United Kingdom, in fact, supplied half the cement imported into Egypt in 1899, and increased her importation of this article by 22,000*l*.E. in 1900, France and Belgium supplying the remainder.

The importation of china and earthenware from the United Kingdom shows a slight increase, but she sank to the sixth place in this respect in 1900, Austria-Hungary doubling her import of these articles in that year.

Colours and Dyestuffs.—British India still retains about four-fifths of the total trade, supplying all the indigo. The quantity imported had sunk from 650,000 kilos. in 1895 to 609,000 kilos. in 1899, but it rose again to 688,000 kilos. in 1900, the value having slightly decreased.

The importation of paint and colouring matter from the United Kingdom has nearly trebled in value since 1895; whereas it was 7,000*l*.E. in that year, it had risen to 15,000*l*.E. in 1899 and to 20,000*l*.E. in 1900.

Chemical Products, Medicines, and Perfumery.—In 1899, the United Kingdom and British India supplied over one-fifth of the total value of this category of imports, their share rising to nearly one-fourth in 1900.

The value of the import of chemical produce from the former country increased from 13,000*l*.E. in 1895 to over 19,000*l*.E. in 1900. Incense and scents came principally from British India. Out of a total import of 15,000*l*.E. under this head in 1899 the trade from British India was of the value of 12,000*l*.E. The United Kingdom exports an increasing quantity of perfumery and perfumed soap to Egypt. The import of common soap is fairly stationary, and Turkey supplies almost the whole of this article.

GERMAN WORKSHOPS AND GERMAN WORKMEN.

Chem. Trade J., July 20, 1901.

A correspondent connected with one of the large manufacturing firms of this country has sent to the *Times* the following report from one of his foremen, who was lately sent by the firm to inspect some of the more modern workshops in Germany. The correspondent adds that the writer of the report stated verbally "that the men in the shops he visited appeared to be trying to do their best, not, as is often the case here, only what is necessary to pass muster."

Works.—Well arranged. Each department self-contained; no traffic of workmen from one department to another; great economy in transit of material. Light and ventilation and method of drawing dust from machines are excellent. Every provision made for the personal cleanliness of the workmen.

Workmen.—Clean, orderly, with steady hands and great delicacy of touch; full of interest in their work, working steadily from bell to bell, and never taking advantage of the foreman's absence. Each man at his post, just as ready and anxious to start at the appointed time as our men are to leave off.

Quality and Cost of Machining.—Kept in beautiful working order, with great economy in use of oil and stores generally. One man working two, three, or four machines, according to the nature of the work. I watched the application of their various tools, timed the operations, and gauged the quality of the work, which I found to be excellent, both turning, planing, milling, and boring; and, taking one operation with another, their cost of machining would be about one-half the cost of ours.

Accurate Tools and Method of Producing them.—Their tools for gauging and testing work are of the most improved kind, giving a positive reading to a much finer degree than ours. Their methods of producing cutting tools for giving correct form of thread, &c., are excellent, and enable the workmen to proceed on well-defined lines with very great accuracy.

My visit was in every respect educational in point of order, system, accuracy, and economy, and the problem which I set myself is the application, as far as possible, of the various improved methods which I have seen to the greater and more varied productions of our works.

II.—FUEL, Etc.

MOND GAS.

Chem. Trade J., July 20, 1901.

The Select Committee of the House of Lords, of which Lord Hatherton is chairman, had under consideration on Thursday and Friday in last week the Mond Gas I which has already passed the House of Commons, under which, according to the opening statement of coun power was sought to incorporate a company to supp producer gas, which has been invented and patented Dr. Ludwig Mond, over a large area of Staffordshire.

After detailing the objects of the company, counsel st that although the area of the company comprised districts of 27 local authorities, opposition was now off by only one—the Corporation of Walsall—who desire be left out of the company's proposed area of supply that the company could not compete with them in supply of gas for power and heating. Counsel, howe urged that the supply by a Corporation of gas for t purposes was almost beyond their function, and certa not a matter in which they ought to be allowed a mono when there were manufacturers who desired to use new gas.

Sir F. Bramwell gave evidence in support of the sch and evidence was given by Prof. Dewar, Prof. Threlfall, other witnesses.

The Committee found the preamble of the Bill pro but directed certain slight alterations to be made in the

The Bill was finally considered on Tuesday, the 16th i and, clauses having been adjusted relating to the main r and bridges within the borough of Walsall, the prea was held proved, and the Bill ordered for third reading.

III.—TAR PRODUCTS, PETROLEUM, E

PETROLEUM EXPORTS FROM BATOUM IN 1900.

Foreign Office Annual Series, No. 2623.

An increase took place during the year in the exp petroleum products from Batoum to the United King Germany, Belgium, Turkey, Egypt, and the Phili Islands. On the other hand, there was a decrease in quantities shipped hence to France, Holland, and se other countries, but the decrease in shipments to Au China, India, and Port Said for orders, show a m falling-off.

The deficiency in the shipments to Austria is acco for by the continued development of the mineral oil in Roumania and Austria, both of which countrie becoming self-supplying. Roumania requires only an sional cargo of oil to meet its requirements.

In consequence of the numerous wells that were menced in the year 1899 a larger number was com during 1900 than in 1899, and the production, ther augmented considerably. It is estimated that the 44 wells yielded an additional quantity of over 136,000 b of crude oil per diem.

The depth of the wells is becoming greater every and the quantity of gases and water met with are o increase. The cost of production is also increasi proportion to the enhanced cost of the wells, neces by the increased depth to which they have to be drill

The total production of mineral oil by the Grozni during the year 1900 was nearly 3,700,000 barrels, which quantity about 3,400,000 barrels were sent awa the place, chiefly to other parts of Russia. These fi when compared with those for the year 1899, sho increase of about 750,000 barrels in production and 700,000 barrels in shipments.

Return showing Total Stocks of Crude Oil and Nap Products at Wells and in Baku on December 31, 1

	Barrels.
At Wells—	
Crude	906,952
In Baku—	
Crude	3,732,601
Illuminating oils	2,203,328
Lubricating oils	263,993
Residuum (Astatki)	6,031,015
Total	13,137,889

Return showing Total Gross Production of Crude Oil of the Baku Fields for the Years 1900—1899. *(In Barrels.)*

District.	Pumping Wells.		Flowing Wells.		Total.	
	1900.	1899.	1900.	1899.	1900.	1899.
akhany	12,468,069	11,484,415	..	1,000	12,468,009	11,485,415
bunchi	24,048,816	19,502,228	1,114,500	3,573,500	25,163,416	23,075,728
many	8,476,339	7,491,978	3,007.270	2,366,200	11,483,609	9,858,178
Eibat	8,259,276	5,975,980	2,661,430	2,108,100	10,920,706	8,084,080
agadi	40,651	16,338	..	..	40,651	16,338
Total	53,293,091	44,470,939	6,783,300	8,048,800	60,076,391	52,519,739

Return showing Total Exports of Naphtha Products from Baku during the Years 1900—1899. *(In Barrels.)*

Products.	By Rail.		By the Caspian.		Total.	
	1900.	1899.	1900.	1899.	1900.	1899.
minating oils	6,281,200	6,676,414	6,063,800	4,786,900	12,345,000	11,463,314
ricating oils	963,600	934,000	377,500	336,666	1,341,100	1,270,666
r Products	8,100	9,600	193,000	113,400	201,100	123,000
luum (Astatki)	463,000	425,800	25,908,500	24,059,800	26,371,500	21,485,600
e	1,151,900	1,005,410	2,745,900	13,886,000	3,897,800	14,891,410
Total	8,867,800	9,051,254	35,288,700	43,182,766	44,156,500	52,234,020

ie past year has been one of prosperity in the oil trade, prices of crude oil touched the highest point ever ied in its history. All connected with it have made y, and the result is that numerous new wells have been and, for the current year, a much larger production be expected.

e total number of producing wells on 31st December ,321, whilst there were 1,495 wells in course of boring, ning, or being repaired. The average depth of the producing wells was 930 feet. During the year 468 were commenced and 434 were finished.

1899 the production of crude oil was carried on by rms and in 1900 by 147 firms, showing an increase of ms for the year.

IV.—COLOURING MATTERS, Etc.

Indigo at Hamburg in 1900.

Foreign Office Annual Series, No. 2628.

igo.—Business in indigo during the first half of 1900 lepressed on account of the precautions which purrs had taken in the autumn of 1899 in view of probable cient crops in India, and also on account of the high asked for natural indigo, which enabled the artificial iffs to come forward as competitors. When, however, summer of last year the prospects of the coming harvest l out very satisfactory, a considerable fall took place es; and during the remainder of 1900 quotations for stood at a figure suited to the wants of consumers. ompetition between natural indigo and its chemical tutes appears to continue. But, whilst the Indian rs do not seem, as some persons expected, to be into give up the battle, the success of their rivals of ars has compelled them to pay more attention to ition, and to sell at a lower figure. It is considered, , probable here that the rivalry between the l and artificial products will keep the price of indigo uch firmer and, for the consumer, more favourable as the market quotations are likely to depend on er holders of both are able to sell at the lower

tuff-yielding Trees of Pemba (East Africa).

Foreign Office Annual Series, No. 2653.

bark of several trees which flourish in this island fast dyestuffs of various tints, which might prove to commercial value. Among such dye-yielding trees be mentioned the clove, the "zambarao," the "m'bura," and a species of mangrove, locally known as "m'sinzi," the bark of which attains a thickness of an inch and upwards. This last article would appear to have found a market, since an Indian merchant of Zanzibar has kept a large dhow regularly employed during the past few months in collecting it here in Pemba. The cargoes of bark thus obtained are shipped from Zanzibar to Europe in due course, but to what port has not been ascertained. The Consul transmits with this report a sample of the mangrove bark, which has been sent to the Imperial Institute.

VI.—DYEING, Etc.

"Kaniki" (Blue Cotton) in Pemba (East Africa).

Foreign Office Annual Series, No. 2653.

There is a large trade done in a plain blue cotton material locally known as "kaniki," which is much affected by the women for general wear, especially throughout the "shamba" districts. Formerly the entire supply of "kaniki" came from British India. The Indian article consists of a material known as "wilayti," imported from the United Kingdom, which is cut up into lengths of 8 yds. each and dyed with indigo, the process being carried on chiefly in Bombay. The colour, as a rule, is good, and fairly fast. Of late years, however, certain German firms in Zanzibar have been introducing a somewhat similar article, which is steadily ousting the Indian-made "kaniki" from the market here.

The material of the German-made "kaniki" is lighter in texture than is the Indian article, but being dyed with aniline, the colour soon washes out. The German "kaniki" is considerably dearer than the other, selling at 5½*d.* per yard, as against 3½*d.* per yard for the Indian article. The reason why the native women prefer the more expensive and really inferior "kaniki" of German make is, firstly, on account of the comparative lightness of its fabric, and secondly—and this, undoubtedly, is the chief reason—because, in its new state, the German "kaniki" possesses a certain amount of surface gloss, which is very pleasing to native taste, whereas the Indian "kaniki" is dull of surface. That such surface gloss disappears with the first washing is well known to the women, as is also the fact that the colour quickly fades; nevertheless, they prefer the German to the Indian article. The British manufacturer should be able to turn out "kaniki" material, possessed of the desired gloss, as cheaply, at least, as the German makers, and, it is to be hoped, of a more durable colour The Consul transmits with this report samples of both

Indian and German "kaniki" as sold in Pemba, which have been sent to the Association of Chambers of Commerce.

VII.—ACIDS, ALKALIS, AND SALTS.

BORIC ACID EXPORTS OF LEGHORN (ITALY).

Foreign Office Annual Series, No. 2637.

The boric acid of Tuscany has now formidable competitors in the borates of California, South America, and Persia, but as will be seen from the statistics given below, this branch of the trade is not unsteady and is still considerable. These figures also show that as a rule when the demand for the native acid is active, the borax locally manufactured for export is shipped in less quantities. As, for instance, in 1895 and 1896, the demand for boric acid increasing, the manufacture of borax consequently fell away. Only about 30 per cent. of the Tuscan native acid is now shipped to the United Kingdom, but the locally manufactured borax appears to be appreciated, for four-fifths of it is exported to the United Kingdom. Tuscan boric acid, being in a free state and associated with valuable salts of ammonia and magnesia, can hold its own against boracite, South American borate, or Californian colemanite. When the Tuscan acid can be had cheap, it still secures the preference.

The following table gives the quantity and value of boric acid and borax exported during the last 10 years:—

Year.	Boric Acid.		Borax.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
1891	1,914	51,650	617	16,316
1892	1,439	36,350	716	18,932
1893	1,262	27,195	625	16,496
1894	1,274	31,072	527	13,947
1895	1,985	40,378	433	11,414
1896	2,250	41,107	149	3,335
1897	1,241	22,673	183	4,087
1898	1,706	30,991	335	6,111
1899	2,610	34,652	315	4,867
1900	1,692	25,416	286	4,653
Average, 1891-99	1,748	35,118	433	10,834

BORATE OF LIME SHIPMENTS FROM MOLLENDO (PERU).

Foreign Office Annual Series, No. 2639.

In 1900 there were shipped from Mollendo 11,993,900 lb. of borate of lime, worth about 5*l*. 10*s*. per ton of 2,240 lb. o.b. Mollendo. It has been shipped to Antwerp, Hamburg, Liverpool, and Glasgow, but principally to Hamburg.

CARBONATE OF SODA AT LEGHORN (ITALY).

Foreign Office Annual Series, No. 2637.

The import of carbonate of soda is steadily on the increase. With the expansion of the manufacture of Italian piece-goods, an ever-increasing quantity of this article is required, and in 1900 the largest quantity of any year in the past decade was imported, namely, 69,819 cwts. Of this total, only 25 per cent. came from British sources, and British dealers ought to secure a larger proportion. Competition is keen, and prices have been cut very low, an obstacle to British articles of superior manufacture. The following table shows the quantity and value of the carbonate of soda imported during the last seven years:—

Year.	Quantity.	Value.
	Cwts.	£
1894	56,752	13,830
1895	56,314	13,720
1896	54,152	9,894
1897	64,561	11,402
1898	59,552	11,484
1899	69,598	15,541
1900	69,819	16,059
Average, 1894-99	60,156	12,645

COPPER SULPHATE AT LEGHORN (ITALY).

Foreign Office Annual Series, No. 2637.

The trade in sulphate of copper, though of consic volume, is somewhat spoilt by the keenness of th petition. The average import in the years 1891- 1,138 tons. In 1895 the article was discovered to most efficient protection against phylloxera. The in 1899 was double that of 1894. If the import by declined in 1900, this is due to an increase in the overland from Germany, and to the competition home-manufactured article. In 1897 the United Ki was represented by 89 per cent. of the article in here, and in 1898 by 96 per cent., whereas only cent. came from the United Kingdom in 1899, a proportion further dropped to 67 per cent. in 190 decline is solely due to United States competition. shippers have been handicapped by high freights, would not seem sufficient to account for the fact t United States shippers have been able to offer an similar article at 28*s*. c.i.f. per ton less than their competitors. One point should never be lost sigh shippers, all barrels should be of hard wood an hooped. These barrels have a great attraction Tuscan peasant, who sells them as "empties" at figure. One of the reasons why Italian sulphate found greater favour is that, not having to under voyage, it is supplied in bags which will fetch nothing. There is a satisfaction in realising a go for "empties," and the point is of real importanc trade.

Imports of Sulphate of Copper, 1894–1900.

Year.	Quantity.	Valu
	Tons.	£
1894	1,716	27,86
1895	1,835	29,80
1896	2,931	42,05
1897	3,667	62,53
1898	3,301	61,65
1899	3,506	65,47
1900	3,177	81,86
Average, 1894-99	2,826	48,23

CHEMICALS AT MOTRIL (NEAR CARTHAGENA),

Foreign Office Annual Series, No. 2636.

Caustic Soda.—The cost of the 50 tons of ca landed in Motril, freight and insurance paid, was ab This article is only employed by the soap industr locality, and its annual consumption may be calc rather under 25 tons.

Chemical Products.—In view of the considerab ence which exists between the tariff units of th chemical products these have to be priced separat

Sulphate of Ammonia.—The price of 220$\frac{1}{4}$ lb. of of ammonia (or rather under 2 cwt.) at 32 peset 1*l*. sterling, including cost of unloading (about 24*s*. 3*d*.

Superphosphate of Lime.—The price of 220 superphosphate of lime at above exchange, includi charge for unloading, was 6*s*. 1$\frac{1}{2}$*d*.

Potassium Sulphate.—The price of 220$\frac{1}{2}$ lb. of p sulphate at above exchange, including above ch unloading, was 20*s*. 1$\frac{1}{2}$*d*.

The importation of the above, which are the artificial manure, increased in 1900, whilst the im of artificial manures themselves diminished. The manure manufactory, established in Motril two has increased its output, and receives raw material manufacture the manures here. Foreign manu seeing that they cannot hold the markets competition, urge their clients to buy raw mate give them instructions and formulas for making suited to the nature of the land, and at a lower pri

REME COURT OF JUDICATURE.—COURT OF APPEAL.

fore the Master of the Rolls, Lord Justice Vaughan Williams, and Lord Justice Stirling.)

E MAYOR, &c., OF THE BOROUGH OF ST. HELENS
v. THE UNITED ALKALI COMPANY, LIMITED.

Chem. Trade J., June 22, 1901.

s was an application for judgment or a new trial in an
t tried before Mr. Justice Bucknill and a special jury
verpool Assizes (see this Journal, December 1900,
9).

learned Judge left questions to the jury, which, with
swers, were as follows:—(1) Is potassium chlorate
lf a dangerous substance?—No. (2) Was it before
te of the accident known to the defendants that it
xplosive when unmixed with other substances?—
(3) If not, ought the defendants to have known that
explosive when unmixed with other substances?—
(4) Did the defendants in the manufacture and
e of potassium chlorate take all reasonable care and
tions to prevent accident by fire or explosion?—
(5) If not, did such want of reasonable care and
tions cause or contribute to the explosion?—Yes.
as the fire one which happened by mere chance
t negligence?—No. On these findings the learned
directed that judgment should be entered for the
ds for an amount of damages agreed upon between
rties. The defendants now asked that on the
s judgment might be entered for them. So far as
ability for the fire was concerned, they contended
e damages were too remote. So far as regarded the
on, they contended that they were under no liability
er, for, up to the time of this explosion, all chemists
sidered chlorate of potassium as being non-explosive,
n now the Home Office had not included it in their
xplosives.

Court dismissed the application.

Master of the Rolls said that the action was based
wo causes of action, one being founded on the
e of "Fletcher v. Rylands," and the other upon
nce. The negligence consisted in the defendants
g into a wooden building, in which large quantities
rate of potassium were stored, extraneous matter
ryant and May's, which produced a spark, causing
The result was that a fierce fire and intense heat
used, and the wooden roof of the burning building
and an explosion occurred, which damaged the
's gasworks. Another piece of evidence of
nce was that the settling tanks were made of wood
t of metal, and they became so impregnated with
of potassium that they were likely to cause a fire.
trial the jury found that chlorate of potassium was
itself a dangerous substance. "Of itself" meant
left alone, it would not spontaneously combust.
answer to the second and third questions, the jury
that the defendants before the accident did not
hat it was explosive when unmixed with other
ces, but that they ought to have known it. There
dy of evidence which warranted the jury in finding
gh the defendants did not know it, they ought
known it. Therefore, chlorate of potassium was
of exploding, and the defendants ought to have known
circumstances were, therefore, these:—The defen-
their negligence caused their premises to catch fire.
ad large quantities of chlorate of potassium
n those premises. They ought to have known
chlorate of potassium might explode. It did
the explosion being caused by the severe fire
intense heat. How could it be said that the
to the plaintiffs' gasworks was not the direct result
lefendants' negligent act? It clearly was. That
cient to decide the case, and they gave no judgment
ny other point raised. The defendants were,
, liable, and the application must be dismissed.
ords Justices delivered judgment, arriving at the
nclusion.

THE ALKALI WORKS REGULATION BILL.

Times, June 21, 1901.

At the offices of the Local Government Board, Westminster, on the 20th June, a deputation waited upon Mr. Walter Long, M.P., the President, in reference to the Alkali Works Regulation Bill (this Journal, May 1901, 514). Sir John Brunner, M.P., introduced the deputation, which included Dr. Mond, Mr. John Brock, chairman, and Mr. Eustace Carey, secretary of the United Alkali Makers' Association, Sir David Gamble, and others. Mr. Long was accompanied by Mr. S. B. Provis, C.B., the Permanent Secretary, Mr. A. D. Adrian, C.B., the legal adviser, and Mr. R. F. Carpenter, the Chief Inspector of Alkali Works.

Sir David Gamble, president of the Association of Alkali Manufacturers, contended that the Bill introduced a new principle in legislation. All the previous Acts had done was to control the acidity or the noxious character of the gases escaping into the atmosphere. The present Bill proposes to test the gases after leaving the manufactories, instead of testing them after they had been mixed with smoke and other gases. Instead of taking measures to protect the public, they were going to control the gases passing from one part of the works to another.

Mr. Eustace Carey, secretary of the United Alkali Company, said he had been concerned with the drafting of the existing Acts, and the whole intention of the legislation was to prevent the escape of noxious gases into the atmosphere. The Bill increased the stringency, and would render it impossible to work the Hargreaves process.

Dr. Mond said he had been connected with the English alkali trade since 1862, and he desires specially to emphasise the effect the Bill would have on the development of the sulphuric acid industry. New processes were being introduced, and the enactment of the Bill would probably hamper or prevent the development of the trade in this country.

Mr. Long, in reply, said many of the points laid before him had been of a highly technical character, and he would consider those points in conjunction with his expert advisers. The last thing that his Department desired was in any way to interfere with a trade, the importance of which was fully recognised by them, as well as by people outside. He had been informed that the process which it was proposed by the present Bill to legalise for the future was the process which, as a matter of fact, had been in practice for a very considerable time, but an appeal had been made to the Law Officers of the Crown as to whether that procedure was legal or not. They had advised that it was not legal, and it was to make that legal, which had been done under misapprehension, that the Bill had been introduced into Parliament. Surely it was difficult to understand what effect of a deterrent character in the future the method of intercepting the gases before they passed into the chimney or flue would have upon their trade. He was informed that the difficulty which had to be dealt with was to test the gases before they passed into a chimney or flue where they became confused with other gases, which might make it impossible for an inspector to ascertain whether they were as free from impurity as the law demanded. He knew that the trade were as anxious as the Department were that there should be no infraction of the law of any kind. Their Chief Inspector, Mr. Carpenter, would be glad to see them, and would carefully consider any special points which they might report to him. He could assure them that he did not wish to force any restrictive legislation upon the trade, but he understood that a good many people connected with the industry had accepted and expressed their approval of the new regulations. No legislative enactment would be passed without the most careful consideration. They would give the Department credit for having no desire in promoting the present Bill to in any way harass the trade.

Sir John Brunner thanked the President for receiving the deputation and for his evident appreciation of what they had placed before him.

The deputation then withdrew.

VIII.—GLASS, POTTERY, AND ENAMELS.

GLASS MAKING IN BADEN IN 1900.

Foreign Office Annual Series, No. 2622.

The glass factory at Waldhof had a good year's trade, but complains that the demand in the United Kingdom for polished glass has fallen off considerably, and that the high price of coals and want of workmen limits production.

IX.—CEMENTS, Etc.

PORTLAND CEMENT IN BADEN IN 1900.

Foreign Office Annual Series, No. 2622.

The German Portland cement factories are much affected by the gradual loss of the American market, the United States producers being able to cover almost the entire demand in America. Hitherto Baden factories have been compensated by the large home demand, but in 1900 there were not so many public works in hand, and building in general was sharply checked by the high price of money.

CEMENT INDUSTRY OF THE UNITED STATES.

Diplomatic and Consular Reports, 1901, *June, No.* 556.

The manufacture of Portland and other cements is rapidly increasing in the United States, but owing to the increased demand, the amount imported has not decreased to a corresponding extent, and it is probable that many years will elapse before the home production will be sufficient to supply the demand without any being imported from Europe.

In 1891, only 13·2 per cent. of the cement used in the United States was of American manufacture, whilst in 1899, this percentage had increased to 73·9, but there still appears to be a great prejudice among contractors and engineers against the home product, although American cement manufacturers maintain that it is at least equal in quality to the German, whilst it is from 50 c. to 1 dol. cheaper.

The following table shows the proportions of the total imports supplied respectively by Germany, Belgium, and Great Britain:—

—	Nine Months ending March 1901.	1900.	1899.
	Per Cent.	Per Cent.	Per Cent.
Germany	46	54	49
Belgium	34	30	32
Great Britain	11	9·5	15
Total imports	541,701,557 lb.	..	..

As regards prices, that of German cement averaged a little over 40 c. per cwt. in 1901, and 40 c. in 1900; Belgian, 35 c. in 1901, and 33½ c. in 1900; and British, 43½ c. in 1901, and over 44 c. per cwt. in 1900.

The most important Customs districts into which cement is imported, together with the figures for the year ended June 1900, are:—

	Lb.
New York	216,349,875
San Francisco	192,865,401
Baltimore	140,698,571
New Orleans	73,630,098
Galveston	57,366,347
Puget Sound	55,124,950
Philadelphia	37,790,587
Savannah	32,361,162
Los Angeles	26,313,617
Boston and Charlestown	25,778,407
Willamette	20,907,232
Newport News	17,920,561
San Diego	16,108,000
Pensacola	4,433,372
Hawaii	3,724,600
St. Louis	2,469,182
Chicago	2,408,675

There are considerable differences of opinion as t reason why the imports of cement from Germany Belgium so largely exceed those from Great Br According to the representative of a large importing the falling off in the sale of British Portland cement i United States, which took place some five or six years was partly due to the fact that Belgian cements o quality were considerably cheaper, and that althoug German cements proved so much more satisfactory quality, the British makers were unwilling to make improvement in the quality of their product. Also, d the last few years, there has been such a large demar British cement at home and from other foreign parts the makers have been able to obtain a higher price where than in the United States, and consequently have not cared to make any concession to the Am trade. The trade in British cement in the Easter Western States is at present very unimportant, but o Pacific coast, where the British makers have the adva of very low freight rates, their cement is still so considerable quantities.

An American cement expert considers that the replacement of British by German cement in the U States is due to the superior quality of the latter, alt some brands of British cement have recently be improved that they are now probably equal to the German. The Belgian cement is used in consequ its low price, whilst it has been preferred to Am cement, notwithstanding its actual inferiority to the simply because it is an imported article. In the o of this cement expert, the best American cement superior to all other brands, and the only r why any cement is imported are (1) that the Am product has until recently been insufficient in qu and (2) many consumers are willing to pay a price for an imported article irrespective of its merits.

The editor of the *Cement and Engineering News* that German cement manufacturers are more thor represented in the United States, and make greater to obtain orders in the interior than do the British ma turers. He also states that the Germans obtained a foothold in the United States for their cements "ow their first introducing cements adulterated with 2 pe or less of gypsum, which controls the setting of the c and for this reason they have maintained their p among certain consumers."

More than 70 per cent. of the cement manufactu the United States is now burned in rotary kilns; the are more economical and have a larger output th vertical kilns, whilst the product is at least equal in The Dietzsch kiln has a capacity of 75—80 barrels p with a fuel consumption of about 20 per cent. of the of cement produced; the continuous shaft kiln, barrels per day, with a fuel consumption of 30— cent.; and the rotary kiln, 120—160 barrels per da a consumption of solid fuel of about 30 per cent cost of labour is considerably less with the rotary ki with any other kind.

The notable feature of modern American cemen is the substitution, wherever possible, of machinery f labour. Crude petroleum and natural gas are use large extent for fuel, and the latter is sometimes drive the engines. In some cases electric power for driving the machinery as well as for lighting p It is stated that in the best arranged works the ma not once moved by hand, from the time the rock i into trucks in the quarry till the finished cement is ready for shipment.

In addition to Portland cement, large quantities of rock cement are manufactured, chiefly in the S Indiana and New York. In 1899 the production cement was 9,868,179 barrels, valued at 1,814,77 the amount of imported Portland cement, 2,108,388 and that of domestic Portland cement, 5,652,266 or a total consumption of all kinds of cement of 17 barrels.—A. S.

X.—METALLURGY.

MINERALS AND PRECIOUS METALS IN NEW SOUTH WALES.

Bd. of Trade J., July 11, 1901.

e following particulars relating to the mining industry ew South Wales have been received at the Board of e through the Agent-General for that Colony. The ns show that the year has proved a successful one. aggregate value of the mineral products to the end of is estimated at 140,635,532*l*. The value of the pro- on for 1900 was 6,570,820*l*., a net increase of 413,262*l*. mpared with the previous year. The following are ot the details in the report :—

dl.—The yield for 1900 was 345,650 ozs., valued at ,521*l*, which was a falling off of 150,546 ozs., valued 7,294*l*., as compared with 1899.

ver, Lead, and Zinc.—The net value produced during ear was: Silver, 2,604,117*l*.; lead, 139,146*l*.; and concentrates), 41,187*l*. The prices ruling for silver ad during the greater part of last year were mainly use of the increase.

per.—The yield for 1900 was valued at 428,636*l*., or *l*. in excess of the previous year. Operations are actively carried on, the higher value of the metal mainly responsible

.—The output for 1900 was valued at 120,932*l*., being *l*. greater than for 1899.

l.—The total quantity produced last year was 497 tons, valued at 1,668,911*l*.; being the largest in the history of the State. As compared with 1899 rease was 910,469 tons.

e.—Output 1900, 126,213 tons, valued at 109,620*l*. e of last year a number of additional ovens were in of erection.

osene Shale.—During 1900 the industry was sed, the output being only 22,862 tons, valued at *l*. Since the opening of this year prospects have ned.

.—The examination by the Geological Surveyor of sily accessible iron ore deposits of the State has been ted. This investigation shows that extensive s of iron ore, suitable for the manufacture of steel, nd it is to be hoped that the establishment in this f works on a large scale for smelting these ores will be accomplished.

13,146 tons of ironstone for flux, valued at 10,946*l*., is estimated, raised during the past year. Oxide of the extent of 313 tons, valued at 686*l*., was also d during the year. This finds use by various gas ies in connection with their operations.

r minerals.—Minerals valued as follows, in addition e already mentioned, were also raised during the ar :—Alunite, 5,745*l*.; antimony, 2,429*l*.; bismuth, ; chromium, 11,827*l*.; cobalt, 1,590*l*.; lime and ne, 13,160*l*.; platinum, 1,007*l*.; sundry minerals s, 7,005*l*.

ALUMINIUM IN INDIA.

Imp. Inst. J., July 1901.

trades which were at one time carried on by of India, such as silk and cotton weaving, iron- , and wood and metal working have, under stress etition, either almost disappeared or have become to the production of a very inferior class of goods.

ler to remedy this state of things, the Indian Govern- ve for some time been endeavouring to resuscitate ve industries, and recently Mr. Chatterton, of the School of Arts, was commissioned to draw up a ndum dealing especially with the methods to be d for improving the native manufactures. This ndum has now been published.

example of the work that can be done in fostering Mr. Chatterton quotes the success which has the inauguration of the aluminium industry, which important feature of the Madras School of Arts. anufacture of aluminium goods was commenced chool in 1897, and no difficulty was experienced from the beginning in selling the goods made, the value of the manufactures sold in 1898 being 30,000 rupees; in 1899 this had increased to 92,000 rupees, while in 1900 the turn-over amounted to 1,50,000 rupees. It was hoped that the aluminium goods made would supplant to a considerable extent the copper and brass utensils largely imported into India, but the effect has been to displace instead the tin and hardware imports, while foreign aluminium manufactures have been practically kept out of the country. If the demand for aluminium goods could be sufficiently increased, it would pay to manufacture the metal in India, since there is plenty of rich ore available, and water-power is cheap. The manufacture of brass and copper goods is also being undertaken at the Madras School, but at present these metals are of secondary interest. The most important feature of the work of the school is the encouragement given to private enterprise. Supplies of the metal are sent, often on credit, to competent workers starting in business on their own account, the school workshops are open to their inspection, and new designs or improvements in methods are communicated to them, while evey facility is afforded in obtaining trained assistants

It is also proposed to instal some European looms for weaving the finer kinds of cloth. This will involve also dyeing and printing, and it is hoped that in a short time the success of this section will be sufficient to justify the appointment of an expert to superintend these branches.

MERCURY IN TUSCANY (ITALY).

Foreign Office Annual Series, No. 2637.

The output of Tuscan mercury in the past year has been considerable, owing to the operations of the "Societa del Monte Amiata," a company formed in 1897 to work a new discovery of cinnabar at Abbadia San Salvatore in the province of Grosseto. There are only two other mines in Italy, both in the province of Grosseto, the well-known mine of the firm of Rosselli at Siele, and the Schwarzenberg mine at Cornacchio; both these mines produced their normal output in 1900. Tuscan mercury is of a very pure quality, and locally is said to be in every respect equal to mercury of Almaden. Yet on the London market the Spanish article enjoys the greater favour, and realises from 2*s*. to 2*s*. 6*d*. per flask of 75 lb. more than Tuscan mercury. If the contention locally made is correct, there would seem to be no valid reason for the difference in price. When the industry was first developed in Tuscany, lack of experience no doubt left something to be desired in the mineral produced, but in course of time the mines have been fitted with the latest mechanical and metallurgical appliances, and have the advantage of the ablest technical supervision. Perhaps the question as between Spanish and Tuscan mercury needs to be looked into a little more closely on the London market. Be the case what it may, about 95 per cent. of the Tuscan mercury is taken by Great Britain. The following table shows the exports since 1891 :—

Year.	Quantity.	Value.
	Cwts.	£
1891	10,826	97,968
1892	5,115	45,710
1893	4,620	41,789
1894	6,605	58,351
1895	4,200	35,800
1896	3,046	28,133
1897	4,655	42,516
1898	4,811	43,948
1899	4,460	45,396
1900	5,016	56,001
Average, 1891 99	5,257	48,846

PLATINUM AND COPPER PRODUCTION OF URAL (RUSSIA).

Foreign Office Misc. Series, No. 555.

Platinum.—A reference to the table will show that the platinum output remains stationary of late years, in spite of the Ural producing 96 per cent. of the world's supply.

Prices are unusually high, too, not less than 2*l.* 16*s.* per oz. troy against 1*l.* 12*s.* per oz. troy in 1895, while the cost of the yield of the metal ranges between 16*s.* and 1*l.* 8*s.* per oz. troy. Last year's output of 174,846 ozs. troy was less than that of 1899, 191,172 oz. troy, when prices were lower. The cause is evidently the absence of new discoveries of this metal in the Ural, its zone of distribution being very limited. Hitherto platinum has been met with only in alluvial form. Enterprise might further develop and exploit both gold and platinum in the Ural, the absence of railways not being of such great importance, these products being well able to bear dear carriage. The reports of the activity of gold and platinum companies, founded by foreigners in the Ural, present for the most part a deplorable picture, shares falling from 60 to 90 per cent., the majority of these concerns giving no dividends.

The new Platinum Industrial Company, which bought up a group of the most productive platinum mines, counting on an annual yield of 130 poods. only produced 50 poods.

Copper.—While, in the 18th century, there were over 20 copper smelting works in the Ural, only two more or less considerable now survive, a third being about to close, the supplies of ore having largely declined.

The yield has increased during the last two years from 2,548 tons in 1898 to 3,710 tons in 1900, due to the very high prices (at present 91*l.* per ton) prevailing of late, which have breathed temporary life into a fast-decaying industry. Over 8,064 tons of copper in the form of bars and goods are now annually imported into Russia.

Ural Production of Platinum and Copper, 1891–1900.

Year.	Quantity.			
	Platinum.		Copper.	
	Poods.	Ozs. troy.	Poods.	Tons.
1891	258	135,874	174,000	2,866
1892	279	146,934	183,000	2,951
1893	311	163,787	174,000	2,866
1894	318	167,473	145,000	2,339
1895	269	141,668	151,000	2,435
1896	301	158,520	167,000	2,693
1897	345	181,693	169,000	2,726
1898	365	192,225	158,000	2,548
1899	363	191,172	230,000	3,710
1900	332	174,846	230,000	3,710

COPPER PRODUCTION OF UNITED STATES, AMERICA.

Eng. and Mining J., June 15, 1901.

——	1899.	1900.
	Tons of 2,240 lb.	Tons of 2,240 lb.
Arizona	55,972	51,520
California	10,677	13,232
Colorado	4,739	3,494
Michigan	69,574	64,387
Montana	106,229	113,599
Utah	4,156	8,261
Eastern and Southern States	1,698	3,088
Other States	2,227	5,596
Copper as sulphate	4,215	5,051
Total	259,517	268,228

The following table shows the production, imports, exports, and approximate consumption of copper in the United States:—

——	1899.	1900.
	Tons of 2,240 lb.	Tons of 2,240 lb.
Production, as above	259,517	268,228
Imports in all forms	42,218	46,342
Total	301,735	314,570
Exports	111,573	157,469
Approximate consumption	190,162	157,101

The marked feature in this table is the large incre exports. In the year 1900 the exports were 58·7 pe of the total production of the United States, or 5 cent. of the total supply; these figures comparing 43·0 and 37·0 per cent., respectively, in 1899. Th due to the extraordinary demand for copper in during a considerable part of the year, while a demand was shown in the United States, especially the second half of the year.

The imports of copper reported were in various chiefly matte, black copper, copper bullion, and material sent to the United States to be refined. imports were from Mexico and Canada largely, whil came from Chile also. There were some import Tasmania, the Mount Lyell Company in that island arranged for the refining of its copper there. period during the year there were some shipment from London for the same purpose. The superior f of American copper refining works are now ge recognised.

COPPER DEPOSITS OF CERRO DE PASCO (PER

Foreign Office Annual Series, No. 2639.

Mr. George E. Steel, the British Consular Ag Cerro de Pasco, reported in 1899 that during the ye about 800 tons of ores, containing up to 45 per c copper, were sent monthly to Oroya and Casapa remittance to Callao for shipment. The exportati tinued more or less on the same scale in 1899, but a improvement took place during 1900. During th about 12,000 tons of ores, containing from 30 to cent. of copper, and 4,800 tons of copper matte, co about 50 per cent. of copper, were sent from Cerro d to the coast for exportation. The accessible hig ores are now exhausted, or nearly so, down to th level, but the quantity of low-grade ore varying fro 18 per cent. of copper is said to be unlimited.

The lower workings of the mines, where rich o expected to be found, are under water, and for man the question of draining them has been under consid but the work has not yet been undertaken seriou syndicate formed in Lima was granted a concessi the Peruvian Government on October 26 last, for t pose of continuing the perforation of the Ru drainage tunnel, the construction of which was disco more than 20 years ago. The work done then was 300 out of 3,000 yards to be pierced.

The fact that the mass of ore is confined within a c area renders it possible to drain the mines with on only.

Cerro de Pasco is situated at a distance of 214 mil Callao. The mineral district extends over a depress rounded by low hills. The average height above s is 14,000 feet.

The extent of the depression is about 2,225 yar north to south and 1,500 yards from east to wes the mass of ore extends over 2,000 yards from south and about 1,100 yards from east to west. standing the fact that the district has been worked f 260 years, Raimondi, the well-known Italian geo and geologist, asserted in 1885 that this almost s of ore had barely been scratched, and this staten been corroborated by various competent mining eng

The mode of transport to Oroya, the terminus Central Railway, which starts from Callao, is upon of burden, and very costly, being from 8*l.* to 9*l.* although the distance is under 80 miles. All th are engaged in the mining industry in that qua most anxious to see the prolongation of the Central to Cerro de Pasco. This line would cost about 60

MANGANESE TRADE OF BATOUM.

Foreign Office Annual Series, No. 2623.

The difficulties under which manganese ore p have had to labour, since the ore was first discover Trans-Caucasus, have not impeded the steady dev of the industry, seeing that since the year 1885 th of ore from this country has increased over t

e. The augmentation has been brought about by the d that has existed for several years past in European ts, the reduction at the beginning of 1899 by the a Government of the rate of transport for manganese from Tchiaturi to the trunk line at Sharopan from o 7 c. per pood ($2\frac{1}{2}d.$ to $1\frac{3}{4}d.$ per 36 lb. avoir.) and rise in the market value of manganese. From the 885, to the end of the year 1899, 1,517,688 tons of nese were produced by the mines of the eight villages d on the right bank of the river Kvirilli, and 758,283 three villages situated on the left bank of the same

largest production of ore was in 1899, when the nese extracted was 549,232 tons, of which quantity r villages of Mgvimevi, Shukruti, Zeda-Rgani, and si yielded 88 per cent., or 483,354 tons.

mines belonging to the 10 principal miners yielded ,451,613 tons, as near as possible one-quarter of the roduction.

number of mines worked in 1895 was 181, containing leries, which gradually reached 429 in 1899 with eries.

not the introduction of machinery or improved of mining that have brought about the increase in ion, but the fact that at present less attention is the sorting of manganese, and to separating good l ore. In some instances producers do not clean it all, but have it transported to the railway in the n in which it is procured at the mines; others, again, their production by admixing waste of previous th their freshly-mined ore.

sport of manganese ore through the ports of Poti oum to foreign countries and shipments to Russia increased in the same proportion as the production ne past 15 years. The following table gives figures ports to foreign countries and shipments to Russia above-mentioned two ports since the year 1885, in :—

	Through the Port of		Total.
	Batoum.	Poti.	
	Tons.	Tons.	Tons.
	18,702	22,695	41,397
	18,077	35,673	53,750
	10,004	49,519	59,523
	7,003	42,073	49,076
	11,255	44,235	55,490
	10,396	125,096	135,492
	5,323	78,716	84,039
	7,155	122,680	129,835
	7,975	113,640	121,615
	6,980	147,852	154,832
	5,516	166,242	171,758
	4,289	158,090	162,379
	3,923	194,791	198,714
	11,596	254,712	266,308
	22,726	381,008	403,734
	52,917	373,262	426,179
...	203,837	2,310,284	2,514,121

he period under review (1885—1900) the United was the largest importer of Russian manganese, ry having taken about 994,848 tons, or 39 per e whole quantity that was exported. Holland t with 18 per cent., followed by France, the tes of America, and Belgium, which took about cent., and, lastly, the manufacturing centres of ich consumed the balance of the shipments made. nd for Russian manganese ore in the United during the years given above fluctuated con- ising or falling according to the requirements of ; whereas the demand from Germany has from steadily increased without fluctuation. Holland sumer of manganese, but only serves as a point Germany, which in 1898—1900 imported more manganese than the United Kingdom.

mated figures of the world's exports of manganese resent about 700,000 tons per annum. Russia's rly 49 per cent.

NICKEL AND COBALT IN NEW CALEDONIA.

Foreign Office Annual Series, No. 2626.

During the last year or two, great impetus has been given to the mining industry—in fact the demand for nickel and cobalt cannot be met.

The United States has become a large buyer of New Caledonian nickel ore, several cargoes having already been shipped, and 60,000 tons more are ordered during the year 1901.

Existing companies are fully engaged, and consumers in Europe find it necessary to take up mining properties in New Caledonia to be able to secure the nickel ore they require. At the present moment several important British firms have their agents here to inspect various mining properties, and to study the question of erecting smelting works on the spot.

NICKEL FACTORY AT PAPENBURG O/EMS.

Foreign Office Annual Series, No. 2628.

The nickel factory here, having considerably enlarged its works, is now in full working order. Nearly 6,000 tons of nickel ore were imported from New Caledonia; and in view of its present prosperity it is probable that the factory will be still further enlarged.

LEAD AND COPPER MINES IN ITALY.

Foreign Office Annual Series, No. 2637.

Some important mining operations in lead and copper ores have recently been begun at Lanzi, near Campiglia, in the south of the province of Pisa. It is not a case of the discovery of new ores, for these mines were known to the Romans, and they have also been worked during the present century. But the valuable nature of the mines has only now fully come to light. The property, which is some 1,350 acres in extent, was recently acquired by a London syndicate, and is now owned by a company styled "The Etruscan Copper Estates, Limited."

The geological conformation of the estate is clay slate, overlain by a bed of marble of the average thickness of 400 feet. The metallic resources of the property consist of five fissure lodes, one of lead (sulphide of lead and zinc blende) and four of copper (sulphides of copper). Each one of the lodes is over 100 feet wide, the lead lode being 110 feet, and one of the copper lodes as much as 130 feet, in width. The quantity of ore available must be enormous. The lead and zinc ore is now being raised and has the appearance of being rich in metal, but it is too early yet to give an estimate of the metallic contents of the vein, as the work so far has only progressed to a short depth. In the copper lodes work is to be carried on underneath the huge Roman and Italian stopes, which, judging from the ancient slag, apparently yielded large quantities of copper sulphides. The old workings, however, only proceeded to a short depth. When these mines are in full working order they may become an important factor in the world's metal supply.

XII.—OILS, Etc.

OIL MILLS AT BREMEN IN 1900.

Foreign Office Annual Series, No. 2628.

The sweet-oil factory was considerably enlarged, producing cotton-seed oil likewise. The other factories worked up no less than 24,000 tons of seed, and did a thriving business in spite of the prices running up 100 per cent. A new factory was completed, producing palm and cocoanut oil.

SOAP IN PEMBA (E. AFRICA).

Foreign Office Annual Series, No. 2653.

In soap, Germany has the Pemba market entirely to herself. The German manufactured soaps sold there are of two kinds, namely, a mottled (blue and brown) variety and a plain brown soap. The mottled soap is put on the market in boxes containing six bars of 3 lb. weight each, at 5*s.* 4*d.* per box; the brown soap is put up in boxes containing 12 bars, the net weight of box and contents being 10 lb., which are sold at 2*s.* 4*d.* the box. The Indian traders retail those soaps to the natives in quantities costing from ¼*d.* upwards. The brown soap sells best at present. The Consul transmits samples of those German-made soaps, which have been sent to the Associated Chambers of Commerce.

XIII.—PIGMENTS, PAINTS, Etc.

Copper Coverings for Railway Carriages.

Ch. of Com. J., July 1901.

About two years ago, according to *Handel's Museum*, trials were instituted for the first time to make use of thin copperplates for coating passenger railway carriages. The intention was thereby to avoid the customary painting and varnishing of the outside. The carriage concerned was put in use by the New York — New Haven — Hartford Railroad, which had been induced to do so by the manager of their waggon works. These trials yielded results so favourable that the Erie Railroad caused 29 new coaches coated with copperplates to be constructed for their stock of waggons. The copperplates employed for coating the sides lengthwise have a thickness of 0·012, those for the transverse sides of 0·014, and those for the roof of 0·051 English inches. The copperplates are fastened to the wood by means of screws. The plates, after having been fixed to the coaches, are washed with a slightly acid solution, by means of which the surface becomes oxidised. This results in a uniform colouring, which would not be the case if the colouring were effected by atmospheric oxidation. A light layer of lacquer is also laid on. The prime cost is greater than that of the customary coat of paint, but in the end a considerable saving is effected. Hitherto a frequent renewal of the painting was necessary, whilst the copper-plates require only a simple cleansing and now and then a brushing over with lacquer, which costs little. The new invention is already in use on a number of other American railways.

Sienna Earths, Ochres, and Umbers at Leghorn.

Foreign Office Annual Series, No. 2637.

The important Leghorn industry of sienna earths, ochres, and umbers in all its aspects has already been fully reported upon (this Journal, 1898, 508). The following table shows the export of these pigments, both raw, burnt, and ground, during the years 1894—1900, with the average of the years 1891-99: —

Year.	Quantity.	Value.
	Tons.	£
1894	579	2,586
1895	903	4,032
1896	959	4,244
1897	1,053	4,702
1898	1,699	6,900
1899	1,933	9,419
1900	1,159	4,705
Average, 1891-99	1,037	4,759

Washing-Blue in Pemba (E. Africa).

Foreign Office Annual Series, No. 2653.

There is a large demand in Pemba for washing-blue, of which the German-manufactured article is the only kind sold locally. It is put up in packets containing 1 lb. weight each; the wholesale price is 3½d. per packet. Washing-blue, as in the case of soap, is retailed locally in small quantities costing from ¼*d.* upwards. The German made blue in question is a very inferior article, as even the natives perceive; it imparts an unpleasant smell to the clothes with which it is used, and it has a tendency to assume a blackish tint after the clothes have been dried. If British manufacturers could put a superior blue on the Pemba market at as low a price as is charged for the German blue, the British article would undoubtedly oust the inferior blue at present sold there. Even if it be not practicable for British firms to manufacture a better blue at as low a price as is charged by the German makers of the ar question, the Consul believes that the natives would ne less be willing to pay a somewhat higher price for a s article. The Consul transmits a sample packet German-manufactured blue sent to the Associat Chambers of Commerce.

Gum Industry of Persia.

Foreign Office Annual Series, No. 2631.

H.M. Consul-General at Bushire reports that t gum industry is making rapid progress, and may ev become an important item in the export trade of t Tragacanth is finding much favour in the United K and Germany, and America might also come in for The industry, however, is not conducted with any or method, and may suddenly die if the collecti exudations is not made scientifically. A few ye tragacanth was unknown in Persia, and only the shah district exported that item *viâ* Bagdad. four years ago both Shiraz and Ispahan came fo contribute. The industry in the province of Fars i be capable of great improvement, and vast tracts full of the tragacanth-producing plant which we untouched before are being utilised. The p employed in the collection of tragacanth work in a manner, causing damage to the plants, to such an to render the same field unproductive for some come. Though the tragacanth fields are numer extensive, they cannot withstand this unless the Government undertakes their supervision. As i industry brings into the country nearly 40,000*l.* and is capable of extensive development if conducted.

Resin and Rubber Industries of German Africa.

Foreign Office Annual Series, Imp. Inst. J., July

More careful exploration of the forests has l discovery that the white copal tree exists in co quantities in the southern part of the colony, and tion of this valuable resin has already commen great demand for rubber in Europe has also led to search after trees yielding latices, and many of t been examined, but only two have been found of viz., *Landolphia Kirkii* and *Mascarenhasia elast* former grows in the outlying parts of the colony, latter only occurs south of Dar-es-Salaam. It w thought that the best rubber could be obtai *Landolphia florida*, but it has lately been found creeper is practically worthless in this respect. juice of the wild fig tree has on several occasions to Europe for trial, but the price obtained did n transport. All attempts to cultivate foreign rubl have so far failed, owing to the dryness of the cli *Hevea Brasiliensis* (Para rubber) has bee repeatedly, but without success. *Castilloa elas* *cornia speciosa* and *Willoughbeia* have also been the seeds did not even germinate. *Manihot gl* planted in Tangu in 1891, and there are now 29 in that district, but it is not considered likely plantation will pay. Another plantation of thi been laid out on a small scale at Donde-Barikiwa is expected to be more productive.

The exportation of trees for tanning material yet been commenced, but it is known that t *catechu*, which is exported so largely from Burma, exists in the colony, as well as *Acaci* *Pterocarpus erinaceus*, and the mangrove.

Another Indian plant, *Calotropis procera*, is with; this yields gutta-percha of a good qualit root bark is stated to possess useful medicinal An interesting account of several natural dyes the colony, and of the native methods of emplo is given, but since natural dyes are now only of interest, it is unnecessary to describe these proces

The medicinal plants, *Strophanthus* and *Stry* occur in the plains, but it is not yet known wh are useful species or not.

Balata Rubber in Venezuela.

Foreign Office Annual Series, No. 2633.

ore extensive use having been found by manufacturers he employment of balata rubber, the prices for 1900 ruled correspondingly high, and a great impetus was 1 to the balata industry in the Ciudad Bolivar let.

e production reached 1,205 tons, as compared with tons in the previous year. Other circumstances er favoured this industry, *viz.*, a wet season, making ees very productive, and abundant labour.

e prospects for the year 1901 are not so favourable: are lower, the new year has commenced with a drought, and labour generally is not so plentiful.

reover, as the rubber trees are indiscriminately cut by the collectors, they have to go farther and farther to find them. The crop for 1901 is, therefore, likely smaller.

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

Tanning Materials at Hamburg in 1900.

Foreign Office Annual Series, No. 2628.

—	Quantity.	
	1900.	1899.
	Cwts.	Cwts.
chy logwood	363,000	284,000
and Jamaica logwood	2 5,000	202,000
ood	36,000	90,000
	132,000	160,000
ans	254,000	174,000
	102,000	157,000
lwood	27,000	17,000
ho wood	2,145,000	1,340,000

trade in dyewoods last year suffered from the in China and from the unfavourable state of in South and Central America, which had a bad on the export trade in textile goods. The impor- o Hamburg of logwood were larger than in previous out, owing to the unfavourable conditions of the large stocks remained on hand at the end of the t is, however, feared that a repetition of the high ted for some sorts of logwood in 1900 would very ve the effect of driving those who at present use ods into the arms of the artificial dyestuff manu- , as these latter are straining every effort to push of alizarin and of aniline dyestuffs. The demand for ood was inconsiderable last year, and the arrivals ood were less than during recent years. Business ivi was prejudiced both by the poor harvest and cal troubles in Colombia and in Venezuela, which rices and restricted the demand for this article. ease in the importations of myrobalans is notice- s article being at present the cheapest tanning imported, and therefore likely to find increasing the future. The market for valonia was dull, prospects of this article are not considered very

cho wood was in good demand throughout the spite of the large stock, *viz.*, 300,000 cwt., on he beginning of 1900, there was a dearth early in already for this article in the Hamburg market, fresh arrivals only coming in slowly. The total ons in 1900 were, however, considerable, exceed- of the preceding year by more than 800,000 cwt. e last part of the year the market slackened down ence of the unfavourable condition of the leather It is evident that the general consumption of ng material is growing in Germany from year to strong protests are being made against sub- ebracho wood to an import duty in Germany.

Gallic Acid Industry of Corsica.

Foreign Office Annual Series, No. 2624.

The head of the Agricultural Department, in his annual report, again draws attention to the reckless destruction of chestnut trees which is going on in order to provide material for the manufacture of gallic acid at the factories at Barchetta and Fiumalto, and he strongly urges that steps should be taken to stop it, or at least some control should be exercised in the matter by the authorities. Disastrous consequences are predicted should this indiscriminate hewing down of young and old trees be allowed to continue. The fine forests of chestnuts at Castagniccia are already, it is said, in part destroyed, and if not checked in time, the inhabitants of this and other chestnut-bearing districts, who, it seems, are blind to the danger, will soon be deprived of their most important if not their only means of living.

To what extent the manufacture and exportation of gallic acid has increased of late years, a glance at the following table will show:—

	Tons	Cwts.
1893	673	17
1894	693	15
1895	2,078	1
1896	2,285	7
1897	3,873	19
1898	4,494	2
1899	5,844	5

Leather Goods in Egypt.

Ch. of Com. J., July 1901.

According to the Austro-Hungarian Chamber of Commerce at Alexandria, imports of leather and skins into Egypt, which had greatly increased in the years 1898 and 1899, showed a still more considerable progress in 1900, when their value reached 83,375 Egyptian pounds. The tanning works are also increasing their activity from year to year, and bring now considerable quantities to market. From this it appears that the consumption in Egypt increases in large proportions, while the local production of shoes, &c. is gaining increasing importance. In spite of the large native production, the importation of ready-made shoes also increases, which proves that the general wearing of shoes of European manufacture, particularly during recent years, has met with increasing favour on the part of the native population. As regards the importation of leather into Egypt, France still occupies the first rank; but it has sustained some loss through the competition in sole-leather. Six years ago Italy began to import this article, and now there is a large sale for it in Egypt, as well as for skins from Buenos Ayres, which are imported salted into France and Italy, where they are tanned. The Italian sole-leather is sold at 2·60 to 2·70 frs. per kilo., the French at 2.90 to 3.50 frs. The trade much prefers the leather from the female animal to that from the male, and that the weight proportionately must not be too heavy; ordinarily the ten skins should only weigh 70 to 75 kilos. The Egyptian leather importation was as follows:—

Producing Country.	1898.	1899.
	Egyptian Pounds.	Egyptian Pounds.
England	20,756	8,794
Germany	1,743	5,174
Austro-Hungary	11,472	7,750
America	622	1,042
Belgium	961	1,027
France	19,640	22,285
Italy	3,695	3,243
Russia	474	371
Turkey	17,594	19,670
Other countries	28	749
Total	77,685	70,105

TANNERY REFUSE; CASE UNDER RIVERS POLLUTION ACT, 1876.

Imp. Inst. J., July 1901.

In the case of the Sevenoaks Rural District Council *v.* Whitmore, a question of great importance arose as to whether the effluent from a tannery could be excluded from its sewage system by a rural district council on the ground that it caused a nuisance. Section 7 of the above Act provides that every sanitary authority shall give facilities for enabling manufacturers to carry the liquids from their factories into the sewers, provided that no such authority shall be compelled to admit into their sewers any liquid which would prejudicially affect the sewers, or the disposal by sale, application to land, or otherwise of the sewage, or which from its temperature or otherwise would be injurious from a sanitary point of view. The plaintiff was the sanitary authority for the parish of Edenbridge in Kent, and the defendants were the owners of a tannery in the parish. The tannery had been in existence some 200 years, and up to 1876 drained into the river Eden. After the passing of the Public Health Act, 1875, the tannery owners were required to substitute a closed drain for an open drain, which was done. In 1879 the sanitary authority took some land on which the sewage was deposited. This was not satisfactory, and in 1886 a new system was adopted, and a sewage farm of about 7½ acres was instituted, of which 5 acres were used for purification. The defendants were called upon to erect tanks on their premises in which the effluent from their works might settle before being pumped on to the sewage farm. This they did at some e Complaints were made, and in 1890 a Local Gove Board inspector recommended alterations in the wor the sewage farm, which were not effected. Othe plaints were made from time to time, and eventua Rural District Council called upon the defendants to their connection on the ground that their effluent dicially affected the sewers within section 7 of the abo The defendants refused to do so, and thereupon the brought the action to restrain the defendants permitting effluents from their tannery to flow i plaintiff's sewers, on the ground that they caus effluent from the plaintiff's sewers to be a n and also on the ground that they prejudicially affec application to land of the sewage within section 7 above Act. The defendants contended that the was caused by the inefficiency and unskilful man of the sewage farm, and that tannery effluents capable of bacterial treatment as sewage. A great expert evidence was called, and eventually Mr. Mathew found in favour of the defendants, on the that the sewage farm was ineffective because sewage formed on it, which found their way in hot through cracks into the river. The Court of affirmed this decision, and the Master of the Rolls it was said by the plaintiffs that the effluent fr tannery killed the microbes which would get ri impurities in the sewage, and by the defendants microbes were killed by the bad working of the far judge in the court below had found in the def favour, and it was impossible to say that he was w

XV.—*MANURES, Etc.*

NITRATE OF SODA.

Shipments, Consumption, Stocks, and Prices from 1894 *to* 1901.

—	1894.	1897.	1900.
	Tons.	Tons.	Tons.
Shipments from South American Ports to all parts for the six months ending 30th June.	460,000	360,000	532,000
Shipments from South American Ports to all parts for the 12 months ending 30th June.	1,000,400	972,000	1,351,000
Afloat for Europe on 30th June	226,000	175,000	196,000
Stocks in United Kingdom ports:—	7,000	17,500	23,000
Stocks in Continental ports on 30th June	25,000	104,500	77,000
Consumption in United Kingdom for the six months ending 30th June	85,000	76,000	92,000
„ Continent for the six months ending 30th June	503,000	629,000	756,000
„ United Kingdom for the 12 months ending 30th June	114,000	100,000	126,000
„ Continent for the 12 months ending 30th June	734,000	824,000	1,026,000
„ United States for the 12 months ending 30th June	100,000	100,000	170,000
„ other Countries for the 12 months ending 30th June	..	10,000	28,000
„ *the World* for the 12 months ending 30th June	948,000	1,034,000	1,350,000
Visible supply on 30th June (including the quantity afloat for Europe, and Stocks in United Kingdom and Continent).	258,000	297,000	298,000
Price on 30th June per Cwt.	9*s.* 1½*d.*	7*s.* 4½*d.*	8*s.* 0*d.*

—	1894.	1897.	1900.	1901.
	Tons.	Tons.	Tons.	Tons.
Liverpool	2,000	5,200	10,000	3,000
London	2,700	4,900	3,500	2,500
Outports	2,300	7,400	9,500	6,500

NITRATE OF SODA REPORT.

W. Montgomery and Co.

In October last an official declaration was made that the long-looked for combination for the regulation of production was completed—an agreement which dates from 1st April last, but which became effective at the opening of the year, inasmuch as, by its terms, nitrate produced during the first three months of the year could not be shipped before April. Early in May a further incentive to buying was given by the declaration of the Nitrate Committee in Iquique that the maximum shipments for the nine months ending 31st December would be only 75 per cent. of the quota permitted under combination agreement for the twelve mont 31st March next.

By virtue of this declaration the trade is sum up the probable position at the close of with tolerable accuracy, the three principal ch uncertainty being—

(*a.*) The cohesion or otherwise of the producer

(*b.*) The consumption from now to the December.

(*c.*) The possibility that some of the small may not be disposed or able to produce th in which case their neighbours are, by the terms, debarred from making good the defici f the first uncertainty, fears as to the cohesion of the ucers have disappeared, the best guarantee of their fulness to themselves and to the public alike being satisfactory results already attained. Of the second, is no ground for doubting that the consumption g the next six months will be equal to that of last As to the third, it is probable that the maximum r cent. will not be shipped.

ist the improvement in values may not be congenial sumers they will, nevertheless, be in sympathy with roducers in their efforts to work their business at a after so many years of vain toil. It still remains for roducers to find out the precise figure which will naterially affect consumptive demand—but of this will be known at the close of the first combination

improved consumption hails principally from any, Belgium, and the Mediterranean ports. It is tant to observe the steady growth of consumption nparatively new markets in the Mediterranean, and ct, in conjunction with the ever-increasing demand in nited States, must be encouraging to the producers, is likely that ere the five years' combination has d, the demand will be such as to tax the resources producers to the utmost to supply the article. ime, production for the past six months has fallen the extent of 75,000 tons.

veries in the United Kingdom, at 83,000 tons against tons, show a falling off to the extent of about cent., but probably this would not have been the ad more suitable weather prevailed. If more rain llen during the past two months, there would have otedly been a much more active demand. Deliveries United States for the half-year show an increase of cent., 101,000 tons against 75,000 tons.

demand for refined quality has been well maintained hout the season at from 1½*d.* to 3*d.* per cwt. over rice of ordinary, the closing value to-day being *d.* to 9*s.* 4½*d.* per cwt. as in position. To-day's supply amounts to 332,000 tons against 298,000 st year.

consumption of the world for the past three years n as follows :—

—	1899.	1900.	1901.
	Tons.	Tons.	Tons.
t of Europe	981,000	1,026,000	1,042,000
Kingdom	121,000	126,000	126,000
States	133,000	170,000	200,000
ountries	25,000	28,000	14,000
	1,260,000	1,350,000	1,382,000
he shipments for the eriods have been ...	1,373,000	1,351,000	1,455,000

Nitrate of Soda at Hamburg in 1900.

Foreign Office Annual Series, No. 2628.

portations of nitrate in 1900 were smaller than in eding year, viz. :—

To—	Quantity.	
	1900.	1899.
	Tons.	Tons.
Continent	993,000	1,037,000
ingdom	134,000	124,000
Total	1,127,000	1,161,000
to Hamburg	435,000	505,000

ecrease in the total importations is accounted for falling-off of 69,900 tons in the import trade to g alone. The figure for 1899 had been, however, nally high, and it had not been expected that it gain be attained last year. The stock on hand at of December 1900, together with cargoes still afloat, was larger by 70,000 tons than that of 1899; so that there will, at all events, be no lack of supplies during the first part of the present year. The conclusion of an agreement amongst nitrate producers will, it is thought, prove to be a sound measure, and create a stable condition of the market for some time to come. The present nitrate prices bear a fair profit to producers; so that a period of prosperity is now likely to set in, which, it is trusted, will be alike satisfactory to consumers and producers.

The trade in refined nitrate, which pursued a steady course during the greater part of the year 1900, was, towards the end, influenced by the fact that the United States of America came forward as a large purchaser, a considerable rise in prices being the consequence. It is now feared here that as the supply of refined nitrate in Chile is comparatively small, European consumers will have to restrict their purchases of this article.

Utilisation of Fish Waste in Canada.

According to the *Monetary Times* of Toronto of 24th May, the British Columbia Fish Glue and Oil Company, of Vancouver, has erected works on Howe Sound, and are engaged in making glue, fish oil, and fertilisers out of refuse, fish, and fish offal. The fertiliser is already contracted for by a Honolulu firm—all that can be turned out. The fish oil is said to be a fine sample, and the output already sold ahead. Such glue as this is used by bookbinders, by hatters, by piano makers, by printers, and furniture manufacturers.

Artificial Manures at Hamburg in 1900.

Foreign Office Annual Series, No. 2628.

Both for phosphate importers and for producers the past year was disappointing. The demand on the part of manufacturers, whose needs were covered by existing contracts, was only a limited one; and this circumstance, together with high rates of freight and of wages, had a depressing effect upon business and caused several mines to be closed down in order to await an improvement in the European markets. Importations of raw animal phosphates to Hamburg in 1900 amounted to only 106,225 tons, as against 168,838 tons in 1899. Bone and bone-ash were only handled in 1900 in small quantities, and at lower prices than in the previous year; business in fish guano was also less profitable than anticipated. With regard to sulphate of ammonia, it is stated that the import trade in this article is diminishing, the demand being now largely, and in an increasing degree, covered by German production. Bone dust was imported again last year in considerable quantities; but the quality of some consignments is said to have given grounds for dissatisfaction, and prices were, on the whole, lower than in 1899.

XVI.—SUGAR.

The Utilisation of Beet-Sugar Waste.

Imp. Inst. J., July 1901.

Some useful information relative to the utilisation of the heads and leaves which are removed from the beetroot at the time of harvesting is contained in a recent report from the United States Consul at Magdeburg. If the leaves are allowed to remain on the ground after harvest, they make a good fertiliser for future crops of beet.

Their nutritive value has long been recognised and many experiments have been made with a view to preparing an easily digestible fodder from them. Some kind of preliminary treatment is necessary because of the large quantity of earthy matter present. Only a small proportion of the material can be used while in a fresh condition, as the greater part becomes spoilt by exposure to the weather; and a further objectionable feature is the amount of soluble salts of oxalic acid present in the leaves, the latter being the most serious, as the effect of this poison upon animals fed on the leaves is to produce severe purging, and, after continued use, fractures of the bones. An attempt has been made to render the oxalic acid harmless by making it insoluble, by the addition of carbonate of lime to the food or by scattering it among the leaves at the time of storing. This treatment can only be recommended in cases of scarcity of fodder, as the large quantity of earthy impurities already mixed with the leaves is thereby increased.

A more satisfactory solution of the problem is supplied by a German farmer, who claims that he is able to cleanse the beet-heads and leaves from earth and dirt, and to almost completely destroy the oxalic acid without in any way injuring the sugar present in the food-stuff.

The bye-products are left on the field for about 10 days, during which time the tops and leaves wither, and lose from 80 to 85 per cent. of the water they contain. A large quantity of the earthy matter may then be mechanically separated from them. The material is then put into revolving drums fitted with sieves through which a current of hot air is allowed to pass; the particles of earth and sand are thus dried and separated, and the oxalic acid is almost completely decomposed. The temperature of the hot air is so regulated that no loss of the sugar contained in the heads is incurred. The material is now sliced and the drying completed at a lower temperature. This order of procedure is very important, as the heads and leafy parts of the beet have a totally different construction to the surface of the leaves, and if the food stuff was dried and the slicing omitted, the leaves would become burnt before the other portions were completely dried. Moreover, if the material were sliced but not dried by the above method, a sticky mass would result, which would be very difficult to dry.

The food, which is now ready for storing, contains 14 per cent. of sugar. It has an admirable appearance and can be preserved for a long time.

SUGAR INDUSTRY OF SPAIN.

Foreign Office Annual Series, No. 2636.

The sugar industry in Spain is threatened with stagnation, owing to excess of production. Last year more than 110,000 tons were produced, which quantity exceeds the demands of national consumption. The manufacturers are consequently engaged in forming a syndicate to regulate production, fix curreot prices, and find new markets.

POTATO PRODUCTS IN GERMANY IN 1900.

Foreign Office Misc. Series, No. 2628.

The chief cause of the stagnation in the German markets for these products is said to have been the abnormally large potato crop in Holland, and the fact that in Germany the estimate of this abundance had been taken at far too low a figure. The opinion in Germany is now, that the only way for German manufacturers and merchants to meet Dutch competition is for the former to work together much more closely than hitherto. The dextrin and grape sugar factories in this country, on the other hand, are said to have done a good business last year; but, whilst the exportations of dextrin kept up to the same figure as in 1899, those of grape sugar experienced a slight falling off. The recent unfavourable experiences in England, resulting from the use of inferior qualities of glucose for beer brewing, are regarded here as likely to cause an increased demand in future for superior qualities, which the Consul states are manufactured chiefly in Germany.

The exportations of the leading potato products from Germany during the 10 months, January to October, of each of the last three years, were respectively as follows:—

—	Quantity.		
	1898.	1899.	1900.
	Cwts.	Cwts.	Cwts.
Potato flour and starch	163,000	514,000	355,000
Dextrin	111,000	161,000	162,000
Grape sugar—			
Liquid	20,000	21,300	21,000
Solid	14,500	19,700	15,000

DUTY ON SUGAR AND GLUCOSE.

Chem. and Druggist, July 6, 1901.

In the House of Commons on 2nd July, in Committe the Finance Bill on Clause 5, which deals with the dut glucose, saccharin, and invert sugar, the Chancellor of Exchequer moved an amendment providing that the should be paid as from 11th June 1901, instead of 1st as mentioned in the Bill. The amendment was agree The Chancellor also moved an amendment to raise Excise duty on glucose from 1*s.* 8*d.* to 2*s.* 9*d.* per cw the solid article, and 2*s.* on the liquid. After a short d the Committee divided, and the amendment was carri 207 votes to 131.

XVII.—BREWING, WINES, SPIRITS

ARTIFICIAL WINES IN GERMANY.

Foreign Office Misc. Series, No. 559.

A firm at Wandsbeck (Holstein) are preparing a bev from malt with addition of cane sugar and yeast, they call "malton wine."

This wine was tested at the Royal School of Hortic and Wine Culture at Geisenheim with the foll result:—

"The samples of 'Malton' Tokayer and 'Malton' s when tasted, showed a striking peculiarity compared grape wines, as regards taste and smell, which showed to be imitation wines. The cheap sorts of wines of at about the same price as the 'malton' wines are su to them in nature and purity of taste."

The Scientific Deputation for Medicine in the Ki of Prussia have not regarded this sort of wine as di injurious to health, and have, therefore, not prohibit sale, but desire that the name of "malt wine," an that of "malton wine" be used.

XVIII. A.—FOODS.

THE PURITY OF BUTTER.

Standard, July 8, 1901.

Mr. Hanbury, M.P., President of the Board of Agric and Mr. H. C. Plunkett, Vice-President of the Depa of Agriculture and other Industries and Technical I tion for Ireland, have appointed a joint Departi Committee to inquire and report as to what regulati any, may with advantage be made under Section 4 Sale of Food and Drugs Acts, 1899, for determinin deficiency in any of the normal constituents of but what addition of extraneous matter, or proportion of in any sample of butter shall, for the purpose of the Food and Drugs Acts, raise a presumption, until th trary is proved, that the butter is not genuine.

FOOD PRESERVATIVES.—CONTINENTAL REGULATI

Bull. U.S. Dept. of Agriculture

Prohibition of the use of chemical preservative aniline dyestuffs as colouring agents for liquors is universal, whilst the employment of all foreign col matter is often prohibited. The use of chemical vatives and foreign colouring matter with beer is prohibited. The sale of foods containing saccharin, and similar preparations is prohibited in Belgium, Germany, Italy, and Roumania. The importation charin, except for medicinal use and under pre conditions, is prohibited by Belgium and Greece countries permit the dyeing of confections and articles which are themselves colourless, but are custo coloured artificially. Belgium permits mustard to be c artificially when properly labelled. Salicylic acid an acid have been used so much more commonly than preservatives that legislation is usually directed agains whilst local bodies often extend the prohibitions to acid and other substances as they come into use. T of foods containing preservatives is prohibited in A France, Hungary, and Roumania, and that of be aining preservatives in Belgium, Germany, and Switzer- The addition of salicylic acid to food is prohibited in ce. Holland does not permit the sale of beer con- ng salicylic acid, and Spain forbids its addition to wine. permits the addition of 0·2 per cent. of boric acid to r, but forbids the use of other preservatives.

FRUIT PRESERVATION.

Imp. Inst. J., July 1901.

e Technical Education Committee of the Kent County il have issued the results of further investigations by Principal of the South Eastern Agricultural College, Kent (County Councils of Kent and Surrey), on the t of fruit preservation. In the course of his report, sor Hall states that while the bottling of fruit on a scale "is easily done and might well be part of the e of every household, it cannot be taken up by the rower on a large scale, least of all as an occasional of coping with a year of glut. The plant required o staff of workers would be expensive, unless they employed during more than the brief fruit season. , fruit-bottling must be regarded as much the same f industry as jam-making, and there is plenty of ence in Kent that the fruit-grower should not attempt aking as an adjunct to his own business." On the of fruit drying, referring to an experiment with the arth" Evaporator, which was carried out by the Horticultural Society in their Chiswick garden, during it season of 1891, he writes:—"The experiments hiefly concerned with apples and plums, the only rown on a large scale in this country that are suitable ing. As regards apples, no difficulty was found in cut a satisfactory product, particularly with certain f apples. The finished article did not, however, pay labour and fuel required. . . . . As regards the Royal Horticultural Society's experiments show ordinary English market plum does not dry satis- , being too thin-skinned and juicy." The Technical on Committee of the County Council observes:— be seen that the report, so far as it refers to fruit- is not such as to justify us in initiating any scheme ction in that industry. We propose, therefore, for ent to await the result of the experimental efforts of n that direction. With respect, however, to the of fruit-bottling, we are considering the best of providing suitable instruction, either by utilising ent staff of teachers in domestic cookery or other- These systems of dealing with perishable food must not be confused with the important industries d with the cold storage and consequent temporary tion of such commodities. The experiments con- y us at Messrs. Hall's engineering works at Dartford n what cases mature fruit could be retarded in its towards ripeness and decomposition. Many trades availing themselves of the system of cold storage, believed that the establishment of central public of this kind will provide at a low cost for the tem- ception and preservation of perishable commodities, avert the recurrence of waste.

XVIII. B.—SANITATION, &c.

CARBON DIOXIDE IN COMPRESSED AIR.

Public Health Engineer, June 29, 1901.

port on 25th June last of the Bridges Committee ondon County Council, contained the following h:—

attention has been directed to the expediency of g, if possible, the deleterious carbonic acid gas air supplied to the Greenwich Tunnel. After nsideration of various schemes, we decided to try of filtering the air through boxes filled with a lution of caustic soda, and although the practical on of the apparatus for this was somewhat arrange and expensive to work, as the arrange- e air-compressing machinery necessitated placing apparatus in the tunnel, and so, of course, in d air, the results have been satisfactory in so far as there has been since the experiment commenced a marked improvement in the purity of the air. Previous to the establishment of the purifier, the amount of carbonic acid in the compressed air at the shield, where the men were working, was, on the average of nine analyses, ·148 per cent., as against ·047 per cent. in the engine-room, or, say an increase of 300 per cent.

"After the purifier was in operation, the percentage of carbonic acid gas at the shield was, on an average of five analyses, ·086 per cent., as against ·0610 per cent. in the free air of the engine-room, or, say, an increase of 34 per cent. We are advised that this very remarkable difference in these two sets of figures is not to be explained entirely by the purifier's action. Differences in pressure, in temperature and character of the men's employment must all be taken into account. Still, the fact that the most favourable analysis of the air before purifying shows an increase of carbonic acid at the shield of 138 per cent., whilst the worst average of the air passed through the purifier gives an increase of 82 per cent., suggest that the experiments are being carried out on the right lines."

TANNERY REFUSE; CASE UNDER RIVERS POLLUTION ACT, 1876.

Imp. Inst. J., July 1901.

See under XIV., *page* 772.

XIX.—PAPER, PASTEBOARD, Etc.

PAPER MILLS IN INDIA.

Bd. of Trade J., July 4, 1901.

There are eight paper mills in operation in British India, three in the Bombay Presidency, four in Bengal, one at Lucknow. Of the eight, two are private concerns in the Bombay Presidency. The capital invested amounts to Rs. 70,22,000. Most of the white and blue foolscap, and much of the blotting paper, notepaper, and envelopes used in the Government offices is now obtained from the Indian mills. The total quantity of paper made in 1900 was about 46,000,000 lb., and its reported value Rs. 62,51,748. The mills employ 4,871 persons. The capital employed has been trebled during the last 20 years, and the production and number of persons employed have increased about sixfold.

Of the quantity produced in 1900, 36,413,715 lb., valued at Rs. 50,97,688 were produced by four mills in Bengal; 7,621,082 lb., valued at Rs. 8,50,180 by the single mill in operation in the North-west Provinces (at Lucknow); and the remaining 1,905,794 lb., valued at Rs. 3,03,880 by three mills in the Bombay Presidency.

XX.—FINE CHEMICALS, Etc.

LIST OF POISONS WITHIN THE MEANING OF THE PHARMACY ACT, 1868, AS PUBLISHED BY THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN.

PART I.

Not to be sold unless the purchaser is known to, or introduced by some person known to, the seller; also entry to be made in poison-book of (1) date of sale; (2) name and address of purchaser; (3) name and quantity of article; (4) purpose for which it is wanted—attested by signature; and must be labelled with (1) name of article; (2) the word "Poison"; (3) name and address of seller.

Arsenic and its preparations. (For special regulations, see "The Chemists' and Druggists' Diary.)

Aconite and its preparations.

Alkaloids.—All poisonous vegetable alkaloids and their salts.

Atropine, preparations of.

Cantharides.

Corrosive Sublimate.

Cyanide of Potassium and all metallic cyanides and their preparations.

Emetic, Tartar.

Ergot of Rye and its preparations.

Prussic Acid and its preparations.

Savin and its oil.

Strychnine and its preparations.

Vermin-killers, if preparations of poisons the preparations of which are in Part I. of this schedule.*

PART II.

Must be labelled with (1) name of article; (2) the word "Poison": (3) name and address of seller.

Almonds, Essential Oil of (unless deprived of prussic acid).

Belladonna and its preparations.

Cantharides, tincture and all vesicating liquid preparations of.

Carbolic Acid, liquid preparations of, and its homologues within the meaning of the Order of the Privy Council of July 26, 1900.†

Chloroform.

Chloral Hydrate and its preparations.

Corrosive Sublimate, preparations of.

Morphine, preparations of.

Nux Vomica and its preparations.

Opium and its preparations; and preparations of poppies.

Oxalic Acid.

Precipitate, White (ammoniated mercury).

Precipitate, Red (red oxide of mercury).

Vermin-killers (*see* Part I.). Compounds containing "poisons" prepared for the destruction of vermin, if not subject to the provisions of Part I., are in Part II.

LEMON AND BERGAMOT OILS; LAST YEAR'S PRODUCTION OF.

Schimmel's Report, May 1901, 24–33.

Bergamot Oil.—The yield of oil from last year's harvest has been very poor, about 75 per cent. less than that of the previous year. The oil is characterised by a low ester content, ranging from 34 to 35 per cent., and a correspondingly low sp. gr. which has been rarely found to exceed 0·880.

Lemon Oil.—Generally, the yield of oil from the fruits was exceptionally high last year, but the quality of the product has been markedly inferior to that of former harvests. So far is this the case, that the oil has only in a few districts reached the sp. gr. 0·858, which has been hitherto regarded as the minimum sp. gr. for pure lemon oil. The opt. rot. has been found to be correspondingly high. Among the oils examined from 28 districts the highest sp. gr. observed was only 0·8588, and the lowest fell to 0·8539. The lowest opt. rot. obtained was +57° 54′, whereas the highest was +66° 2′.—J. O. B.

ATTAR OF ROSES IN EASTERN ROUMELIA IN 1900.

Foreign Office Annual Series, No. 2642.

The rose harvest was excellent and abundant, yielding about 900,000 meticals, or 4,300 kilos. Prices varied from 27*l.* to 32*l.* per kilo. for the best qualities, while inferior oil fetched from 20*l.* to 22*l.* About 5,346 kilos. were exported, of which 1,171 went to the United Kingdom, 1,548 to France, 568 to Germany, 849 to the United States, and 886 to Constantinople. There can be no doubt, as the figures above quoted prove, that notwithstanding all regulations to the contrary, the introduction of geranium oil and palma rosa for purposes of adulteration is still carried on to a great extent, and this is the more to be regretted as the "synthetic attar of roses" now prod in Europe, although inferior to the pure natural oil, prove a serious rival to the adulterated article no largely exported. This ought in their own interest borne in mind by the Bulgarian rose distillers.

COCOA SHIPMENTS FROM MOLLENDO (PERU).

Foreign Office Annual Series, No. 2639.

In 1900 there were exported through Mollendo 61 lb. of cocoa leaves from Cuzco. The average price d the year has been about 16*s.* per drum of 25 Cuzco. The value of that shipped is approxin 19,500*l.* The shipments have gone principally to Ham but some hundreds of pounds have gone to New York 1899 the quantity shipped was 608,675 lb.; and in 617,100 lb.

CAMPHOR OIL.

Professor Shimoyama, Ph.D. Chem. and Drugg June 22, 1901.

Camphor is one of the chief export staples fro Japanese Empire, and during the first four months o year 1,435,000 yen* worth have been exported. Formosan Government estimates the annual product that island at 50,000 piculs of camphor and 20,000 of so-called original oil of camphor, the latter cont 50 per cent. of camphor. At present two Japanese chants in Kobe are engaged in redistilling camphor the original oil by arrangement with the Formosan G ment. In the course of redistillation two grades of r white oils are yielded. White oil, more popularly as camphor oil, finds its way throughout the interi is very widely used by the Japanese for disinfection red oil is exported to Europe and elsewhere to the ex from 7,500 piculs at the best to 3,500 piculs at th annually. This red oil of camphor is used in countries for the manufacture of safrol, which i widely used abroad in the soap and perfume industri is also used as a raw material for the manufacture of tropin, the price of which has been reduced from 5 per kilo. to something like 17 yen per kilo.

About 20 years ago, when no one knew how to red oil economically, and distillers used to throw i Mr. K. Goto, a merchant in Kobe, made a trial sh of it, in order to find a market, but without any su the time. In 1883, Mr. Peltman, of Messrs. Schi Co., Leipzig, Germany, invented a process for safrol out of it; thus red camphor oil found its Europe. In the first instance prices were abnorma foreign buyers paying only 3 yen per picul for it. then, owing to increased demand, it has advanced to six times the price; present export quotations are to 18 yen per picul.

When the author visited Formosa in February l for botanical research, by instruction of the University, he was asked by Dr. S. Goto, Chief Civil Affairs Bureau, to submit a report about the facture of safrol out of red oil of camphor. A report was submitted to the Formosan Governm November 1900. As a result, it was decided to m periments on a large scale at a cost of 50,000 yen, plant has been laid down in Kobe. The result i factory so far, but when the plant is completed than 500 catties of safrol can be made daily. Whe is manufactured out of red oil a blue-coloured obtained, which is estimated to amount to 1000 "ko a year. It is a powerful disinfectant.

CLOVE OIL FACTORY IN PEMBA (EAST AFRIC

Foreign Office Annual Series, No. 2653.

No one, hitherto, has thought fit to establish a p equipped factory for clove oil in this island. There be the saving of freight—which is extravagantly hi Zanzibar to the home ports—upon the dried cloves constitute such a bulky and incompressible cargo.

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* The "*Chemist and Druggist*" of June 29 remarks that the gazetted resolution says:—"Every compound containing any poison within the meaning of 'The Pharmacy Act, 1868,' when prepared or sold for the destruction of vermin," is a poison; but inclusion thereof in Part I. was not gazetted.

† The actual wording is "liquid preparations of carbolic acid and its homologues containing more than 3 per cent. of those substances except any preparation prepared for use as sheep-wash, or for any other purpose in connection with agriculture or horticulture, and contained in a closed vessel, distinctly labelled with the word 'Poisonous,' the name and address of the seller, and a notice of the agricultural or horticultural purpose for which the preparation has been prepared, ought to be deemed poisons within the meaning."

* 1 yen = 2*s.* 3*d.*

io, the cloves and clove stems being obtainable in the ıh state, would be in the best condition for yielding their besides which there would be available the fresh leaves, n which also oil can be extracted. Moreover, the cloves ld be purchased direct from the growers, with a saving ll the added charges of the middlemen. The requisite er for fuel is abundant throughout the island, and d readily be conveyed by sea to the refinery, which ıld be situated preferably near the shore. The estab- d bi monthly service of steamers between the two ds would afford facility for sending the oil to Zanzibar ranshipment to Europe. His Highness's Government ld, no doubt, were such a refinery established there, ect the State revenue by imposing an export duty on the quivalent to that which it now levies upon the cloves.

ıe manufacture of cocoanut oil should prove a re- erative undertaking, as is the case in Seychelles. ndance of nuts can be had in this island at a price ing from 22*s*. to 25*s*. per 1,000, and there exists plenty ıitable timber there for the manufacture of the necessary ls.

XXII.—EXPLOSIVES, MATCHES, Etc.

OHIBITION OF PHOSPHORUS (WHITE) MATCHES IN THE NETHERLANDS.

Bd. of Trade J., July 19, 1901.

e *Netherlands Official Gazette* of the 12th ult. con- a Ministerial Decree to the effect that by the Phos- s Matches Law of May 28 last it is prohibited :—

om the 1st July, 1901.—Wilfully to manufacture or to be manufactured phosphorus matches, as also to t phosphorus matches, except that the transit of horus matches is still allowed.

m the 1st January 1902.—To convey phosphorus es in larger quantities than 100 grms. at a time, as have phosphorus matches in stock for sale.

phosphorus matches the aforesaid Law means matches ch there is white phosphorus.

decree also declares that the wax matches imported he Netherlands are phosphorus matches; that phos- matches in that country are obtainable in the trade l both in round chip boxes and in the so-called slide ; and that phosphorus matches on being rubbed on on any more or less rough surface may be set alight, flaming up spread a distinct smell of garlic.

ranslation of the above Law may be seen on applica- the Commercial Intelligence Branch of the Board of 50, Parliament Street, London, S.W., any day n the hours of 10 a.m. and 5 p.m.

BOARD OF TRADE RETURNS.

SUMMARY OF IMPORTS.

Articles.	Month ending 30th June	
	1900.	1901.
	£	£
....	2,670,833	2,300,054
ıls and dyestuffs	416,879	476,668
....	980,251	856,876
aterials for non-textile in- es.	6,298,953	5,671,081
tal value of all imports	42,016,307	41,711,038

SUMMARY OF EXPORTS.

Articles.	Month ending 30th June	
	1900.	1901.
	£	£
other than machinery)	3,861,175	3,397,965
ls and medicines	738,998	697,658
ıeous articles	2,941,588	3,177,705
tal value of all exports....	24,895,335	22,444,424

IMPORTS OF METALS FOR MONTH ENDING 30TH JUNE.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Copper :—			£	£
Ore .... Tons	10,753	6,564	107,493	76,538
Regulus .... ,,	5,065	7,716	211,587	324,326
Unwrought ..... ,,	4,505	4,838	331,375	346,623
Lead, pig and sheet ,,	18,707	19,095	320,676	240,656
Pyrites .... ,,	39,438	52,050	66,322	87,899
Mercury .... Lb.	30,800	426,300	3,700	52,091
Silver ore....... Value £	..	..	137,170	95,652
Tin .... Cwt.	48,756	39,525	330,243	245,615
Zinc.............. Tons	5,144	4,889	108,721	84,612

IMPORTS OF CHEMICALS AND DYESTUFFS FOR MONTH ENDING 30TH JUNE.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Bleaching materials. Cwt.	28,210	22,703	15,773	8,028
Soda compounds... ,,		17,886		6,240
Borax, &c. .... ,,	12,094	12,592	6,451	7,212
Brimstone .... ,,	35,947	42,612	8,930	9,341
Nitrate of potash.. ,,	20,088	19,825	16,679	16,674
Chemicals, other. Value £	..	..	117,491	150,092
Cutch and gambier. Tons	1,661	926	35,534	20,754
Dyes :—				
Alizarin....... Value £	..	..	17,644	15,217
Aniline and other ,,	..	..	36,806	38,652
Indigo .... Cwt.	775	1,960	9,664	27,217
Bark.............. ,,	29,159	49,917	10,114	22,104
Valonia .... Tons	2,016	2,494	20,454	27,019

IMPORTS OF OILS FOR MONTH ENDING 30TH JUNE.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Cocoa-nut....... Cwt.	52,319	30,987	64,197	38,252
Olive............ Tuns	605	1,790	24,464	68,149
Palm .... Cwt.	84,325	130,521	102,696	145,730
Petroleum :—				
Illuminating.. Gall.	19,969,352	13,574,352	375,417	221,247
Lubricating... ,,	2,916,199	3,193.124	88,723	94,467
Seed............ Tons	2,892	3,586	76,511	94,521
Train, &c. ...... Tuns	1,995	1,683	40,213	35,116
Turpentine ..... Cwt.	79,954	61,340	149,899	80,936

IMPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 30TH JUNE.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Cement.......... Tons	9,139	18,274	20,262	30,945
China and earthenware. Cwt.	26,152	44,438	67,229	81,662
Drugs .... Value £	..	..	91,983	94,162
Glass :—				
Sheet .... Cwt.	91,349	105,679	51,699	59,637
Plate .... ,,	16,455	41,304	19,531	45,088
Flint .... ,,	45,907	48,831	83,453	90,524
Bottles .... Gross	123,960	131,414	51,897	58,497
Other.......... Cwt.	21,087	21,614	39,100	44,183
Glue, size, gelatin ,,	17,816	17,866	41,406	37,648
Leather, unmanufactured. ,,	118,540	114,935	760,960	707,772
Oil-seed cake .... Tons	31,747	29,847	191,819	184,499
Paints and pigments. Value £	..	..	102,133	119,340
Paper, pasteboard Cwt.	514,050	482,514	370,418	337,554
Scientific instruments. Value £	..	..	60,901	82,697
Soap and soap powder. Cwt.	15,035	17,579	18,503	19,628
Zinc manufactures. ,,	32,587	39,870	43,037	44,950

Imports of Raw Material for Non-Textile Industries for Month ending 30th June.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Bark, Peruvian ..	Cwt.	7,167	3,836	14,868	7,728
Caoutchouc	„	53,541	88,790	719,618	411,898
Gum :—					
Arabic	„	5,212	9,280	9,954	19,961
Lac, &c.	„	8,471	12,617	27,754	38,384
Gutta-percha	„	11,279	5,801	148,663	85,017
Hides, raw :—					
Dry.............	„	99,362	30,155	252,568	83,882
Wet	„	54,115	61,540	124,500	147,889
Ivory	„	1,938	1,157	45,250	40,439
Manure :—					
Guano	Tons	6,126	3,004	25,286	14,296
Bones..........	„	4,960	5,285	23,408	20,578
Paraffin..........	Cwt.	61,550	45,743	..	..
Linen rags	Tons	1,443	1,449	15,869	13,910
Esparto	„	15,458	19,604	59,835	80,478
Pulp of wood.....	„	41,071	38,634	254,916	209,715
Rosin............	Cwt.	186,965	175,148	51,672	40,594
Tallow and stearin	„	263,524	217,807	339,757	278,068
Skins :—					
Goat	No.	1,266,957	2,184,066	120,233	191,635
Sheep...........	„	1,932,631	1,151,044	177,408	109,898
Nitrate of soda...	Tons	16,600	5,694	125,989	49,366
Phosphate of lime	„	26,091	26,613	38,633	37,382

Exports of Miscellaneous Articles for Month ending 30th June.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Gunpowder.....	Lb.	313,700	Cwt.4,896	5,687	15,120
Candles.........	„	2,070,500	2,007,100	36,544	36,281
Caoutchouc.....	Value £	..	..	107,955	86,163
Cement.........	Tons	35,137	31,253	63,742	59,634
Products of coal.	Value £	..	..	142,947	90,885
Earthenware ...	„	..	..	118,160	157,327
Stoneware	„	..	..	17,300	17,174
Glass :—					
Plate	Sq. Ft.	228,856	Cwt.6,045	13,774	10,850
Flint	Cwt.	8,001	7,906	19,338	19,172
Bottles	„	78,982	76,245	38,198	39,094
Other kinds ...	„	19,622	23,283	20,448	24,900
Leather :—					
Unwrought	„	9,719	10,851	105,289	114,238
Wrought......	Value £	..	..	33,032	36,902
Seed oil	Tons	3,711	3,216	102,492	91,916
Floorcloth.......	Sq. Yds.	2,241,000	2,228,900	105,304	102,753
Painters' materials	Val. £	..	..	169,821	183,801
Paper..............	Cwt.	96,541	89,465	149,393	142,465
Rags..............	Tons	5,439	5,980	30,608	36,295
Soap	Cwt.	81,605	95,553	86,920	99,166

Exports of Drugs and Chemicals for Month ending 30th June.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Alkali	Cwt.	285,641	..*	92,281	..*
Bleaching materials	„	77,439	61,749	23,604	20,633
Copper sulphate ..	Tons	3,596	2,566	85,484	58,265
Chemical manures	„	26,227	31,524	172,195	195,521
Medicines.......	Value £	..	..	108,337	114,576
*Soda compounds :—					
Ash.............	Cwt.	..	*81,967	..	*19,347
Caustic	„	..	92,943	..	47,872
Bicarbonate	„	..	28,420	..	9,909
Crystals	„	..	18,005	..	3,333
Sulphate........	„	..	31,391	..	2,370
Other sorts	„	..	27,289	..	10,162

Exports of Metals (other than Machinery) for Month ending 30th June.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Brass............	Cwt.	9,665	9,659	51,055	49,1
Copper	„	43,926	68,512	173,171	260,1
Lead.............	Tons	3,751	4,368	68,901	61,7
Plated wares...	Value £	..	..	34,327	36,8
Tin	Cwt.	10,815	8,741	74,793	50,2
Zinc	„	13,194	15,022	14,764	14,4

Monthly Patent List.

* The dates given are the dates of the Official Journals which acceptances of the Complete Specifications are adverti Complete Specifications thus advertised as accepted are open inspection at the Patent Office immediately, and to opposit within two months of the said dates.

I.—PLANT, APPARATUS, and MACHINERY.

Applications.

12,311. P. Naef. Improvements relating to the treatm of materials with gases, such as for gas making, c making, smelting or calcining, glass making or steel maki Filed June 17. Date applied for Nov. 17, 1900, being d of application in United States.

12,411. C. B. Burdon.—From A. Frey, France. I provements in the method of working and in the constr tion of metallurgical and other furnaces, gas producers, the like. June 18.

12,425. M. Sommer. Improvements in refrigerati June 18.

12,447. A. Holland. Improvements relating to cen fugal apparatus. June 18.

12,507. W. Reeves. Improvements in connection thermometers for the use of brewers and others. June

12,586. A. B. Soar. Improvements in filtering appara June 20.

12,601. J. T. Shadforth. An improved furnace for in fusing, melting, or otherwise treating metals, minerals other substances where high temperatures are requi June 20.

12,684. P. M. Justice.—From The Brunswick Refr rator Company, United States. Improvements in c pressors for air and gases. Complete Specificat June 21.

12,693. E. Theisen. Improved means of causing g or vapours to move in contact with liquids, but in an opp direction. June 21.

12,797. T. Larkio. An improved kiln or apparatus drying malt, hops, and the like. June 24.

12,837. C. Crastin. Improvements in or connected apparatus for carburetting. June 24.

12,932. E. S. Beaven. Improvements relating to furn of malt and other kilns and drying apparatus. June 25

13,125. C. R. Littler. New or improved means of r lating the supply of air to the combustion chambe furnaces. June 27.

13,194. C. F. Zeller. Improvements in the proces and in contrivances for evaporating and drying var materials and substances. June 28.

13,588. E. G. Scott. Improvements in the treatme liquids for the crystallisation or deposition of substa therein. July 3.

13,694. O. Guttmann. *See* Class VII.

14,110. W. P. Miles. An improved method of a matically regulating the flow of liquids, gases, electri chemicals, and powders. July 11.

,276. W. Hampson. Improvements in methods of and aratus for refrigeration. July 12.

,327. S. Douglas and G. Conroy. Improvements in relating to cooling or refrigerating apparatus. July 13.

Complete Specifications Accepted.*

1900.

,042. L. Allen. Apparatus for expanding and comsing gases and vapours for use in refrigeration, &c 10.

,050. B. Talbot. Open-hearth melting or other ces. July 3.

,650. H. H. Lake.—From C. H. Fish, United States. aratus for drying continuous webs of fabric, paper, and materials. June 26.

052. M. Euuson. Liquid fuel furnaces and muffle . July 17.

455. H. B. Kershaw. Apparatus for heating, cooling, ndensing liquids or gases. July 17.

727. B. R. Harrington. Furnaces. July 3.

052. J. M. Gibson and The Buckley Brick and Tile Packing material for Gay-Lussac, Glover, and the s. July 17.

1901.

. J. Ingram. Apparatus for charging retorts. July 17.

4 F. Kaeferle. Pressure-reducing apparatus. June 26.

5. F. Kaeferle. Syphon pipes for pressure-reducing atus. July 17.

5. Davey, Paxman, and Co., and T. S. King. Supers. July 10.

32. E. Snowden. Steel or iron stills for gas works, rks, &c. June 26.

29. H. H. Lake.—From N. B. Powter, United States. ting apparatus. July 10.

II.—FUEL, GAS, AND LIGHT.

Applications.

92. W. Newbigging and E. A. Franks. Improvein the construction and fastening of the lids or covers purifiers. June 17.

93. W. Newbigging and E. A. Franks. Improven the construction of gas purifiers and the connections . June 17.

7. O. Imray.—From La Société Anonyme pour la tion et l'Emploi de la Vapeur Surchauffée, France. roved construction of gas producer. June 17.

3. G. Buhlmann. A new and useful process of turing incandescent mantles. June 18.

0. G. Kerr, jun. An improved acetylene gas or. June 19.

2. H. S. Smith-Rewse and T. Coates. Improven or connected with gas purifiers and the like. .

2. F. Appleyard. Improvements in or appertaining ndescent gas burners, and chimneys for same. .

. P. R. van der Made. A process and apparatus retting air with carburetted hydrogen. Complete tion. June 24.

. W. R. Herring. Improvements in or relating to lucers for the production of fuel and other gases.

. J. B. Smith and G. P. Wincott. Improvements nected with gas producers. June 25.

. W. J. McClurg. Improvements in and relating nerators. Complete Specification. June 25.

. C. L. J. Trocquenet. Improvements in incan gas burners. Complete Specification. June 25.

. L. L. Merrifield and E. J. Checkley. Improvemachines for producing gas from peat, sawdust, organic substances. June 25.

L. L. Merrifield and E. J. Checkley. An imethod of producing gas from peat and other bstances. June 25.

12,972. L. Fischer de Blanitza and J. Herard. Improvements in and connected with apparatus for the manufacture of gas. June 25.

13,148. J. F. Hoyne. Improvements relating to the production of ozone. June 27.

13,191. J. Chamberlain. Improvements in methods of obtaining light from gases of low calorific value. June 28.

13,197. A. P. Compin. Improvements in and apparatus for automatically incinerating incandescent light mantles. June 28.

13,302. P. Naef. Improvements relating to the treatment of gases. Filed June 29. Date applied for Nov. 30, 1900, being date of application in United States.

13,450. S. N. Yeadon and W. D. Mason. Improvements in apparatus for revivifying gas lime. July 2.

13,460. W. Mackean and E. Walker. Improvements in apparatus for burning and seasoning incandescence mantles. July 2.

13,630. V. T. Taylor. Improvements in or connected with vapour incandescent lighting apparatus. July 4.

13,653. H. W. Smith, W. T. Gidden, A. G. Salamon, and G. S. Albright. The treatment of coal gas for the manufacture of sulphocyanides. July 4.

13,675. J. Greenwood and J. Greenwood, jun. Improvements in fuel, and the manufacture thereof. Complete Specification. July 5.

13,690. P. Gilgan. An automatic acetylene gas generator. July 5.

13,746. C. Whitfield. Improvements in and relating to the manufacture of combustible gas from soft or bituminous fuel. July 5.

13,788. J. E. Prégardien. Improvements in apparatus for purifying gas. Complete Specification. July 6.

13,837. S. Solomons. An improvement in incandescent and other lighting. July 8.

13,852. Lockerbie and Wilkinson, Ltd., and J. C. Brand. Improvements in acetylene generators. July 8.

13,913. E. Eaton. "Coalette," an improved artificial fuel. July 9.

13,918. W. S. Clapham. Improved apparatus for use in the purification of coal, oil, and like gases. July 9.

13,983. C. Whitfield. Improvements in and relating to apparatus for the generation, purification, and storage of combustible gas. July 9.

14,091. C. Pataky. Improvements relating to acetylene generators. July 10.

14,100. M. Taylor. Improvements in gas producers. Complete Specification. July 10.

14,164. J. S. G. Kay, W. Higgins, and A. M. Posener. Improvements in the production of combustible vapours for lighting and heating. July 11.

14,183. M. Taylor. Improvements in gas producers. Complete Specification. July 11.

14,184. H. E. Baker. Improvements in or connected with generators for gases such as acetylene. July 11.

Complete Specifications Accepted.

1900.

12,993. E. W. Sprott. Acetylene generators. July 17.

14,845. S. N. Yeadon and W. D. Mason. Apparatus for revivifying gas lime and analogous materials. June 26.

15,030. A. G. Bloxam.—From Phlox-Glühlicht Gesellschaft mit Beschränkter, Germany. Manufacture of incandescent gas mantles. July 10.

15,045. W. R. Clay and C. F. Ennis. Incandescent gas burners. July 17.

15,813. P. Lazareff. Generator for the manufacture of combustible gases from hydrocarbon liquids. July 17.

16,104. C. J. Whittaker. Utilising for preparation of fuel blocks or briquettes the sludge and scum produced during treatment of sewage by bacterial or biological processes. July 17.

18,321. R. Nicholls. Improvements in gas-lighting. July 3.

22,088. C. Gluth. Incandescence gas burners. July 3.

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* *See* note (*) on previous page.

23,222. W. P. Thompson.—From S. Zielenziger, Germany. Incandescence gas-lamps. July 17.

1901.

7234. S. G. Watson. Generators for acetylene and other gases. July 10.

8372. H. J. Haddan.—From The Adams and Westlake Co., United States. Acetylene generators. July 10.

8817. A. J. Boult.—From Société Lumière Boule, Belgium. High-pressure incandescent gas-lighting plant. June 26.

8905. L. T. D'Altoff. Manufacture of gas. June 26.

10,725. W. L. Wise.—From R. Klinger, Austria. Acetylene gas generators. July 3.

11,218. F. C. von Heydebrand und der Lasa. Artificial fuel. July 10.

11,466. G. F. Jaubert. Preparation of oxygen gas. July 17.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Complete Specification Accepted.

1901.

9259. R. Fallnicht. Production of solidified naphtha July 10.

IV.—COLOURING MATTERS and DYESTUFFS.

Applications.

12,325. G. W. Johnson.—From C. F. Boehringer und Soehne, Germany. The manufacture and production of new derivatives of camphoric acid. June 17.

12,326. G. W. Johnson.—From Kalle and Co., Germany. Improvements in the manufacture of mono-alphyl-alpha (1)-naphthylamine alpha (4) sulphonic acids. June 17.

12,578. T. R. Shillito.—From The Aniline Colour and Extract Works, formerly J. R. Geigy, Switzerland. New sulpho acids and sulphur dyestuffs. June 20.

12,591. C. D. Abel.—From The Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of a mordant-dyeing colouring matter. June 20.

12,861. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture of a sulphur compound. June 24.

12,985. G. W. Johnson.—From C. F. Boehringer und Soehne, Germany. The manufacture and production of diacetyl-diamido-uracil. Complete Specification. June 25.

13,059. G. W. Johnson.—From The Deutsche Gold und Silber Scheide-Anstalt vormals Rössler, Germany. Improvements in the production of indoxyl derivatives from aromatic glycocolls, their homologues and their substitution products. June 26.

13,205. O. Imray.—From A. Liebrecht, Germany. Manufacture of new derivatives of isovaleramide. June 28.

13,377. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of colouring matters directly dyeing cotton. July 1.

13,378. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Improved manufacture of reduced indigo. July 1.

13,619. I. Levinstein, C. Mensching, and Levinstein, Ltd. The manufacture of new azo colouring matters. July 4.

13,863. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of mordant-dyeing mono-azo dyestuffs. July 8.

14,081. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of a blue dyestuff from para-amido-para-oxydiphenylamine. July 10.

14,129. I. Levinstein, H. Levinstein, and Levinstein, Ltd. Manufacture of a new blue colouring matter directly dyeing cotton. July 11.

14,130. I. Levinstein, H. Levinstein, and Levinstein, Ltd. Manufacture of new colouring matters containing sulphur. July 11.

Complete Specifications Accepted.

1900.

14,220. R. B. Ransford.—From L. Cassella and Germany. Production of dyestuffs. July 3.

14,725. H. H. Lake.—From K. Oehler, Germany. Ma facture of diazo colouring matters. July 3.

14,830. J. Y. Johnson.—From The Badische Anilin Soda Fabrik, Germany. July 3.

15,598. T. Ewan and J. Peleger. Manufacture of alk amides. July 3.

16,247. R. B. Ransford.—From Cassella and Co., many. Manufacture of dyestuffs. July 17.

16,565. B. Willcox.—From The Badische Anilin Soda Fabrik, Germany. Manufacture of acetyl-ph glycocoll-ortho-carboxylic acid. July 10.

23,858. H. J. Haddan.—From A. S. Ramage, U States. Obtaining colour substance from ferrous liq July 17.

23,859. H. J. Haddan.—From A. S. Ramage. *See* VII.

1901.

5168. O. Imray.—From The Society of Che Industry, Basle. Manufacture of indophenol-thiosu nates from sulphurised indophenol, and of correspo sulphurised compounds. June 26.

10,277. H. H. Lake.—From K. Oehler, Ger Manufacture of disazo colouring matters. July 3.

10,833. W. P. Thompson.—From Chemische F Opladen vormals Gebr. Flick Gesellschaft mit Beschrä Haftung, Germany. Reduction of indigo. July 10.

V.—TEXTILES: COTTON, WOOL, SILK, Et

Applications.

12,319. I. Bronn. An improvement in the trea of textile and other fibrous materials of animal origin, as wool, hair, silk, feathers, leather, and the like, a animalised fibrous materials of vegetable origin. Jun

13,297. W. Martin. Improved methods and proces treating fibrous material. June 29.

14,106. H. J. Haddan.—From G. Dutilleul, Franc new or improved process for rendering fabrics and products impermeable. July 10.

Complete Specification Accepted.

1900.

17,764. C. D. Abel.—From Délainage Verviétois and Co., Belgium. Removing fat from wool, and app therefor. June 26.

VI.—DYEING, CALICO PRINTING, PAPE STAINING, and BLEACHING.

Applications.

14,327. J. Y. Johnson.—From The Badische Ani Soda Fabrik, Germany. Improvements in dyein shades. June 17.

12,540. R. B. Ransford.—From L. Cassella a Germany. Improvements in reserve printing on fab be dyed with sulphur colours. June 19.

13,375. O. Imray.—From The Firm of C. Roe Cie., Germany. Apparatus for bleaching, dyeing, w and otherwise treating fibres, filaments, and woven by means of circulating liquids. July 1.

Complete Specifications Accepted.

1900.

15,639. F. Kornfeld. Alizarine dyeing pr July 10.

16,312. F. Gebauer. Means for bleaching sliver card ends, and similar textile products; also loos &c. July 17.

20,140. R. F. Schüle. Boiling and dyeing ya apparatus therefor. June 26.

VII.—ACIDS, ALKALIS, AND SALTS.

APPLICATIONS.

12,510. O. Imray.—From The Farbwerke vormals ister, Lucius und Brüning, Germany. Manufacture of ydrosulphite. June 19.

12,729. E. Knecht. Process for the production of hydrophites. June 22.

12,781. J. Y. Johnson.—From The Badische Anilin und la Fabrik, Germany. Improvements in the manufacture sulphuric acid by the contact process. June 22.

3,001. C. J. Haines. Lime from by-products. June 26.

3,221. J. T. Ainslie Walker and J. T. Steele. Improve- nts relating to the manufacture of caustic soda and to the tment of lime sludge produced in such manufacture. e 28.

3,293. E. C. Rossiter and G. S. Albright. Improve- its in the manufacture of cyanides of the alkalies. e 29.

3,384. E. G. Scott. Improvements in the absorption ulphuretted hydrogen evolved in the manufacture of hate of ammonia and coal gas, and in other chemical cesses. July 1.

3,403. C. N. Waite. Improvements in the manufacture roduction of purified lactic acid from crude solutions taining lactic acid. Complete Specification. July 1.

3,694. O. Guttmann. Improvements in condensing ratus used in the manufacture of nitric acid and for r purposes. Complete Specification. July 5.

3,733. A. E. Urbain. Improved manufacture of carbon chloride. July 5.

3,973. W. Noad and W. Owen. Improvements in the inment of lead sulphur compounds. July 9.

,062. F. H. Gossage. Improvements in the manufac- of common salt (sodium chloride) from brine *in vacuo.* 10.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

,815. G. J. Atkins. Manufacture of chlorine. July 17.

,573. C. M. Hall. Manufacture of alumina. July 3.

,282. G. J. Atkins. Manufacture of chlorine. June 26

,589. G. Weddell. Manufacture of table salt. July 10.

,371. L. Wenghöffer. Manufacture of picric acid. 17.

,376. J. L. Kessler. Apparatus for concentration of uric acid. July 3.

,482. G. Craig and R. M. Paterson. Apparatus for ment of alkaline cyanides from crude materials. 10.

488. C. Reim. Production of a dry alkaline silicate. 26.

859. H. J. Haddan.—From A. S. Ramage, United s. Obtaining ferro-ferric oxide. June 26.

1901.

1. G. J. Atkins. Manufacture of chlorine, and nent of metallic ores thereby. June 26.

S. A. Gutensohn. Production of picric acid. July 3.

VIII.—GLASS, POTTERY, AND ENAMELS.

APPLICATIONS.

589. L. A. Garchey. Improvements in and relating manufacture of glass stone. June 20.

033. J. M. Garrison. Improvements in glass separa Complete Specification. June 25.

08. T. Haviland. Improvements in apparatus for ing designs in powdered color for use in ceramic tion. July 10.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

65. G. Cooke. Electro-deposition of metals upon s of china, earthenware, &c. June 26.

16,233. A. Metz. Manufacture of tiles, slabs, &c. for paving road and other surfaces; and employment thereof. July 17.

1901.

12,017. L. Stein and W. Storr. Uniting pieces of glass, &c., for mosaic work. July 17.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

APPLICATIONS.

13,136. E. Helbing. A new or improved method for producing artificial wood. Complete Specification. June 27.

13,151. W. L. H. Roberts. An improved continuous cement and lime kiln. June 27.

13,289. C. Le Tourneur-Hugon and F. J. de la Passardière. Improvements in the manufacture and production of artificial stones or bricks. June 29.

13,328. W. Bügler. Improvements in the manufacture of flat and curved artificial slabs. July 1.

13,413. F. Kilby. Improved kiln for burning cement, lime, plaster, bricks, and the like. July 2.

13,452. C. Knott Graham. Improvements in the manufacture of artificial stone. July 2.

13,638. W. Knowles. Improvements in or in the manufacture of bricks, flags, blocks, mouldings, concrete, and the like. July 4.

13,793. H. Passow. Improvements in the process for producing cement. July 6.

13,965. O. G. Blunden. New or improved process for making an artificial substitute for wood. July 9.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

13,896. A. H. Crozier. Manufacture of artificial stone blocks, bricks, &c. June 26.

14,778. A. H. Crozier. Manufacture of artificial stone. June 26.

15,352. T. Rouse. Manufacture of articles composed of concrete, to be used for building, paving, &c. July 3.

1901.

4202. F. Marx. Manufacture of artificial stone. June 26.

8691. F. Boenke. Fireproof artificial stone blocks or tiles for building purposes. July 10.

9376. J. Cozerwnk. Manufacture of imitation marble. June 26.

10,297. C. von Forell. Manufacture of Portland cement. June 26.

X.—METALLURGY.

APPLICATIONS.

12,291. F. J. C. Jones. Adding carbon to metals. June 17.

12,308. J. P. van der Ploeg. Improved method of extracting antimony from ores or residues. June 17.

12,349. E. Ferraris. Improved treatment of mixed ore for the separation of metals, such as lead, zinc, copper, iron, silver, and gold. Complete Specification. June 17.

12,601. J. T. Shadforth. *See* Class I.

12,686. J. Baxeres de Alzugaray. Improvements in or relating to the extraction of metals from their ores and other metal-containing compounds. June 21.

12,831. T. V. Allis. Improvement in metal heating furnaces. Complete Specification. June 24.

12,886. H. Louis. An improved method of treating ores, such as sulphides of zinc, zinc and lead, and the like. June 25.

12,950. G. J. Snelus. Improvements relating to the manufacture of iron and steel. June 25.

13,042. A. F. Cothias. An improved crucible for moulding under pressure alloys and fusible metals of all kinds. Complete Specification. June 26.

13,061. H. Kleinert. Improvements in annealing furnaces. June 26.

13,073. J. Shanks. An improved furnace for melting metal in crucibles or pots. June 27.

13,167. J. G. Forbes. A furnace for smelting scrap or other metals, for reducing metals from their ores into a condition of practical purity, and for casting metals into a malleable state. June 28.

13,171. T. Twynam. Improvements in the utilisation of blast-furnace slag. June 28.

13,227. W. Heyes. Improvements in kilns or furnaces for roasting or calcining pyrites and other ores. June 28.

13,361. C. E. Steinweg. Process of manufacturing hollow bodies from easily fusible metals and metal compounds. Complete Specification. July 1.

13,365. C. E. Steinweg. Process for separating the matrices from galvanoplastically precipitated metals. Complete Specification. July 1.

13,379. G. Taddei. Improved process for obtaining aluminium and other metals. July 1.

13,607. H. Penn. An aluminium solder. July 4.

13,705. J. H. Michelsen. Improvements in ore concentrators. Complete Specification. Filed July 5. Date applied for Dec. 6, 1900, being date of application in United States.

13,855. R. Wilcox. Improvement in mining machinery for the concentration of gold and other metals and minerals from pulverised ore and mineral sands. July 8.

13,862. W. Oswald. Manufacture of hearths with blast channels for metallurgical furnaces. July 8.

13,864. A. G. Bloxam.—From La Compagnie des Forges de Chatillon, Commentry et Neuves Maisons and Charpy, France. Improved manufacture of armour plates. July 8.

13,867. M. Ruthenburg. Improvements in methods of and apparatus for agglomerating comminuted ores and concentrates. July 8.

14,046. H. V. Bertrand. Improvements in the method of coating iron with tin, lead, spelter, or the like metals. July 10.

14,146. A. J. Boult.—From Cöln-Müsener Bergwerks-aktien-Verein, Germany. Improvements in or relating to the melting or fusing of metal. July 11.

14,256. La Societa Italiana di Electrochimica "volta." Improvements relating to the treatment of mineral substances. Complete Specification. July 12. Date applied for Jan. 7, 1901, being date of application in Italy.

14,266. J. S. Wolfe, L. K. Englert, and T. J. Geiger. Composite metal. Complete Specification. July 12.

14,306. P. Garuti and R. Pompili. New process of soldering with oxy-hydrogen gas. Complete Specification. July 13.

Complete Specifications Accepted.

1900.

6590. G. B. Hammond and T. Kendrik. Manufacture of tin, terne, and like plates, and apparatus therefor. July 17.

9346. W. J. Foster. Introducing carbon and fluxes, and mixtures of carbon and fluxes into blast furnaces, and in manufacture of iron and steel. June 26.

11,603. E. Martin. Manufacture of sheets or plates of steel or iron, covered on one or both surfaces with a fixed proportion of copper. July 3.

14,303. B. Talbot. Preparing bricks and blocks for lining metallurgical furnaces. July 17.

14,983. T. Twynam. Treatment of zinc-lead sulphide ores and tailings. June 26.

15,171. E. Murmann. Manufacture of an improved alloy. July 3.

16,535. O. Imray.—From the firm of Wolf, Netter, and Jacobi, Germany. Furnaces for annealing metal sheets and plates. July 3.

19,248. J. Meikle. Furnaces for oxidising iron and steel surfaces. July 17.

1901.

5661. G. J. Atkins. *See* Class VII.

9503. J. C. Clancy and L. W. Marsland. Extractio gold, silver, lead, and other metals from sulphide July 17.

9676. The British Aluminium Co.—From A. H. Co United States. Electric smelting process and apparatu be used therein. July 10.

9903. The British Aluminium Co.—From A. H. Co United States. Obtaining volatile elements from ores and compounds. July 3.

10,983. E. D. Wassell. Manufacture of wrought i July 10.

11,687. O. Schramm. Improved process for harde iron. July 17.

11,763. R. Hutchinson and H. Mitchell. Compos for hardening and toughening steel and cast iron. Jul

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

Applications.

12,514. J. C. Fuller and G. Fuller. Improvements connected with storage or secondary batteries. June

12,954. W. Peto.—From P. Gouin, France. Imp ments in electrical secondary or storage batterie accumulators. Complete Specification. June 25.

12,974. A. F. Madden. Apparatus for making secon battery plates. Complete Specification. Filed Jun Date applied for March 19, 1901, being date of applic in United States.

12,975. A F. Madden. Secondary batteries. Com Specification. Filed June 25. Date applied for Marc 1901, being date of application in United States.

13,048. A. Tribelhorn. Improvements in electrode accumulators. Complete Specification. June 26.

13,078. G. J. Gibbs. Improvements in electric acc lators. June 27.

13,187. J. Baxeres de Alzugaray. Improvemen solutions to work electric and galvanic batteries. Ju

13,300. A. Nodon. Improvements relating to the facture of electrode plates of secondary electric batt Complete Specification. Filed June 29. Date applie Dec. 1, 1900, being date of application in France.

13,568. D. Tommasi. Improvements in plates for tric accumulators. Filed July 3. Date applied for Ja 1901, being date of application in France.

13,640. J. Buffaud and A. Tavian. Improveme secondary batteries. July 4.

13,662. J. Raschen and The United Alkali Com Ltd. Improvements in electrolytic cells. July 4.

13,981. H. K. P. Barham. Improvements in or re to electrical storage batteries. Complete Specific July 9.

14,034. P. J. Davies. Improvements in leaden plate bars, or connecting rods or lugs, for secondary batteri accumulators, and the moulds and tools connected ther July 10.

14,086. R. J. Gülcher. Improvements in the constr of electrodes for accumulator batteries, and in m therefor. Complete Specification. July 10.

14,165. E. Pohl. Improvements in or relating t manufacture of carbon electrodes and of coke. July

Complete Specifications Accepted.

1900.

13,656. R. W. James.—From J. J. Heilmann. trodes for accumulators, and manufacture thereof. J

15,019. R. H. Gould. Recovery of tin and simulta generation of electric energy. June 26.

15,173. A. J. Boult.—From E. Andreas, Ger Forming of electrodes. July 3.

16,534. F. W. Bühne. Manufacture of porous plates for electric accumulators. July 17.

1901.

5017. G. Heidel. Batteries. July 17.

5596. G. J. Atkins. Electrolysis of chlorides of metals the alkalies and alkaline earths for obtaining chlorine, d apparatus therefor. June 25.

8598. G. F. W. Kloth, O. H. G. Bünning and J. G. L. D. mhardt. Secondary batteries. July 3.

10,159. V. G. Apple. Storage batteries. July 17.

10,975. P. M. Justice.—From Castner Electrolytic Alkali . Electrodes for electrolytic cells. July 10.

10,976. P. M. Justice.—From Castner Electrolytic Alkali ., United States. Electrolytic cells. July 17.

XII.—FATS, OILS, AND SOAP.

APPLICATIONS.

3,019. G. Bamberg. Improvements in detergents and ir manufacture. June 26.

3,831. C. Weygang. Improvements in the the treatment oils and fats for soap making and for other purposes. y 8.

3,846. W. R. Harrison. Improvements in or in contion with the extraction of oil from seeds, oleaginous stances, or the like. July 8.

3,964. W. F. Warden. Improvements in oil filters. C aplete Specification. Filed 9 July. Date applied for Dec. 1900, being date of application in United States.

1,085. H. Sefton-Jones.—From Siegfried Feder and an de Bücken, Germany. Apparatus for making carpet ning soap. Complete Specification. July 10.

1,329. E. Douillet. Process and apparatus for refining and fatty matters. Complete Specification. July 13.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

2,268. M. L. A. Guilbert. Manufacture of resinous . July 10.

.986. W. J. Ward. Manufacture of waterproof paper; mineral oil, grease, soap, &c. July 10.

1901.

69. A. J. Boolt.—From C. Wacker, United States. A ratus for extracting oil from fish, &c. July 3.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, ETC.

APPLICATIONS.

671. M. Zingler. An improved method of treating ed or other rubber. July 5.

974. T. H. L. Bake and W. Owen. Improvements in btainment of oxidised lead compounds. July 9.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

844. H. R. A. Philp. Preservative preparation for natic tyres. July 17.

1901.

9. A. O. Bourn. Improvements in the art of ising. July 17.

238. E. Edwards.—From Oxylin Werke Actienschaft, Germany. Rubber-coated materials, and preon and treatment of same. July 10.

7.—TANNING, LEATHER, GLUE, AND SIZE.

APPLICATIONS.

1 32. E. Maertens. Improvements in the art of tannd tawing hides, skins, and similar animal tissue. 7.

1 72. P. Bez and E. Bez. Improvements relating to g hides and skins. Complete Specification. June 18.

1 39 F. L. Demantké and L. Salentey. Improvein apparatus for use in tanning, tawing, and like oc es. June 19.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

14,625. A. Edwards and E. M. Nelson. Drying gelatine and other surfaces. July 17.

1901.

10,152. C. A. Allison.—From The Scott Leather Machine Co., United States. Apparatus for treating and colouring hides and skins. July 17.

XV.—MANURES, ETC.

COMPLETE SPECIFICATION ACCEPTED.

1901.

9773. J. Carstairs. Production of fish guano. June 26.

XVI.—SUGAR, STARCH, AND GUM, ETC.

APPLICATIONS.

12,588. A. Classen. Process for converting wood and other cellulose material into sugar. Complete Specification. June 20.

13,000. R. C. Thomson.—From R. Hamilton and W. B. Wilson, Straits Settlements. Improvements in and relating to the utilisation of the heat from waste gases of boiler furnaces for the concentration and evaporation of sugar juice or other liquids. June 26.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

13,659. H. Wulkan and H. Straetz. Obtaining dry starch or starch syrup or sugar and albumen from maize, wheat, rice, and other fruits. July 3.

1901.

10,461. J. Y. Johnson.—From The Cereal Sugar Co., United States. Refining Sugar, and apparatus therefor. July 3.

XVII.—BREWING, WINES, SPIRITS, ETC.

APPLICATIONS.

12,314. J. Schaefer. Improvements in steam boiling apparatus for brewing purposes. Complete Specification. June 17.

12,628. M. A. E. Hervieu and E. V. F. L. Giron. A new or improved liqueur. June 20.

12,697. A. G. Bloxam.—From Gebrüder Sulzer-Winterthur. Improved manufacture of non-alcoholic beer. Complete Specification. June 21.

12,906. C. A. Allison.—From O. Selg, J. Bohnet, and C. F. Guntrum, United States. Improvements in means for converting wort into beer and other fermented liquids. Complete Specification. June 25.

12,932. E. S. Beaven. *See* Class I.

13,080. J. McKenny. A process for hastening the maturing of whisky and other spirituous liquors. June 27.

13,561. A. R. Ling and J. L. Baker. Improvements in the production of brewers' wort. July 3.

13,751. S. Young. A new method of preparing absolute alcohol from strong spirit. July 6.

14,041. D. A. Blair, J. B. Blair, and F. Wertenbruch. Improvements in and relating to the evaporation or treatment of distillery spent wash or "pot ale" and the like. July 10.

14,104. R. C. Scott. Improvements in treating or ageing spirit. July 10.

14,337. W. T. Forbes. Improvements in the treatment of spirits for eliminating fusel oil. July 13.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

14,876. J. F. H. Gronwald. *See* Class XX. July 26.

1901.

10,287. C. F. von Schlichtegroll. Rectifying spirit by the action of refrigeration and filtration. June 26.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

Applications.

A.—Foods.

13,097. M. Elb. An improved process of preparing an alimentary yeast extract. June 27.

13,783. E. H. Posen. Milk sugar. July 6.

B.—Sanitation. Water Purification.

12,477. H. Guthrie. Improvements in furnaces for burning refuse, and in the utilisation of the bye products thereof. June 19.

12,840. J. Bermond.—Improvements in sterilising apparatus. Complete Specification. Filed June 24. Date applied for May 6, 1900, being date of application in France

13,135. W. P. Thompson.—From Maschinenbau-Aktiengesellschaft vormals Beck and Henkel, Germaoy. An improved process for obtaining fatty and fertilising substances from fecal substances. June 27.

13,736. G. Watson. Improvements relating to furnaces for the destruction of town refuse. July 5.

C.—Disinfectants.

13,003. C. S. Drayton. "Insectine." June 26.

Complete Specifications Accepted.

A.—Foods.

1900.

12,807. H. J. Haddon.—From E. Passburg, Germany. Treating milk for the purpose of solidifying and preserving same. July 3.

15,589. G. Weddell. *See* Class VII. July 10.

16,708. H. Brat. Preparation of food from gelatine. July 10.

16,734. L. Wenghoffer. Treatment of gluten or glutinous by-products with other albumins. July 10.

1901.

6417. E. von Bühler and A. Bernstein. Manufacture of butter and other alimentary fats. July 10.

9215. H. Marquardt. Preserving milk, cream, &c. and apparatus for use therein. July 17.

B.—Sanitation; Water Purification.

1900.

12,124. F. M. Spence, D. D. Spence, H. Spence and M. Royley. Treatment of sewage sludge and similar matters. July 3.

15,720. A. Bayer. Purification of sewage and industrial effluents; utilisation of sewnge precipitates; and manufacture of filtering media. July 10.

16,104. C. J. Whittaker. *See* Class II. July 17.

16,728. B. R. Harrington. Refuse destructors. July 17.

1901.

9183. A. G. Bloxam.—From E. Dillan, Germany. Treating liquids with ozone for sterilising and other purposes. June 26.

11,354. C. H. Royl. Purification of water. July 10.

XIX.—PAPER, PASTEBOARD, Etc.

Applications.

12,769. C. Wurster. An improvement in sizing paper. June 22.

12,859. F. Eckstein Parchment paper provided with pattern in relief and a process for manufacturing the same. June 24.

Complete Specifications Accepted.

1900.

12,668. C. Dreher. Manufacture of paper. July 3.

13,255. A. B. Knopf. Treatment of material for use in the manufacture of paper. July 17.

14,988. W Fairweather.—From A. and G. B. Farnari. Producing chromo-diaphanous filigrees in hand-made paper June 26.

15,986. W. J. Ward. *See* Class XII. July 10.

1901.

10,213. E. Zühl. Manufacture of a celluloid lik material. June 26.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

Applications.

12,325. G. W. Johnson.—From C. F. Boehringer an Soehne, Germany. The manufacture and production new derivatives of camphoric acid. June 17.

12,421. H. E Newton.—From The Farbenfabrike vormals F. Bayer and Co., Germany. The manufacture production of new chemical compounds. June 18.

12,864. G. W. Johnson.—From Kalle and Co., Germany Improvements in the manufacture of benzyl ester cinnamic acid. June 24.

13,392. R. Groppler. A new or improved method f producing a solid composition containing formaldehyd July 1.

13,745. M. Dinesman. Improvements in the process manufacturing thymol. Complete Specification. July 5.

Complete Specifications Accepted.

1900.

14,876. J. F. H. Gronwald. Method and apparatus f preventing changes in aromatic alcoholic liquors duri their sterilisation. June 26.

15,172. J. C. Mewburn. From Chem. Fabrik v Heyden Aktiengesellschaft, Germany. Manufacture peptone. July 3.

1901.

2899. E. Wirth. Manufacture of a nitro-derivative carbazole from nitroso-carbazole. July 17.

XXII.—EXPLOSIVES, MATCHES, Etc.

Applications.

12,617. A. A. da Silva. New or improved explosiv Complete Specification. Filed June 20. Date applied Feb. 8, 1901, being date of application in Brazil.

12,695. H. Richter. Process for the denitration of nit cellulose. June 21.

13,589. The Cotton Powder Company, Ltd., G. E. Arno and A. S. Fox. Improvements in the manufacture explosives. July 3.

13,895. R. Schulz. Improvements in or relating to manufacture of priming for detonating caps and the l July 8.

14,231. C. O. Lundbolm and The Nobel's Explosi Company, Ltd. Improvements in smokeless pow July 12.

Complete Specifications Accepted.

1900.

15,587, A. G. Bloxam. From La Société Anonyme Macbines Industrielles, Belgium. Machines for manu turing matches. July 3.

1901.

8101. M Fiedler. Improvements in explosives. Jul

11,212. J. S. Potts. Improvements in matches. July

PATENT UNCLASSIFIABLE.

Application.

12,500. F. W. Martino. An improved composition matter constituting a chemical agent and the metho manufacture thereof. June 19.

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hen notifying new addresses, members are requested to them distinctly, and state whether they are temporary ermanent. Multiplication of addresses is also to be ed as tending to create confusion. When sending riptions, the use of the form attached to the application n the verification of addresses, on which the safe ry of the Journal depends.

Communications.

thors of communications read before the Society, or its Local Sections, are requested to take notice that Rule 43 of the Bye-laws the Society has the right of y of publication for three months of all such papers. gement of this Bye-law renders papers liable to be d by the Publication Committee, or ordered to be cted for the Journal, in which case no reprints can nished to the author.

Arsenic.

view of the great public interest which has been d by the Arsenic Epidemic, it has been decided to ish, in pamphlet form, uniform with the Journal, the , discussions, and abstracts dealing with the detection termination of Arsenic and other associated elements, have appeared in the Journal since the beginning of ar. To these have been added extracts bearing on bject from other sources, including a description, from lyn's new book on Arsenic, of the Marsh test, in the or's own words, and dated 1836. Copies, price 1*s.* nay be obtained from Messrs. Eyre and Spottiswoode.

Arsenic Committee.

Joint Committees of the Societies of Chemical ry and Public Analysts have circulated a number of s containing definite quantities of arsenic, and have ly considered the results returned by the members. Committee believe that these results justify them in bing a method for dealing with the various substances, fore taking this course think it desirable to submit thod to somewhat more extended trials.

Foreign Office Reports.

reference to the notice from the Foreign Office appeared on page 761 of this Journal, inviting ers of Commerce and other bodies to suggest special s upon which H.M. Consular Officers might be l to report, it should be noted that such suggestions be addressed to the Commercial Department of the Office. On page 859 of this number of the Journal found a report furnished by Consul-General Gurney, the Foreign Office, at the request of this Society, stor Oil Manufacture at Marseilles." It is hoped mbers will avail themselves, through the Society, of lities thus placed within their reach by the Foreign

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Death.

Ness, Thos., Black Banks Chemical Works, Darlington. Aug. 15.

Journal and Patent* Literature.

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* Any of these specifications may be obtained by post by remitting 8*d.*—the price now fixed for all specifications postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

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I.—PLANT, APPARATUS, AND MACHINERY.

PATENTS.

Furnaces. H. S. Woolley, Paris, Idaho, U.S.A. Eng. Pat. 10,977, May 28, 1901.

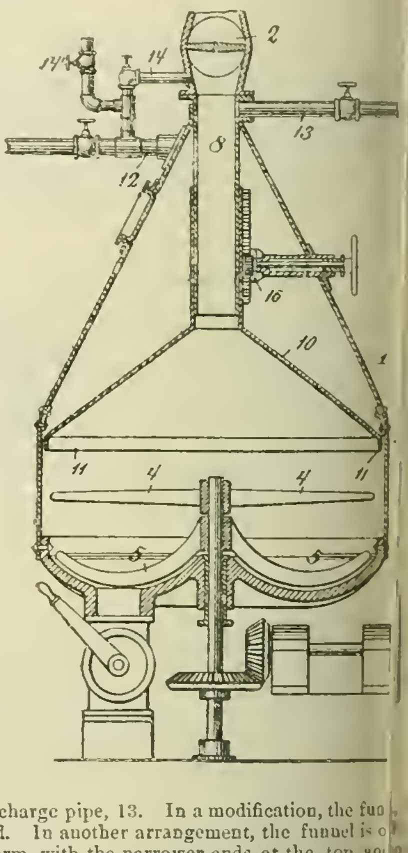
The grate of the furnace is composed of segments, each of which consists of transversely sloping portions flanking a longitudinally sloping portion, and the entire grate inclines downwards towards the centre, so as to form a kind of trough for the fuel. The centre of the grate is traversed by an imperforate conical pipe, projecting upwards and conveying air into the secondary combustion chamber. The crown of the furnace also slopes downwards towards the centre, and the products of combustion in the primary combustion chamber are discharged into the secondary chamber through a narrow passage situated around the conical pipe, the diameter of which passage can be modified by making the cone adjustable. This arrangement ensures the heating of the air admitted to the secondary combustion chamber, and the thorough mixing of this air with the products of combustion from the primary chamber, thus securing perfect combustion in the secondary chamber. —C. S.

Pyrometers. M. Arndt, Aachen, Germany. Eng. Pat. 11,052, May 29, 1901.

The pyrometer comprises a movable body, or plunger, enclosed in an elongated closed vessel, which has a cooling chamber at the top and a heating chamber, adapted to be inserted in the chimney flue, &c., at the bottom. The movable body is actuated by a rod, which passes through a stuffing-box in the enclosing vessel, and is adapted to force a volume of air or gas out of the cooling chamber into the heating space, and *vice versâ*, the difference of pressure or expansion of the air or gas, corresponding to the difference in temperature of the two chambers, being measured by a manometer or read off on a scale. An air-valve in the enclosing vessel is closed during the measuring operation, but is opened when the movable body is in its lowest position, for the purpose of placing the pressure in the pyrometer and manometer in equilibrium with the atmosphere. In a modification, the pyrometer is pivoted in the side of the chimney flue, the movable body and air-valve being actuated by tilting the instrument. In another arrangement, the movable body is actuated automatically by a motor operated by the draught in the chimney, and the temperature is indicated on a scale and recorded on a rotating drum.—R. A.

Separating Liquids of Different Densities; Apparatus for ——. H. H. Lake, London. From N. B. Powter, New York, U.S.A. Eng. Pat. 11,429, June 4, 1901.

This apparatus is stated to be particularly applicable for extracting oil or grease from waste animal matter, &c. The apparatus comprises a vessel, 1, provided with stirrers, 4, and scrapers, 5, for mixing and agitating the materials, and having a tube or chamber, 8, 10, fitted at its upper end. The funnel mouth, 10, of the chamber is open at its lowe and is adjustable by means of the rack and pinion ge so that its rim, 11, can be kept below the level of the in the vessel. The material is supplied throug valve, 2, from a digester, &c., or a digester heated jacket may be combined with the apparatus. Af material has been agitated, the pressure-equalising val is closed, and a difference in pressure is produced b the vessel, 1, and tube, 8, by admitting air or steam t the pipe 12, or by suction applied to the pipe 13, the lighter liquid (oil, &c.) rises through the funnel the discharge pipe, 13. In a modification, the fun omitted. In another arrangement, the funnel is o cone form, with the narrower ends at the top an the discharge pipe, 13, is connected to the top of the and the pipe 12 to the tube 8. The apparatus ma arranged to discharge alternately from the vessel



Temperature, Pressure, and Humidity of Li Gases; Device for Constantly Maintaining H. Schultz, Berlin. Eng. Pat. 1082, Jan. 16, 1

Two adjustable electric contacts are arranged o the pointer of a mechanical thermometer, or a an equivalent displaceable mercury thread, and nected separately to two electro-magnets, which slide or other suitable valve controlling the supp &c. One of the electro-magnets is adapted to valve, and the other to close it. The moven valve by either one of the magnets actuates switch, which disconnects that magnet and conn other, ready for reverse operation of the v apparatus is applicable for controlling the suppl a gas heating-stove, the contacts, one of which maximum and the other as a minimum, being the desired range of temperature. For the re gas pressure, say the force of draught in the steam boiler, the contacts are controlled by a whilst for regulating the amount of moisture in t in connection with spinning, they are contr hygroscopic body, such as a human hair.—R. A *s for Liquid.* Siemens Brothers and Co., Ltd., stminster, Z. H. Kingdon, Lee, Kent, and F. Turner, rey. Eng. Pat. 15,128, Aug. 24, 1900.

arying the volume of liquid delivered by a double- pump, slide valves governing ports at the ends of the er, and working in time with the pump piston, are yed, the stroke of the valves being adjustable to more or less liquid to pass from one end of the er to the other, and so to reduce by a corresponding t the volume delivered by the pump.—R. A.

g, Kneading, and Triturating Machines. H. H. e, London. From Werner and Pfleiderer, Cannstatt, rttemberg. Eng. Pat. 15,159, Aug. 30, 1900.

ng devices are provided for the driving mechanism he cover of the trough of the machine, and are ed so that the driving mechanism is locked when the s opened, and the cover, when closed, is locked when iving mechanism is ready to start the machine, or the machine is at work.—R. A.

ement Kilns and the like. H. H. Lake, London.
Eng. Pat. 18,350, 1900.

See under IX., *page* 810.

II.—FUEL, GAS, AND LIGHT.

Coals; Solvent Action of Pyridine on Certain ——. T. Baker. Trans. North Engl. Inst. Mining and Mech. Eng. 1901, **50**, [2], 23—26.

The author has examined the solvent action of that portion of the pyridine bases (from coal-tar) boiling between 110° and 120° C., on samples of coal from the Hutton and Brockwell seams, Durham; anthracite from Yniscedwyn colliery, S. Wales; and New Zealand coal from the Taupiri colliery, Kimihia, Auckland. In each case, 5 grms. of the finely divided coal were extracted for 50 hours with 250 c.c. of pyridine in a Soxhlet apparatus. The pyridine solution, which was red to brown in colour, and in some cases possessed a rich green fluorescence, was distilled under reduced pressure till the greater part of the pyridine was removed, the residue was treated with hydrochloric acid to precipitate dissolved matter, the mixture filtered, and the precipitate washed several times with water acidulated with hydrochloric acid, finally with water, and then dried at 100° C. The residue from the extraction was dried, to free it as far as possible from pyridine, then washed with water and dried at 100° C. The results obtained were:—

Locality.	Sample.	Amount Extracted by Pyridine.	Elementary Analysis.				
			Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Sulphur.
		Per Cent.					
tton seam	Coal	20·4	80·82	4·66	10·81	1·84	1·84
	Extract	..	79·37	5·79	10·73	2·66?	1·40
	Residue	..	82·06	4·85	9·65	1·78	1·64
ockwell seam	Coal	14·5	86·59	5·15	5·33	1·67	1·23
	Extract	..	77·50	6·16	..	..	..
	Residue	..	86·66	4·95	..	..	..
thracite	Coal	No appreciable amount.	92·59	3·55	..	..	0·66
w Zealand coal	Coal	21·4*	72·45	5·08	20·54	1·15	0·47
	Extract	..	73·72	7·69	..	..	..
	Residue	..	70·81	4·63	..	2·11	..

* Of this 21·4 per cent., 15·75 consists of water; hence the actual amount extracted is only 5·65 per cent.

imate analyses were also made of the coals, extracts, idues, but these were not carried out under similar ons, and the results are therefore not strictly com- . The chief differences exhibited by the coals —

ham (Brockwell) Coal.—Gives a moderately com- oke. Extract is very rich in volatile matter, and a very intumescent coke. Residue retains the coking ies of the original coal to a small extent, but the the coke is considerably reduced.

ham (Hutton) Coal.—Gives a caked but friable coke. t is extremely rich in volatile matter, and yields a ighly intumescent coke. Residue has lost all the properties of the original coal.

Zealand Coal.—Gives a pulverulent coke. Extract ar to those from the Durham coals. Residue does ke. (See also this Journal, 1898, 985; and 1899, -A. S.

Cargoes; Spontaneous Combustion of ——. (1) South Wales: Report of the Royal Commission inted to inquire into the Cause of the Dangers to h Vessels carrying Coal are said to be peculiarly , &c., 1897, 1—5, 1—87, and 1—105; with illustra- and 1 plate. (2) New South Wales: Report of the l Commission appointed to make further investiga- , &c., 1900, 1—28; with 6 diagrams. Trans. North Inst. Mining and Mech. Eng. 1901, **49**, [6], 112—

port of the first Commission, which was appointed by .W. Legislative Assembly in 1896, deals mainly with ger of spontaneous combustion, whilst the special of the second Commission was to more particularly ate the influence of moisture as a factor of spon- combustion.

Report (1).—The conclusion arrived at, is that the two conditions which bring about spontaneous combustion are (1) a sufficient supply of oxygen and (2) a sufficient confinement of the heat developed by oxidation. The most favourable conditions for heating occur when heaps of moderately lumpy coal are mixed with certain quantities of fine coal dust. Such heaps are found under the hatchways of ships, loaded by dropping the coal from hoppers, spouts, &c.; indeed, in every case of spontaneous combustion investigated by the Commission, the mode of loading ensured a cone of broken coal in the square of the hatchway. They recommend "that the cranes be altered so as to admit of the waggons being lowered down the hatchways, with a view to minimise the breakage of coal." The Commission also find that ships loaded in hot weather are more liable to spontaneous combustion than those loaded in cold weather, and that the danger increases with the depth of the store of of coal, the length of the voyage, the average temperature during the voyage, and the temperature of the enclosure containing the coal. They attach no importance to the presence of iron pyrites. They recommend "that very large ships should not be loaded with the existing appliances on days when the maximum shade temperature rises above 80° F., or the maximum sun temperature above 110° F." Surface ventilation is the only method of ventilation recommended for coal cargoes.

Report (2).—In order to determine the influence of moisture on the liability to spontaneous combustion, two cubical bins, 21 ft each way, were loaded with the same class of coal, under exactly similar conditions, except that one bin was loaded with dry coal, whilst in the other case, a stream of fresh water was continuously played over the coal when being loaded into the bin, in such a way as to thoroughly saturate it. The quantity of water used was sufficient to cause a small stream to flow from the bottom of

the bin, but not sufficient to wash out any considerable quantity of fine dust. For the purpose of observing the temperature, 13 thin galvanised-iron pipes about 2 in. in diameter and 0·018 in. thick, were placed vertically in each bin prior to loading. The bins were filled on Dec. 2, 1898, and temperature readings were taken at intervals. In the dry bin the temperature rose very rapidly, until on Feb. 13, 1899, it was so high at 8 ft. from the surface in the centre tube, that the solder-connections of the thermometer were melted; at 4 ft. below the surface, in this central tube, the temperature was 135° C. In all the other tubes the temperature was much lower, the highest reading being 87·7° C. At this stage the bin was flooded and the hot coal removed. The heating appeared to be "confined to a spot immediately in the vicinity of the central pipe." With the wet bin the experiment was continued until April 30, 1899, but no signs of heating could be observed, and from Jan. 27 onward, there was a steady decline in the mean temperature. Having regard to the fact that cases of spontaneous heating invariably occur in the heap of small coal under the hatchways (see Report (1)), and in view of the conclusive result of the above experiment, the Commission recommend "that when large ships are being loaded during warm weather (say, when the temperature is 90° F. or over) a hose should be played down the hatchways, so as to wet, at all events, the coal which collects at that spot." The Commission summarily dispose of the findings of the British Commission of 1876 as follows:—"The British Commission received 26 answers to the effect that wet coal was the more dangerous. But an analysis of the evidence discloses that 25 of these answers were based on 'general impression' or hearsay evidence only, while the 26th was not tested by cross-examination. The opinions referred to were held, not by scientific men, but by those engaged in the coal trade . . . . . . All such views, it seems to us, must now be definitely abandoned."
—A. S.

Peat Utilisation in Germany. Foreign Office Annual Series, No. 2671.

The coal famine in Germany has directed attention to the production of peat, a substance for which there was formerly only a local demand. It is now proposed to prepare it as a heating material, not only for private requirements, but for those of large industrial establishments. An international company for peat utilisation in Oldenburg has, by the so-called Ziegler's invention, succeeded in reducing the peat to coke, which experts declare to be suitable for all technical purposes. The amount of carbon contained, its great hardness, and freedom from sulphur make it specially suitable for use in furnaces; it can also be used in machine factories, in copper and brass smelting works, and in soldering and welding operations. Similar experiments on a large scale have been made in East Prussia, and the results have been very promising.

Coke Manufacture in the United States.

See under Trade Report, *page* 852.

Water-Gas Practice; British ——. R. Porter. J. Gas Lighting, 1901, 77, [1988], 1654—1657.

According to Parliamentary Returns, there was in 1900, carburetted water-gas plant capable of a maximum day's output of 104,045,000 cb. ft. 10,067,306,210 cb. ft. of gas were made by it during the year, being 6·84 per cent. of the total production of illuminating gas. Coal-gas plant is usually assumed to be employed to such an extent that the annual output is 260 times the maximum day's output of which it is capable. On this basis, the carburetted water-gas plant was only utilised to the extent of 48·37 per cent. of its normal capacity. Hence the capital charge becomes heavier than is often assumed. Plant capable of making one million cubic feet of gas per diem costs, exclusive of storage gasholders, 28,600*l.* if for coal-gas, or 15,000*l.* if for carburetted water-gas; but assuming that the latter plant would be utilised only to 48·37 per cent. of the normal annual capacity, and the former to the full extent, the relative capital outlay for carburetted water-gas plant of the same annual output as the coal-gas plant would be 31,010*l* instead of 15,000*l*. There may be a saving in the expenditure on storage accommodation in resp both gas and the raw materials for the manufactu favour of carburetted water-gas, but the author thi cannot be very great. The oil used in 1900 for the facture of carburetted water-gas amounted to 33,10 galls., or 3·28 galls. per 1,000 cb. ft. of gas made. average illuminating power of the gas is not known gas may, however, be assumed to have been used material extent for enriching purposes. Only seven u takings report the amount of coke used. In these c varies greatly, but averages 55·23 lb. per 1,000 cb. carburetted water-gas made. This is referred to as most unsatisfactory feature." The other advantages cl on behalf of carburetted water-gas plant, *viz.*, that it a of rapid production in case of emergency and of ready trol of illuminating power, and that it affords comparati dependence of coal supplies and practical control of th market, have, in the author's opinion, been over-esti Purification of carburetted water-gas, according to recently published figures applying to three years' wo costs 1·50*d.* per 1,000 cb. ft., which is three times as as has been given in estimates.

The author gives statements of the working and costs per 1,000 cb. ft. of carburetted water-gas made (A) claims made by others, and (B) his own compu based on the practical returns, &c., already quoted.

The following is a summary of these statements:—

——	A.		B.
Oil, 3·28 galls.	At 2·50*d.*	= 8·20	At 4*d.*
Coke, at 12*s.* per ton	45 lb.	= 2·89	55·23 lb.
Labour		0·69	
Purifying		0·50	
Repairs, maintenance, and water.		0·60	
Management and supervision		..	
Capital charge		0·90	1
		13·78	
Less value of residual tar		0·63	0
Total cost		13·15	1

The author is of opinion that carburetted water-g never exceed 10 per cent. of the total output of gas country.—J. A. B.

Fuel Gases and Fuel Tests in Germany. Foreign Annual Series, No. 2671.

The iron trade is now considering the practicab furnace gas as a driving power. Up to this time gases were used only in hot-blast stoves and for gen steam for blowing engines, but lately they have be for specially constructed gas engines. First the gas freed from dust and then cooled down from 125° C. 6° to 8° C. A beginning was made by driving sm engines for electric lighting purposes, but now furn motors are built capable of developing 1,200 horse and are used for driving blowing engines. The fur Germany can produce an energy of 500,000 hors

——	Calorimetric
	From
Sawdust briquettes	3,400
Turf, peat	2,700
Soft brown coal	1,900
Briquettes	4,600
Bohemian brown coal	3,600
Coal from Silesia	5,300
„ Saxony	5,100
„ Saar district	5,800
„ Westphalia	6,000
„ United Kingdom	6,000
Coal briquettes	6,100
Anthracite	7,600
Crude coke	3,550
Coal coke	5,600
Paraffin oil	9,800
Petroleum	10,300

hat by the use of furnace gases it would be possible to one-twentieth of the whole steam energy of the man Empire.

areful revision of the working of steam boilers has be- e necessary for the iron industry, and no factory in which h coal is used can dispense with carefully testing the ing power of its fuel. This is especially the case in many, where various coals compete with each other. he latest rules issued for steam boiler trials, the calori- ic testing of the heating material is made obligatory. Langbein, of Nieder Lössnitz, has constructed a new ratus for that purpose. He publishes 150 complete nical and calorimetric experiments of heating materials, 153 purely calorimetric experiments, which he has ied out as a supplement to his experiments in evapora- The accompanying table is the result of his experi- ts.

'*er-Gas ; Illuminating and Heating Value of* ——. . Strache and R. Jahoda. J. für Gasbeleucht. **44**, [25], 7—448.

e successful use of water-gas, in conjunction with Auer sbach) mantles, for illuminating purposes, much depends the construction of the burner employed. The burner gned by Strache consumes only 1·787 litres per Hefner- (= 15·8 candles per cb. ft.), while a modification of burner by Nuschei consumes 1·5 litres (= 18·8 candles cb. ft.).

has been stated that water-gas has less than half the inating power of coal-gas when used in incandescence ers. This view is based partly on observations with ior water-gas burners, and partly on the supposition the illuminating power depends directly upon the ific value of the gas, the calorific value of water-gas g only about half of that of coal-gas. The luminosity mantle, however, is essentially a function of the tem- ture of the flame, and the flame of water-gas is iderably hotter than that of coal-gas.

e calorific value of water-gas was determined at different s, and was found to average from 2,747 to 2,497 ies. The results were obtained by calculation from nalyses. The illuminating power of the water-gas was determined by different observers, new Auer mantles g used for each test. Mantles used with water-gas are nguished from those used with coal-gas by the fact that lluminating power hardly diminishes even after 1,000 s' burning (compare this Journal, 1895, 17); an increase en observed during the first 200 or 300 hours. It was fore unnecessary to take the average illuminating r of a 300 hours' test, as is usual with coal-gas. The n the gas was determined, and found to be from 3·5 per cent. The following are the average results ned :—

ache burner, Type IV., for 88 candle-power—16·2 es per cb. ft.

ache burner, Type VI., for 44 candle-power—16·8 es per cb. ft.

ache burner, Type VII., for 22 candle-power—14·6 es per cb. ft.

ache burner (Nuschei's modification), for 132 candle- r—18·8 candles per cb. ft.

oda has constructed a burner which is suitable both al-gas and for water-gas.—H. B.

Blast-Furnace Gases Utilisation in Germany.

See under Trade Report, *page* 854.

descent Gas Light ; Theory of the ——. H. Bunte. J. für Gasbeleucht. **44**, [23], 411—412.

st and Bose (see following abstract), in agreement Le Chatelier (this Journal, 1898, 1129), have shown he luminosity of incandescent mantles is due solely to high temperature. As the heat emission of the Auer sbach) mixture (99 parts of thoria *plus* 1 part of ceria) aller than that of all other bodies which have been ined, the mantle attains the temperature of the flame nearly and rapidly than other bodies do. The author, ascribing the luminosity of the mantle solely to its temperature, accounted for the high temperature by assuming (this Journal, 1898, 229) that the mantle exercised a catalytic action upon the combustible gases—an assumption which Nernst and Bose, and other investigators, hold to be unnecessary, as they consider the temperature of the Bunsen flame to be sufficient in itself. Their experiments, however, do not exclude the possibility that, in the different zones of the flame, contact action plays some part in determining the incandescence.

The following experiments show that an Auer mantle can be brought to full incandescence, without any flame, by contact action upon a cold mixture of gas and air. They also show that the author's former assumption, that thoria exercises no catalytic action, is incorrect :—

(1) The tube (16 mm. diameter) of a Teclu burner was extended by means of a glass tube (18 mm. diameter) to 29 cm. in length, and the burner was so regulated with a large air supply that the inner flame cone rested quietly at the mouth of the glass tube. Pieces of mantles of different composition, inserted into the flame, could be pushed down into the glass tube as far as desired, without ceasing to glow in the cold gaseous mixture. The luminosity of the Auer mixture was much greater than that of thoria alone, but the catalytic power of both appeared to be the same.

(2) Fragments of mantles composed of Auer's mixture, thoria alone, and ceria alone, were introduced into the tube of the burner, two at a time, to see which was first extinguished ; but no clear difference in this respect could be observed between the three compositions.

(3) To the mouth of a Teclu burner (16 mm. diameter) was attached, by means of a cork, a small glass chimney ("Jewel burner" size : 3·45 cm. diameter at one end, 2·8 cm. diameter at the other end, and 13·5 cm. high), and the burner was so regulated that the flame at the top of the chimney had no tendency to strike back. Mantles of cylindrical form, hung from platinum wires, were lowered into the chimney. Under these conditions an Auer mantle became incandescent, just as over an ordinary burner. A cylinder, composed of one half of thoria and one half of Auer's mixture, became incandescent in both halves by catalytic combustion, the difference in illuminating power being very clearly shown.—H. B.

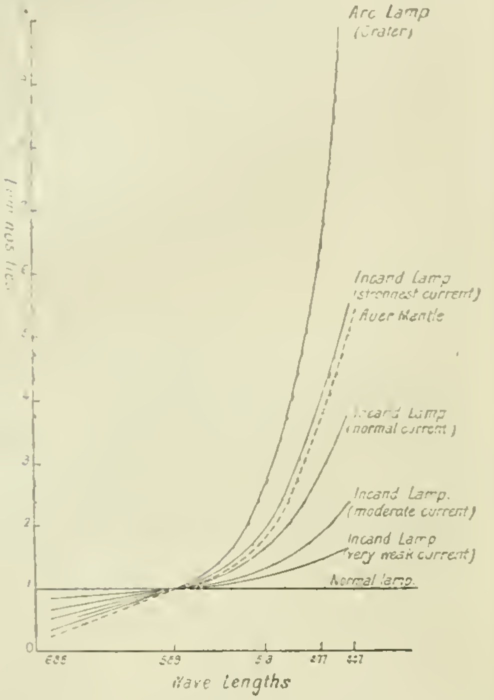
Theory of the Auer (Welsbach) Light. W. Nernst and E. Bose. Physik. Zeits. 1900, [26], 289—291 ; through J. für Gasbeleucht. **44**, [23], 412—413.

A THICK platinum wire, placed in a Bunsen flame, glows moderately, a thin wire becomes white hot, and a very thin wire melts in the flame. It is heat *radiation*, not heat *conduction*, that prevents the thicker wires from so nearly attaining the temperature of the flame. When therefore a substance is to be heated to as high a degree as possible in a flame, it should be very finely divided, so that the gases may communicate heat to it as quickly as possible, and its heat emission should be reduced. The carbon particles in luminous flames fall far short of the temperature of the flame, because they give the normal spectrum of "black" bodies, and therefore radiate principally heat, and relatively very little light. On the other hand, substances which have a "selective" emissivity, in the sense that they give out few ultra-red rays, the rest of their spectrum being approximately normal, attain more completely the temperature of the flame, and have a correspondingly greater luminosity.

Applying these principles to the study of the incandescent gas light, the radiation from an Auer mantle was compared with that from a heated black body, taking as the latter an incandescent electric lamp. The results are shown in the following diagram, in which the abscissæ represent wave-lengths, and the ordinates the relative luminosities, all luminosities being taken as equal to 1 for sodium light.

Several strongly excited incandescent electric lamps, at different temperatures, were compared, by means of Hüfner's spectro-photometer, with a slightly incandescent one, the luminosity of which, throughout the range of its spectrum, was taken as unity. The curves shown in the diagram were thus obtained. The comparison of the luminosity was made in each case at wave-lengths 688, 589, 518, 477, and

447. The examination of the light from the Auer mantle shows that in the yellow to violet portion of the spectrum, the curve falls within those of the electric lamps, but that towards the red end the emission is less, to a striking degree, than the normal. By filling in the curve in the direction of the ultra-red end, one may conclude with certainty that the heat-emission of the Auer mantle is much less than that of another body at the same temperature, the behaviour of which is normal.



In order to determine whether the gases of the flame exercise any specific influence upon the luminosity of the mantle, a comparison was made between small filaments of the earths, heated, in the one case, by means of a flame, and, in the other, by an alternating electric current. To render the filaments conductive for the latter purpose, they received a preliminary heating, as in lamps of the Nernst type. During the comparison of the luminosities, both the flame-heated and the electrically-heated filaments were kept at the same temperature, this being effected by regulating the heating so that their electrical resistances were the same. Using thin filaments, almost identical values were obtained for the relative luminosities, as the following table shows; with thicker pieces, differences were found, explained by the fact that the heating took place in the one case largely from within, in the other case from without the filament:—

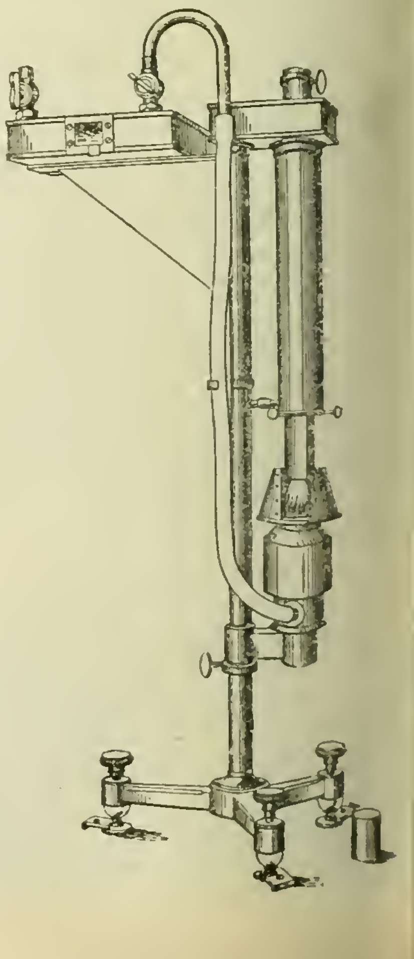
Wave Length.	Flame-heated.	Electrically heated.	Ratio.
688	0·770	0·790	1·03
589	1·000	0·987	0·99
518	1·28	1·37	0·93
477	2·39	2·34	0·98
447	4·21	4·09	0·97

These results show that the luminosity of Auer mantles is purely due to their temperature, and the assumption of a catalytic action is unnecessary. The authors conclude that, owing to its relatively slight heat emission, the Auer mantle can attain the temperature of the flame much more completely than carbon particles or similar "black" bodies, the high temperature thus reached causing radiation to take place in the visible portion of the spectrum, especially the yellow to violet.—H. B.

Photometer, The New (Gas Referees') Table ——, *Pentane Ten-Candle Lamp.* F. Clowes. J. Gas Li ing, 77, 1901, [1988], 1648—1651.

The Harcourt ten-candle pentane lamp, which has rece been prescribed by the gas referees as the standard so of light for official gas testing in London, has prov convenient and satisfactory substitute for the can formerly used. It is shown in the following figure. fuel is pentane, which is obtained by fractionating American petroleum and purifying the fraction which co over at 45° C. It must conform to certain tests destine ensure constancy of its quality. Gaseous pentane is n more than 2½ times as heavy as air, and hence ma siphoned from one vessel to a lower one. The li pentane partially fills the shallow carburetting reser which has one pipe, with tap, intended for the admissio air, and a bent pipe, with tap, connected by a long fle tube to the burner to which it is intended to conve heavily carburetted with pentane, for the support of flame. The influx of air through the open pipe and efflux of carburetted air to the burner are maintained m by the siphoning action, and controlled by one or oth the taps so that the tip of flame is seen through a window between two points in the metal chimney, w surmounts the burner and is set at a definite height a it by means of a standard wood block. The upper p the metal chimney is surrounded, as shown, by a l metal tube. Air passes up the interspace, becomes he and is drawn down the hollow pedestal of the lamp t burner, where it constitutes the air-feed to the interi the ring-shaped flame. The air-feed to the exterior p through an interconical space around the burner, a thus heated.

The table photometer with which the Harcourt lar intended to be used comprises a firm table carrying a sc contiguous portions of which are illuminated by



ndard flame and the flame of the gas under test. These mes are at fixed, accurately determined distances from screen, and equality of illumination of the contiguous rtions of the latter is achieved by adjusting the supply gas to the flame by means of a control tap, which is erted in the pipe leading to the burner. The gas eviously traverses a meter and balance governor. The e of flow of gas through the meter is observed after the ntrol tap has been set at the position which gives equality illumination of the screen, and the illuminating power the gas is inferred therefrom. Screens are placed where eled on the table to prevent the interference of reflected ht from the flames or direct light from other sources. e table and apparatus are painted black. It has not n found necessary to have the observing room comtely darkened.

This apparatus has now displaced the bar photometer in fixed gas-testing stations in London. It has also been de in a portable form by the London County Council making tests in other places. It has been found to e satisfactory results in rooms not specially fitted up for ting purposes, provided cross currents of air are screened and window blinds are used. Experience shows that ler such conditions the portable apparatus is trustworthy. The Harcourt lamp and the table photometer are fully cribed in the "Notification of the Gas Referees," which ublished by the Government stationers.—J. A. B.

cetylene; Reactions of ——, with Cuprous Chloride dissolved in Potassium Chloride. R. Chavastelon.

See under XXIII., *page* 841.

Limestones; Composition of some Canadian ——. J. T. Donald.

See under IX., *page* 810.

PATENTS.

t; Drying of ——. A. A. Dickson, Toronto, Canada. Eng. Pat. 10,520, June 9, 1900.

peat is introduced into an inclined, slowly rotating ng cylinder at its upper end, where the fire is situated. llating rakes are arranged within the cylinder, so as to ate but not lift the peat, and thereby allow of the easy pe of steam. The rates of rotation of the cylinder, and he feeding and raking mechanisms, may be varied rding to the amount of moisture present. Each end of drying cylinder is mounted upon truck wheels capable adial adjustment in the carrying brackets.—R. S.

'; Carbonisation of ——, and Apparatus therefor. . Holm, Aalborg, Denmark. Eng. Pat. 12,523, ly 11, 1900.

peat is first dried in an upper drying chamber, and is wards carbonised in one of three or more chambers by ns of smoke cooled down to about 250° C., and passing nwards through the peat. The chambers surround a non kiln structure, which contains a central distributing nber for the smoke, and is connected by a flue to a ace and by other flues to any one of the carbonising nbers. Beneath the kiln are two superposed chambers. lowest is connected with the bottom of any one of carbonising chambers by a flue, so as to receive the y cooled smoke, while the upper one is connected her flues to the top of the carbonising chambers, and ves the once utilised gases after they have passed igh an air condenser. The condenser consists of pipes nged in groups, so that the smoke passes backwards and ards through each group.—R. S.

or the like; Coking of ——, and Apparatus therefor. I. Ziegler, Berlin. Eng. Pat. 15,092, Aug. 23, 1900.

operation is carried on in pairs of vertical retorts, each being connected with a common receptacle below, and ed so that while the peat in one retort is being coked, n the other is being dried. Flues, by which firing is ed, surround the retort chambers, and each retort has re, so that either retort can be put into communication with the flues to admit combustion gases for drying the peat, or disconnected therefrom when coking is proceeding. The valve consists of a small vertical tube situated in the upper part of each retort, and communicating both with the retort and the flue. Inside the tube is a movable tubular lining having orifices adapted to register as desired, with orifices in the tube surrounding it.—R. S.

Fuel from Moor Earth and Moor Moss; Producing ——. F. Hasselmann, Munich-Nymphenburg, Germany. Eng. Pat. 14,627, Aug. 15, 1900.

The earth or moss is mixed with an easily inflammable and combustible organic substance (organic acids, particularly "oleine ether oils," resins, alcohol, and fluid hydrocarbons), a mineral substance for increasing the duration of combustion and causing greater development of heat (loose tufaceous material, fossil meal, kaolin, chalk, asbestos), and a binding agent (dolomite powder, trass, burnt lime powder, calcined sulphate of soda or magnesia, powdered bituminous slate, and limestone). The whole is then formed into briquettes.—R. S.

Fuel; Artificial ——. F. C. von Heydebrand und der Lasa, New York, U.S.A. Eng. Pat. 11,218, May 31, 1901.

The object of the invention is to obtain a smokeless artificial fuel, which, after the apparent exhaustion of its combustible properties as a fuel in a fire, may be subsequently rekindled, or added to a going fire, and be re-burned without any retreatment of the composition. The materials employed—which, however, are subject to variations both as to nature and proportion—are earth, carbonaceous matter (preferably coal dust), pitch, sulphur or sulphuric acid, sulphates of magnesium and sodium, lime or "solid products of lime," and sulphate of iron or pyrites.—R. S.

Gas; Manufacture of ——. L. T. D'Altoff, Brussels. Eng. Pat. 8905, April 30, 1901.

The gases produced in a generator are drawn by suction through a purifier and carburettor, preferably charged with porous combustible materials saturated with the hydrocarbons, which materials are claimed to possess the advantage that they retain the smoke present in the crude gas, and being in addition impregnated with hydrocarbon, they form a valuable fuel when removed from the apparatus. The carburettor being placed in close proximity to the generator, the carburetting is conducted at a high temperature, so that heavy hydrocarbons may be used. The suction apparatus also delivers the enriched gas to the gasholder. —C. S.

Gas Lime (Sulphide of Calcium) and other Analogous Materials; Apparatus for Revivifying ——. S. N. Yeadon and W. D. Mason, Leeds. Eng. Pat. 14,845, Aug. 20, 1900.

The claims are for the combination of a revolving retort and a permeator, in such a manner that, when in operation, the foul gas lime is first passed through the permeator, where it is impregnated with carbon dioxide driven off from the retort, thus eliminating the sulphur compounds, and is afterwards passed through the retort, in order to eliminate the carbon dioxide. The permeator consists of a cylinder, a lower air-tight jacket, a gas chamber, an air-tight feed hopper, rollers, a shaft (fitted with stirring and conveying blades), an exhauster, gas orifices, and an air-tight discharge passage.—C. S.

Alkaline Cyanides from Crude Materials containing Cyanogen; Obtainment of ——. G. Craig and R. M. Paterson. Eng. Pat. 11,912, July 2, 1900.

See under VII., *page* 808.

Alkaline Cyanides from Crude Materials containing Cyanogen; Apparatus for Use in the Obtainment of ——. G. Craig and R. M. Paterson. Eng. Pat. 22,482, Dec. 10, 1900.

See under VII., *page* 809.

Acetylene Lamps. R. J. Urquhart, Manchester. From O. F. Kubin, Berlin. Eng. Pat. 357, Jan. 7, 1901.

Water is fed to carbide through a valve, which is opened by hand, but is closed automatically by a bell crank lever, worked through the expansion of a flexible chamber into which passes acetylene evolved in excess of that consumed. The flexible chamber also serves to store gas generated after the feed valve has been closed and the flame extinguished; the gas thus stored is ready for the immediate supply of the burner when the lamp is next required for use. The lamp is intended for use on vehicles. —J. A. B.

Acetylene Gas Lamps or Generators. C. W. Beck, New York. Eng. Pat. 7188, April 4, 1901.

Carbide is fed into water through a port, which is opened and closed by piston valves, operated by the pressure of a spring acting in opposition to the pressure of the evolved gas in an expansible chamber in communication with the gas outlet to a pressure regulator and the burner. The feeding apparatus may be locked in the closed position when the lamp is extinguished. Several modifications of parts of the apparatus are described.—J. A. B.

Acetylene and other Gases; Generators for the Manufacture of ——. S. G. Watson, Birmingham. Eng. Pat. 7234, April 6, 1901.

A mercury seal is interposed in the gas exit from the generating chamber to the gas holder, and acts in such a manner that it is unsealed and admits of the passage of gas when the gasholder contains but little gas, and sealed when the gasholder is nearly full. When sealed it causes gas subsequently generated to accumulate in the generating chamber, forcing out the water therefrom, and thus stopping the generation of gas.—J. A. B.

Acetylene Generators. H. J. Haddan, London. From The Adams and Westlake Company, Chicago, U.S.A. Eng. Pat. 8372, April 23, 1901.

A number of bowl-shaped carbide receptacles, forming a pile within an outer cell, are supplied with water in order, commencing at the top, through an inlet at the top of the cell. Each receptacle has a perforated lid, which distributes the water uniformly, and when its contents are exhausted, the water flows over into the receptacle next below it.—J. A. B.

Acetylene Gas Generators. W. L. Wise, London. From R. Klinger, Gumpoldskirchen, Lower Austria. Eng. Pat. 10,725, May 23, 1901.

A carbide receptacle, mounted in the crown of a gasholder, has a discharge orifice which is controlled by brushes of flexible wire, which are moved automatically according to the movements of the gasholder. The brushes effectually close the orifice even though a lump of carbide be jammed between them. The carbide falls into water in a funnel-shaped vessel within the gasholder tank, and the sludge produced is run off through a tap in the stem of the funnel.—J. A. B.

Incandescence Gas Mantles; Process for the Manufacture of ——. A. G. Bloxam, London. From Phlox-Glühlicht-Gesellschaft, Heidelberg. Eng. Pat. 15,030, Aug. 22, 1900.

It is stated that to obtain the best light effect from thoria-ceria mantles, the percentage of ceria should be in inverse proportion to the mass of the mantle; and the mass, for a given size of mantle, should be as small as is practicable, in order that the fibres may attain as fully as possible the temperature of the flame. In making a mantle of reduced mass, it is necessary to compensate for the loss of radiating surface that would otherwise result, by increasing the number of meshes in the fabric, and the mantle is strengthened by the addition of a substance which has a sintering tendency, such as silica, either in the form of dialysed silicic acid or of an organo-silicon compound. Actual sintering is prevented during the burning-off, by the use of a substance, such as ammonium nitrate sugar, which will give off gas and so counteract t sintering.

An ordinary thoria-ceria mantle weighs 0·60 grm., a contains 1 per cent. of ceria. If a mantle of the sa size is to be made according to this invention, and t mass is reduced to 0·35 grm. (the ratio of reduction bei 1·71 : 1), the percentage of ceria in the mantle must *increased* in the same ratio, that is, to 1·71 per cent.

The following example is given:—45 grms. of thori nitrate, 0·95 grm. of cerium nitrate, and 20 grms. of a monium nitrate are dissolved in 271 grms. of water, and the solution are added 11·2 grms. of a dialysed solution silica containing 2 per cent. of SiO_2. A fabric made "No. 100 cotton," containing 120 meshes in every turn the knitting and 5 turns per centimetre, is impregnated w this solution and it is burned off as usual.—H. B.

Incandescent Gas and Vapour Lamps. C. Niemann Berlin. Eng. Pat. 2508, Feb. 5, 1901.

This specification describes a hanging incandescent gas la in which the gas pipe, which extends from the ceiling dov wards, passes through the centre of the lamp and acts as axis; that is to say, the lamp surrounds the lower end of gas pipe, which is carried vertically downwards withou bend. The gas pipe is closed at its lower end, and lateral openings near the same, which allow the gas to esc into a Bunsen tube that concentrically surrounds the pi The Bunsen tube has air holes in its lower part, and car at its top an annular burner head provided with an ordin side support for the mantle, down through the centre which the gas pipe passes. The Bunsen tube carry the burner head, mantle, globe support, &c., is loo attached to the gas pipe by means of a pin or otherwise that it may be drawn downwards as a whole, off the pipe. That part of the gas pipe which is exposed the flame consists preferably of incombustible material. —H. I

Incandescent or Bunsen Gas Burners. A. J. Bo London. From Société Lumière Boule, Brussels. E Pat. 8275, April 22, 1901.

The Bunsen burners ordinarily used in incandescence g lighting are provided with only one gas inlet nozzle at foot of the mixing tube. This effects a satisfactory m ing of the gas and air in the case of ordinary low-pres gas, but with high-pressure gas, incomplete admix occurs. According to the present invention, the bur which is intended for use with high-pressure gas, is vided at the foot of the mixing tube with several gas i nozzles (three or more, according to the dimensions of burner), whereby an intimate mixture of the gas and is effected.—H. B.

Incandescent, High-pressure Gas Lighting Plant. Boult, London. From Société Lumière Boule, Bru Eng. Pat. 8817, April 29, 1901.

"The individual parts of the apparatus are of well-kn construction, the invention lying solely in the combin of the apparatus for the particular purpose descril Gas, at the ordinary town's pressure, is pumped by m of a suction and force pump into a reservoir at the de pressure, and the plant is furnished with relief and l pressure valves and a branch to an expansion chambe that any untoward increase of pressure, caused diminution in the gas consumption, may be automati prevented.—H. B.

Incandescent Electric Lamps; [Heaters for ——] Swinburne, Westminster. Eng. Pat. 10,940, Jun 1900.

Resistance heaters for starting lamps of the Nernst can be made of carbon or other conductor mixed with but if the conductor oxidises in the air at the temper necessary for a heater, the heater becomes useless. overcome this difficulty, the oxidisable material is prot by vitrifying or glazing the insulating material. example, graphite (20 parts) is kneaded up with (60 parts) and felspar (20 parts) and squirted int rm of thin rods or spirals. These are dried and either ked at such a high temperature that the kaolin is vitrified, glazed in the usual manner by dipping into a glaze bath uch as boric acid solution) and then firing. Instead of rbon, carbides, silicides, silicon, or finely-powdered metal, ch as tungsten, may be employed.—H. B.

ncandescence Lamps, Electric; Manufacture of Filaments for ——. V. Thomas, Paris. Eng. Pat. 12,160, July 5, 1900.

The invention consists essentially in the employment in timate admixture with the graphite or carbon of the ament, of a certain metallic oxide or oxides in definite oportions, the filament being made from collodion con- ining in solution a salt or salts of the oxide or oxides." fteen parts of nitrocellulose are dissolved in 85 parts of cial acetic acid, and with this collodion there is mixed aqueous solution of the acetates or nitrates of the metals, d in the proportions, by weight, mentioned in the follow- g prescriptions:—(1) collodion, 99·8 parts; cerium etate or nitrate, 0·2 part; (2) collodion, 98 parts; orium acetate or nitrate, 2 parts; (3) collodion, 98 parts; ryllium acetate or nitrate, 2 parts; (4) collodion, 98 rts; thorium acetate or nitrate, 1 part; aluminium etate or nitrate, 1 part. It is essential that the salt or lts employed be pure.—H. B.

ectrodes for Arc Lamps; Carbon ——. V. Alexandroff. Eng. Pat. 15,021, Aug. 22, 1900.

See under XI. A., *page* 816.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

phenylene Oxide from Coal Tar and Diphenol therefrom. G. Kraemer and R. Weissgerber. Ber. 1901, **34**, [9], 1662—1667.

E separation of hydrocarbons from the higher boiling oils is a matter of some difficulty, and whilst ace- phthene, on account of its comparatively low boiling int and crystalline form can be tolerably readily isolated, s doubtful whether fluorene and phenanthrene can be ectly obtained pure in any quantity. Since the discovery t carbazol forms a potassium compound in the pre- ation of anthracene of high percentage strength (Ger. t. 111,359), it has been found that the carbazol potash lt contains considerable quantities of phenols. On partial tralisation and purification, a crystalline compound has n isolated from the melt, having the formula $C_{12}H_{10}O_2$. e same substance is obtained in much purer form from the rene melt, as this hydrocarbon, like carbazol, also gives otassium compound. By partial neutralisation with acid, ration, and precipitation with sufficient acid, diphenol is ained as an oil, which after distillation *in vacuo* and stallisation from toluene yields white prisms melting 109° C., and identical with the o-o-diphenol already ained by Barth (Annalen, **156**, 96) and Hodgkinson and tthews (Chem. Soc. 1882, 168; Annalen, **261**, 332). On ion with zinc chloride it is converted into diphenylene de, melting at 87° C. and boiling at 276° C. (uncorr.). s product furnishes the diphenol in the potash melt, l is a constituent of the crude fluorene fraction of the vy coal-tar oils. Commercial fluorene, on fusing with ash, yields about 12 per cent. of diphenol, although it not been hitherto possible to isolate directly diphenyl- oxide from the fluorene fraction. A relatively high perature is required for the conversion of the oxide into phenol, and the best results were obtained by dissolving grms. of diphenylene oxide in 200 grms. of pure phen- hrene, and fusing at 280°—300° C. with 100 grms. of stic potash, when 18·6 grms. of diphenol were obtained. henylene oxide forms a stable, well crystallised sulphonic l, which cannot be hydrolysed by blowing steam into its ition in sulphuric acid. Diphenol crystallises from water lates melting at 74° C., which effloresce, losing water n standing over sulphuric acid. It boils without decomposition at 315° C. (768 mm.), is readily soluble in cold sodium carbonate solution, but can be partially extracted therefrom by ether. The aqueous solution is coloured dark reddish-violet by ferric chloride. It combines with diazobenzene to form a sparingly soluble red dyestuff, dyeing wool yellowish shades. On fusion with phthalic anhydride and zinc chloride, it forms an almost colorless phthaleïn, soluble to a bluish-violet solution in alkalis. When boiled with acetic anhydride it yields a diacetate, which separates from xylene in colorless crystals, melting at 95° C., readily soluble in hot and sparingly soluble in cold alcohol, ether and benzene.—T. A. L.

Petroleum; Composition of Texas ——. C. F. Mabery J. Amer. Chem. Soc. 1901, **23**, [4], 264—267.

Corsicana oil has been found by Richardson to yield a distillate at 100°—150° C. under 25 mm. pressure, corresponding to C_nH_{2n}. Mabery and Buck found a sample from Jefferson County to be made up mainly of hydrocarbons of the C_nH_{2n-2} and C_nH_{2n-4} series, the sp. gr. being 0·95. The author has now examined a quantity of oil from the Lucas well, drawn from a pool probably 200 ft. below sea level; when the oil was reached in boring, the pressure was so great that the 4-in. casing, weighing 6 tons, was driven 200 ft. into the air, and the oil flowed at the rate of 70,000 barrels a day before the well could be capped. The oil, fresh from this well, had a strong odour of hydrogen sulphide; its sp. gr. was 0·92 at 20° C., and it contained 2·16 per cent. of S and over 1 per cent. of N. Under atmospheric pressure, 4 per cent. of a distillate of 46° Baumé was obtained at 145°—200° C., and 11 per cent. (at 35° B.) at 200°—250° C. Under 14 mm. pressure, it distilled as follows:—

——	Per Cent.	Baumé.
		°
95°—100°	17	29
150°—200°	17	25
250°—300°	51	17
Residue	15	14

The distillates 130°—135°, 155°—160°, and 190°—195 were selected for examination after purification with concentrated and with fuming sulphuric acid, and washing with caustic soda.

The fraction 130°—135° C. had a sp. gr. of 0·8553, and the mol. wt. determined by the method of freezing = 170. The formula was approximately $C_{12}H_{22}$.

The fraction 155°—160° C. had a sp. gr. = 0·8746; the mol. wt. = 194. The formula derived was approximately $C_{14}H_{32}$.

The fraction 190°—195° C. had the sp. gr. = 0·8915; mol. wt. = 222·8; the approximate formula being $C_{16}H_{30}$.

Hence the principal hydrocarbons in this oil belong to the C_nH_{2n-2} series. The residue from the last distillate *in vacuo* had a sp. gr. equivalent to 14° B., so that it is not so rich in the most valuable lubricating fractions as the heavier Texas oils previously examined. Since the hydrocarbons found, show no evidence of unsaturation, it is assumed that the structure corresponds to that of a double methylene ring and its derivatives; thus $C_{12}H_{22}$ would be a dihexahydrodiphenyl.—W. G. M.

Paraffin Wax; Determination of the Melting Point of Crude and Commercial ——. R. Kissling. Chem. Rev. Fett- u. Harz-Ind. 1901, **8**, [7], 141—142.

The author has modified his method (this Journal, 1898, 380) with the object of simplifying it and rendering it more accurate. From 10 to 30 grms. of the paraffin wax, &c., are introduced, in a clear melted condition, into a beaker, the size of which is comparatively unimportant. The quantity must be sufficient to cover by several mm. the bulb of the thermometer used to stir the mass. The length of the thermometer should not exceed 200 mm. The beaker containing the paraffin is brought to a temperature about 10° above the solidifying point of the substance, and is then immersed in a beaker containing water at the same temperature, and having a diameter about 10 mm. greater. The level of the water in the exterior beaker should be about 10 mm. higher than that of the paraffin in the inner beaker. The mass is stirred regularly with the thermometer until flakes begin to separate, and this is taken as the solidification point.

The author describes the results of 20 tests with 8 different varieties of paraffin wax to show that the melting points thus obtained are in close agreement in duplicate determinations.—C. A. M.

Catalysis in Concentrated Solutions. J. M. Crafts.

See under IV., next column.

PATENTS.

Anthracene; Manufacture and Purification of ——. L. Luyten and E. Blumer, Marche-les-Dames, Belgium. Eng. Pat. 14,892, Aug. 20, 1900.

IT has been found that for the purification of anthracene by treatment with solvents, such as solvent naphtha, carbon bisulphide, acetone, and the like, the tar oil (green oil) which is contained in crude drained anthracene as obtained from filter presses or centrifugal machines, is in no way prejudicial, but is, on the contrary, useful. The following is an example of the new process:—25 parts of drained crude anthracene are heated with 35 parts of naphtha until near the boiling point of the solvent. It is then allowed to cool, whereupon the anthracene crystallises, while nearly all the other matters remain in solution. The mixture is then filtered, and the anthracene washed with a little of the solvent. The latter is recovered by distillation. The anthracene is dried by heating it to its point of fusion, the solvent being distilled off and recovered. By this means, anthracene of 80 per cent. purity is said to be obtained.
—D. B.

Hydrocarbons, Pure, such as Fluorene and Phenanthrene, contained in Coal Tar; Obtaining ——, and Recovering certain By-Products. J. Wetter, London. From The Aktiengesellschaft f. Theer- und Erdöl-Ind., Berlin. Eng. Pat. 5047, March 9, 1901.

THE process is based upon the discovery that by removing a certain class of bodies from the solid constituents of coal tar, the boiling points of which are situated between those of naphthalene and anthracene, their separation from each other may be effected with comparative ease. The removal of the said class of bodies is performed by fusion with caustic alkali. The unaltered hydrocarbons will then be found floating on the melt, whilst the alkali contains a substance resembling phenol, consisting substantially of diphenol. After fusion with, say, caustic potash, the melt is lixiviated with water, which absorbs the potassium compounds of the newly-formed diphenols, while the hydrocarbons remain in the residue. By passing carbon dioxide into, or adding a mineral acid to the aqueous solution thus obtained, the diphenols may be precipitated and recovered as a by-product. After the solid deposits from the high-boiling coal-tar have been well fractionated, the corresponding hydrocarbons may be immediately obtained in a pure form by means of this process, provided that the said oils had been previously freed from acids and bases in the usual manner, and that the neutral liquid constituents had also been removed by combined pressure and heat.—D. B.

Naphtha, Solidified; Production of ——. R. Fallnicht, Altona, Germany. Eng. Pat. 9259, May 4, 1901.

THE solidification is effected in the following manner:—2 parts of caustic soda are dissolved in 3 parts of water. The solution is heated to 75° C. and poured into 10 parts of alcohol (90—96 per cent.) previously heated to 63° C. This solution is then slowly added with vigorous stirring, a mixture heated to 95°—100° C., consisting of 10 parts of stearine and 5 parts of colophony and finally to the entire mixture, 100 parts of naphtha are added, previously heated in a water-bath at 75° C. The mass is then allowed to cool.—D. B.

Stills, Steel or Iron, for Gas Works, Tar Works and th like Purposes. E. Snowden, Hull. Eng. Pat. 10,33 May 18, 1901.

THE inventor claims the method of constructing the botto of the stills in sections or segments connected directly t the shell by the use of flanges, whereby the bottom ca be repaired or renewed without lifting the still and witho disturbing more than a section of the adjoining brickwor This construction also facilitates cleaning.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Catalysis in Concentrated Solutions. [*Sulphonations* J. M. Crafts. Ber. 1901, **34**, [8], 1350—1361.

THE results obtained by a study of the catalytic action acids in dilute solutions have led to the discovery of number of simple relations between ionisation, chemic affinity and electrical conductivity, and it is genera assumed that the hydrogen ion is the active agent. T quotient of the velocity of the reaction by the concentration the catalytic agent is in dilute solutions of strong acids alm a constant quantity, whilst in the case of weak acids, increa of concentration beyond certain limits or the presence substances which retard the ionisation diminishes the veloc. the reaction, although the addition of certain salts in so cases causes a small increase. The author has investiga the hydrolysis of sulphonic acids by hydrochloric acid si firstly the reaction is a catalytic one in so far that i effected merely by the presence of a strong acid wh forms no intermediate compound and does not enter t finished product and secondly the concentration of t catalytic agent has no action on the sulphuric acid a corresponding hydrocarbon formed. The experime show that the velocity of the reaction is in no se proportional to the concentration of the catalytic agent, a 38 per cent. hydrochloric acid hydrolyses 35 times m rapidly than one of 19 per cent., and moreover by add to a 38 per cent. hydrochloric acid solution, half its wei of zinc chloride, the velocity is increased fourfold. He increased concentration and other causes antagonistic ionisation increase the rate of hydrolysis very percepti from which it would appear that the hydrolysis is effec by the molecules $HCl + H_2O$ and not by the hydrogen i unless some other action is due to dehydrating agents l hydrochloric acid, sulphuric acid, and zinc chloride. T question is still under investigation, but the present exp ments show that there is a marked difference betw catalysis in concentrated and dilute solutions. At 100 , benzene and *p*-toluene sulphonic acids are not decompo and *p*-xylene sulphonic acid only partially, whilst hig homologues react too rapidly and are moreover o partially soluble in concentrated hydrochloric acid at temperature. The experiments therefore were carried with *m*-xylene sulphonic acid $C_8H_9SO_3H + 2H_2O$ weighing a quantity out together with a weighed amoun hydrochloric acid or other catalysing agent into a g tube about 1 cm. diameter calibrated with weighed qu tities of *m*-xylene. After sealing and heating for a cer time, the height of the column of hydrocarbon liberated read off, taking all necessary precautions. A table is g showing the results obtained by employing different centages of hydrochloric acid with and without the addi of zinc chloride, for varying periods of time. There e between the velocity constant and the concentration of hydrochloric acid the following relation:—Each incr of 6 per cent. of hydrochloric acid between the lim 13 to 31 per cent., corresponds to a quadrupling of velocity constant. This law holds good for other sulph acids and also for lower percentages than 13. The rela ship can be expressed mathematically as follows. logarithm of the velocity constant is a linear function o percentage of hydrochloric acid. Compared with Ostw definitions of catalysis, hydrolysis by means of concent acids has little in common. Ionisation in this case pre a new aspect. For whilst substances like sugar or e under the influence of a catalytic agent are not capab ny appreciable dissociation in aqueous solution, the sulhonic acids in dilute solutions are almost as much issociated as the strongest acids. The practical outcome f such results as these is the establishment of methods for he separation of hydrocarbons by means of their sulphonic cids. Thus several investigators have employed similar ethods for separating *m*- and *p*-xylene and the author imself has found in the course of these researches that esitylene sulphonic acid is almost completely hydrolysed t 80° C. within 15 minutes, whilst ψ-cumene sulphonic cid yields under the same conditions no trace of ψ-cumene ven after 5 hours.—T. A. L.

ylidines; Nitro- and Bromo-Derivatives of the ——.

E. Noelting, A. Braun, and G. Thesmar. Ber. 1901, **34**, [11], 2242—2262.

n 1891 Noelting and Stoecklin (Ber. 1891, **24**, 567; eilstein, III. ed., Vol II., 540—541) investigated the itration of the two orthoxylidines and obtained two itro derivatives of each, viz., *ortho*- and *para*-nitro-*vic*.-rthoxylidine and *ortho*- and *meta*-nitro-*as*.-orthoxylidine.

The authors have now found that, not only two, but all hree isomers are formed during the nitration of both *vic*.-nd *as*.-orthoxylidine. Their original object was to study he formation of indazoles from derivatives of *vic*.-orthoylidine. All three nitro derivatives of *vic*.-orthoxylidine ield indazoles.

The bromo derivatives of metaxylidine were also more losely investigated. They do not yield indazoles. On the ther hand, nitrobromoxylidines give, as a rule, a very good ield of indazoles. The experiments on the formation of ndazoles are to be published subsequently.

Mono-nitro Derivatives of vic.-orthoxylidine.—The mononitro derivatives of *vic*.-orthoxylidine may be obtained by he nitration and subsequent hydrolysis of acetyl-*vic*.-orthoylidine. In this case the separation of the three isomers very tedious, though the yield is good.

On the other hand, by nitrating *vic*.-orthoxylidine, the eparation is both completely and rapidly effected.

Metanitro-*vic*.-orthoxylidine sulphate crystallises from lcohol in bright yellow needles, melting at 111°—112° C. t is more soluble in alcohol and water, and is more strongly asic than the corresponding ortho-nitro compound.

The filtrate from the above substance separates the orthoitro-*vic*.-ortho-xylidine (free base) on the addition of 1½ vols. f water. It is obtained almost pure on filtration.

The 4-nitro-3-amino-1.2-xylene crystallises from alcohol brick-red plates, melting at 118°—119°. It is sparingly oluble in water, but fairly readily so in alcohol and benzene. n very concentrated hydrochloric acid it dissolves, but the ydrochloride is decomposed and the free base is precipitated n the addition of water. Thus the presence of a nitro roup in the ortho position to the amino, neutralises to a reat extent the basicity of the latter group.

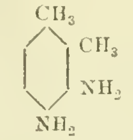
The para-nitro-*vic*.-orthoxylidine is obtained by carefully dding ammonia to the filtrate from the above. This -nitro-3-amino-1.2-xylene crystallises from alcohol in ellow-brown prisms, melting at 114°, dissolving with ifficulty in water but fairly readily soluble in alcohol and enzene.

Under these conditions, the yield of each of the three omers was: ortho-nitro-*vic*.-orthoxylidine, 25 per cent.; eta-nitro-*vic*.-orthoxylidine, 45 per cent.; para-nitro-*vic*.-thoxylidine, 30 per cent. If only 10 parts of sulphuric id be used, the yield of each is: ortho-nitro-*vic*.-orthoylidine, 25 per cent.; meta-nitro-*vic*.-orthoxylidine, 33 per nt: and para-nitro-*vic*.-orthoxylidine, 42 per cent. With parts of sulphuric acid, the yield of the meta derivative ses to 58 per cent., while that of the ortho derivative falls 15 per cent.

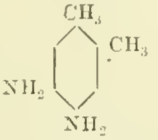
Mononitro Derivatives of as.-orthoxylidine. The nitration *as*.-o xylidine is carried out under similar conditions to ose adopted for the nitration of *vic*.-o-xylidine. The meta rivative is formed in very small quantity and, in order to crease the yield of this substance, 30 parts of sulphuric id are used, and the temperature is not allowed to rise ove −15° C. during the nitration. On pouring the reaction oduct into water, the greater part of the 5-nitro-4-amino-1.2-xylene separates and the whole is obtained on fractionally adding ammonia to the solution, and then filtering. When pure, it crystallises from alcohol in red brown prisms, easily soluble in alcohol and benzene, but sparingly soluble in water, and possessing only very weakly basic properties. The salts are decomposed by water. The filtrate from this substance is made strongly ammoniacal and treated with a current of steam, until the whole of the 3-nitro-4-amino-1.2-xylene has distilled over. This substance crystallises from alcohol characteristically in fine scarlet prisms of m. pt. 65—66°, very easily soluble in alcohol and benzene, and not inconsiderably soluble in water. It is much more strongly basic in its properties than the *vic*-o-nitro derivative, yet its salts are decomposed by steam, in which it is easily volatile.

6-nitro-4-amino-1.2-xylene is found in the non-volatile residue from the steam distillation and may be readily extracted by dilute acids. The pure substance crystallises in long, shining leaflets of an orange color melting at 74°—75° C. They are very easily soluble in benzene and alcohol and appreciably so in water. This substance is much less volatile with steam than the two isomers. Under these conditions, the most favourable to the formation of the meta derivative, the yields were:—47 per cent. of *sym*.-orthonitro-*as*.-orthoxylidine; 31 per cent. of *vic*.-orthonitro-*as*.-orthoxylidine; and 13 per cent. of metanitro-*as*.-orthoxylidine.

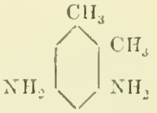
o-Xylylenediamines.—The 4 isomeric xylylenediamines were prepared by the reduction of the corresponding mononitroorthoxylidines with tin and hydrochloric acid.



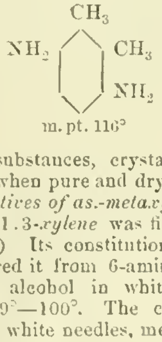
m. pt. 118°—119°



m. pt. 125°—126°



m. pt. 65°—67°



m. pt. 116°

They are white substances, crystallising in needles or leaflets, very stable when pure and dry.

Monobromoderivatives of as.-metaxylidines.

6-*Bromo*-4-*amino*-1.3-*xylene* was first obtained by Genz. (Ber. 1870; **3**, 225.) Its constitution was proved by the authors, who prepared it from 6-amino-4-nitro-1.3-xylene. It crystallises from alcohol in white leaflets volatile in steam melting at 99°—100°. The corresponding *xylenol* crystallises in nearly white needles, melting at 72° C.

2-*Bromo*-4-*amino*-1.3-*xylene* was prepared from *vic*.-metanitrometaxylidine (Noelting and Stoecklin, Ber. 1891; **24**, 568).

2-*Bromo*-4-*nitro*-1.3-*xylene*.—This crystallises in light yellow, transparent tapering needles, m. pt. 57°—58°. It is volatile in steam. On reduction it gives the amino body, which crystallises in long white silky needles, melting at 47°—48°, and is likewise volatile in steam.

2-*Bromo*-4-*oxy*-1.3-*xylene* crystallises in light yellow needles melting at 68° C.

5-*Bromo*-4-*amino*-1.3-*xylene*.*—Prepared by the direct bromination of *as*.-metaxylidine in glacial acetic acid solution. It crystallises in long, white silky needles, perfectly similar to 2-bromo-4-amino-1.3-xylene, and melting, like the latter substance, between 47° and 48° C.

The corresponding 5-*bromo*-4-*oxy*-1.3-*xylene* (4) melts 72° C. (nearly white needles).

Monobromo Derivatives of vic.-metaxylidine.—5-*Bromo*-2-*amino*-1.3-*xylene* was obtained by Fischer and Windaus (Ber. 1900, **33**, 1974) by the direct bromination of *vic*.-*m*-xylidine, but its constitution was not determined. It crystallises from alcohol in long, white needles, m. pt. 50°—51° C.

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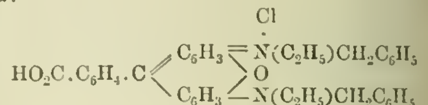
* It is stated that this substance was described by E. Fischer and A. Windaus. Ber. 33, 1971 [1900]. Its constitution was determined by them; but the independent experiments of Noelting, Braun and Thesmar were carried out in 1899.

4-Bromo-2 amino-1.3-xylene was obtained as a colourless mobile liquid (b. pt. 146°—147° at 15 m.m.), which solidifies in a freezing mixture and then melts at 21·5°. It is obtained by the reduction of *4-bromo-2-nitro-1.3-xylene*, which is obtained from the corresponding nitroxylidine, on replacing the amino-group by a bromine atom. The substance crystallises characteristically in fine yellowish prisms, melting at 70°—71° C.—H. L.

Alkylated Aminobenzene Sulphonic Acids and Metaminophenols. R. Gnehm and Th. Scheatz. J. prakt. Chem. 1901, **63**, [9 and 10], 405—427.

Since the discovery of the Rhodamines, *m*-sulphanilic acid (or metanilic acid) has become an important substance for the colour industry. Its dialkyl derivatives form the raw materials for Rhodamines and Pyronines, in which dyestuffs an increasing molecular weight changes the shade from reddish yellow to bluish red. In order to obtain yellower shades it is necessary to start with an incompletely alkylated product or else to remove alkyl groups from the products of blue shade, by heating to a high temperature. The authors describe the preparation of monalkyl-*m*-sulphanilic acids (monalkylmetanilic acids) their conversion into the corresponding *m*-aminophenols and the production of alkylbenzyl-*m*-amino derivatives and some dyestuffs from these compounds. Free metanilic acid cannot be directly alkylated by means of methyl iodide and methyl alcohol, but the sodium salt, on boiling for 2½ hours with these reagents, gives the desired product. The same is the case with the acetyl derivative obtained by heating the sodium salt with somewhat more than the theoretical quantity of acetic anhydride to 140° C. This salt crystallises in long, colourless needles, melting at 185° C. The acetyl compound could not be alkylated by heating with methyl iodide and methyl alcohol under any conditions. Under pressure, alkylation does take place, but the acetyl group is split off simultaneously. The sulphonation of monomethyl aniline gives a yield of about 35—40 per cent. of the *m*-derivative, by adding 200—300 grms. of the base in about 4 hours to twice its weight of "oleum" (25 per cent. SO_3) at a temperature not exceeding 50° C. Three parts by weight of "oleum" (75 per cent. SO_3) are then added in about 2 hours, below 50° C., and the melt is allowed to stand for 2—3 days until a sample is readily soluble in alkaline water. The melt, after pouring into water, is treated with barium carbonate, and on evaporating the filtered solution after acidifying, the free acid crystallises out in needles, insoluble in alcohol and ether, moderately soluble in cold, easily soluble in hot water. The sodium salt is a white crystalline powder containing no water of crystallisation. The melt also contains an isomeric acid which decomposes at 244° C., and of which the sodium salt crystallises in white plates containing 3 molecular proportions of water. Ethyl-aniline sulphonated in the same same way, gives a 45—50 per cent. yield of the *m*-acid, which separates from water in white needles, decomposing without melting at 294° C. The affinity constant (K) of metanilic acid is, according to Ostwald, 0·0185, that of the ethylmetanilic acid is 0·0158, whilst as regards solubility, 100 parts of a solution of metanilic acid contain at 15° C., 1·485 parts of the acid, but 2·15 parts of the ethyl derivative. Ethylmetanilic acid combines with diazobenzene, forming an azo compound which crystallises from alcohol and ether in microscopic needles, decomposing at 165° C. The action of benzyl chloride in presence of sodium hydroxide on the salts of alkylmetanilic acids, yields alkylbenzylmetanilic acids. Methylbenzylmetanilic acid forms white needles more sparingly soluble in water than the methylmetanilic acid. The barium salt of ethylbenzylmetanilic acid is very sparingly soluble in water.

The alkylated metanilic acids when fused with potash or soda yield the corresponding alkylated aminophenols. The reaction requires a lower temperature than *m*-aminophenol. For instance, methyl-*m*-aminophenol is obtained by adding methylmetanilic acid to three times its weight of caustic potash fused at 200° C., with one-tenth its weight of water. The temperature is then raised to 220° C. and maintained for eight hours, when the brown melt, after cooling, is dissolved in 10 times the weight of hot water of the origin methylmetanilic acid, acidified with hydrochloric acid, boil cooled, neutralised with bicarbonate, and extracted wi ether, giving finally an oil distilling at 170° C. under 12 mı pressure. The product is readily soluble in hot wate alcohol, ether, benzene, and especially acetic ether. It giv on heating with phthalic anhydride a yellowish-red Rhod mine. Ethyl-*m*-aminophenol forms a crystalline powd melting at 62° C., and distilling under 12 mm. pressure 176° C. Ethylbenzyl-*m*-aminophenol obtained from sodiu ethylbenzylmetanilate requires to be fused at about 240 250° C., and finally for a short time at 260° C. The produ forms a brownish viscid oil which gradually crystallise On heating ethylmetaminophenol with phthalic anhydride 130° C., it is converted into the corresponding phthalein, which the chloride separates in shining greenish needle The base is sparingly soluble in water and benzene, readil in alcohol. The salts are soluble in water with a red colo and orange-yellow fluorescence. The Rhodamine 6 G commerce, is for tho most part the ester of this derivativ The benzyl derivative of the foregoing compound having tl formula:—



$$HO_2C.C_6H_4.C\begin{cases}C_6H_3=\overset{Cl}{N}(C_2H_5)CH_2C_6H_5\\ \quad\;\; > O\\ C_6H_3-N(C_2H_5)CH_2C_6H_5\end{cases}$$

forms a brownish-red shining greenish powder, of whi the carmine-red solutions show an intense yellow fluore cence.

By nitrating ethylbenzylaniline in sulphuric acid soluti below 5° C. it yields a product which separates from eth in red nodular crystals, sparingly soluble in water, solub in organic solvents. On reduction it gives an oily ba which does not form a phthaleïn with phthalic anhydrid but gives a blue dyestuff when treated with sulphurett hydrogen and ferric chloride in hydrochloric acid solutio It must therefore be considered as a *p*-nitroderivative, a hence ethylbenzylaniline behaves to nitric acid like benzy idene aniline, which also yields only a *p*-nitro compoun whilst ethylaniline gives a mixture of *m*- and *p*-derivativ and dimethyl- and diethyl-aniline principally *m*-nitro com pounds.—T. A. L.

Sulphocyanogen, so-called Pseudosulphocyanogen and t Yellow Dyestuff obtained from Sulphocyanide Sal A. Goldberg. J. prakt. Chem. 1901, **63**, [9 and 1 465—495. (See also this Journal, 1884, 629.)

The investigation of sulphocyanogen products $(CNS)_x$ w commenced by Liebig in 1829, and the results obtained him and other investigators since that time are summaris as follows:—A true sulphocyanogen $(CNS)_x$ has not be obtained in a pure state. So-called pseudosulphocyanog (a reddish-yellow amorphous substance) prepared by vario wet methods (also electrolytically) differs in compositi according to the conditions under which it is obtain It contains, however, without doubt, hydrogen, and oxyg also probably enters into its composition, but there is so doubt as to whether it is or is not a simple substance o mixture. Its alkaline solution gives a voluminous gelatino precipitate which dries to a yellow powder. On boili with water, small quantities of sulphuretted hydrogen given off, whilst soda or potash lye on heating give precipitate of sulphur. Boiling with potassium hyd sulphide (KSH) yields potassium dithio-melanurate. Hyd chloric acid or aqueous ammonia under pressure split sulphur and sulphuretted hydrogen forming cyanuric a or its derivatives (thioammelin, melamine sulphocyanic and ammonium thiocyanate. Fusion with potash yie potassium thiocyanate and cyanate, whilst treatment w phosphorus pentachloride gives chlorocyanogen, chlor of sulphur, phosphorus sulphochloride, and phospho trichloride. The colouring properties of pseudosulp cyanogen were already referred to by Liebig, and certai since 1849 it has been known that alkaline solutions of t substance dye vegetable fibres. According to Ger. 1 32,356 (1884), H. O. Miller obtained a yellow dyestuff the action of potassium chlorate and hydrochloric acid ɔtassium thiocyanate and subsequent precipitation of the ;estuff by alcohol, which he termed Canarin. He was of ɔinion that the substance is different from pseudosulpho-·anogen, and this view is also taken by Markownikoff (Ber. /, Ref. 279), Goppelsroder (this Journal, 1884, 629), and e author, whilst other investigators assume them to be entical substances (this Journal, 1901, 113).

The author describes at greater length the methods which e summarised in his previous paper (this Journal, 1901, .8), and endorses his conclusion that the products, so-lled pseudosulphocyanogen and Canarin the true sub-ıntive cotton dyestuff, when obtained by purely chemical ethods are undoubtedly different substances. The in-stigation of Miller's method, shows that the true dyestuff not present in the first product of the reaction and is ly formed as one component of a mixture by treatment th alkali. The following table gives the percentage ıounts (calculated on the potassium thiocyanate taken) pseudosulphocyanogen and Canarin obtained by the tion of various reagents on potassium thiocyanate, the estuff being precipitated by soda lye or concentrated dium carbonate solution as sparingly soluble sodium salt ɔm the solution of pseudosulphocyanogen in potash lye.

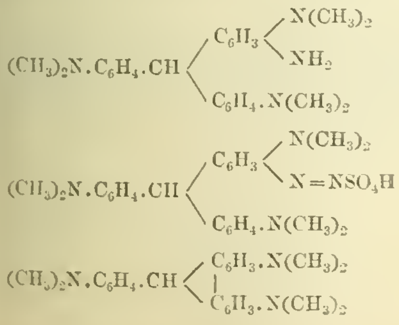
KCNS and	Pseudo-sulpho-cyanogen.	Canarin Sodium Salt.	Free Canarin.
lorine in excess	43·3	5·96	3·9
....	33·0	3·6	c. 2·0
r....................	60·7	2·5	1·9
r....................	42·2	..	c. 2·0
r....................	10·0	..	..
Br..................	21·6	..	c. 2·0
O_3 (sp. gr. 1·54)...	26·8—30·9	2·3—3·0	1·0—1·3
out 1·5HNO_3	25·0—30·0	10·5	2·5—3·5
NO_3..................	27·0	..	..

—T. A. L.

phenylenephenylmethane; Dyestuff derived from ——. A. Haller and A. Guyot. Comptes Rend. **132**, [25], 1527—1531.

THOAMINO - HEXAMETHYLTRIAMINOTRIPHENYLMETHANE s diazotised. In dilute hydrochloric acid solution the e result was the conversion of the ortho-amino- into the hohydroxy-derivative (fine needles, m. pt. 173° C., in-uble in aqueous but soluble in alcoholic potash; dised in alcoholic solution by chloranil, it gives a violet) de in concentrated hydrochloric acid, the corresponding aochloro derivative obtained. (Fine white needles, pt. 97° C., slightly soluble in boiling alcohol, very soluble benzene or chloroform. Oxidised by lead peroxide acetic acid, it yields a crystallised dyestuff which s a wool pure blue).

Vhen the diazotisation is carried on in dilute sulphuric l, the hydroxy derivative described above is obtained; as the concentration of the acid is increased, the diazo ıpound needs a higher temperature to decompose it, and ds on breaking up a *hexamethyltriaminophenylfluorene*, fine white crystals, very soluble in alcohol or boiling zene, melting at 214° C. Oxidised in alcoholic solution chloranil, it gives a greenish-blue coloration which omes blue-violet on dilution with water. The following nulæ show its formation :—



$$(CH_3)_2N.C_6H_4.CH\left\langle\begin{array}{l} C_6H_3\left\langle\begin{array}{l}N(CH_3)_2\\ NH_2\end{array}\right. \\ C_6H_4.N(CH_3)_2\end{array}\right.$$

$$(CH_3)_2N.C_6H_4.CH\left\langle\begin{array}{l} C_6H_3\left\langle\begin{array}{l}N(CH_3)_2\\ N=NSO_4H\end{array}\right. \\ C_6H_4.N(CH_3)_2\end{array}\right.$$

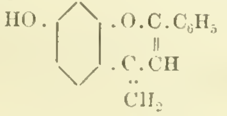
$$(CH_3)_2N.C_6H_4.CH\left\langle\begin{array}{l} C_6H_3.N(CH_3)_2\\ \mid \\ C_6H_3.N(CH_3)_2\end{array}\right.$$

The substance is not formed by the production and subsequent elimination of the elements of water from the orthohydroxy compound.

Hexamethyltriaminofluorene is a leuco-base, and when oxidised by lead peroxide yields a blue dyestuff; the introduction of the fluorenic linking into "Crystal Violet" seems to have the effect of making the tint bluer, without producing any other alteration, for the general properties of the new dyestuff are essentially similar to those of "Crystal Violet."—J. T. D.

1.4-*Benzopyranol, the Parent Substance of a new Class of Dyestuffs II.; Derivatives of* ——. C. Bülow and H. Wagner. Ber. 1901, **34**, [9], 1782—1804.

In continuation of their previous work (Ber. **34**, 1189; this Journal, 1901, 704) the authors have now replaced the symmetrical 1.3-diketone, acetyl-acetone, by an unsymmetrical one,-such as benzoylacetone $CH_3.CO.CH_2.CO.C_6H_5$, and have condensed this substance with resorcinol, phloroglucinol and pyrogallol in the manner already described, obtaining similar condensation products to those previously formed. For example, resorcinol when condensed with benzoylacetone in glacial acetic acid solution with gaseous hydrochloric acid yields anhydro-2-phenyl-4-methyl-7-oxy-[1.4-benzopyranol]



which by decomposition with caustic alkalis, gives acetophenone and resacetophenone. In a similar manner phloroglucinol yields anhydro-2-phenyl-4-methyl-5.7-dioxy-[1.4-benzopyranol] and pyrogallol, anhydro-2-phenyl-4-methyl-7.8-dioxy-[1.4-benzopyranol]. Hence in the condensation of unsymmetrical benzoylacetone with suitable phenols to benzopyranol derivatives, the phenyl radicle invariably enters ortho to the oxygen in the side ring, the methylene group being para. The chromophoric group of this class of dyestuffs is also as in the case of the acetylacetone derivatives—

$$\begin{array}{l} .O.C. \\ .C.\ddot{C}. \\ \;\;\;\;CH_2 \end{array}$$

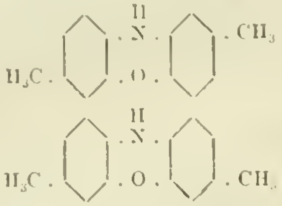
which only differs from that of Flavone in having a divalent methylene radicle in place of a ketonic oxygen. The action of reducing agents on acid solutions of these dyestuffs yields leuco compounds containing the group—

$$\begin{array}{l} .O\ .\ C. \\ .CH.\ddot{C}. \\ \;\;\;\;\;\;CH_3 \end{array}$$

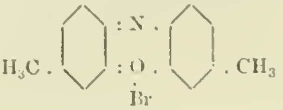
which by the action of air or oxidising agents reproduce the original dyestuffs. The new derivatives behave similarly to those already described. They form additive hydrochloric acid salts which lose part of their acid on exposure to air and are dissociated in dilute aqueous solutions. They give tolerably stable picric acid compounds. With regard to the acetyl derivatives, anhydro-2-phenyl-4-methyl-7-acetoxy-[1.4-benzopyranol] exists in two forms, one being white, amorphous and readily soluble, the other separating in brownish-red-greenish metallic shining crystals very sparingly soluble and only dissolving partially in boiling aniline, nitrobenzene and pyridine. Similar dimorphic phenomena are exhibited by the methylated products. With dimethyl sulphate in alkaline solution, an amorphous substance is obtained, whilst methyl iodide under certain conditions forms very sparingly soluble shining greenish needles. It is not possible to convert the amorphous into the crystalline form.—T. A. L.

Azoxonium Compounds. F. Kehrmann. Ber. 1901, **34**, [8], 1623—1626.

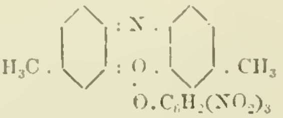
In 1887, Bernthsen, by condensing pyrocatechol with o-aminophenol, obtained phenoxazine. The author finds that this reaction proceeds more smoothly by condensing homopyrocatechol 1.3.4.$C_6H_3.CH_3.(OH)_2$ with o-amino-*m*-cresol 1.4.5.$C_6H_3.CH_3.NH_2.OH$ at 250°—260° C., giving two isomeric dimethylphenoxazines, having the formulæ—



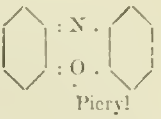
and melting at 179° and 205° C. respectively. Both products, more especially the one with higher melting point, are converted by the action of oxidising agents (Fe_2Cl_6, Br) in alcoholic or benzene solution, into salts of dimethylphenazoxonium for example, the bromide—



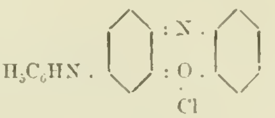
If the oxidation with bromine be performed in presence of picric acid, the resulting stable picrate has the formula—



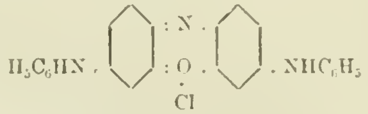
and separates as a reddish-violet crystalline powder almost insoluble in cold alcohol. The bromide forms a violet crystalline powder soluble in water to a reddish-violet solution. It dissolves with a bluish-violet colour in concentrated sulphuric acid, which only becomes slightly redder on dilution with water, and hence there only exists one series of salts. The picrate of phenazoxonium from the simplest phenoxazin is very unstable, and separates as a brick-red powder having the formula—



By treatment, more especially in a nascent state, with different amines, the hydrogen atoms para to the trivalent nitrogen are readily substituted, yielding for example—



and



the first being a magenta and the second a greenish-blue dye-stuff similar to Capri Blue.—T. A. L.

Erica Pink; Note on ——. E. Knecht. J. Soc. Dyers and Colourists, 1901, **17**, [6], 151.

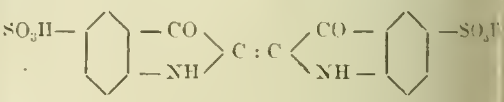
The dye-stuff known as Erica B is obtained by combining diazotised dehydrothiometaxylidine with α-naphthol-ε-disulphonic acid (Epsilon acid). The shades produced with it are pure and comparatively fast to light, but possess, in common with all the direct cotton colours, the disadvantage of bleeding, so that for coloured figured goods of high quality Erica Pink is not available. The fastest colour f such purposes is a good Turkey pink, and this is also use for beadings in cotton and linen goods which have t undergo the bleaching process. Even Turkey pink, however, is not absolutely fast and sometimes nearly disappea if the bleaching be not carefully carried out.

With the object of obtaining a very fast pink, the auth attempted to produce an unsulphonated Erica on the fibr The great difficulty was the insolubility of the dehydro bas but this was overcome by dissolving in spirit and pourir into water, when a milky liquid results. The cotton turned in this for some time in the cold, after which tl temperature is raised to the boil and kept at the boil for hour. Diazotised, developed with β-naphthol, and clear in a boiling soap bath, a pink results, which, though n equalling Erica B in brilliancy, is brighter than Turk pink. The colour does not bleed nor lose in strength wh boiled with water or alkali, nor when put through t ordinary bleaching process.

Unfortunately, however, the colour is extremely fugiti to light, and for that reason would not find practical applic tion. It is theoretically interesting as showing the effect the sulpho groups on the fastness to light of this particul class of colour.—R. B. B.

Constitution of Indigo-Carmine. D. Vörlander and I Schubart. Ber. 1901, **34**, [9], 1860—1863.

Indigo Carmine, the disulphonic acid of indigo, contains sulphonic groups in the para position relatively to the im radicles, and has the following constitution :—



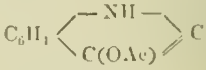
It has been synthetically prepared from aminotolu sulphonic acid ($CH_3 : NH_2 : SO_3H = 1 : 2 : 5$); this s stance, when heated with an alkali chloro-acetate, converted into the corresponding glycocoll derivat $SO_3H.C_6H_3(CH_3)NH.CH_2.CO_2H$, which on oxidat yields the carboxy acid—

$$SO_3H.C_6H_3(COOH).NH.CH_2.CO_2H.$$

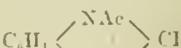
The intermediate indoxyl derivative, produced by hea the carboxylic acid with acetic anhydride and sodium acet is readily converted by a dilute solution of caustic s into indigo disulphonic acid, the dyestuff being thr down as a flocculent blue precipitate on the additio common salt. The absorption spectrum of the synthet product corresponds exactly with that of Indigo Carm and both dyestuffs yield sparingly soluble barium and salts. The product, obtained by performing a similar se of experiments on 1 : 2 : 4-aminotoluene sulphonic ($CH_3 : NH_2 : SO_3H = 1 : 2 : 4$), differs markedly from In Carmine ; its solution cuts off the greater portion of the end of the spectrum and gives no precipitates with solut of lead or barium salts. Basic lead acetate gives pre tates with both the isomeric dyestuffs, but that prod from the 1 : 2 : 4 acid is soluble in excess of the reagent —G. T.

Indoxyl and Indoxylic Acid; Acyl Derivatives of — D. Vorländer and B. Drescher. Ber. 1901, **34**, 1854—1860.

The acyl monoacetylindoxylates are prepared eithe heating the dry ethereal salt with acetic anhydride o shaking its alkaline solution with the same reagent. T derivatives are insoluble in solutions of the caustic al and do not develop colorations with ferric chloride; may accordingly have one or other of the follo constitutions—

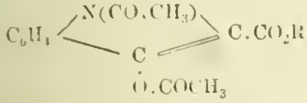


or



ıe formation of the compounds in alkaline solutions orts the first formula, whilst the non-formation of itroso-derivatives is evidence in favour of the second.

ıacetylindoxylates are obtained by boiling the mon-l derivatives with acetic anhydride and sodium ıte; they have, in all probability, the configuration esented by the formula—



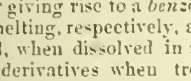
ethyl acetylindoxylate melts at 143°—144°, and the ester at 136; they crystallise in needles. *Methyl thyl diacetylindoxylates* melt, respectively, at 83—84° 82.

ethyl indoxylate yields a *benzoyl* derivative, melting at ; the ethyl ester giving rise to a *benzoyl* derivative and *enylcarbimide*, melting, respectively, at 163° and 187°—. Indoxylic acid, when dissolved in alkaline solutions, ily yields acyl derivatives when treated with acetic ropionic anhydride or benzoic chloride, and since r these conditions phenylglycine carbonic acid is known ive rise to *N*-acyl compounds, it is highly probable the mono-acyl indoxylic acids obtained correspond in ture with the second formula proposed for the mono- indoxylates, the acyl group attaching itself to the ic nitrogen atom.

etylindoxylic acid melts at 175°, develops a red ation with ferric chloride, and is not acted on by us acid; the corresponding *propionyl-* and *benzoyl-* atives melt respectively at 163 and 196°. These acyl esters may also be prepared by treating dry xylic acid with the appropriate reagent, although at temperatures the acid loses carbon dioxide, when ed with acetic anhydride or chloride, yielding a tylindoxyl, melting at 82°.

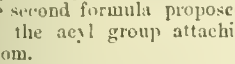
dexyl, produced when indoxylic acid is heated at 120°, oiled with water, is partly decomposed under these itions, yielding a tarry product; it may, however, be ned in a crystalline form by heating the acid with r (20 parts) at 70°—80°.

-Acetylindoxyl—



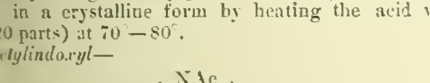
ıced on dissolving indoxyl in acetic anhydride, allises in needles, and melts at 136°.

Acetylindoxyl—

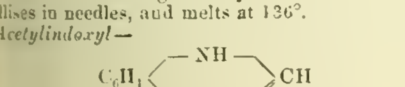


ned by treating an alkaline solution of indoxyl with anhydride crystallises in leaflets, and melts at 126. ıugh indoxyl itself develops a coloration with ferric ide, yet both its acetyl derivatives give a negative result this reagent. Both acetyl derivatives can be converted liacetylindoxyl, whilst only the *O*-derivative yields a o compound, this product crystallising in yellow es, and melting at 83°.

hen these experiments are repeated on Indigo White, it ınd that this substance, when acetylated either alone the presence of aqueous alkalis, yields the same yl derivative. This compound, supposed by Lieber- and Dickhutt to be the keto-form of *N*-Diacetyl- White, corresponds with *O*-diacetylindoxyl, and ıbly has the constitution—



t its oxidation product diacetylindigo, produced by the of nitrous acid, corresponds with the formula—



Tetracetylindigo white is obtained by boiling the diacetyl derivative with acetic anhydride in the presence of sodium acetate.

Dipropionyl- and *dibenzoyl-indigo white* melt at 218° and 240° respectively; the latter when oxidised by nitrous acid yields brownish-red crystals, probably consisting of dibenzoylindigo (compare Liebermann and Dickhutt, this Journal, 1892, 426).—G. T. M.

Anthranilic Acid; Action of Formaldehyde and Nascent Hydrocyanic Acid on ——. E. Kohner. J. prakt. Chem. 1901, **63**, [9 and 10], 392—404.

ANTHRANILINOACETONITRILE, $HO_2C.C_6H_4.NHCH_2CN$, is obtained by treating 140 grms. of anthranilic acid and 100 grms. of finely-powdered potassium cyanide in 120 c.c. of glacial acetic acid with 100 c.c. of commercial formaldehyde at low temperature, the mass subsequently being warmed for half an hour to 80°—90° C. The excess of hydrocyanic acid then escapes and a brown solution results, which solidifies to a yellowish brown mass. After filtering from adherent mother-liquor, the residue is dissolved in sodium carbonate solution and precipitated with hydrochloric acid, giving 141·5 grms. of an almost colorless product, melting at 179°—180° C. On crystallisation from three times its weight of 96 per cent. alcohol, it forms yellowish leaflets, melting at 181° C. The substance has no basic properties, being insoluble even in concentrated hydrochloric acid; it reddens litmus and gives salts with bases. The dilute aqueous alcoholic and ethereal solutions fluoresce with a violet colour. On boiling with caustic alkalis it is decomposed, giving off ammonia and yielding phenyl-glycin carboxylic acid. This method can be employed for determining the percentage of a given sample of anthranilinoacetonitrile. If, after boiling off the ammonia, the melt be heated for two hours to 225° C., out of contact with air, a yellowish-red melt is obtained, which, after dissolving in water, gives Indigo when air is blown through the solution. The methyl ester is best obtained by means of dimethyl sulphate in methyl alcoholic solution, and forms yellowish-grey matted needles, melting at 106·5° C. Attempts to obtain an inner condensation product from the ester in ethereal or benzene solution did not produce the desired cyanindoxyl or indoxyl derivatives. By heating the methyl ester in an oil bath to 150° C. for six hours with fused sodium acetate and acetic anhydride, it is converted into an acetyl derivative, which separates from benzene-petroleum spirit as an oil solidifying to colorless crystals, melting at 83° C. The ester, by the action of bromine in chloroform solution, yields a monobromo derivative, melting at 142° C., whilst anthranilinoacetonitrile itself also gives a mono-bromo derivative, melting at 212° C., and separating from chloroform in colorless plates. An unstable nitroso product is obtained from the nitrile by the action of nitrous acid. It forms a yellowish-white powder, melting at 114° C., but could not be converted by reduction with stannous chloride into a hydrazine derivative.—T. A. L.

Indigo; Conversion of Anthranilic Acid Derivatives into ——. H. Erdmann. J. prakt. Chem. 1901, **63**, [9 and 10], 385—391.

THE author describes condensation products from anthranilic-methyl ester and formic ester and formaldehyde and certain reactions of these substances. By condensing formic ethyl ester with anthranilic methyl ester in presence of sodium at the ordinary temperature, and finally cohobating the mixture on the water bath for half an hour, there is obtained *o*-aminobenzoyl formic ethyl ester, $H_2N.C_6H_4.CO.CO_2C_2H_5$, which forms colorless needles melting at 49° C., soluble in concentrated hydrochloric acid, from which solution it is precipitated unchanged by adding water. It gives, on hydrolysis, anthranilic acid melting at 142° C. The condensation product from anthranilic methyl ester and formaldehyde in presence of sodium, yields methylene anthranilic methyl ester $H_2C:N.C_6H_4.CO_2CH_3$, the yield from 25 c.c. of fused ester being 26 grms. The product separates from chloroform in colourless crystals melting at 116·5° C. Hydrobromic acid forms an unstable addition product, whilst bromine in chloroform solution gives a dibromide melting at about 184 C. to a violet solution, which gives off large quantities of carbon dioxide. The dyestuff thereby formed is soluble in alcohol and hot water, and gives reddish-violet shades on wool. Hydrochloric acid turns the product yellowish-brown, becoming raspberry-red on dilution. The product is most probably an acridine derivative. The reaction between methylene anthranilic ester and hydrocyanic acid did not proceed smoothly, but condensation takes place when formaldehyde and nascent hydrocyanic acid act on anthranilic acid (see preceding abstract). The author finds further that those derivatives of anthranilinoacetonitrile $HO_2C.C_6H_4.NH.CH_2.CN$. in which the carboxyl hydrogen is replaced by alkyl and the imino hydrogen by an acid radicle, readily yield Indigo when fused with a relatively small quantity of caustic soda and at a temperature 50°—70° C. lower than is required with phenylglycin carboxylic acid. Using naphthalene as a diluent he obtains from 1 grm. of acetanthranilinoacetonitrile methyl ester, 0·27 grm. of pure Indigo, or 48 per cent. of the theoretical amount.—T. A. L.

Indigo; Manufacture of ——, from Naphthalene. H. Levinstein. J. Soc. Dyers and Colourists, 1901, **17**, [6], 138—142.

In the present competition between natural and artificial Indigo, one of the chief difficulties against which the planters have to contend is their ignorance of the cost price of artificial Indigo (this Journal, 1901, 353). This chiefly depends on (1) the price of the raw materials, and (2) the yield of colour obtained from these. The first of these items is easily ascertained from the market price lists; with regard to the second, the author furnishes more complete details of the manufacture than those already published (this Journal, 1901, 239, 554, &c.), in order that a chemist may, by repeating the operations in his laboratory, directly determine the yields obtained and deduce from these the actual cost of production.

The first step in the process is the conversion of naphthalene into phthalic acid. Naphthalene is dissolved in fuming sulphuric acid and the solution distilled in the presence of mercurous sulphate. The solution of naphthalene contains 1 part of naphthalene in 13—14 parts of fuming sulphuric acid (5—6 per cent. anhydride) and is kept in a large elevated reservoir. From this it can be transferred to a small pan holding 22 litres, which serves to measure it, and the solution is then conducted into a flat cast-iron distillation pan.

(*a*) *Coating of the Pan.*—Before the distillation the pan is coated with the mercury preparation, by charging it with 120 parts of sulphuric acid (86·6 per cent.) and 4 parts of mercury, and then in about 1½ hours distilling over the excess of sulphuric and sulphurous acids.

(*b.*) *Distillation.*—The temperature is slightly lowered and the contents of the measuring vessel are run into the distillation pan. The heating is so regulated that all distils over in 15—17 minutes. A fresh portion is then run in, and this process is carried on until the pans no longer work owing to the accumulation of carbon on the inside.

(*c.*) *Treatment of the Distillate.*—This consists of two parts:—(1) The gaseous distillate, which is composed of sulphurous acid. This is passed through the condensing apparatus, drawn off to the absorbers, and reconverted into sulphuric anhydride by the contact process. (2.) The liquid portion, consisting of sulphuric acid and phthalic anhydride. The two are separated by means of a hydro-extractor, the sulphuric acid is recovered, and the phthalic anhydride is well washed, and then dried in the stoves. It is subsequently obtained in a state of purity by redistillation from an iron cylinder with a wide escape pipe at the top, which serves as a receiver, whence the molten distillate is run into suitable flat tins, cooled with water, and there solidified.

Phthalimide from Phthalic Anhydride.—650 parts of phthalic anhydride are melted in a cast-iron boiler heated by gas and gradually brought to 140° C. in the course of four hours. The temperature is then raised gradually to 170° C. in 7—8 hours, and at the end of this period it is raised to 240 C. Gaseous ammonia is admitted from pressure cylinders and 70—75 parts of gas are allowed to enter. The current of gas can be observed and regul by causing it to pass through two Woolf's bottles half-fi with water. The whole operation lasts 18 hours. The r is run into a pan and cooled, then broken up and grou and directly used for the preparation of anthranilic a In this process 500 parts of phthalimide are dissolved the cold in a solution containing 114 parts of chlorine, parts of caustic soda at 40° B., and 440 parts of water.

The solution is filtered, and then blown into a vat taining an agitator, and saturated with sulphurous a Anthranilic acid separates on the addition of about parts of hydrochloric acid.

Preparation of Phenylglycocoll-o-Carboxylic Acid.- a lead-lined tub provided with a wooden agitator, 1, parts of anthranilic acid are dissolved in 800 parts caustic soda of 40° B. The solution is thoroughly co by adding about 800 parts of ice, and then 665 part chloracetic acid dissolved in about 50 parts of water added. The mixture is stirred for about five hours, a kept alkaline during this period by the further additio 900 parts of caustic soda. The viscous dark mass is d on tins at 50° C. until it becomes hard and appare crystalline. It is then finely ground, treated with w and dried in a hydro-extractor. The residue consist phenyl-glycocoll-o-carboxylic acid; the filtrate contains changed anthranilic acid, which is precipitated by mean 35 per cent. sulphuric acid.

Indigo Melt.— 60—65 parts of phenylglycocoll-o boxylic acid are ground in a ball mill with 100 par powdered caustic soda. Air is rigorously excluded du the grinding and subsequent processes. The pow substance falls into a receiver, whence it is conveyed so-called "pockets" made of ordinary sheet-iron. T capacity is 15—18 kilos. They are filled completely, then transferred to a special furnace, which is real large oil bath provided with a stirrer, and heated by so that a very constant temperature can be maintained. furnace is designed to hold 10 pockets; the temperatu raised to 260° C., and the pockets, with closed valve introduced. The whole surface of the furnace is covered by an iron door. The temperature is maint for 2¾ hours, the pockets are then removed and allow cool. The contents of a large number of pocket washed out into a large iron tank, and heated with s to 115° C., whilst air is at the same time blown in. I now begins to separate, and, after cooling, the dyest filtered from the liquid in a press. The filtrate cont large amount of anthranilic acid which is regained.

The dyestuff obtained, is either ground up with to a 20 per cent. paste with the addition of a little or it is dried, ground, and mixed. In the latter 23 parts of good colour are ground up with two pa inferior colour obtained from the recovered anthranilic

—R. B

Indigo; Determination of the Value of ——; and O tion of Indigo White by Oxygen. W. Manchо J. Herzog.

See under XXIII., *page* 841.

PATENTS.

Indigo; Process for the Reduction of ——. Thompson, Liverpool. From The Chemische Opladen vormals Gebr. Flick, Ges. m. b. H., O Cologne, Germany. Eng. Pat. 10,833, May 25, 19

The reduction of indigo by means of finely divided (zinc, tin, iron), and ammonia is attended by great ev of heat whereby a portion of the indigo is decompos yield of indigo white being correspondingly smalle order to prevent this, the patentees effect the reductio temperature below 5 C. either by adding ice or by the reducing vat externally. A double-walled c vessel provided with an agitator, is charged with 1 of pure Indigo and 4—5 kilos. of zinc dust wh thoroughly mixed. After cooling below 5° C., about 2 of ammonia liquor (25 per cent.) are gradually adde constant agitation, the temperature being maintaine 5° C. The reduction is complete in about two hours, y a soluble paste of indigo white.—T. A. L.

ylphenylglycocoll-o-carboxylic Acid [Indigo]; Manucture of ——. B. Willcox, London. From The dische Anilin- und Soda-Fabrik, Ludwigshafen-onine, Germany. Eng. Pat. 16,565, Sept. 17, 1900.

TYLPHENYLGLYCOCOLL-*o*-CARBOXYLIC acid has been ared hitherto by the oxidation of acetyl-*o*-tolylglyl; Vorländer obtained a brown amorphous product ttempting to acetylate the acid by means of acetic dride or acetyl chloride (Ber. **33**, 566). The patentee s the manufacture of the acetyl compound by treating ueous solution of a salt of phenylglycocoll-*o*-carboxylic with acetic anhydride, alone or in the presence of a which can act as an alkali (sodium acetate). The ion is performed with cooling, and the acetyl ound precipitated by sulphuric acid.—A. C. W.

zo Colouring Matters [Red, Brown, Violet, Blue]; e Manufacture and Production of New ——. J. Y. hason, London. From The Badische Anilin und Soda brik, Ludwigshafen, Germany. Eng. Pat. 14,830, g. 18, 1900.

RDING to Ger. Pat. 74,111 (lapsed), amino-phenol onic acid III. is obtained by sulphonating *m*-aminoue sulphonic acid and fusing the resulting disulphonic with a caustic alkali. The patentees find that this acid valuable middle component in the manufacture of dary disazo dyestuffs giving red, reddish-brown, and sh-violet shades on wool which on treatment with nic acid are changed to violet, blue, or greenish-blue. avy shades these are almost black and sufficiently fast ll practical purposes to washing, milling, and soap. over the fastness to light is good and the blue shades r the same by daylight as by artificial light. For ple, the diazo compound from 44·5 kilos. of 1.4′-thylamine sulphonic acid is mixed with a solution of t 40 kilos. of aminophenol sulphonic acid III., and ilos. of crystallised sodium acetate in 400 litres of . The amino-azo compound formed is diazotised dding 138 kilos. of hydrochloric acid (30 per cent. , 800 kilos. of ice, and a solution of 14 kilos. of sodium e. The diazo solution so formed is run into a solution 4 kilos. of the sodium salt of 2.3.3′-naphthol disulic acid and 106 kilos. of calcined soda in 1,400 litres of . The solution is kept cool by means of about kilos. of ice, and when the combination is complete, lyestuff is filter-pressed and dried, and if necessary ed by redissolving and reprecipitating.—T. A. L.

olouring Matters [Red, Orange], and of Intermediate oducts for use therein; Improvements in the Manuture or Production of ——. H. E. Newton, London. om the Farbenfabriken vorm. F. Bayer and Co., erfeld, Germany. Eng. Pat. 12,899, July 17, 1900.

specification is supplementary to Eng. Pat. 3615 of (this Journal, 1901, 117). The patentees now find hey can obtain mixed urea and thio-urea compounds rtain amino-naphthol derivatives having the general da R.NH.CX.NHR′, where X represents oxygen or ar, and R and R′ different radicles of a naphthol phthol derivative, by condensing two different aminohols or their derivatives (having free ortho or peri ons) by means of phosgene, thiophosgene or carbon hide. The compounds so obtained combine with one molecular proportions of a diazo compound yielding ble azo dyestuffs for unmordanted cotton fast to acids ght. Dyestuffs belonging to the same series are also ed by combining a diazo compound with a suitable aphthol derivative in an alkaline solution, and quently condensing two molecular proportions of the ct so obtained by means of phosgene, thiophosgene, bon bisulphide.—T. A. L.

uffs [Violet, Blue]; Production of ——. R. B. sford, Upper Norwood. From L. Cassella and Co., nkfort-on-Maine, Germany. Eng. Pat. 14,220, Aug. 8, 0.

violet or reddish blue dyestuffs for mordanted wool otton very fast to milling and light are obtained according to this specification by condensing alkylated aminohydroxybenzoyl benzoic acids with pyrogallol, gallic acid, tannin or gallamic acid. For example, 28·5 kilos. of dimethylaminohydroxybenzoyl benzoic acid are dissolved at about 90° C. in 120 kilos. of sulphuric acid (66° B.) and 30 kilos. of water. The temperature is then raised to 100° C., and whilst maintaining it, 15 kilos. of pyrogallol are gradually added. In about 4—5 hours the melt is dissolved in 200 litres of hot water, and on cooling, the dyestuff separates in small crystals. It is somewhat sparingly soluble in cold water, but dissolves easily with a red colour in dilute acetic acid. Sodium carbonate or soda lye dissolve it with a bluish violet colour, and the product also dyes this shade on chrome mordanted wool.

—T. A. L.

Disazo Colouring Matters [Red, Violet]; Impts. relating to the Manufacture of ——. H. H. Lake, London. From K. Oehler, Offenbach-on-Main, Germany. Eng. Pat. 14,725, Aug. 16, 1900.

THE intermediate compound from tetrazotised benzidine, tolidine or dianisidine and a hydroxy-carboxylic acid of the benzene or naphthalene series is combined with an acetylamino naphthol sulphonic acid, particularly valuable products being obtained from 2.4′.2′-acetaminonaphthol sulphonic acid. For instance, the tetrazo compound from 9·2 kilos. of benzidine in 28·5 kilos. of hydrochloric acid (20° B.) and 300 litres of water diazotised at 5° C. with 7 kilos. of sodium nitrite in 50 litres of water, is run into an ice-cold solution of 9·5 kilos. of β-oxynaphthoic acid (m. pt. 216° C.) and 24 kilos. of sodium carbonate in 400 litres of water. The intermediate compound so obtained is treated with a solution of 14·8 kilos. of 2.4′.2′-acetaminonaphthol sulphonic acid, the whole allowed to stand 24 hours, slowly heated to 80°—90° C., and the dyestuff finally salted out, pressed and dried. The product so formed dyes unmordanted cotton violet shades very fast to washing and light.

—T. A. L.

Disazo Colouring Matters; Impts. relating to the Manufacture of ——. H. H. Lake, London. From K. Oehler, Offenbach-on-Main, Germany. Eng. Pat. 10,277, May 17, 1901.

THIS specification is supplementary to Eng. Pat. 14,725 of 1900 (see above), the patentee having found that in the process there described, the 2.4′.2′-acetaminonaphthol sulphonic acid may be replaced by the corresponding benzoyl derivative, the resulting dyestuffs giving brighter and bluer shades. The process for obtaining them is essentially the same as that already described.—T. A. L.

Indophenolthiosulphonates from Sulphurised Indophenols and of Corresponding Sulphurised Compounds; Manufacture of ——. O. Imray, London. From The Society of Chemical Industry, Basle, Switzerland. Eng. Pat. 5168, March 11, 1901.

THE sulphurised indophenols obtained according to Eng. Pat. 5385 of 1900 (this Journal, 1900, 530), Eng. Pat. 25,234 of 1897, Weissberg's sulphurised dyestuff from nitroaminohydroxydiphenylamine and the dyestuffs known as Eclipse Black, Pyrogene Black, Katigene and the like, may be converted into indophenolthiosulphonates by sulphurous acid, normal sulphites, bisulphites, or substances which yield these agents. The aqueous solutions of the new indophenolthiosulphonates do not dye unmordanted cotton, but acquire this property after treatment with reducing agents, when the thiosulphonates are converted into the corresponding sulphydrates, sulphides or disulphides. For the production of sulphurised indophenol, 10 kilos. of dry pure indophenol are melted in an autoclave with 20 kilos. of sodium sulphide and 8 kilos. of sulphur. The temperature is then raised to 140°—160° C., until a sample no longer dissolves when boiled with hydrochloric acid. In order to convert the product into a thiosulphonate, 10 kilos. of it are boiled in solution or in a finely divided state with 10—30 litres of a solution of an alkaline bisulphite (30·3 per cent.) and about 20 litres of water, until a complete solution is obtained. The new product is then salted out or the solution is evaporated to dryness. The thiosulphonates dye unmordanted cotton from an alkaline bath containing a suitable reducing agent, such as glucose, dextrin or the like, giving greenish and reddish blues to blacks. The tints may be oxidised to purer blues on the fibre or may be darkened by chromium mordants.—T. A. L.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Shower-proofing of Textile Fabrics. C. O. Weber. J. Soc. Dyers and Colourists, 1901, **17**, [6], 147—149.

THE process of shower-proofing consists in rendering fabrics water-repellent, by coating or incrustating the threads of the fabrics with some water-repellent substance, but leaving the pores unobstructed.

The processes may be divided into two classes. In the first the fibre is impregnated with some water-repellent hydrocarbon or wax. In the second, a deposit of alumina, or of some colloidal aluminium salt, is formed on the fibre. The "Cravenette" process is a type of the first-named class. The cloth is treated with a dilute solution of paraffin wax or similar hydrocarbon in petroleum spirit, coal-tar naphtha, or benzene, and subsequently pressed between hot plates. The water is now no longer able to wet the fibre but assumes at once the spheroidal form on coming in contact with it.

Common to all processes of the second class is the attempt to deposit upon the fibre a water-repellent precipitate formed *in situ*. For this purpose are employed alumina or aluminium salts or insoluble soaps in conjunction with a variety of indifferent colloidal precipitates. The oldest of these processes consists in treating the cloth with a solution of aluminium acetate, passing through wringing rollers, and drying upon a tentering machine. Probably the explanation of the shower-proofing effect of this process is that on the tentering machine, the aluminium acetate is decomposed into a deposit of highly basic aluminium acetate and free acetic acid, which is driven off with the water. A very great improvement, is the conversion of the aluminium acetate into an aluminium soap, preferably an oleate. This is carried out by passing the cloth, after padding in the solution of aluminium acetate and wringing through a soap solution, and subsequently washing and drying. An even better result is obtained by drying the cloth after padding, and passing it then through a boiling soap solution. In this case, before the cloth enters the soap bath, the aluminium salt has been fixed on the fibre as an insoluble basic salt; consequently the soap bath shows no muddiness owing to the precipitation of aluminium soap in the bath, a frequent cause of stains in the cloth. Other aluminium salts, *e.g.*, alum, aluminium sulphate, or chloride, give much less satisfactory results than the acetate, since they less readily form basic salts in aqueous solution.

A further variation consists in forming upon the fibre simultaneously a precipitate of the basic aluminium soap and of some other insoluble and colloidal aluminium salt, such as the silicate, which is used in the solution with the soap.

Attempts have often been made to utilise tannic acid for these processes, and during the last two years a process has come into prominence which possesses several advantages over those already described. This is commercially known as the K.A. process, and consists in the preparation of a 3 per cent. solution of aluminium acetate by the interaction of aluminium sulphate and lead acetate in equivalent quantities. To this solution a concentrated solution of tannic acid is added, until a permanent precipitate is formed; the actual quantity of tannic acid required being very small. The solution is now ready for use, and is employed by passing the fabric through it, squeezing between rollers, and briskly drying on a suitable machine. To obtain the best result, the fabric should be damped before it is treated. The K.A. process, in addition to its cheapness and ease of application, has the further advantage of being much more lasting in its effect than any of the other processes named.

Crystalloid substances cannot possibly fulfil the conditions required, as crystalloid deposits are never continuous. All colloids, as a class, yield, under suitable conditions, continuous coatings we require, and there are great po bilities in the fact that colloids with basic propertie f absolutely insoluble colloidal precipitates with coll possessing acid properties. The K.A. shower-proo process may, indeed, be looked upon as an applicatio this principle, the colloidal aluminium hydrate and colloidal tannic acid forming an insoluble, water-repell colloidal aluminium tannate.

It should also be remembered that colloids combine a number of crystalloids, to form colloidal precipitat fact which enormously enlarges the range of substanc be drawn upon for these experiments.—R. B. B.

Peat Fibre in Germany. Foreign Office Annual Seri No. 2671.

MR. KARL GEIGE, of Düsseldorf, has produced a peat capable of being spun, which is absorbent, and which be bleached and dyed. Geige first of all isolated the fi by means of acids and alkalis, the result being a peat consisting of nearly pure cellulose. This wool is soft elastic, and with the addition of cotton or sheep's wool, can be spun into fabrics. It possesses the quality of sorption. The felt manufacturer uses it in the produ of peat-felt hats. If the inventor is successful in redu this peat yarn to a still finer thread, it will find great in hosiery manufacture, for which, as it is a bad cond of heat, is absorbent, and cheap, it is especially suit Geige has produced not only dress-stuffs, but carpets other such-like goods capable of being bleached and Peat-wadding is specially valuable for sanitary and sur purposes, keeping wounds clean and dry. From the re Geige manufactures paper, which will take a light-colo dye. The strength of the fibre may be judged by the that it can be used for transmission bands.

PATENT.

Rubber-coated Materials and Method of Preparing Treating them. E. Edwards, Middlesex. From Oxylin-Werke Actienges., Wittenberg, Germany. Pat. 11,238, May 31, 1901.

A TEXTILE or other material is first coated by means mixture of india-rubber, loading, and colouring substa and a heavy hydrocarbon, and is then dried and vulca in the usual way. The material is then passed thro vessel containing a heavy hydrocarbon, such as minera tar-oil, ozokerite, or paraffin, heated by means of a c a water-jacket to about 70° C.; in this way the india-r coating is caused to swell and the pores become clos that, after drying, the material is pliable and soft t touch, and more easy to disinfect than the untreated r —T. H.

VI.—DYEING, CALICO PRINTING, PAPR STAINING, AND BLEACHING.

Dyeing Process; Theory of the ——. P. D. Zacl Färber-Zeit. 1901, **12**, [10 and 11], 149—153 165—167.

THE author reviews the various theories of dyeing so they rest on an experimental basis. The older ch and mechanical theories have been supplemented in times by the solid solution theory of Witt (Färber 1890–91, 1; this Journal, 1891, 42), the osmotic the the substantive dyeing of cotton (Weber, this Journal, 120), and Krafft's theory of colloidal precipitates 1899, **32**, 1608; this Journal, 1899, 757), accord which the colour coats the fibre as oil pigments do wo

Many facts urged in support of one or other the dyeing are wrongly based on supposed analogies chemical processes, *e.g.*

(1) It is stated that wool removes the base fro solution of a basic dyestuff leaving the acid in so We know, however, that in solution the salt may sociated into acid and base, and the wool may then

base only without having been the cause of its separa- n from the acid.

2) Vignon measured the heat developed when fibres steeped in normal solutions of acid and bases (Bull. . Ind. Mulhouse, 1892, 563; this Journal, 1893, 351) l thus exhibited the inertness of vegetable fibres com- ed with animal fibres; but there is no evidence that heat is really heat of neutralisation, nor is it possible make calculations of any value when dealing with fibres molecular weight of which is unknown.

(3) Weber considers the formation of colours on wool as hemical process analogous to that of the precipitation of stuff solutions by an acetic acid solution of albumin. ese precipitates may, however, depend on coagulation the albumin which retains the dyestuff in the same dition as that in which it exists in solution.

4) Wool steeped in acidified sodium nitrite solution can sequently be dyed with phenols, &c. The production hese colours has now been shown to be independent of wool fibre. (This Journal, 1901, 711.)

he author puts forward a theory of dyeing which he ignates the "new chemical theory" intended to cover phenomena of dyeing. The dyeing process always takes ce in two stages, *viz.*:—(1) Absorption of the dyestuff. Fixation and development of the colour.

bsorption.—The dissolved dyestuff diffuses from the tion into the fibre. No attraction of it by the fibre need postulated, for any body held in the water can pass by diffusion into the fibre. Chemical combination of stuff and fibre is not to be expected, the textile fibres g inert substances and undoubtedly of very high lecular weight. They are also colloidal and hygroscopic. ry body which possesses similar absorbent properties be dyed according to the same general laws; such are phous carbon, coagulable albumin, and certain colloidal allic oxides. These substances can remove from tion those dyestuffs which dye textile fibres direct.

ll colloidal substances absorb according to the law—

$$\frac{C_1}{C_2^v} = K$$

re C_1 is the concentration of the dyestuff in the solution r dyeing, C_2 the concentration of the dyestuff in the e, K a constant, and v a constant coefficient which may greater or less than, or equal to unity.

he same formula may be mathematically deduced from known laws of diffusion, expressing the change of centration by a formula representing Fick's law as given Nernst, and integrating up to the point at which the centration is constant, *i.e.*, when equilibrium is estab- ed between solvent and fibre.

similar law is known to hold good for the distribution a substance between two immiscible solvents, but to uce from this that the substance absorbed by the fibre lissolved in it would lead to certain absurdities and tradictions (Walker and Appleyard, Trans. Chem. Soc. 6, **69**, 1334). The distribution of Picric Acid between er and silk, for example, would indicate that the ecular weight of this dyestuff in water is 2·7 times as t as in silk (since the coefficient $v = \frac{1}{2\cdot7}$). The author ers to explain this and similar cases by saying that on unt of the change of the force resisting absorption, the tive amount diffusing into the fibre diminishes with easing concentration, and, therefore, in order that the centration in the colloid (fibre) should increase slightly, e must be a much greater relative increase in the centration of the bath.

ixation.—The dyestuff which has passed into the fibre liffusion must now be fixed, *i.e.*, it must be transformed an insoluble dye, incapable of being washed out again. may take place either by chemical precipitation, as Chrome Yellow, Indigo Blue, &c., or by colloidal ipitation, as with direct or substantive dyestuffs. The tions of many dyestuffs, and solutions of colour lakes cids are colloidal, and the precipitation of insoluble idal substances from them is accelerated by the presence he fibre, which, by virtue of its structure, exercises a lytic action. As a rule the dyebath is not exhausted by colours, but if the dye formed by hydrolysis or other chemical change is very insoluble, the equilibrium is constantly destroyed, and further amounts of dyestuff are taken up until the bath is exhausted.

The author distinguishes explicitly between dyestuff and dye on the fibre.

With the salts known as acid and basic dyestuffs, the dyes formed are the free colloidal colour acids or bases. With the direct cotton dyestuffs of high molecular weight and pronounced colloidal character, the dyes on the fibre do not differ in chemical constitution from the dyestuffs in solution. These dyes are not fast to washing, since they are readily transformed back to the soluble condition. Dyes which are fast to washing are always produced by some chemical alteration of the dyestuff.

The various dyestuffs can be divided into crystalline and colloidal, but the division between these groups is not sharp. Picric Acid, for example, is crystalline, but has weak colloidal properties, it dyes wool quickly, but does not give a fast colour, and it is incapable of dyeing vegetable fibres. Magenta is colloidal, but not sufficiently so to be capable of dyeing cotton direct.

Every substance which assists the colloidal separation (insoluble) of the dye is a useful addition to the dyebath. For this purpose acids are often added, and dyeing seldom takes place in an alkaline bath, since alkalis tend to bring colloids into solution. The additions to the dyebath will of course affect the value of the constants K and v in the distribution equation, and the determination of these constants for a large number of dyestuffs would be of great value to the scientific dyer, and would enable him to carry out dyeing experiments with the certainty of successfully applying their results in practice.—R. B. B.

Alizarin Sky-Blue and its application in Dyeing Woollen Piece-Goods. A. Steinberg. Leipziger Färber- und Zeugdr. Zeit. 1901, **50**, [6], 221—222.

This is a new dyestuff in many respects resembling Bayer and Co.'s Alizarin Sapphirole S.E. It is superior to the latter in fastness to light and purity of tone, but inferior in level-dyeing properties. Pale shades may however be dyed quite evenly by entering the material into a cold bath only moderately acidified and shading if required with Alizarin Sapphirole.

Colours dyed with Alizarin Sapphirole are rendered faster to milling, though not absolutely fast, by an after-treatment with bichromate, and the shade is only changed by the slight added tint of the precipitated chromium oxide. This colouring matter is well suited for topping vat indigo blues for military uniforms; for this purpose dyeing takes place in an acid bath to which the saddening agents, preferably chromium fluoride and oxalic acid, are subsequently added. It is also a useful dyestuff for pale and medium blue shades on piece goods, but for dark colours its high price is prohibitive. For fashionable colours, where great fastness to light is not required, Alizarin Sapphirole is to be preferred, and this completes, with Chromotrope 2 R and Tartrazine, a useful triad of level-dyeing dyestuffs, of which the yellow is the least fast to light.

Both the Sky Blue and the Sapphirole are destroyed in an alkaline hydrosulphite solution, the former to a brownish-yellow, the latter to a brick red, and neither colour is restored by oxidation. The brick-red substance becomes yellow on treatment with acid, and might serve as an indicator.

Pale bluish-greys may be dyed by dissolving Alizarin Sky Blue in ammonia and dyeing below 50 C. After dyeing, the goods are stoved or merely passed through dilute acid. The colours are fast to washing and milling, and very pure in tone if stoved after dyeing.—R. B. B.

VII.—ACIDS, ALKALIS, AND SALTS.

Boric Acid; Volatility of ——, with Steam. F. W. Skirrow, Zeits. physik. Chem. **37**, 84—90. Chem. Centr. 1901, **1**, [25], 1306.

In order to ascertain in what form of combination boric acid is volatile with steam, the author determined the ratio of the concentration of the boric acid in the vapours to its concentration in the liquid. He found that with increasing concentration in the liquid, the concentration in the vapour increases more slowly. This fact is compatible with the view that the molecules of the solution are de-polymerised on evaporation. It is probable that the vapour contains molecules of H_3BO_3, whereas the molecules in solution are $H_2B_2O_4$ and $H_2B_4O_7$.—A. S.

Phosphoric Acid: Neutralisation of ——. Berthelot. Comptes Rend. **132**, [22], 1277—1281.

The author has formerly shown that phosphoric acid possesses three degrees of acidity, the first that of a strong acid, the second that of a weak acid like acetic, the third that of an alcohol. These were shown by the use of Methyl Orange, Phenolphthaleïn, and Blue C_4P respectively, and correspond with the formation of monobasic, dibasic, and tribasic phosphates.

He has now pursued these researches with calcium and barium phosphates. When lime-water is gradually added to phosphoric acid, Methyl Orange changes at the point indicating the proportions $CaO:P_2O_5$, and there is no precipitation. When the procedure is reversed, there is precipitation, and the indicator changes at the point $2CaO:P_2O_5$. If however, phosphoric acid be added to a considerable excess of lime-water ($4CaO$ or $10CaO$ to P_2O_5), and portions of the solution be tested from time to time, it is found that the proportion of calcium in the precipitate slowly increases, up to a limit (reached after three or four days) of $4CaO:P_2O_5$. A precisely similar set of phenomena occurs when baryta water is used instead of lime-water, a tetrabasic barium phosphate being formed.

When calcium or barium phosphate is formed by double decomposition, the composition of the precipitate is dependent on that of the soluble alkali-phosphate used, the relative proportions of the reacting substances, the concentration of the solution, &c. Bibasic, tribasic, or intermediate phosphates may be thrown down, double salts (P_2O_5, $2BaO$, $2NaOH$), like those obtained by Joly, or, with an excess of potash or soda, tetrabasic phosphates, or mixtures of them with tribasic salts.—J. T. D.

Phosphoric Acid; Equilibrium between two Bases in Presence of ——. Berthelot. Comptes Rend. **132**, [25], 1517—1525.

When four equivalents of sodium hydroxide and two equivalents of calcium hydroxide in solution are mixed with six equivalents (two molecules) of phosphoric acid, and the precipitate is immediately filtered off, it is found that the liquid contains approximately 1·75 equivalents of sodium as tribasic phosphate and 0·30 equivalent as dibasic phosphate; while the composition of the precipitate is 3·75 equivalents of phosphoric acid and 3·93 equivalents of base, so that not only the calcium, but nearly half of the original sodium, is contained in the precipitate. Digestion of the precipitate with the liquid makes very little difference in the composition of either.

A precisely similar reaction occurs if baryta be used instead of lime, save that the ratio of phosphoric acid to base in the fresh precipitate is 4·14 equivalents to 3·93, while, after digestion, it is 4·17 to 4·33. Here more than half (in equivalent) of the base in the precipitate is sodium.

Even when the total amount of the two bases (keeping the same relative proportions as above) is such as to correspond with the formation of a dibasic salt, instead of a tribasic salt as above, there is formation of a precipitate, mixed tribasic and dibasic phosphates ($H_3PO_4:RO$ = 3·96 : 2·93 in the case of calcium, 4·29 : 2·91 in that of barium), which contains not only the alkali-earth metal, but also sodium.

The precipitation of sodium under these circumstances is a point of considerable importance from an analytical point of view.—J. T. D.

Phosphoric Acid; Acidimetry of ——, *by means of Baryta.* J. Cavalier.

See under XXIII., *page* 838.

Acetic Acid from Calcium Acetate; Manufacture of —— E. A. Behrens and J. Behrens. Ger. Pat. 121,19 Oct. 6, 1899. Through Zeits. angew. Chem. 1901, [24 593.

Claim is made for a process of obtaining acetic acid of high degree of strength, by dissolving calcium aceta partially or altogether, in acetic acid of at least 60 per cen strength, adding sulphuric acid, and collecting the acet acid by distillation, expressing the mass, or otherwise.

The acid separated by expression is free from calciu sulphate, which does not dissolve in acetic acid.—C. A. M.

Sodium Chromate; New Hydrate of ——. H. Salkowsl Ber. 1901, **34**, [9], 1947—1950.

Besides the tetra- and decahydrates already describe neutral sodium chromate forms a hexahydrate, Na_2CrO_4, $6H_2O$. This salt was obtained first by cooling a saturat mother-liquor of the tetrahydrate, and afterwards by seedi a hexahydrate crystal into a solution of the chromate, a allowing the liquid to evaporate. The new hydrate, f which the most favourable temperature of formation 18°—20°, is obtained in deep yellow, tabular, tricli crystals, growing together to form beautiful drusy mass On heating, partial liquefaction occurs at 26°—27 C., t salt being converted into the tetrahydrate and its saturat solution. The solubility of the hexahydrate has be measured and its solubility curve compared with those the two other hydrates.—T. H. P.

Basic Salts with two Metals: Action of a Metal Hydroxide on Salts of other Metals. A. Recou Comptes Rend. **132**, [23], 1414—1416.

Copper hydroxide, freshly prepared, was digested w solutions of various sulphates, boiling or cold. Defin compounds were formed, more or less rapidly according the metallic salt used, not decomposed by heating for short while with sodium carbonate solution. The followi table shows the composition and colour of these salts:—

Formed in Hot Solutions.		Formed in Cold Solutions.	
$3CuO.ZnSO_4$	Pale bluish green.	$24CuO.7ZnSO_4$	Pale blue.
$3CuO.CdSO_4$	Pale blue.	$20CuO.6CdSO_4$	Bright blu
$3CuO.MnSO_4$	Grey-green.	$24CuO.MnSO_4$	Green.
$3CuO.CoSO_4$	Pale greenish.	$24CuO.CoSO_4$	Blue.
$16CuO.5NiSO_4$	Pale blue-green.	$20CuO.NiSO_4$	Bright blu
$3CuO.CuSO_4$	Pale green.	$3CuO.CuSO_4$	Pale gree

—J. T. D

[*Basic Salts, Mixed* ——]; *Action of a Metallic Oxide Hydroxide on the Solutions of the Salts of other Met* P. Sabatier. Comptes Rend. **132**, [25], 1538—1540.

The author points out that he had long ago prepare series of salts similar to those recently described by Reco (see preceding abstract). He groups the possibilit when a metallic oxide or hydroxide acts on a salt of anot metal, into six categories:—1. No reaction. 2. Sim displacement, or exchange of the two metals. 3. Par displacement, with formation of a basic salt of one of metals. 4. Oxidation of the dissolved salt by an ea reducible oxide or hydroxide, or peroxidation of the ox or hydroxide by the dissolved salt. 5. Formation o mixed oxide, with or without simultaneous formation basic salt. 6. Production of a mixed basic salt.

Instances of the last case are, the action of cu hydroxide on solutions of silver salts (with productio *crystallised* basic argento-cupric salt), that of cu hydroxide on manganous chloride, and that of cupric *tetracupric* hydroxide on salts of cobalt, nickel, &c. *tetracupric* group appears to possess considerable stabi and gives quite a series of salts; a similar tendency is sh by other metals, to form, *e.g.* tetrazincic, di-, tri-, te mercuric, di-, tri-, tetraplumbic salts.—J. T. D.

Metallic Salts; Action of Mercuric Oxide on Aqu Solutions of ——. A. Mailhe. Comptes Rend. 1 [25], 1560—1563.

The following results have been obtained by the actic the cold of mercuric oxide upon solutions of met

:—*Manganous chloride:* A brown precipitate, a mix- of manganese oxychloride with manganoso-manganic e. *Manganous sulphate:* No reaction even after many ths. *Manganous nitrate:* White crystalline substance, $NO_3)_2.MnO.3H_2O$. *Cadmium chloride:* Amorphous e precipitate of $CdCl_2.CdO.7H_2O$. A precisely similar lt with cadmium bromide. No reaction with cadmium hate. *Cadmium nitrate:* White crystalline prisms of $NO_3)_2.CdO.3H_2O$. *Lead chloride:* White powder, $l_2.2PbO.2H_2O$. No reaction with lead nitrate. *Ferrous ide.* If a considerable quantity of mercuric oxide be d at once, a black precipitate is formed which quickly s yellowish-brown; this is not decomposed by water, nitric acid separates from it calomel, while dissolving a basic ferric chloride (3·5 parts of chlorine to 16·5 of iron). If the mercuric oxide be added very ually to the ferrous salt, the ultimate result is a pre- ate of calomel, while the solution contains ferric chloride. *ous sulphate:* After prolonged contact, the black tance formed at first, changes into an amorphous w powder—a mixture of mercurous sulphate with the tance $Fe_2(SO_4)_3.Fe_2O_3.nH_2O$. *Ferric chloride:* The dissolves, then a red gelatinous precipitate of oxy- ide is deposited. *Ferric sulphate:* A lemon-yellow phous powder, having the composition of Turpeth ral, $HgSO_4.2HgO$. *Ferric nitrate:* The oxide dis- s, then a crystalline powder is deposited of $Hg(NO_3)_2$. $.H_2O$. The formation of mixed basic salts by the n of mercuric oxide on the nitrates is more rapid in hot ions; the salts so obtained have usually the same ut of water of crystallisation as those formed in the yet crystallise in different forms.—J. T. D.

and Chlorine; Mercury Cell for Electrolytic Pro- ction of ——. E. Frauke. Amer. Electrician, 1901, , 104.

See under XI. A., *page* 815.

PATENTS.

rides of Metals of the Alkalis and Alkaline Earths; lectrolysis of ——; *for the Purpose of obtaining hlorine, and Apparatus therefor.* G. J. Atkins. Eng. t. 5596, March 16, 1900.

See under XI. A., *page* 815.

hurie Acid; Apparatus for the Concentration of —. J. L. Kessler, Paris. Eng. Pat. 21,376, Nov. 26, 00.

invention, as to its main features, consists in effecting inal concentration by radiation downwards from red- lates above the acid; in supplementing this, and pre- ng escape of acid, by suction of a portion of the gases ombustion; in placing in communication the space rised between the radiating plates and the trough with chambers resembling Glover towers; and in certain modifications.

The coal or coke furnace *a* (Fig. 1) is of ordinary construction, as are the pans *j* (Figs. 1 and 2), in which the acid is concentrated up to 60° to 62 B. The trough *c* is formed of material not attacked by concentrated sulphuric acid, being preferably of "Volvic stone"; the plate *d*, at a distance of from 2 to 6 cms. above the surface of the acid in the trough, are of "cast metal," and are maintained at a red heat; above these plates is the arch *e*, into which the conduit *b* (Fig. 1) opens, and from which the conduit *f* conducts the gases of combustion into the chamber *g*, communicating with the chimney by the passage *h*. In the column, the upper compartment *l* (Fig. 1), filled with coke crushed to the size of rice grains, is separated from the lower compartment *m*, filled with stone or brick fragments, by the plate *n*, perforated by apertures *o* in the protuberances, and the lower plate *p* has similar apertures communicating with the rear of the trough. The siphon *q* serves to deliver a regulated flow of acid from the pans *j*, to the interior of the column, as shown. Through the tubes *w* and *x*, samples for testing can be taken. The surface of the acid in the trough is kept at the desired height by a sluice or valve in the pipe 1 leading the concentrated acid into the cooler 2, whence it is discharged into the vessel 3 for passage into carboys. The column is enclosed in a lead jacket having a cover through which the lead pipe *u* passes for escape of gases to the exterior; the nozzle *v* admits steam, which causes an upward draught, and prevents (by suction produced by the chimney *i*), air from entering. The acid entering from the pans by the channel *y* into the upper compartment of the column passes into the compartment below as soon as the acid rises above the upper portion of the protuberances in the plate *n*, and then meets the vapours from the trough, whereby it is heated before reaching the latter. The vapours undergo successive condensation in the two compartments of the column before escaping through the tube *u*. The trough is placed in the tank *r* of lead, bound by cast metal plates. Arrangements may be made for passing a portion of burned gases under the plates *d*, to assist in the concentration. But if *all* the gases are so passed, the pans *j* are not needed, and the column must be much larger. Also, the fuel used should contain little hydrogen, like coke, for example. The products of

Fig. 2.

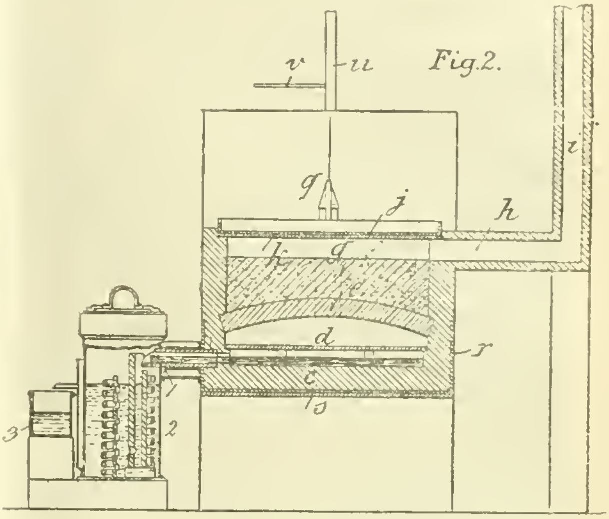
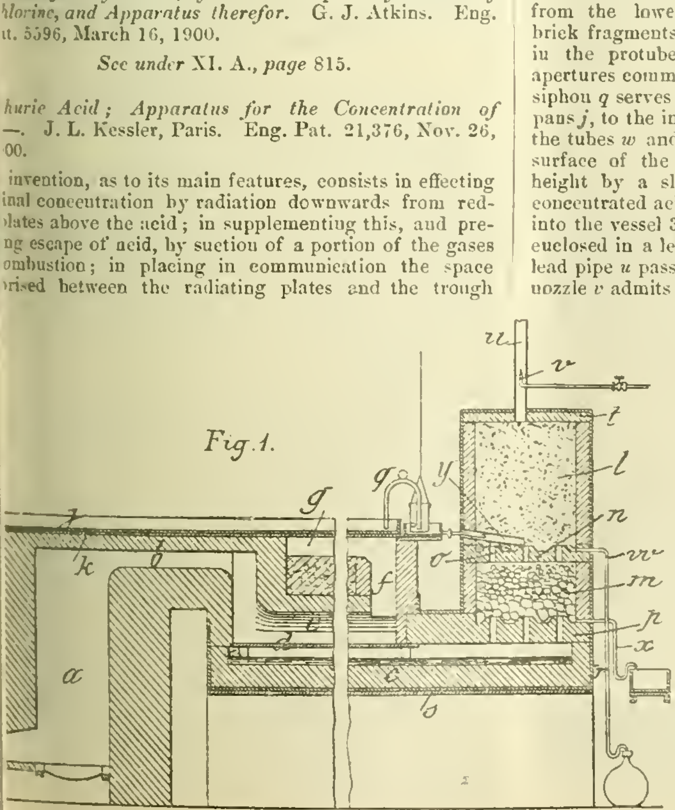


Fig. 1.



combustion, if coke be used in the main process, may be taken, after passage under the pans *j*, "through a grating of Volvic stone contained in a kind of Glover tower, filled with quartz, pumice, or débris of Volvic stone sprinkled or not with the acids to be concentrated." The upper portion of the tower should then communicate with the chimney. Other modifications are mentioned, among which is that the trough in which the final concentration of the acid is effected, may be stepped, in which case the radiating plates *d* above are correspondingly stepped. —E. S.

Chlorine, Manufacture of ——. G. J. Atkins, Tottenham, Middlesex. Eng. Pat. 15,282, Aug. 28, 1900.

The salt or salts produced electrolytically by the process described in Eng. Pat. 5596, 1901 (see page), consisting of "chlorate (including perhaps oxychlorides) and chloride of sodium in the proportion of one part of chlorate to three parts of chloride," is mixed with powdered ore, in such proportion that there may be a considerable excess of chlorine evolved over that required to combine with the metals to be extracted, and the mass is then treated with an excess of sulphuric acid, which liberates chlorine "as nascent chlorine and very slowly and gradually." After some time the mass is leached, to obtain solution of the metal or metals dissolved. In applying the invention to bleaching purposes "a more or less dilute solution of the salt is prepared; to this is added a slight excess of sulphuric acid. Into this solution the articles to be bleached are immersed, the essential point of the invention being the use of a bleaching solution made in the manner described, from which chlorine in the nascent state is gradually evolved over a protracted period of time."—E. S.

Chlorine, Manufacture of ——, *and Treatment of Metallic Ores thereby.* G. J. Atkins, Tottenham, Middlesex. Eng. Pat. 5661, March 18, 1901.

The mixture of sodium chlorate (with "perhaps oxychlorides") and chloride, produced electrolytically as described in Eng. Pat. 5596, in solution or solid, is added to pulverised ores, and particularly sulphide and telluride ores, so as to yield an excess of chlorine on further treatment with dilute sulphuric acid. Considerable time is allowed for the action of the reagents. The mass is finally leached to obtain the dissolved metals.—E. S.

Alumina; Process for obtaining Pure ——, *from Bauxite.* C. M. Hall, Niagara Falls, U.S.A. Eng. Pat. 14,572, Aug. 14, 1900.

Bauxite is mixed with a small proportion of carbon, and calcined, and is then mixed with sufficient carbon to bring the proportion up to 8 or 10 per cent.; preferably also aluminium powder is added, in stated proportion to the ferric oxide, silica, and titanic acid present in the ore; ferric oxide may also be introduced when the proportion of that constituent in the bauxite is low. The mixture is charged into an electric furnace, which is carbon-lined, with a metal casing and a suspended carbon connected to the source of electricity, and a tapping hole. The charge is fused, either for a considerable time or at an intense heat, in order that the impurities, as iron, silicon and titanium, may form an alloy with a small portion of the aluminium, and, sinking to the bottom, be removed; a flux, such as lime, soda, cryolite or fluorspar, may in some cases be used. The mass, when cold, is removed. After powdering, fine metallic particles are removed by the magnet. The alumina thus purified may be dissolved in fused baths and electrolysed for the production of aluminium, for which its freedom from sodium is stated to render it suitable. —E. S.

Alumina; Manufacture of ——. C. M. Hall, Niagara Falls, U.S.A. Eng. Pat. 14,573, Aug. 14, 1900.

Calcined bauxite is mixed with caustic lime and digested in a solution of sodium carbonate, the latter in the proportion of two or three parts for each part of Al_2O_3 in the ore, and the lime sufficient to combine with the silica, &c., and to causticise the alkali carbonate, and effect its conversion into sodium aluminate. The digestion is ca out in a closed vessel, into which steam at about 14 pressure is injected, and the mixture is agitated for s hours. The sodium aluminate solution obtained is filt and the aluminium hydroxide precipitated by CO_2, lea sodium carbonate solution, which may be concentrated again used. The essential feature of the invention is st to be the use of lime in the digester; and the proce also applicable in processes in which bauxite is introd with caustic soda or with the caustic aluminate liquor w results from the precipitation of alumina in the B process, described in Eng. Pat. 10,093, 1887. The l it is stated, forms insoluble compounds with the f oxide, silica, and other impurities present in bauxite. —E.

Metallic Chlorides and Oxides; Treating and Obtai ——. J. Hargreaves, Farnworth-in-Widnes. Eng. 13,493, July 27, 1900.

Concentrated ferrous chloride solution, such as derived from pickling sheet iron, is added to waste from the causticising of alkali, or other form of cal carbonate, and the mass is dried and oxidised by expo to air, which is preferably heated. Or the ferrous chl may, in the solid state, be ground with the calcium bonate, and the mixture exposed to oxidation. The pro (which may be roasted) consists of calcium chloride ferric oxide; the former is extracted by solution in w and the residue is heated to obtain any desired ti colour. Magnesium chloride and zinc chloride ma similarly obtained, substituting in the process magne or zinc oxide or carbonate for the calcium carbonate. —E.

Alkali Silicate; Production of a Dry ——. C. Rei Odessa, Russia. Eng. Pat. 22,488, Dec. 10, 1900.

To obtain a dry alkaline silicate, easily soluble in w the purified alkaline silicate of commerce is subjecte evaporation in a finely-divided state. This is effecte running the solution from a reservoir provided with a sie gutter-shaped outlet on to the outside of a heated horiz revolving drum, and removing by a scraper the dried sil after each revolution; or the drum may be arranged to into a vat, so as to take up a film of the liquid.—E. S.

Alkali Cyanides from Crude Materials conta Cyanogen; Obtainment of ——. G. Craig, Glas and R. M. Paterson, Paisley, N.B. Eng. Pat. 11 July 2, 1900.

The invention consists in treating crude materials conta cyanogen, such as the raw cyanide cake obtained coal-gas, spent iron oxide from the same source, or alk sulphocyanides, with such agents as may, when he therewith, convert the cyanogen compounds into alk cyanides, soluble in liquefied ammonia, and render inso in that menstruum certain impurities otherwise sol and also in the conduct of the process for obtainin final product.

Taking as the first example, the treatment of "c cake" obtained from coal gas, containing cyanogen cl as ferrocyanide, and partly as Prussian blue; it is ground with a stated proportion of an alkaline carbo the mixture is dried, and mixed with zinc powde reducing and sulphur-fixing agent, and is heated, wi fusion, in a retort through which an inert gas is pa The drying and heating apparatus is described in Pat. 22,482, abstracted below. The retorted mater conveyed by a "creeper" into a water-jacketed cooler thence to an air-tight extraction vessel for treatment liquefied ammonia, with which the material is systemati washed. The solution is then distilled, with recove the ammonia, the cyanide being obtained as a solid re Other substances, such as sodium, aluminium, iron, nesium, or certain carbides and carbon, may replace in the described process. The second example giv that of spent iron oxide, containing from 2 to 6 per of cyanogen, and a large proportion of sulphur. cyanogen compounds are dissolved out by caustic solution, which is then evaporated to dryness, an idual cake treated as in the first example. In the case alkaline sulphocyanides, 100 parts are mixed with parts of sodium carbonate and with from 100 to 0 parts of zinc dust, the further processes being conducted before.—E. S.

kali Cyanides from Crude Materials containing Cyanogen; Apparatus for Use in the Obtainment of ——. G. Craig, Glasgow, and R. M. Paterson, Paisley, N.B. Eng. Pat. 22,482, Dec. 10, 1900.

ie treatment of crude cyanogen materials to obtain aline cyanide is described in the preceding abstract, l the present invention relates to the apparatus to employed in the process. The first portion of the paratus, designed for drying, mixing, and heating the terials used, consists essentially of a furnace conning an upper and a lower horizontal cylinder, each ovided with a screw creeper, and connected outside furnace by a vertical passage in which a mixer is ed. The crude material with, say, sodium carbonate, is roduced at one end of the upper, or drying cylinder, l by action of the screw is delivered at the opposite end o the mixer, into which, through another hopper, lucing material (such as zinc dust) is added; the mixture n travels through the heating cylinder into a cooler. aus are used to exclude air, and, preferably, an inert gas assed through the arrangement. The second portion of apparatus comprises a series of extractors, in which the pared material is exhausted systematically by liquefied monia, in combination with a concentrator, an ammonia idenser, and a crystalliser, besides a liquefied ammonia ervoir and a pump that can be placed in communication h all the parts. The extraction vessels are provided h upper and lower filters, upward filtration being used, l the liquid passes from the top of one extractor to the ttom of the next. The concentrating vessel is surrounded a coil from the pump for condensing the ammonia given , the charge, while yet liquid, passing by small portions o the crystalliser. Air is excluded throughout by monia vapour.—E. S.

anides from Sulphocyanides; Manufacture of ——; *and Apparatus for.* J. Raschen, J. Norman, W. G. Luxton, nd The United Alkali Company, Limited, all of Liverpool. Eng. Pat. 12,180, July 5, 1900.

ECOMPOSING vessel, containing water or mother-liquor from revious operation, and provided with a steam pipe, a pipe admission of sulphocyanide in suspension or in solution, l with another pipe to admit nitric acid, or a mixture of phuric acid and sodium nitrate, has a passage from its er part leading to a chamber, having an exit for the lrocyanic and nitrous gases produced, and packed, as to t of its capacity, with flints or the like. The water or nor in the decomposing vessel having been made to boil, sulphocyanide is gradually introduced, and simuleously, the nitric acid. The effluent gases are treated to ain the hydrocyanic acid and recover the nitric acid, as cribed in Eng. Pat. 19,767, 1898 (this Journal, 1899,), and the mother-liquor, which still retains some lrocyanic acid, is run into the adjoining chamber on to flint packing, where it is exposed to the action of am, passed upwards through the packing, whereby the aining HCy is expelled. The liquor, flowing downwards, collected. A tower may alternatively be used, conected with superposed compartments or trays; live steam passed into the top and bottom compartments, and the rmediate compartments are so arranged that the liquor sing through them is always agitated by the steam ering below. Reference is made, besides the specification rred to above, to Eng. Patents, 10,476 and 10,956, 1895 is Journal, 1896, 513), and to Eng. Pat. 21,678, 1895 s Journal, 1896, 807).—E. S.

ro-ferric Oxide; Process of Obtaining ——. H. J. laddan, London. From A. S. Ramage, Cleveland, Ohio, .S.A. Eng. Pat. 23,859, Dec. 31, 1900.

ROUS chloride or sulphate liquor, such as the waste or from pickling iron, is placed in a tank provided with a mechanical agitator, and having arranged near the bottom a horizontal perforated pipe connected to a steam supply pipe and an air intake. Air and steam are admitted under pressure until two-thirds of the iron is oxidised to the ferric state, the bulk of the liquor being meanwhile about doubled by condensation of the steam. If waste chlorine or other oxidising agent be used, the liquor must first be largely diluted. Solution of a caustic or carbonated alkali is then run in, to precipitate the ferro-ferric oxide (which is stated to be anhydrous), the agitator being worked and the liquor kept hot throughout. The contents of the tank are then discharged into a closed vessel, from which, by air pressure, they are forced into a filter press. The precipitate is washed, and dried at a low temperature, for application as a colouring material or pigment.—E. S.

Fire-Extinguishing Substances. R. Hoult, Rotherham. Eng. Pat. 738, Jan. 11, 1901.

THREE parts of sodium bicarbonate are mixed with one part of fullers' earth, and the mixture is put up in vessels suitable for throwing on to the fire to be extinguished. Any one or a combination of any of the following substances may be added to the above mixture in stated proportions:—Ammonium phosphate, "metallic brown," pipe-clay, common salt, ochre.—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Copper Oxide for Glass Manufacture; Cuprous Oxide in Commercial ——. P. Drawe. Zeits. angew. Chem. 1901, [24], 586—587.

THE author recently examined samples of copper oxide which contained only slight traces of iron, but yet did not give the colour required by the glass manufacturers. In each instance considerable quantities of cuprous oxide were found.

A method of analysis was based upon the facts that cupric oxide is soluble in dilute sulphuric acid, whilst cuprous oxide is decomposed, as in the equation—

$$Cu_2O + H_2SO_4 = CuSO_4 + Cu + H_2O.$$

Thus, if a sample of commercial copper oxide yields metallic copper on treatment with sulphuric acid, the presence of cuprous oxide may be inferred, and its amount determined quantitatively by the following method:—

From 1—2 grms. of the sample are treated with 10 times the quantity of dilute sulphuric acid (1:5) and heated until the separated copper becomes red. The liquid is filtered through a tube containing asbestos, with the aid of a filter-pump, and the residue ignited in hydrogen, and weighed. It is then dissolved in nitric acid, and the copper determined in the solution. The sand and other insoluble matter remains in the tube.

The copper in the original filtrate is precipitated with potassium sulphocyanide in the presence of sulphurous acid, and the iron determined in the filtrate.

The results are calculated from the equation—

$$x\text{CuO} + y\text{Cu}_2\text{O} + (x + y)\text{H}_2\text{SO}_4 = (x + y)\text{CuSO}_4 + y\text{Cu} + (x + y)\text{H}_2\text{O}.$$

For example, a sample yielded 160·62 per cent. of copper sulphate, so that $x + y = \frac{160\cdot62}{159\cdot66} = 1\cdot006$, whilst the metallic copper was 19·84 per cent., giving—

$$\therefore y = \frac{19\cdot84}{63\cdot6} = 0\cdot312 \text{ and } x = 0\cdot694$$

from which the sample was calculated to contain 55·26 per cent. of cupric oxide and 44·74 per cent. of cuprous oxide.

It was therefore unsuitable for the coloration of glass.
—C. A. M.

PATENT.

China, Earthenware, and the Like; Electro Deposition of Metals upon ——. G. Cooke and J. Parr. Eng. Pat. 15,363, Aug. 29, 1900.

See under XI. B., *page* 817.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Limestones; Composition of some Canadian ——. J. T. Donald. Eng. and Mining J. 1901, **71**, [25], Canadian Suppl. 812.

In the following table are given the results of the analysis of a number of Canadian limestones :—

——	1.	2.	3.	4.	5.	6.	7.	8.
Insoluble matter......	..	2·14	10·92	2·10	0·14	1·51	20·23	24·7
Carbonate of lime.....	96·89	52·00	87·71	56·21	98·78	97·21	50·37	41·8
Carbonate of magnesia	1·64	42·71	0·30	41·20	Traces	1·15	24·63	8·6
Oxide of iron	..	2·20	0·70	0·09	0·19	0·17	2·81	6·3

The principal industries in which limestone is used as a raw material are:—(1) Calcium carbide; (2) chemical wood pulp; (3) Portland cement.

Calcium Carbide.—For use in the manufacture of calcium carbide, a limestone should not contain any considerable amount of magnesia, this constituent being particularly detrimental, but a small percentage of silicious matter and oxide of iron may be allowed. No. 5 would be suitable for this purpose; whilst No. 1 is actually being used in a Canadian carbide works.

Chemical Wood Pulp.—For the manufacture of soda pulp, any ordinary limestone will give lime suitable for causticising the soda, but for the manufacture of sulphite pulp, a limestone containing a considerable proportion of magnesia is desirable, whilst the presence of oxide of iron is objectionable. For this latter purpose, No. 4 is a suitable material; No. 2 contains too much iron and No. 5 not sufficient magnesia.

Portland Cement.—For the manufacture of this product, the presence of magnesia in the limestone is inadmissible, in so far as the finished cement must contain less than 3 per cent. of magnesia. The presence of silicious matter is not disadvantageous; in fact the usual raw material for certain kinds of Portland cement is a natural cement rock or clayey limestone, such as No. 8. No. 6 is an ordinary limestone suitable for the manufacture of cement; No. 7 contains too much magnesia for that purpose.—A. S.

PATENTS.

Wood and other Fibrous Substances with any Desirable Solutions; Process for Impregnating ——. W. Youlten, London. Eng. Pat. 12,157, July 5, 1900.

The wood or other material is heated to drive off the moisture, immersed into a warm impregnating solution and subjected, if desirable, to the action of an electric current; finally the material is again dried and desiccated.

—J. W. H.

Stone Blocks, Bricks, and the like; Manufacture of Artificial ——. La Société H. Croizier et Cie., Paris. Eng. Pat. 13,896, Aug. 2, 1900.

Platforms, capable of rotation or removal, for the support of the blocks to be hardened by means of wet steam, are arranged round a central rod; the platforms are raised bodily, by hydraulic pressure or otherwise, into a bell; after treatment, the platforms are lowered slowly, discharged and recharged.—J. W. H.

Stone; Artificial, Manufacture of ——. A. H. Croizier and A. E. Thomine, Paris. Eng. Pat. 14,778, Aug. 17, 1900.

Clay or loam earth, mixed in suitable proportions with fat lime, sand or analogous material, being added if desired, is moulded under hydraulic pressure, and further hardened by the action of steam.—J. W. H.

Stone; Manufacture of Artificial ——. F. Marx, Leip Germany. Eng. Pat. 4202, Feb. 27, 1901.

A mixture of marble and burnt magnesite in fine pow is placed in a vessel, in which a vacuum is produ moistened with a solution of magnesium chloride, pla into a mould, and again submitted to a vacuum. The bu magnesite may be regenerated by means of carbon diox The contents of the moulds on exposure to the air soli and rise in temperature considerably while doing so.

—J. W. I

Stone Blocks or Tiles for Building Purposes; Impr Fireproof Artificial ——. F. Boenke. Wiesenbur der Mark, Germany. Eng. Pat. 8691, April 27, 1901

Artificial stone blocks are formed of a mixture of w ashes, sawdust, magnesite, heavy spar, and magnes chloride, and have embedded in them a fabric compose strips or pieces of bamboo.—J. W. H.

Limestone; Manufacture of ——. W. Schwartz, Züri Eng. Pat. 15,940, Sept. 7, 1900.

In the manufacture of artificial limestone, water is spr on the blocks one or more times during the usual st hardening process.—J. W. H.

Lime; An Apparatus for Slaking ——. F. A. B Oppenheim-on-the-Rhine, and J. Heinrigs, Schlebu Bahnhof, Germany. Eng. Pat. 9730, May 10, 1901.

The lime is delivered into a drum, where it is continu agitated, and treated with water and steam; the m of agitation also propel the material through the d at a suitable rate, when it is discharged into tap receivers, where it becomes further slaked and dried.

—J. W. I

Cement Kilns and the like. H. H. Lake, London. F Fellner and Ziegler, Frankfort-on-the-Maine, Germ Eng. Pat. 18,350, Oct. 15, 1900.

The connecting head between the drying and clinke drums of rotary cement kilns is constructed of iron, ins of masonry, provided with suitable openings, and w jacketted or protected from the heat by fire-insula materials.—J. W. H.

Concrete; Manufacture of Articles composed of ——, *to be used for Building, Paving, and other Purp* T. Rouse, Upper Clapton. Eng. Pat. 15,352, Aug 1900.

Bricks, slabs, paving blocks, &c., are formed partl cement concrete, and partly of lime concrete, the ce concrete forming the face of the block.—J. W. H.

Portland Cement; Manufacture of ——. A. Gibb, E Cross, near Liverpool. Eng. Pat. 15,432, Aug. 30, 19

In the manufacture of Portland cement, the inv obtains uniformity in composition by fusion; iron or oxidised compounds of barium are added to r this possible; after fusion under oxidising condit the product is cooled and reduced to a fine powder.

—J. W.

Portland Cement; Manufacture of ——. C. von F Giessen, Germany. Eng. Pat. 10,297, May 17, 190

Blast-furnace slag is granulated in water, clinkered it its proper proportion of lime (about 50 per cent.), c and ground.—J. W. H.

X.—METALLURGY.

Metals ; Cellular Structure of ——. G. Cartaud. Comptes Rend. **132**, [22], 1327—1329.

EN a melted metal is poured in a thin sheet over a of glass, so as to be suddenly cooled, there is seen on mining its surface under some magnification, not only a alline structure, but also, penetrating and penetrated e crystals, a *cellular* structure. The cells bear some nblance, not only in their appearance, but also in their a of formation and division (as revealed by more or sudden cooling of the melted metal), to the cellular ture of organised tissue.—J. T. D.

and Steel ; Instrument for Measuring the Permeility of ——. C. G. Lamb and M. Walker. J. Inst. ect. Eng. 1901, **30**, [151], 930—941.

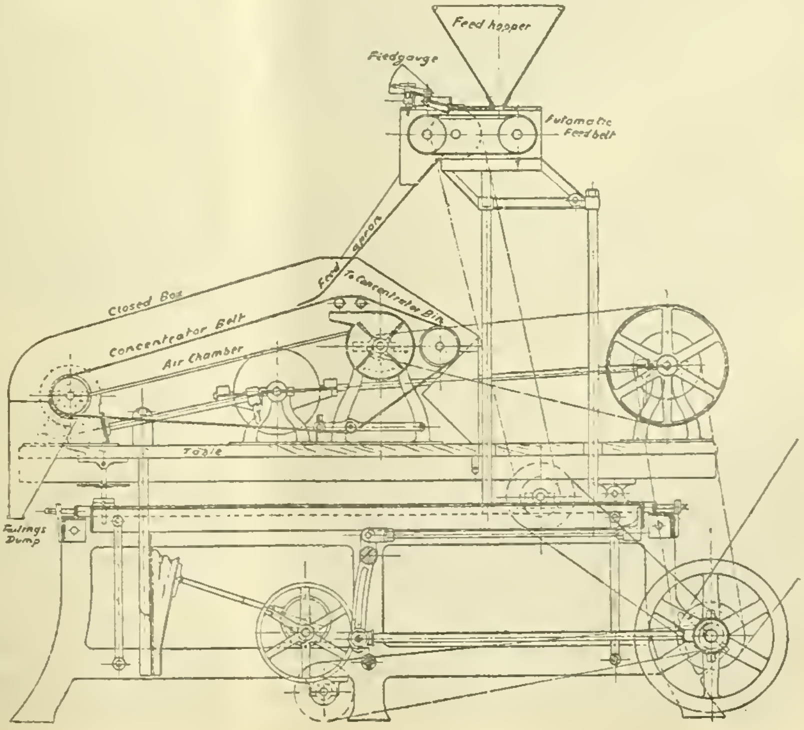
principle adopted is the balancing of the reluctance of ir-gap against that of the specimen under test by ing the length of the air-gap, so that the instrument once calibrated is incapable of alteration with time or somewhat careless usage. The bar to be tested is ed down to a specified diameter ($\frac{3}{8}$ in.) and is about long. It is surrounded by a magnetising coil, and is, e one end, clamped to one end of an iron yoke piece, st at the other it is held firmly in the centre of a lar iron head fitting into a recess in another maging coil of greater internal diameter. Facing the head in this second coil is the flat face of an iron cylinder s. in diameter and 3 ins. in length. This cylinder slides y (but with a good fit, and on the same longitudinal as the specimen bar), through a circular hole in the r end of the yoke-piece above referred to as clamping end of the specimen. The cylinder may be made to in or out of the second magnetising coil (thus altering length of the air-gap between the clamped head of the imen and the opposing face of the cylinder), by means threaded (narrow) co-axial prolongation passing ugh a boss on a bracket attached to the yoke piece. number of turns and fractions of a turn, of the screw, read by a micrometer scale, so that the length of the gap may be accurately de- ined. The two magnetising s, one around the specimen the other around the air- are connected in series and wound with an equal num- of turns. So arranged, the netic "flux" passes from specimen across the air-gap the cylinder, and thence ugh the yoke piece back to specimen, or *vice versa*. If air-gap be so adjusted in th that its "reluctance" is l to that of the specimen, , since the magneto-motive s are the same for both, whole of the lines of force t cross the air-gap, and can escape from the back of the iron head. But if eluctance of the specimen lifferent from that of the gap, the whole of the head be magnetised either posi- y or negatively, as the case be. The magnetic state of head is observed by means delicately poised magnetic lle, with an aluminium ter attached, protected from urrents by a brass tube ided with observation win- s; this needle is placed in proximity to the head. se, a reversing key is placed he electro-magnet circuit, so that the current passing through the two coils may be reversed at will. Observations are first taken with the current flowing in one direction and then after reversal; the mean readings are accepted as correct. The length of the air-gap is taken when the indicator needle remains in a central position, while the magnetising current is flowing, an alteration of $\frac{1}{1000}$th of an inch sufficing to disturb the balance. The calibration curves given with the instrument enable the permeability or its reciprocal to be found without calculation after the reading has been taken. A few accumulator cells supply the current and an ampère meter shows the current flowing in the circuit, and (on a separate scale), the magnetising force H applied. The precautions as to reversal, and the means used to destroy the magnetism from a previous test, as also the method of calibration, with fuller details of construction are given in the paper.—W. G. M.

Iron ; Production of ——, *in the Electric Furnace by the Stassano Process.* V. Lucchini. Chem.-Zeit. 1901, **25**, [45], 489.

See under XI. B., *page* 816.

Concentrating System ; The "Crown" Dry ——. Eng. and Mining J. 1901, **71**, [22], 694.

In this system of dry-crushing and concentrating, the ore, after being broken up, is passed through a series of rolls carefully gauged to give pulp of the desired fineness, without grinding or crushing the sulphides to a sliming powder. The pulped ore is conveyed by a carrier belt to the "sizer," which consists of a dust-tight box containing screens of from 40—180 mesh, the sizes of the meshes varying with different ores. The sizer is given a rapid oscillatory motion, and each screen discharges its special sized grains into a separate bin. An arrangement is provided by means of which assay samples are taken automatically at regular intervals from the separate bins, and only those "sizers" which carry values are passed through the concentrator. From the sizer, the assorted particles are conveyed to the concentrators by travelling belts, each size being concentrated separately, but all of the concentrates are delivered into one receptacle, and all the waste is



discharged into one dump, unless it be desired to keep the sizes distinct.

The concentrator proper (see figure) consists of a woven corrugated belt travelling through a closed box, which is fastened to a shaking table, to which is given a vibratory motion sufficient to keep the ore particles on the belt in a state of active vibration. The speed of the belt can be varied, and the table elevated or depressed as required. At the elevated end of the concentrator is a blower, which discharges air horizontally into the space below the upper portion of the belt. The air pressure can be regulated from an ounce to the smallest fraction of an ounce per square inch of belt surface, and is varied according to the gravity and size of the grains of ore. The horizontal air column strikes the belt, which runs at an angle of about 15°, at an acute angle, and passing through the interstices of the woven material, deflects the slower moving light and worthless grains from the perpendicular, causing them to travel toward the lower or waste discharge, whilst the heavier and valuable particles being unaffected by the air current, are carried by the belt to the upper or concentrate discharge. A dust collector can be arranged to catch the floating particles of dust, when the concentrator is in action.

It is claimed that from 85 to 95 per cent. of the total quantity of sulphides contained in the ore will be saved, and that the concentrates will contain only from 5 to 10 per cent. of worthless matter. Among the advantages claimed for the process are :—

(1) The material is treated automatically from the ore-breaker to the waste dump.

(2) Limited personal supervision is necessary.

(3) The cost of the plant is moderate, and the space occupied is much less than that required for a stamp mill and wet concentrators.—A. S.

Gold Extraction at Florence, Colorado. J. E. Rothwell. Eng. and Mining J. 1901, 71, [23], 721—724.

This paper gives a description of the plant and method of working of the Union Gold Extraction Company, Colorado.

Sampling.—The plant for sampling consists of two 10 by 20 Blake crushers, two sets of 16 by 36 belt-driven crushing rolls, two sets of sampling devices, and four belt elevators, the capacity of the whole being from 20 to 40 tons per hour, according to the condition of the ore. Each sampling device consists of two Vezin automatic samplers arranged, in one case with a revolving mixing-drum between each sampler, and in the other with a set of rolls to recrush "the first sample cut before taking out the samples." The sample taken, which is one-sixteenth of the original amount of ore, is reduced to an assay sample by coning, quartering, and recrushing.

Drying and Fine-Crushing.—The ore is dried in two revolving tubular driers with four tubes 26 ins. in diameter, and 22 ft. long each, set at an inclination of $\frac{1}{2}$ in. to 1 ft., and turning $4\frac{1}{2}$ revolutions per minute. The lower 8 ft. of each tube is lined with fireclay tile, $2\frac{1}{2}$ in. thick, and the remaining portion with a $\frac{1}{4}$ in. steel sleeve, 21 ins. in diameter. From the driers, which have a capacity of 150—200 tons per day each of ore containing 5 per cent. of moisture, the ore passes, at a temperature of 200°—300°, direct to a belt elevator. The dry ore then passes alternately to a series of separating devices and Davis crushing rolls, until it is of the desired fineness. Each set of rolls is arranged as a unit in the crushing plant; that is, each roll is connected with an elevator and set of four screens. Each screen casing and elevator is in connection with a line of pipe leading to a large exhaust fan, by means of which the dust is withdrawn and discharged into cotton bags.

Roasting and Cooling.—The plant in this department consists of six Pearce turret furnaces, 40 feet in diameter, provided with the new feed arrangement by which the pulp is fed to the hearth of the furnace from below, thus avoiding the loss which occurs when the fine pulp is dropped through the arch to the hearth. The furnaces are arranged in sets of two, with the discharge openings together, and from the latter, the roasted ore passes to the automatic cooling hearths, of which there is one to each set of furnaces. Each hearth has a surface of 787·75 sq. practically all of which is available for cooling. T hearths are open to the air above, and are provided w arrangements by which cold air can be blown in on t under side, to assist in dissipating the heat. Means also provided for keeping the ore in motion on the heart and sprinkling it with water. As fuel, oil residuum used; it is conveyed to each furnace from a storage ta and blown into a specially constructed firebox with a jet steam.

Chlorination and Precipitation.—The eight chlorinati barrels are each 5 ft. 6 ins. in diameter by 16 ft. long insi and have a nominal capacity of 25,000 lb. of dry ore. Th are revolved on trunnions at a speed of 5 revolutions minute. The ore is introduced into the barrel, toget with the reagents and water, and the whole revolved $3\frac{1}{2}$—4 hours. The solution is then flushed out, and pas first through a small sand filter and then into the settli tanks of which there are four, each 36 ft. long by 18 2 ins. wide by 6 ft. 6 ins. deep, and lined throughout w "6-lb." sheet lead. The surface of the ground below tanks is covered with a concrete and cement floor incli to a sump to collect any solution escaping in the event a leakage. Each settling tank is provided with two pip one which extends to 10 ins. above the bottom, takes the clear solution to the precipitating tank, the other dra directly from the bottom and conveys the slimes to a fil tank. The three precipitation tanks have a capacity 90—95 tons of solution each, and have bottoms sloping a central point to permit of easy cleaning. Two lines lead piping, perforated along each side with $\frac{1}{4}$ in. holes, laid on the bottom of each tank equidistant from the si and with one end extending above the top of the tank the introduction of the hydrogen sulphide gas used as precipitant. From the precipitation tanks the solution precipitate pass, with a fall of 14 ft. to pressure tanks thence to the filter presses.

Roasting the Sulphides and Melting.—The two roast furnaces are of the muffle type; they are fired with and have a separate flue and dust chamber connecte each muffle to collect any dust given off during roasti The melting furnace has two openings large enough No. 125 graphite crucibles, each separately fired with residuum. It is stated that a fusion can be made in than 1 hour in this way, as against $2\frac{1}{2}$—3 hours with a c fire.

Concentration.—The tailings from the chlorina barrel are conveyed to eight large tanks, and thence succession to 16 double-deck 12-ft. Wilfley concentra tables, a shaking launder, and four 12-ft. single-deck tal The tailings from all the tables are delivered to tailings dump, and any excess of water overflows in launder, is settled in a large pond and pumped back to used again in concentration. The object of concentra after chlorination is to save the coarse gold resulting f the roasting of the telluride ores, since time cannot be g for complete solution, as also any other material of due to imperfect roasting or faulty chlorination. general concentration is high, being on an average, al 75 tons of tailings to one ton of concentrates. The sav made is from 40—60 per cent. of the values in the b tailings.—A. S.

(*Gold*) *Auriferous Mispickel Ores at Deloro, Onta Treatment of ——, by the Cyanide Process.* S. B. Wright. Eng. and Mining J. 1901, 71, [25], Cana Supplement, 807—810.

The ores of the Deloro mine are described by P. Kirkeg as consisting generally of quartz, more or less heavily pregnated with arseno-pyrites—mispickel—and occasion containing copper pyrites and frequently a large percen of iron sulphide.

The method of treatment followed may be briefly desc as :—

(1.) Leaching with a dilute solution of potassium cya to which is added a small proportion of cyanogen bro solution.

(2.) Precipitation of the dissolved gold by metallic

(3.) Recovery of gold from the zinc-gold slimes.

ie wet concentrates from the mill consist principally ispickel, with some iron pyrites carrying small but ing quantities of copper, and 15—20 per cent. of quartz . The latter is retained purposely as it renders the equent leaching more effective. The pulp is introduced tly into the leaching vats, of which there are four, l with sand-and-pebble filter bottoms and bottom disge gates; the charge is about 40 tons for each vat. r washing with water and partial draining, the solutions anide and cyanogen bromide are run in, the weight of ion introduced at this stage into each vat being about ons. The wash water which is displaced by the bromoide solution is passed through the zinc boxes. It has observed that the first portions of the cyanide solution pass through the charge are very weak in potassium ide, but contain appreciable quantities of soluble ferroides, and thus the appearance of a distinct Prussian coloration on adding ferric chloride to a sample of the ion is an indication of the appearance of gold-bearing ion. When this point is reached, the solution percolating igh the charge is directed into the "strong tank," e it is made up to its original strength by addition of ide, and is then again run on to the charge with the isite quantity of cyanogen bromide solution. This of operations may be continued until the liquor tins as much as 6—7 oz. of gold per ton. After 24 s' leaching, when from 60 to 70 per cent. of the total contents will have been extracted, the ore is allowed to t, and then turned over with a shovel in order that fresh ices may be exposed to the solution. The leaching is continued until it is shown by tests on samples of the ion, that the extraction is complete. The charge is washed first with weak cyanide solution and then with r; the weak cyanide washings are collected and used for further charges of ore, whilst the wash water is ed through the zinc boxes.

r precipitating the gold from the "strong" and "weak" rs, zinc fume or dust is employed. The precipitating el consists of an inverted sheet iron cone, 4 ft. 6 in. in eter and 4 ft. 6 in. deep, fitted at its apex with a threecock and a small perforated cone, by means of which the ion is distributed uniformly. The zinc fume is introduced igh a central funnel and pipe, the latter being expanded s lower end into an inverted funnel. The pipe, by eting the stream of liquor helps to more thoroughly the latter with the zinc fume. The liquor runs direct igh the three-way tap into the bottom of the cone, and s the zinc fume just above the distributing rose. The pitated liquor, which, by the time it reaches the rim e cone, carries only a small quantity of suspended matter, overflows into a peripheral gutter, and thence flows to a wooden settling box.

The gold-bearing precipitate, whether obtained from the zinc boxes or from the fume cone, is agitated with sulphuric acid (1 : 10), and the gold slimes washed free from zinc sulphate by decantation with cold water, the washing being run into settling tanks. The gold slimes are then drained and heated to dull redness on shallow sheet iron trays in a small wind furnace, which is so arranged that it can be heated by waste furnace gases. The roasted slimes are smelted with a suitable flux in clay crucibles, and the slags, which are stated to be exceptionally clean, are allowed to accumulate and then treated by Caldecott's process.

The following average results have been obtained during two years' experience with this method :—Potassium cyanide per ton of concentrates treated, 2·0 lb.; cyanogen bromide, 0·5 lb.; zinc fume, 0·19 lb.; total length of treatment, 80—100 hours; extraction of gold from concentrates, 87—94; mean, 90·5 per cent. The author considers that with practically all the so-called refractory ores, the results obtainable both as regards cost, and completeness of extraction are better with the above method than with the ordinary cyanide process.—A. S.

Alluvial Gold Deposit in Bosnia; Composition of ——.

F. Katzer. Chem. Zeit. Rep. 1901, **25**, [21], 187.

The deposit examined is on the Pavlovac, a tributary of the Fojnička, having its origin in the Matorac massive. The alluvium is fairly auriferous in places, showing grains of gold, of the size of poppy or millet seed, which give no indication of rolling action. On examination the deposit showed, per 100 kilos. :—(*a*) Artificial products: lead, 716; lead slags, 1,252; copper slags, 308; and iron slags, 848 grms. (*b*) Natural constituents: gold, 0·0376; dolomitic limestone, 84; titaniferous iron ore, 348; quartz, 472; iron glance, 740; magnetite, 888; pseudomorphs of goethite, 3,452; and phyllite, 88,760 grms. The goethite probably had its origin in auriferous pyrites beds which had been cut through by the river. The occurrence of slags is interesting, because at the present time there are no copper or silver works along the whole course of the river, though there are evidences of old workings.—W. G. M.

Tellurides of Gold and Silver in the Kalgoorlie Region.

A. Carnot. Comptes Rend. **132**, [22], 1298—1302.

In this paper analyses of the West Australian telluride ores from the Paris Exhibition are given.

No. 1 is from the *Lake View Consols* mine; the rest are from the *Great Boulder Proprietary.*

——	1.	2.		3.		4.	5.	6.	
		a.	*b.*	*a.*	*b.*			*a.*	*b.*
....	60·45	56·55	53·70	32·33	33·00	60·30	51·13	31·58	41·11
....	29·85	23·15	27·75	24·16	23·42	33·90	37·06	23·58	26·10
....	9·18	16·65	13·60	41·22	41·37	4·82	4·71	43·31	30·43
....	..	3·10	3·70	2·00	2·26	..	3·70	0·88	0·70
....	0·15	0·10	0·25	0·10	0·16	0·63	0·88	0·20	0·60
....	0·10	..	..	..	..	..	..	..	..
....	..	Trace	Trace	..	..	Trace	0·90	Trace	0·40
....	..	0·20	0·15	..	..	..	1·20	0·30	0·80
	99·73	99·75	99·15	99·81	100·21	99·65	99·58	99·85	100·14

Clean and brilliant cleavage; structure fibrous in directions; colour, silver-white on the cleavage planes, wise steel-grey. Composition expressed by the ula $(AuAg)Te_2$: the *Sylvanite* of Offenbanyo.

Practically no cleavage planes; fracture conchoidal; ir, steel-grey to yellow-grey. Formula, $(AuAgHg)_2Te_3$. author suggests the name *Coolgardite.*

No cleavage; conchoidal fracture; steel-grey to iron-k; brittle and, easily powdered. Formula, $(Au_2Ag_6HgTe_6)$. ably this is Pittmann's *Kalgoorlite.*

Yellowish-grey, in places darker; conchoidal fracture; leavage. Formula, $(AuAg)Te_2$. The same formula as sylvanite, but with much less silver; agrees with Genth's *Calaverite.*

5. Yellowish-grey; conchoidal fracture; contains both mercury and antimony. Formula, $(AuAgHg)_2Te_3$. *Coolgardite*, but with more gold and other metals, less silver.

6. Greyish-black; looks like an aggregate of small fragments, somewhat resembling anthracite in appearance. The two samples differ, one seems to be *Kalgoorlite*, the other a mixture.—J. T. D.

Gold and Silver Buttons in Quantitative Blowpipe Assays; Measurement of ——.

J. W. Richards.

See under XXIII., *page* 839.

Gold Ores; Assaying of Complex ——. E. A. Smith.

See under XXIII., *page* 839.

Gold and Silver Alloys, &c. from Egyptian Tombs. Berthelot.

See under XXIV., *page* 846.

Silver Chloride; Reduction of ——, *by Hydrogen.* Jouniaux. Comptes Rend. 1901, **132**, [21], 1270—1273.

THE author adduces some experimental facts to show that at 640 C. the reaction $AgCl + H = HCl + Ag$ is reversible, and that the point of equilibrium can be displaced by varying the pressure.—J. S.

Alloy; Density of Aluminium-Antimony ——. Lippmann. Comptes Rend. 1901, **132**, [21], 1266—1267.

AN alloy of aluminium and antimony corresponding to the formula $AlSb$ fuses at 1,078—1,080° C., whilst the melting points of its constituents are 660° and 630° respectively. Its specific gravity at 16° C. referred to water at 4° C., and *in vacuo* was found to be 4·2176, whilst the densities of the elements are 2·67 and 6·72. If no change of volume had taken place during the formation of the alloy, the density should have been 5·2216. It therefore follows that a large increase in volume occurs during the formation of the alloy, which thus forms an exception to Matthiessen's rule.—J. S.

Pyritic Smelting; The Present Position of ——. E. Bahlsen. Chem. Zeit. Rep. 1901, **25**, [21], 187. From Stahl u. Eisen, 1901, **21**, 597.

GAUTIER has stated that the process of pyritic smelting has not fulfilled all that was expected of it. He expects, however, to be able to apply it in the production of coarse matte from Canadian copper-nickel ores, and also in making the Norwegian ores smeltable; and since pyritous gold ores cannot be amalgamated, and cupreous ores cannot be treated by the cyanide process, he proposes to treat these also by pyritic smelting. Lodin, however, contends that the process is declining, and that in its true form it is in use in only two places, namely, in Tilt Cove and in Mount Lyell (Tasmania). He disputes the utility of separate charging, and, on theoretical grounds, contends that an addition of carbon to the charge is essential, an omission of carbon leading to irregular descent of the charge. Gautier states that in Leadville and Silvertown, with cheap coke and lead ores, the process of concentrating the precious metals in lead is cheaper than that of pyritic smelting. The author arrives at the following conclusions:—The vertical method of charging and smelting without an addition of carbon is practically discontinued, but a mixed process with horizontal charging and the addition of combustible material is in use; it is, however, displaced by treatment with lead in the case of gold and silver ores. The process is only a special one for districts where fuel is scarce. The disadvantages are slow driving, a matte poor as to copper-contents, and a tendency to scaffolding.—W. G. M.

Copper-Tin Alloys; Results of Chilling ——. C. T. Heycock and F. H. Neville. Proc. Roy. Soc., **68**, May 23, 1901, 171—178.

THE authors have pursued their experiments on copper-tin alloys, and have thrown light upon the question of the crystalline patterns shown by the various alloys of the series, by examining microscopically the structures of the same alloy chilled from different temperatures. In the ordinary cooling curve of the alloy containing 19 atomic per cents. of tin and 81 of copper, there is a considerable evolution of heat during solidification between the temperatures 800° to 700° C., and slight evolutions at temperatures below the latter, and after the alloy has become a rigid mass. Points on the curve were chosen for chilling the alloy so as to examine the structure between the changes produced at the moments of heat evolution in the following manner:—A bath of tin was heated above the highest freezing point of the alloy and the pyrometer transferred thereto. A number of small test tubes of Jena glass, each containing from 5 to 10 grms. of the alloy, were immersed in the bath, and the whole allowed to cool slowly and uniformly, an atmosphere coal-gas being employed to prevent oxidation of the all samples. As the temperature fell to each of the selec points, one tube was withdrawn and plunged into water. T chilled alloys were afterwards ground, polished, and pattern brought out by slightly heating the surface unti pale yellow oxide film was formed, this being preferable etching for developing differences of chemical compositi Reagents were employed, however, where the chilli temperature was low, so as to avoid any possibility of heating reversing the chilling effect. The softer parts the alloy, or those containing the most copper, were dark in the yellow stage with alloys richer in copper than Cu With alloys containing more tin, the richer copper pa were darkened by etching with ammonia. All the allo except the hottest one, had solidified before chilling, a were therefore compact, the first one being granulated.

The results show that the crystalline structure of alloys chilled from the liquid or partially solidified stat large and best seen at 10 or 20 diameters, but the specin chilled after the alloy had been solid for some little ti revealed no crystalline pattern at all even at 400 diamete The latter specimens were chilled at temperatures betw the heat evolution point on solidification at above 700° and the first heat evolution of the solid metal at bel 600° C. After the alloy had cooled below this lower he evolution point, the chilled structure was again crystall and resembled somewhat that of the slowly cooled all Chilled from a still lower temperature the result was almost perfect reproduction of the slowly cooled crystall pattern. Another and slight heat evolution below t temperature seems only to affect the eutectic. Other all of different proportions of copper and tin, but not too removed in composition to the above, all showed a si larity between the chilled and slowly cooled patterns, w a corresponding region of temperature in each where chilled specimen yielded no pattern whatever.

The no-pattern condition was also obtained, as anticipated, by heating to a faint red heat and chillin piece of the slowly cooled and crystalline alloy. On th reheating to just below redness, and quickly but not rapidly cooling, the crystalline pattern was restored. T polygons were then of the same size as in the origi alloy, but the fern-leaf pattern was smaller, the former f pointing to the probability that the polygons were forn at an earlier period in the history of the alloy.—A. W.

Copper; Analysis of Commercial ——. A. Hollard

See under XXIII., *page* 840.

Copper; Electro-Metallurgy of ——. G. Codar Elettricità, 1901, **20**, 20, 21, 39—41, 56, 67, 67—70.

See under XI. B., *page* 816.

Alloys; Aluminium-Molybdenum ——. L. Guillet. Comp Rend. **132**, [22], 1322—1325.

THESE alloys are formed similarly to those of tungsten (Journal, 1901, 723), and their formation presents sim phenomena. With all proportions between $AlMo_{15}$ Al_6Mo, well-fused ingots are obtained. With these betw $AlMo_3$ and Al_4Mo, superb lamellar crystals are obtai often forming by their interlacing the whole ingot. Bes these, little geodes occasionally appear, containing filiform crystals; and with great excess of alumini kidney-shaped excrescences form on the surface of ingot, which consist of agglomerations of filiform crys All these crystals are as a rule pure, not covered, like tungsten compounds, with a coating of aluminium. Anal shows that the lamellar crystals are Al_4Mo, the filif crystals from the geodes $AlMo$, and the crystals from kidney-shaped bodies Al_7Mo. They are all attacke strong acids; not by boiling water.—J. T. D.

Alloys; Aluminium-Magnesium ——. O. Boudouar Comptes Rend. **132**, [22], 1325—1327.

THE melting-points of various alloys of these metals taining from 5 to 90 per cent. of aluminium were determi and the results plotted. The curve showed two max corresponding to $AlMg_2$ and $AlMg$; there were also t na. The mechanical strength of the alloys diminishes recede from either pure metal, to a minimum for the r cent. alloy.—J. T. D.

gnalium. British Jour. Phot. **48**, 1901, [2143], 337.

presence in the aluminium from which this magnesium-nium alloy is made, of any sodium, carbon, or nitrogen the product. For sheet and tubes the alloy should in less than 10 per cent. of magnesium, but castings contain a larger proportion. The alloy does not clog the finest file and turns well; its fracture is more like of steel than that of zinc; its specific gravity is 2·5, t is in tension from three to four times stronger than nium. Of great importance is the fact that it can ldered satisfactorily.—J. W. H.

sten in Ores; Determination of ——. O. P. Fritchie.

See under XXIII., *page* 840.

PATENTS.

ing Process, Electric ——; *and Apparatus to be used rein.* The British Aluminium Company from A. H. wes. Eng. Pat. 9676, May 9, 1901.

See under XI. B., *page* 817.

Recovery of ——; *and the Simultaneous Generation Electric Energy.* R. H. Gould. Eng. Pat. 15,019, g. 22, 1901.

See under XI. B., *page* 817.

ine; Manufacture of ——; [*Extraction of Metals*]. G. J. Atkins. Eng. Pat. 15,282, Aug. 28, 1900.

See under VII., *page* 808.

ine; Manufacture of ——; *and Treatment of tallic Ores thereby.* G. J. Atkins. Eng. Pat. 5661. rch 18, 1901.

See under VII., *page* 808.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(A.)—ELECTRO-CHEMISTRY.

and Chlorine; Mercury Cell for Electrolytic ——. Franke. Amer. Electrn. 1901, **13**, 104. Through ence Abstracts, 1901, **4**, [42], 526.

is cell a falling stream of mercury is used as cathode arge surfaces of platinum or carbon as anodes. On a scale, with anodes 3 cm. apart, with a warm strong on of salt, and with an E.M.F. of 4 volts, a flow of s. of mercury per second sufficed for a current of 0·7 res when the anodes were of carbon, or of 1·2 ampères they were of platinum. In an experiment on a larger with carbon anodes, 500 grms. of mercury carried 160 res with a potential difference of 4 volts (with platinum s the weight of mercury was 100—150 grms. per d). The proportion of sodium in the mercury is sarily low, owing to the rapidity with which the latter s through the cell. Glazed stoneware cells of this type, n. square, may be used for a current of 3,000 ampères volts. The advantages claimed are:—(1) Low E.M.F. se the mercury is quickly removed; (2) high current ncy (98 per cent. has been recorded); (3) relatively veight of mercury per unit of soda produced; (4) vely high yield per unit of plant.—W. G. M.

phragms; Electrolytic ——. M. Le Blanc. Zeits. für Elektrochem. 1901, **7**, [48], 653—656.

dition to the acid-resisting diaphragms described by uthor (this Journal, 1901, 132), a new diaphragm, g a slightly different composition, has been discovered. more difficult to manufacture, but plates measuring 38 cm. and 4 or 5 mm. thick have been made. The original composition was roughly 75 per cent. SiO_2 and 25 per cent. Al_2O_3. In the new diaphragms about 2 per cent. of the alumina is replaced by alkali. An analysis of the Pukall composition gave the following results: 70—71 per cent. SiO_2, 27—28 per cent. Al_2O_3, and about 1·5 per cent. alkali. The resistance of the new diaphragms is less than half that of the old. On comparing diaphragms 5 mm. thick, it was found that the fall of potential caused by the new plates was 0·17 volt as against 0·40 volt, using a current density of 300 ampères per square metre.

Attempts were made to correlate the electrical resistance of the diaphragms with the porosity of the composition, but without success. As a measure of the porosity the author tried the rate of diffusion of sodium chloride through the material, the amount of water absorbed by the air-dry material, and the rate at which water filtered through it.—J. S.

Cobalt from Nickel; Electrolytic Separation of ——. D. Balachowsky.

See under XXIII., *page* 840.

Electrical Heating Apparatus. J. Sebelien. Chem. Zeit. 1901, **25**, [45], 485.

See under XXIII., *page* 837.

PATENTS.

Chlorides of Metals of the Alkalis and Alkaline Earths; Electrolysis of ——, *for the Purpose of Obtaining Chlorine, and Apparatus therefor.* G. J. Atkins, Tottenham. Eng. Pat. 5596, March 16, 1901.

A COMPOUND salt (mixture of chlorate, hypochlorite, and chloride), useful for the subsequent manufacture of chlorine, is produced by the electrolytic decomposition of chlorides of alkalis or alkaline earths, such as chloride of sodium, carried out under conditions where hydrogen alone is evolved, and practically the whole of the oxygen and chlorine are kept in solution. A long containing vessel of wood or other suitable material, is lined with carbon, which subsequently becomes the anode, and within it revolves, on suitable bearings, a cylinder, preferably of wood, and entirely encased in sheet lead or other conductor, which acts as the cathode. The trough is so arranged that there is a natural slow flow from one end to the other of the salt solution, which covers the anode, and somewhat less than half the diameter of the cathode, so that its axis may be out of the electrolyte. A scraper of india-rubber or other suitable material rests on the entire length of the cathode, and, as the latter revolves, pushes back the adhering electrolyte, liberates the bubbles of hydrogen, and cleans the surface from it before re-entering the electrolyte. The apparatus is connected to a dynamo or other source of electric current by conductors.—G. H. R.

Accumulators or Secondary Batteries. G. F. W. Kloth, O. H. G. Bünning, and J. G. L. D. Kunhardt, Lübeck, Germany. Eng. Pat. 8598, April 26, 1901.

THE accumulator comprises a plate or the like, charged in the ordinary manner for accumulator purposes, arranged in a salt solution or acidified water in combination with a body relatively electro-negative to the plate. This body, though previously uncharged, serves to produce an electric current from the moment of its co-operation as a counter electrode to the charged plate submerged in the common liquid. A charged positive plate may be used with an uncharged zinc one, or a charged negative plate with an uncharged one of carbon or manganese oxide.—G. H. R.

Electric [*Constant*] *Battery.* P. E. Francken, Brussels. Eng. Pat. 12,977, July 18, 1900.

THE improvements in the permanent battery claimed are characterised by the rectangular form of the partitioned carbon pole surrounding the porous cell containing the zinc plate for the purpose of effecting the maximum of the generic action developed by the combination of sulphuric acid at 15° B. as exciting liquid, and of bichromate of soda solution at 30° B. as depolarising liquid. The surface of the carbon electrode is considerably increased, and consequently the output of the cell, by partitioning the rectangular carbon pole by the insertion of carbon plates at right angles to the sides of the sockets, in which they are fixed at the two ends.—G. H. R.

Electrodes for Arc Lamps; Carbon ——. V. Alexandroff, St. Petersburg. Eng. Pat. 15,021, Aug. 22, 1900.

The lighting energy of carbon electrodes for arc lamps can be increased by the addition to the ordinary carbon mass of oxides or salts of certain metals, such as magnesium, aluminium, zinc, copper, and silver, and also of oxides of such metals as are used for the incandescent mantles known as Welsbach mantles.—G. H. R.

Electrodes; Process for the Forming of ——. A. J. Boult, London. From E. Andreas, Dresden, Germany. Eng. Pat. 15,473, Aug. 30, 1900.

Electric accumulator plates can be formed without paste, by first subjecting the lead plates in the usual way, in a dilute sulphuric acid bath, to the influence of an electric current, until a brown coating of peroxide of lead is formed, washing them, and then subjecting them to a very dilute solution of nitric acid, until the brown colour of the coating becomes grey, and repeating this alternating treatment until the desired capacity of the plate is obtained.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

Iron; Manufacture of ——, *in the Electric Furnace by the Stassano Process.* V. Lucchini. Soc. Chim. di Milano; through Chem.-Zeit. 1901, **25**, [45], 489.

Stassano's first patent was taken out in 1898, and the original form of his electric furnace resembled that of the blast furnace, with a graphite lining, for which afterwards magnesite was substituted. The form now used (patented in April 1900) is that of a narrow Martin-furnace with basic hearth, heated by three electric arcs placed above the upper surface. The charge is so calculated that, besides the carbon necessary for reduction, sufficient is added for carburisation, according to the product aimed at. Enough limestone is added to form silicates of the composition M_2SiO_4. The ore is worked into balls of about 5—6 cm. diameter. The average yield of the furnace when used for reductions has been found to be 50 per cent., and when employed for smelting or refining, 80 per cent. Under the least favourable conditions, it appears that 5 h.p.-hours are required to produce 1 kilo. of iron; hence each h.p. should, in a year of 7,000 working hours, afford 1,400 kilos. of iron. The iron produced by this process contains very little manganese, and is suitable for dynamo work. Only half the sulphur can be removed. Analyses are given in the original paper of various products obtained with the aid of this furnace, including iron with 99·7 per cent. Fe, ferro-manganese (67 per cent.), spiegeleisen (7 per cent.), and ferro-chrome (40 per cent.).—W. G. M.

Copper; Electro-Metallurgy of ——. G. Codara. Elettricità, 1901, **20**, 20—21, 39—41, 56—57, 67—70. Through Science Abstracts, 1901, **4**, [42], 525.

Reference is made to the four processes that have been tried for the electrolytic extraction of copper from its ores, namely, those of Body, Siemens and Halske, Höpfner, and Marchese. The second of these, using ferric sulphate as a solvent for the roasted sulphide, has been tried on a large scale at Martinikenfelde, at Pena de Herro, and in the Tyrol, but without success. Höpfner's process was tried in the Saxony Erzgebirge, at Giessen, and at Wiedenau, with a similar result, although at Safenburg, with a Rio Tinto ore containing 3·37 per cent. of Cu, it gave good results, yielding 54 kilos. of copper per horse-power in 24 hours. After references to the remaining processes above mentioned, the electrolytic refining of copper by Siemens and Halske's, Borchers' and Goslar's, Stahlmann's, Hayden's, Smith's, Randolf's, and Thofehrn's processes are described (in the original article).—W. G. M.

Chromium; Electrolytic ——. B. Neumann. Zeits. Elektrochem. 1901, **7**, [48], 656—661.

Under certain conditions, good deposits of electrol chromium can be obtained on electrolysing solutions chromium salts. The cathode compartment contains chromium solution, whilst the anode compartment is char with mineral acids or salt solutions. Carbon is gener used as the cathode, but deposits can also be formed metals such as platinum, brass, lead, &c. Accordin the nature of the anode electrolyte, lead, platinum, carbon is employed as the anode. In order to get g metallic deposits free from oxide, it is essential that cathode solution should be kept well stirred. The influe of the current density on the character of the depo t determined with a chromic chloride solution contai 100 grms. of metallic chromium per litre, the soluti being prepared at the ordinary temperature. The res are given in the table:—

Current Density per Sq. Dcm.	Product.	Curr t Efficien
Amp.		Per Cen
0·9	Oxide.	..
1·8	Metal at first, oxide later.	..
3·6	Metal and oxide mixed.	..
4·5	Thin metallic deposit, covered later by oxide.	5·4
7·2	Metal with small quantities of oxide.	23·4
9·1	Pure metal	38·4
13·7	Pure metal and some crystals...	38·9
18·2	Pure metal, mostly crystalline ..	38·8

The temperature of the electrolyte may be raised to a 50°, but above this temperature the chromium is depo as a black powder. Increase of temperature scarcely a the current efficiency.

The result of varying the concentration of the soluti shown in the following table:—

Cr per Litre.	Product.	Curren Efficien
Grms.		Per C n
210	Metallic powder mixed with chromous chloride.	..
184	Metallic powder mixed with chromous chloride.	..
158	Pure metal	56·6
135	Pure metal	49·0
105	Pure metal	38·4
79	Metal at first, oxide later.	..
53	Oxide and hydrogen.	..
26	Small quantity of oxide, and strong evolution of hydrogen.	..

The highest yield shown above is about 57 per cent. by altering the anode solution, this can be increase 89·5 per cent.

Electrolysis of the sulphate and acetate gave si results. The best conditions in the case of the su are: 65—85 grms. of Cr per litre, and a current densi 13—23 ampères per sq. dcm. The current efficiency 84·6 per cent., which increased to 86·2 on raisin temperature. The solution of the acetate did not give deposits.

The deposits can be obtained several mm. in thick and they have the same tendency to split off in thin l as electrolytic nickel. On examining the fracture o metal, there appear to be several very thin films of between the metallic layers. Electrolytic chromiu bright grey, like polished steel, and resembles silver in thin deposits. It is hard and brittle, and very pure taining only 0·1—0·2 per cent. of iron. Like ord chromium, it occurs both in an active and in a p state.

The decomposition potential in a 5 N-sulphate solut 1·898 volt, and in an 8 N-chloride solution 1·6 5 volt. practical purposes, however, it is necessary to empl E.M.F. at least twice as great.—J. S.

PATENTS.

ng Process, Electric ——; and Apparatus to be Used ein. The British Aluminium Company, London. n A. H. Cowles, Cleveland, U.S.A. Eng. Pat. 9676, 9, 1901.

lic sodium and an aluminous product from aluminate are manufactured by forming a mixture of sodium ate with carbon in a granular, broken, or intimately ted condition in proper proportions, and heating it ightly closed chamber by heat generated from an current, whereby the sodium is reduced, volatilised, sses out of the chamber, and the aluminium is l from its oxide and combined with carbon. The vapour is collected and condensed, and the carbide ed or removed from the furnace. By mixing sodium ate and carbon with a compound of a non-volatile nd treating it as above, the oxide of aluminium is , and an alloy of the aluminium with the non-volatile of the charge is produced. Alloys of sodium and um can be made by charging the mixture of sodium te and carbon with a volatile and non-volatile metal furnace, whereby the sodium is reduced, and with atile metal is volatilised and passed out of the , while the oxide of the aluminium is reduced by the and the aluminium alloyed with the non-volatile The furnace, which has a wall permeable to vapours es, and a condensing chamber outside the wall, has top and an electrode extending from the furnace through it. A gas-tight pipe fits around, and a close joint with the electrode, so as to form a r between the top of the electrode and the pipe. let to the chamber discharges on the top of the e to prevent the passage of vapour through the G. H. R.

Electro-deposition of ——, upon Articles of China, enware, and the like. G. Cooke, Sheffield, and J. Wolstanton. Eng. Pat. 15,363, Aug. 29, 1900.

rfaces of articles of china, glass, porcelain, or vare can be prepared so as to enable them to n electro-deposition of metal by forming a metallic them by (firstly) the application of a preparation d and rape oil in equal proportions, mixed with five h of brimstone and red lead, or arsenic instead of r. Secondly, the surface is coated with a prepara- hree parts each of calcined borax and of oxide of pper, and seven parts of calcined and pulverised third coating is given of a mixture containing two "brown gold," two parts each of a flux (such as nd of mercury, seven parts of oxide of silver, and each of nitric acid and red lead. A list of metallic es for those mentioned above is given, which can yed according to the metal to be deposited.

—G. H. R.

covery of ——, and the Simultaneous Generation ctric Energy. R. H. Gould, Surbiton. Eng. Pat. , Aug 22, 1900.

scraps to be treated are immersed as an anode in a element or the elements of a galvanic battery, each being formed by a suitable tank, vessel, or the like, g a suitable carbon body as negative electrode), and sea-water, brine, saline solution, or a similar n electrolyte. The action of the battery causes on and separation respectively of the tin and other roducts from the iron, and generates simultaneously nergy for the secondary cleansing treatment of the s in a suitable bath in circuit with the battery, rrent may be used for any other purpose.

—G. H. R.

XII.—FATS, OILS, AND SOAP.

Characteristics of Certain ——. M. Greshoff and . Rec. Trav. Chim. des Pays-Bas. 1901, **20**, 65; Zeit. Rep. 1901, **25**, [20], 177.

Wax.—This wax is obtained from the leaves of a e order of *Musaceæ*. It forms white crystalline cakes, has a specific gravity of 0·963 to 0·970 at 15° C., and melts at 79°—81° C. It is only slightly soluble in boiling alcohol, but dissolves readily in boiling turpentine, amyl alcohol, and carbon bisulphide. Its acid value is only 2 to 3, and its saponification value 109. The authors obtained from it on saponification, an acid, $C_{24}H_{48}O_2$, which melted at 71° C. This they termed "pisangcerylic acid." The "pisangceryl alcohol," which they also isolated, melted at 78° C., and had the formula, $C_{13}H_{28}O$.

Godang Wax.—This is obtained from *Ficus ceriflua*. It forms masses which are brown outside and yellow within. Its specific gravity is 1·015, and its melting point, after purification from alcohol, 61° C. The wax is soluble in the ordinary solvents on boiling, but a large proportion separates out on cooling the solutions. The authors isolated from it "ficocerylic acid," $C_{13}H_{26}O_2$, which melted at 57° C., and "ficoceryl alcohol," $C_{17}H_{28}O_2$, melting at 198° C. They regard godang wax as a connecting link between wax and caoutchouc.

On dry distillation godang wax yielded an aqueous liquid containing acetic and propionic acids, and an oily fraction. The latter contained a colourless hydrocarbon, $C_{14}H_{26}$, which boiled at 220° C., fluoresced, and had an odour recalling those of petroleum and turpentine. It also contained two crystalline substances—an acid $C_{12}H_{24}O_2$ (m. pt. 55° C.), and an alcohol, $C_{41}H_{88}O$, melting at 51° C.

Pisang Wax yielded, on dry distillation, a hydrocarbon, $C_{16}H_{34}$, boiling at 280° C., and an acid, $C_{27}H_{54}O_2$, which differed from cerotic acid in having a lower melting point (58° C.).

Beeswax, when subjected to dry distillation, yielded a hydrocarbon, $C_{15}H_{30}$, boiling at 240°—250° C., and regarded by the authors as identical with a substance isolated from petroleum. They also obtained from the distillation a substance melting at 63° C., and another melting at 56° C., which they concluded belongs to the olefine series.

—C. A. M.

Strophanthus Seed Oil; Characteristics of ——. M. Bjalobrsheski. Pharmaz. Journ. 1901, **40**, 199; through Chem. Rev. Fett- u. Harz-Ind. 1901, **8**, [6], 123—124.

Strophanthus nispidus yielded by expression 12·8 per cent. of fatty oil, whilst an additional 9·2 per cent. was obtained by subsequent extraction with ether. The oil was fairly thick and of a brownish-green colour, appearing yellowish-brown by transmitted light. Its specific gravity at 15° C. was 0·9249. It became completely solid at −6° C., and melted again at +2° C. It was rapidly bleached by sunlight, but did not dry. Completely insoluble in water, slightly soluble in alcohol, and readily soluble in ether, chloroform, and petroleum spirit. Examined by the usual methods it gave the following results:—Acid value, 24·3; saponification value, 194·6; iodine value, 101·6; Reichert value, 0·9; Hehner value, 94·1; melting point of fatty acids, 30·2° C.

It was found to contain slight traces of a volatile oil, phytosterol, formic acid, and another volatile fatty acid. The insoluble fatty acids were converted into their ethyl esters and separated by fractional distillation. In this way oleic, stearic, and arachidic acids were identified.—C. A. M.

Castor Oil Manufacture at Marseilles.

See under Trade Rep., *page* 859.

Vegetable Wax. Chamber of Commerce J., Aug. 1901.

The *Moniteur Officiel du Commerce* calls attention to a product called "Vegetable Wax," furnished by the "Rhimba" tree of Madagascar. It appears in the shape of small irregularly tabulated masses, and adheres to pieces of bark, of a brownish red, coming from the tree. Most of these masses are incrusted with woody and earthy particles, which give it a very unclean appearance; others have a smooth, but dull and greyish surface, column-like, resembling many resins, which harden in the open air whilst running over the surface of the trunks of trees. "Rhimba" wax is fusible at 60° C., completely soluble in boiling alcohol, incompletely soluble in cold alcohol (20 per cent. insoluble). It contains 14 per cent. of vegetable wax.

Unlike beeswax, however, it resists decolorising agents, such as peroxide of hydrogen, hypochlorites, and even weak nitric acid. It might be used as a basis for sealing and modelling wax. The bulk of it melts below 100° C., but a simple means of separating from it the vegetable and earthy particles which stain it is required. At present the yield is only about 15 per cent. of pure product, but by means of a hydraulic press, with plates heated to 90° C., the whole of the resin-wax might be obtained. The separation of the resin from the wax would next have to be undertaken. The wax fuses about 72° C., and hence might serve for candles, but the resin is too dark at present to be used in making varnish.

PATENTS.

Oil from Fish or other Material; Apparatus for Extracting ——. A. J. Boult, London. From C. Wacker, Baltimore, Maryland, U.S.A. Eng. Pat. 9969, May 14, 1901.

In the type of apparatus claimed, the material containing the oil is passed through a tank of hot water under gradually increasing pressure, and the extracted oil removed as it rises to the surface. The residual mass is then forced from the tank in a moist compact state suitable for drying and manufacture into fertilisers.

In one of the special forms of apparatus described, the fish or other material is introduced through a hopper, and forced down into the water by means of a conveyor. It is next carried along horizontally by means of a screw, whilst the heat is maintained by the introduction of steam. As the mass reaches the smaller end of the conveyor press, the pressure gradually increases and the oil expelled is skimmed off the surface of the water from time to time through a special opening. The residual material, which is practically free from oil when it reaches the outlet, is forced through an opening, whilst the water is prevented from escaping by means of a valve.

Various modifications and combinations of the different parts of the apparatus are claimed.—C. A. M.

Resinous Soap; Process of Manufacturing ——. M. L. A. Guilbert, Paris. Eng. Pat. 12,268, July 6, 1900.

According to this patent a suitable quantity of powdered colophony or other resin is mixed with dry sodium carbonate, and the mixture boiled with water in an open or closed vessel. The soap is said to effect perfect sizing, and to be suitable for white paper of the best quality.—C. A. M.

Soap; Manufacture of ——. A. Klumpp, Lippstadt, Westphalia, Germany. Eng. Pat. 23,804, Dec. 29, 1900.

Claim is made for a soap resembling prime hard soap in appearance and amount of fat, whilst at the same time containing glycerin. It is prepared by saponifying the fat with a strong lye (38°—40° B.), and adding, during the saponification, a small quantity of a salt such as sodium chloride, soda ash, ammonium carbonate, or other alkaline salt, which has the effect of preventing the separation of the glycerin.—C. A. M.

Waterproof Paper, also Mineral Oil, Grease, Soap, and the like; Manufacture of ——. W. J. Ward. Eng. Pat. 15,986, Sept. 8, 1900.

See under XIX., *page* 831.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

PATENT.

Ferro-ferric Oxide [*Pigment*]; *Process of Obtaining* ——. A. S. Ramage. Eng. Pat. 23,859, Dec. 31, 1900.

See under VII., *page* 809.

(*B.*)—RESINS, VARNISHES.

Varnish; Chemical Processes in the Manufacture of —. A. Heupel. Oesterr. Chem.-Zeit. 1901, 249; thr
Chem. Rev. Fett- u. Harz-Ind. 1901, **8**, [7], 149—1

Attempts to dissolve copals without previous fusion
not given satisfactory results, for the process of powd
is more expensive than the melting. Certain copals e
dissolved in an autoclave at about 160° C. and at a pressu
20 atmospheres in a mixture of linseed oil and turpenti
do not yield good varnishes. Flemming tried dichlorh
and a mixture of that substance with alcohol as the sol
and used the fatty acids of linseed oil to thin the var
It was found impracticable, however, to cover large su
in this way.

The so-called "rosin-lime" ("*Harzkalk*") is pre
by melting lime and rosin together. It is used
substitute for varnish, but has the drawback of
speedily broken up into its constituents by the acti
moist air. In 1884 "rosin esters," prepared from
phony and alcohols, were patented by Schaal. The gl
ester of abietic acid has been found the most servic
but as a whole these esters are inferior to good cop
nishes in quality and keeping properties, whilst at the
time they are more expensive.

The oil japans, which are dried at a higher t
rature, are far more stable, and are specially u
the decoration of tin-plate. The tin is stamped w
design and dried in the oven, then coated with varnis
again dried for several hours in the lacquering oven
which it is made into the different articles. This is
advance on the older method in which the finished
were painted and varnished.

Attempts have been made to introduce the ex
original Japan lac into Europe, but on the one hand i
dear, and on the other it contains a ferment which pr
swellings on the hands, nose, and eyes of Europea
men, although Japanese workmen are immune aga
action. Yoshida has also called attention to the poi
properties of the urushi acid which it contains. Th
duces itching on the skin, which, however, is less
after continuing to work with the varnish. He recon
a strong solution of lead acetate as a remedy.—C. A.

(*C.*)—INDIA-RUBBER, &c.

India-Rubber; Recovery of ——. C. T. B
Munich. Ger. Pat. 120,810, Dec. 31, 1899.
Zeits. für angew. Chem., 1901, **14**, [23], 574.

Old rubber or rubber residues are ground as f
possible and heated with an equal weight (approxi
castor-oil at 180°—210° C. till dissolved. The cold
is stirred into two volumes of alcohol (90 per ce
the solid so obtained washed successively with
water, alkali, and finally water.—R. L. J.

PATENT.

*Rubber-Coated Materials, and Method of Prepa
Treating them.* E. Edwards. Eng. Pat. 11,238,

See under V., *page* 804.

XIV.—TANNING, LEATHER, GLUE,

Skins; "Re-Greening" of ——. Leather Man
12, [6], 116.

The term "re-greening" is applied to the me
ployed for soaking dried skins. Clean fresh wat
be used for soaking and the goods should not be
about, any rough handling being injurious to t
Skins may be soaked in water at a temperature
93° F. for 24 hours, transferred to cold water for
when they are again immersed for 20 minutes
water, and transferred to cold water; they are
to be limed; warm water has a solvent action on t
of the skin, but when used with discretion, the m
not have any detrimental effect on the goods.

e use of old soak liquors accelerates the soaking but at xpense of the skin which is inferior in quality on nt of the loss of hide substance, the old soak liquor aing with bacteria which attack the skin. Alkalis ate the soaking and "plump" the skins. Skins ied by milling require a longer liming, the fibres being ied and broken and the tanned leather "flat" and sing little substance.

phide of soda is often added to the soak water, the afterwards being drummed. Skins thus treated are ghly limed in from four to five days.—M. C. L.

er for Bookbinding; Report of the Committee on ——. J. Soc. Arts, **49**, 621—638.

ommittee was formed in February, 1900. Two subttees were elected, the first to visit important libraries, ond to investigate the cause of decay and deterioration he scientific standpoint.

first sub-committee visited a large number of libraries, ing that of the British Museum, the Bodleian Library, niversity Library, Cambridge; the libraries of the eum Club, Patent Office, and Chemical Society; also valuable private libraries. They ascertained that the aints of premature decay of modern bookbinding were justified by facts, and that books bound during t 80 or 100 years showed far greater evidence of ration than those of an earlier date. Many recent s showed evidence of decay after so short a period or even five years. They concluded that while leather eriods shows some signs of decay, the deterioration s more general on books bound after 1830, and that bound after 1860 appear to have deteriorated. The ration of calf bindings at the latter end of the ntury may be attributed as much to the excessive s as to the poor quality of the material.

Committee found that in libraries in which there was icial light used, and where the ventilation was good, lings were generally in a better state than elsewhere. gas is used, the bindings are in the worst state, ly on the higher shelves. Daylight, and still more, unlight have a disintegrating effect upon leather.

e old leathers (15th and 16th centuries), white pig robably alum-tanned, is the most durable, but its e hardness and want of flexibility render this leather ble for most modern work. Old brown calf has ell, but loses its flexibility and becomes stiff and when exposed to light and air. Some 15th and 16th sheep skin bindings had remained soft and flexible. ecimens of red morocco, from the 16th to the end 8th century, were found in good condition, and of eathers noticed, this seemed to be the least affected arious conditions which it had been subjected to. bindings earlier than 1860 were generally found good condition, but morocco after that date seemed uch less reliable, and in many cases had become otten. Since about 1830 hardly any really sound ns to have been used. Sheep skin bindings, dating e early part of the century, were many of them till to be in good condition, but since the year thereabouts, real sheep skin is scarcely to be found. kins were grained in imitation of other leathers, se imitation grained leathers are generally found worse condition than any of the other bindings, erhaps, some of the very thin calf skin.

n leathers dyed with the aid of sulphuric acid are condemned. In nearly every case Russia leather d to have become rotten, at least in bindings of 50 years.

ork of the second sub-committee, which was com- chemists specially conversant with the treatment r, was directed specially to the elucidation of the points: An investigation of the nature of the leather used for bookbinding, an examination of s of this decay, a research into the best methods ring leather for bookbinding, and a consideration ints required to be dealt with in the preservation .

The sub-committee made a number of tests and analyses of samples of decayed leather bookbindings, as well as of leathers used for binding, and found that the most prevalent decay was what they termed a "red decay," and they think this may be differentiated into "old" and "new;" the old red decay being noticeable up till about 1830 and the "new" since that date. In the old decay, the leather becomes hard and brittle, the surface not being easily abraded by friction. The older form is specially noticeable in calf-bound books tanned with oak bark. The new form affects nearly all leathers, and in extreme cases seems absolutely to destroy the fibres.

Another form of deterioration, more noticeable in the newer books, renders the grain of the leather liable to peel off when exposed to the slightest friction. In nearly all samples of Russia leather a very violent form of red decay was noticed. In many cases the leather was found to be absolutely rotten in all parts exposed to light and air.

An extensive series of experiments was carried out, with a view of determining the causes of the decay of bindings. The sub-committee find that this is caused both by mechanical and chemical influences. Of the latter, some are due to mistakes of the leather manufacturer and the bookbinder, others to want of ventilation and to proper heating and lighting of libraries. In some cases inferior leathers are finished (by methods in themselves injurious) so as to imitate the better class leathers, but, in the main, the injury for which the manufacturer and bookbinder are responsible must be attributed rather to ignorance of the effect of the means employed to give the leather the outward qualities required for binding, than to an intentional production of an inferior article.

The sub-committee give detailed instructions as to the preparation of leathers suitable for binding, and deals in detail with the tanning, dyeing and finishing, and with the preservation of books.

The following general conclusions are the results of a long series of experimental work and research. It is shown conclusively that the catechol tannins, which include turwahr, quebracho, hemlock, larch barks, and gambier, are unsuitable for bookbinding leather where durability is required, and that sumach yields a much more permanent leather, whilst myrobalans occupy an intermediate place, but nearly approaching sumach. Cassia bark, which is the tanning material employed for East India sheep and goat skins, has proved absolutely unreliable. Sumach leathers in some cases showed darkening in colour, but this was probably due to the adulteration of the sumach used with pistacia, the tannin of which is closely allied to that of cassia.

Of all the influences to which books are exposed in libraries, gas fumes, no doubt because of the sulphuric and sulphurous acids which they contain, are shown to be the most injurious; but light, and especially direct sunlight, and hot air, are shown to possess deleterious influences which had scarcely been suspected previously, and the importance of moderate temperature and thorough ventilation of libraries cannot be too much insisted upon.

Substitutes for leather in bookbinding were also examined, but found not to be so durable as properly prepared leather, although they last longer than Persians or improperly prepared leather.

The committee recommend that only sumach should be used in the tanning of leather for high-class work; that calf or goat skins are to be preferred. The skins used must be in good condition, and preferably dry or wet salted skins rather than dry-salted skins. No putrid soaks or violent mechanical treatment should be used in softening. Old limes, smelling strongly of ammonia, and containing large quantities of bacteriological products, must be avoided. A great deal of damage is frequently caused by want of care in the puering and bating, and the committee speak highly of erodin as a substitute for the ordinary dung bate. A light tannage is recommended. Excessive shaving and tight setting-out is condemned.

The common custom of clearing and bleaching the skins by means of sulphuric acid is found to be one of the most frequent causes of decay; and the addition of sulphuric acid to the dye-bath in the dyeing is likewise condemned, and mild vegetable acids are recommended in its place.

The use of nitric acid as a preparation for glazing was found to be destructive, and damp glazing was condemned. The bookbinding custom of washing up the leather with oxalic acid was found to be detrimental, and the custom of sprinkling the leather with ferrous sulphate for the production of "sprinkled" calf, or "tree" calf was most strongly condemned. The stretching of leather tightly over books in a wet condition has a bad effect.

In the preservation of books in libraries, the committee recommend tinted glasses which will exclude the strong actinic rays of light.—J. G. P.

Glue for Special Purposes. Leather Trades Rev. **34**, 436 and 507.

Ordinary glue is not suitable for every purpose in leather manufacture, but must be either mixed with other ingredients or treated in such a manner that it can be satisfactorily applied for the desired purpose. For a cement for leather, 1 oz. of sugar is added to 16 ozs. of glue size, and the mixture boiled for 10 minutes; this produces a glue which can be used successfully for glueing leather linings on to the outer leather of a pair of leggings.

Ordinary glues are generally unsuited for leather work on account of their harshness and liability to crack, and also because they penetrate the surface of the leather, making an ugly stain upon the material to which they are applied. The flexible glues hereafter described have not these defects. For thin leathers, such as skivers and roans, the following prepared glue is satisfactory:—

Soak four parts of glue in water, and separately soak one part of gelatin in water, put the softened glue and gelatin into a steam-jacketed vessel or glue-pot. Melt them without further addition of water, adding 5 per cent. of their weight of pure glycerin, and boil for 10 minutes. The product is then ready for use.

A non-flexible cement for leather may be made by adding to the above, 2—5 per cent. of red lead mixed in with the glycerin. This dries hard like india-rubber, and possesses a small amount of flexibility. This cement is useful for stuff linings of portmanteaux, bags, dress baskets, &c., and for attaching leather tops to writing tables.

Flexible Glue for attaching Leather to Metals.—Soak some glue for one hour in cold water, then melt in glue-pot; while boiling, stir in one part by weight of Venetian turpentine to every four parts of dry glue used, and heat until the mass evolves bubbles and becomes sticky. It is then poured into moulds and dried in the air. This glue must be used fairly fresh.

Bookbinders' Glue Paste.—Soak 1 lb. of best gelatin in 2 oz. of cold water for a few hours, melt in a glue-pot to form a jelly. Dissolve separately ½ oz. of yellow rosin or colophony in 1 fluid ounce of methylated spirits, and to the mixture add 1½ oz. of glycerin. Stir this into the heated glue jelly, continue the heating, and stir for 10 to 15 minutes, then pour out into moulds. When required for use this may be melted in an ordinary glue-pot with or without the addition of water.

Another recipe for a similar paste is as follows:—Soak 1 lb. of gelatin in water, draw off the superfluous water, and melt the softened gelatin in a glue-pot. When boiling hot, put in one ½ oz. of liquid ammonia. Separately soak one ½ lb. of good transparent glue in water for a few hours, and then melt in a glue-pot. While boiling, put in about one fluid ounce of glycerin. Mix this with the other by boiling together for from 10—15 minutes, pour out into moulds, and use as required with or without the addition of water.—J. G. P.

Quebracho Extracts; Analysis of ——. G. Klenk.

See under XXIII., *page* 841.

XV.—MANURES, Etc.

Nitrification and Denitrification. A Beddies. Chem.-Zeit. 1901, **25**, [49], 523—524.

The author has studied the effects of the action of pure cultures of the nitro-nitroso manure bacteria, both alone and in presence of denitrifying organisms, upon a dilute solution of ammonium sulphate in sterilised sand. In control experiment the whole of the ammonia added, recovered unaltered from the sterile sand. When the was mixed with 1 per cent. of unsterilised sand, the w of the ammonia was decomposed, half of the nitrogen b found in the nitrous and nitric conditions, and the o half being lost. When the denitrifying organisms added in the form of an infusion of straw, similar re were obtained.

Another control experiment showed that a pure cu of nitrifying bacteria in sterile sand converted the who the ammonia to nitrate without loss of nitrogen.

In the impure sand the effect of the addition of nitrif bacteria was to diminish considerably the loss of nitr still leaving some of it in the form of nitrate. This the case both with unsterilised sand and with infusion. The addition of a solution of humus t impure sand also restricted the loss of nitrogen due t denitrifying bacteria; whilst the use of humus tog with nitrifying organisms entirely prevented any lo denitrification, and gave results equal to those obtained sterilised sand and nitrifying bacteria. Hence, the ne of nitrifying organisms alone is not sufficient in practi prevent loss of nitrogen in manure heaps, but it seem that with the addition of humus extracts the d result might be obtained. It is noticed that the pre of lime is necessary, since any acidity in the h extracts is quite sufficient to prevent all nitrifying whatever.—J. F. B.

PATENTS.

Fish Guano; Production of ——. J. Carstairs, rhydding, Yorkshire. Eng. Pat. 9773, May 10, 19

The low value of fish guano compared with that of guano is due to its much smaller content of nitrate soluble phosphates and to its inconvenient state of div the soluble salts and albuminoids are washed out whe fish is treated with boiling water or steam to remo oil, whilst when a solvent for fat alone, such as be or carbon bisulphide, is employed, the soluble albun are partly taken out with the oil and partly left jellified state, so that the resulting product is diffic not impossible, to powder. In the author's process, obviates these disadvantages, the fish, after dryin cutting into small pieces, is subjected in a suitable ext to the combined action of the vapour of (1) one or solvents of oil, such as carbon bisulphide, ether, benzen (2) ethyl or methyl alcohol or both; the mixture obtained may be used either alone or mixed with a which seems to dissolve or disintegrate the cell-w the proteid matter, thus giving access to the solvent proportions of the several ingredients to be taken d on their exact nature, and when benzoline and alcohol are employed the best results are obtaine 80—85 parts by weight of the former, 12—15 of the and 3—5 of acetone. In practice it is prefer employ a series of extractors to secure contin working and the repeated use of the same solvent The oil-free fish obtained by this process is hard an and can be readily powdered.—T. H. P.

Oil from Fish or other Material; Apparatus for F ing ——. C. Wacker. Eng. Pat. 9969, May 11, 1

See under XII., *page* 818.

XVI.—SUGAR, STARCH, GUM, Et

Sugar Juices; Influence of Specific Heat and Visc the working of ——. H. Claassen. Bull. de l'As Chim. de Sucr. et de Dist. 1901, **18**, [11], 93 From Centralb. Zuckerind. 1901, [24], 512.

The specific heat of sugar juices has little influ manufacture. In proportion as the concentration or molasses increases, the specific heat and co-effi transmission of heat diminish, while for salt solut specific heat diminishes, but the co-efficient of tran rather increases.

practical sugar work the term "viscosity" is used to le all the phenomena which are connected with the ular actions of liquids, that is, not only internal friction, lso adhesion to solid bodies, cohesion of liquids, and e tension. The viscosity from a purely physical of view would have no value, useful results being only ed by a viscometer which measures rate of flow. The rative numbers thus obtained are those utilised in ce.

author has found that viscosity diminishes rapidly increase of temperature, and in greater proportion he increase due to supersaturation, hence he deduces ule that, circumstances permitting, crystallisation l always be conducted at a high temperature and supersaturation, but if it must be worked at a low rature, the supersaturation should be maintained at a um.

similar reasons centrifugalising should be performed igh temperature, and with the mother liquor diluted to saturation, to favour the separation of the viscous ts.

ration is more dependent on the character of the ded matters in the liquid to be filtered.

evaporation, surface-tension has a very real import- ausing a diminution of the effective heating surface bubbles do not separate until they have attained a volume, and the ascent of the bubbles and circulation liquid are retarded.—L. J. de W.

Solutions; Solubility of Lime in ——. H. Pellet. . de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**, , 882—886.

w the influence of the quantity of lime added on the ity of lime in sugar solutions, four mixtures were each containing 500 c.c. of a 20 per cent. sugar, n, and 150 to 500 c.c. of milk of lime of 22° Baume, ·5 of actual lime per 100 c.c.

mixtures were shaken for one minute and a portion , all being at the same temperature. Other portions iltered after 1 hour, 6 hours, and so on to 40 hours kalinity of the various solutions was determined by n.

lime dissolved per 100 of sugar, was found to e with the amount of lime present, and with the f time it also increased in all the solutions.

equently, in order to indicate the solubility of lime r solutions, it is necessary not only to give the s in sugar of the solution before and after mixing, temperature, but also the proportion of lime added duration of contact.

eply to Weisberg the author contends that their nents are not contradictory if account be taken of all n.

diminution of the solubility of lime occurs only in e of an excess of lime, for if the successive filtered s are heated to 80° C. for example, there is no ation of lime.—L. J. de W.

t Juice; Liming and Carbonating ——. rnaud. Bull. de l'Assoc. des Chim. de Sucr. et de 1901, **18**, [11], 886—889.

works the alkalinity of limed juice is tested on the liquid. The figure obtained represents the quantity soluble in the juice, from 10 to 13 grms. per litre. thod of controlling the liming of the juice is faulty, mount of lime dissolved depends on the purity of used, the density and purity of the diffusion juice, dilution caused by the addition of the milk of lime. ng two or three times the amount of milk of lime y, and filtering, the titration of the liquor would not e excess, but would indicate too little lime. It is e the total lime which should be determined on the quor.

mount of lime to be added is very variable and on the composition of the beetroots and on that of stone used. If the latter contains notable quantities esia and silica, the saturation scums are difficult to d filtration is slower. More lime should be added in this case, so as to give a greater amount of carbonate of lime, and render the precipitate more granular and porous, and consequently easier to filter.

Some manufacturers leave, on first carbonating, an alkalinity of 0·650 to 0·800 grm. of CaO per litre; others leave from 1 to 1·2 grms. The best condition as regards both colour and purity of the juice should be determined several times during the course of manufacture, and should not be left to chance. 10 to 15 litres of diffusion juice should be taken, limed to 18 to 20 grms., and carbon dioxide gas from the limekiln passed in. Samples should be taken at intervals as carbonation proceeds, from 2 grms. downwards, and the filtered juice analysed to determine the best point at which carbonating should cease.—L. J. de W.

Beetroot Juice; Krause's Method for Determination of the Purity of ——. A. Hinze.

See under XXIII., *page* 843.

Beetroot Juice; Determination of the Purity of ——. K. Krause.

See under XXIII., *page* 843.

Beetroot Juice; Determination of the Purity of ——. H. Claassen.

See under XXIII., *page* 843.

Sugar Beets; Analytical and other Notes on ——. P. F. Trowbridge.

See under XXIII., *page* 842.

Sugar Solutions; Action of Strontia on ——. A. Schöne and B. Tollens. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**, [11], 914—915. From Zeits. Ver. deutsch. Zuckerind. 1900, 978.

Although Beythien, Parcus, and Tollens have proved that raffinose is not formed by heating sugar solutions to 100° C. with lime and strontia, it might possibly happen that the reaction would occur at a higher temperature. This fact would then explain the large quantities of this sugar found in the residues of the desugarisation of molasses by strontia. It is the more likely, since the separation of the saccharate of strontia in sucrate works takes place under pressure, and therefore at a high temperature, and, as Lobry de Bruyn and van Ekenstein have shown, levulose, for instance, may be transformed into other sugars (but not into galactose) under the action of alkalis.

The authors treated in an autoclave for six hours at 125° to 128° C. a mixture of a solution of 100 grms. of sugar in 100 c.c. of water and 50 grms. of strontium hydrate dissolved in 900 c.c. of water.

In the product of this treatment it was not possible to detect raffinose, but lactic acid was found, characterised by its zinc salt.

These tests prove that raffinose is not formed during the recovery of sugar from molasses by strontia, and this sugar comes exclusively from the beetroot, as Lippmann has already stated.

If heating is prolonged, there is a modification of the sugar indicated by the yellow colour of the syrups and the presence of lactic acid.—L. J. de W.

Sugar Products; Acidity and Alkalinity of ——. S. Stanko. Zeits. Ver. Deutsch. Zuckerind. 1901, **51**, [545], 552—554.

The alkalinity of sugar products is usually expressed in percentages of lime, and acidity as sulphuric or hydrochloric acid. The greater part of the alkalinity being due to lime justifies its expression as CaO, but it is hard to say why the acidity should be determined as H_2SO_4 or HCl since it is the sum of the effects of a number of acids.

Instead of the above, it is proposed, as more scientific and simpler, to take 1 grm. of hydrogen as unit in making up the standard solutions and to call the acidity or alkalinity obtained so many degrees. These can be converted to any particular base or acid as desired by multiplying by the equivalent per c.c., thus, 100 c.c. of first saturation juice required 4 c.c. of normal acid, its alkalinity is therefore 4°, and the percentage expressed as lime is 4 × 0·028 = 0·11 per cent. CaO.—L. J. de W.

Gum Arabic: Amount of Pentosans in ——. R. Hefelmann. Zeits. öffentl. Chem. **7**, 195—198. Chem. Centr. 1901, **2**, [3], 195.

The appearance of Fromm's article on the valuation of gum arabic (this Journal, 1901, 621) has led the author to publish the results of determinations, made by him three years ago, of the amount of pentosans in 25 samples of commercial gum arabic. The furfural developed by distillation with hydrochloric acid, and precipitated with phloroglucinol was calculated to pentosans by multiplication by the factor, 1·84, according to the proposal of Tollens (Zeits. angew. Chem. 1896, 195). The amount of pentosans varied from 20·65 per cent. in Australian gum to 51·21 per cent. in Argentine gum, and could not therefore be taken as a criterion of the purity or otherwise of the sample. No relation between the amount of pentosans and the trade value of the gum could be fixed. The author considers that the determination of the viscosity is the best means of obtaining quickly an opinion as to the adhesive power of a sample of gum.—A. S.

Inversion; Studies on ——. E. Cohen. Zeits. physik. Chem. **37**, 69—83. Chem. Centr. 1901, **1**, [24], 1261.

The course of inversion of cane sugar by water at 80° C., which has been investigated by Raymann and Sule (this Journal, 1897, 343), is best explained by the assumption that invert sugar or one of its constituents is a stronger acid than cane sugar. In order to test this hypothesis, the author made experiments on the saponification of ethyl acetate by caustic soda in presence of different sugars. If the sugars are of an acid nature, they must neutralise, to a greater or less extent, the caustic soda, thereby causing a diminution of the catalytic influence of the hydroxyl ions on the saponification. The constants for the velocity of saponification of $\frac{1}{40}$ N. ethyl acetate by $\frac{1}{40}$ N. caustic soda at 25° C., were:—

—	$\frac{1}{5}$ N.	$\frac{1}{10}$ N.	$\frac{1}{20}$ N.	$\frac{1}{40}$ N.	$\frac{1}{80}$ N.	—
In water……	..	..	..	..	..	6·86
In cane sugar solution……	2·01	3·12	4·29	5·19	5·88	..
In invert sugar solution……	0·38	0·67	1·17	2·03	3·38	..
In *d*-glucose solution……	0·79	1·37	2·32	3·69	4·79	..
In *d*-fructose solution……	0·59	1·02	1·88	3·04	4·27	..
In mannite solution……	5·17	5·85	6·18	6·40	6·81	..

The results confirm the explanation proposed above, for whilst mannitol has hardly any effect, cane sugar appears to be of a distinctly acid nature, and *d*-glucose and invert sugar have a still stronger acid character. (*See also* this Journal, 1901, 395).—A. S.

Invert Sugar; Determination of ——. F. Stolle.

See under XXIII., *page* 843.

Sugars other than Xylose and Dextrose in the Products of Hydrolysis of Wood from the Trunks of Trees; Search for ——. F. H. Storer. Bull. Bussey Institution, 1900, **2**, [9]. Chem. News, 1901, **83**, [2165], 249—250; [2166], 256—258; [2167], 270—271; [2168], 283—284; [2169], 292—294.

Having regard to the fact that the visible effect produced by matters held in store in trees, is often out of all proportion greater than can be credited to the small quantities of starch and glucosides shown to be present by analysis, the author considered it probable that there must be other carbohydrates stored habitually in trees as reserve mat He therefore made an extensive series of experiment determine what other substances (if any), besides cellu that are capable of yielding sugars by hydrolysis, coul detected in woods. The results of the experiments le the following conclusions:—

(1) When strong sulphuric acid is made to act cellulose, and the product is subsequently boiled in d acid, it is not true, as has been frequently stated, tha whole of the cellulose may readily be converted dextrose.

(2) It has been known for some time that when st sulphuric acid is made to act upon carbohydrates—st sugars, dextrins, or cellulose—compounds of the c hydrate and the acid are formed. These compound decomposed to a large extent by long continued boili diluted acid, but generally a not inconsiderable part o organic matter with which the strong acid united at fi not changed to dextrose by this operation. When the solution is neutralised and evaporated, it is undoubtedl fact that the dextrose syrup obtained is contaminat part of this undecomposed matter.

(3) Although solutions of salts of the above-ment compounds of a carbohydrate and strong sulphuric aci unstable, yet such solutions are not decomposed comp even by long continued boiling of dilute solutions strong alcohol is added to the contaminated dextrose s obtained by evaporation of such solutions, any u posed "sulpho salt" will remain undissolved, and t cause the author attributes the presence of notable tities of inorganic matter in the syrups obtained by ev tion of the neutralized liquors from the hydrolysis of and of cotton.

(4) The statement of Béchamp (Ann. Chim. Phy [2], 502), that on crystallising his glucose from "li (presumably cotton), he obtained "two kinds of cr one hard as cane sugar, the other 'houppes' such as of starch sugar," is readily explained by the assu that one of the products consisted of crystals of mo matter, which had resulted from the decomposition th last portions of the calcium salt of the cellulose-sul acid. The author also obtained two kinds of crys evaporating the glucose syrups, but the hard, well-d prisms were not crystals of sugar—they consisted so inorganic matter.

(5) The results of the experiments confirm the vie (except xylose, which may be obtained in small qu from wood cellulose) no other sugar than dextr obtainable on hydrolysing cellulose with acids, bu statements hitherto accepted as to the quantity of de formed from a given weight of cellulose appear incorrect, owing probably to neglect in taking into a the fact that the dextrose syrups obtained, are inv contaminated by other matters, which are capa reducing no inconsiderable quantities of Fehling's sol

(6) It is probable that the insoluble residue lef the impure dextrose syrups are treated with strong a consists for the most part of a more or less impure trin," which has resulted from the decomposition "copulated acid" that was formed at first by the ac the strong sulphuric acid on the cellulose. This "dextrin" is similar to the body described as consis "dextrins," obtained by Hœnig and Schubert (Mo für Chem. 1885, **6**, 708 and 1886, **7**, 471), and it esp resembles the "dextrin de ligneux" that was ol long ago by Béchamp (Ann. Chim. Phys. **46**, 3 **48**, [2], 463; and Comptes Rend. 1856, **42**, 1213 **51**, 256).

(7) The difficulty of studying the products of the hy of cellulose is greatly increased by the fact that not "dextrins" result from the splitting up of the "co compounds" formed by the union of strong su acid with carbohydrates, but the phenomenon of re of dextrose to dextrin may occur in the process of lysing with diluted acids.—A. S.

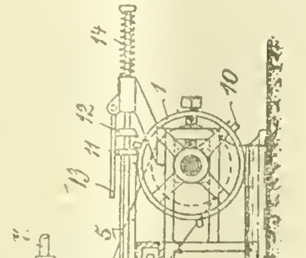
Potassium Hydroxide; Absorption of ——, by Sil Rumpler. Deutsche Zucker-Ind. 1901, 525.

See under XXIV., *page* 846.

PATENTS.

p Sugar; Apparatus for Manufacture of ——. Daniczewski, Odessa-Karantine, Russia. Eng. Pat. 56, May 21, 1900.

claim made is for an apparatus for ufacturing lump sugar, comprising lds carried on an endless apron or 1, moved successively through a filling e and a cooler, then under perforated s from which "clairce" drops upon s drawn through the moulded sugar finally through a drying chamber. In ination with the endless chain, a slide be feeding funnel, sliding sleeves for "clairce" pipes and slides for the g chamber may be employed. Figs. 1 2, which together show a longitudinal on of the apparatus, show the endless gauze band extending round two s, 1 and 2 (Fig. 1), and carrying at intervals moulds, 3, divided into artments corresponding with the sizes e lumps of sugar to be made; in place s band may be used a chain of moulds with wire gauze bottoms and par- walls preferably of sheet steel. A ng funnel, 4, surrounded by a steam t, 6, and having an open bottom can be closed by a slide, 5, is ed with a mass of heated sugar kept etly mixed by a stirrer, 9, arranged e lower part of the funnel and driven belt from the shaft of the drum, 1. drum carries at its circumference , 10, for actuating the slide, 5. When uld, 3, is brought under the funnel, tter is opened by means of springs, ad then gradually closed by one of eth, 10, striking a projection, 11, on lide, the latter being locked in its l position by a lever, 13, dropping d the projection, 11. When the next l comes under the funnel, another of eth, 10, strikes an arm, 12, of the and disengages the projection from that the slide is drawn back by the gs. From the filling funnel, each l travels to the cooler, where it s between two chambers, 15 and 16, gh which cold water circulates, and to the coating device, under per- d pipes, 19, supplied with "clairce" e pipe, 20; the "clairce" drops the sugar from the perforated pipes its passage through the sugar is ed by means of a chamber, 21, is arranged under the mould and which the air is drawn through a 22. "Clairce" is prevented from ing into the intermediate spaces en the moulds by providing the 19, with shifting sleeves, 23, each g the length of such intermediate and all being moved together with oulds like the slide, 5, with which may be connected by rods. The l is then moved to the drying device d of a casing, 24, internally heated ipes, 25, and afterwards through er chamber, 26, which has double enclosing a space supplied with , a vacuum being produced in the er to remove the moisture from the Cold damp air is prevented from ng this drying chamber by closing nds of it by double slides, 28 and nnected by the rod, 31, so that they together. The mould is finally brought on to the drum, 2, a table or other recipient being arranged to catch the sugar from the mould. During its return to the drum, 1, the endless band passes through a washing pan, 33.—T. H. P.



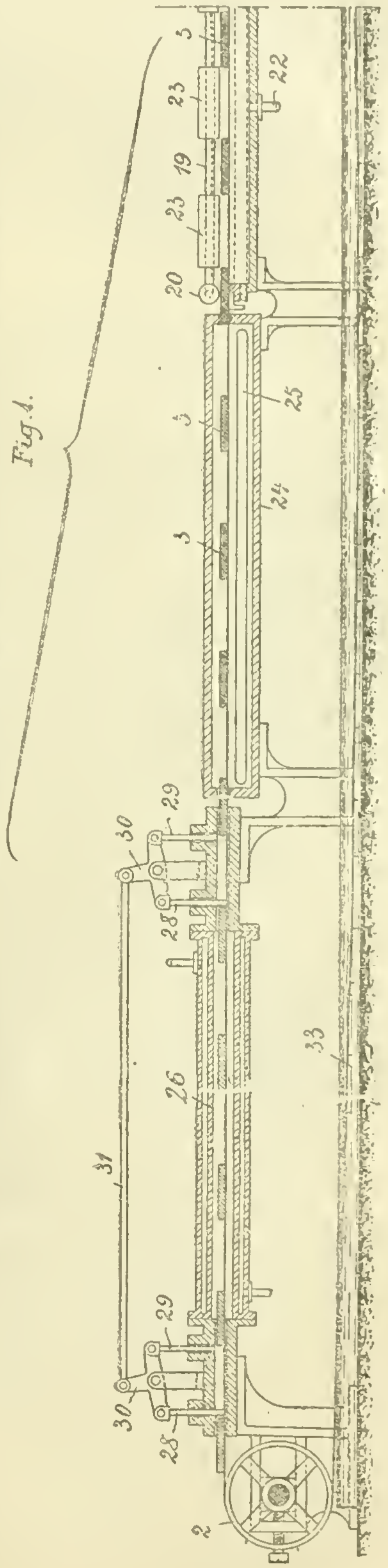


Fig. 1.

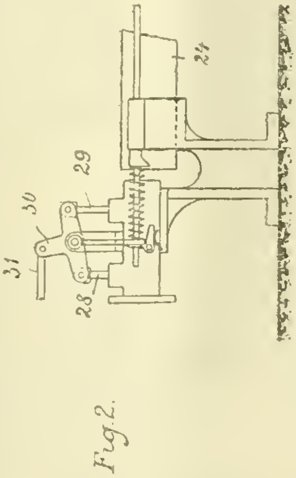


Fig. 2.

Sugar: Impts. in, and Apparatus for, the Refining of ——. J. Y. Johnson, London. From the Cereal Sugar Co., St. Louis, U.S.A. Eng. Pat. 10,461, May 20, 1901.

This specification describes a method of refining sugar especially crude grape sugar, in which the sugar, when in a hard and non-pasty condition, is finely divided, placed in an envelope of duck canvas or other suitable material, and after pressing into a cake, is subjected to a pressure of from 2,500 to 5,000 pounds to the square inch or even more. By this means the moisture is expelled, carrying with it other impurities, and it is found that sugar, and especially grape sugar, is transformed from its crude state into a marketable purified product in much less time than is required by the centrifugal process. Besides for this method of refining, claim is also made for apparatus, of which illustrations are given, for "forming" the sugar and for receiving the envelopes containing the sugar to be placed in the press.
—T. H. P.

Starch or Starch Syrup or Sugar, and Albumin: Improvements in the Preparation of Dry ——, *from Maize Wheat, Rice, and other Grains.* H. Wulkan, Slanje, Austria, and H. Straetz, Matos-Vasahely, Hungary. Eng. Pat. 13659, July 30, 1900.

In this process, the starch milk, liberated from husks and corns in the usual way, but still containing albumin, is drained, as far as possible, in depositing vats or centrifugal chambers, and the moist material treated in a vacuum-extraction apparatus, with a mixture of saturated soda-lye and strong spirit, containing from 0·1 to 0·2 grm. of sodium hydroxide per 100 c.c. of liquid; hot strong spirit is then kept passing through the starch, until all the albumin is dissolved. The resulting starch is found to be pure, dry, and neutral. The alcohol is removed from the extract by distillation in a vacuum, the albuminous substances being precipitated from the residual liquor by means of dilute acids, and if necessary extracted with a suitable solvent to remove fat and colouring matter. If starch syrup or sugar, and not starch, is required, the preliminary removal of husks and germs is unnecessary, the finely-ground maize being extracted directly with alkaline spirit and the pure starch thus obtained converted into sugar in the usual way, the cellulose being afterwards removed by filtration.—T. H. P.

XVII.—BREWING, WINES, SPIRITS, Etc.

Yeast; Oxidising Enzyme of ——. J. Grüss. Woch. für Brau. 1901, **18**, [24-25], 310–312 and 318—321.

The author has demonstrated the presence of an oxidising enzyme in yeast, and, although he has not succeeded in isolating it, he has been able to study the conditions under which its activity may be observed. This enzyme does not react with tincture of guaiacum, either alone or in presence of hydrogen peroxide, but, like the spermase of malt, it gives reactions with salts of Würster's "tetra-base" [tetramethyl-*p*-phenylenediamine]. The author prepares reagents which contain, in one case, the hydrochloride alone, and in the other, the hydrochloride, with the addition of so carbonate, and soaks filter paper in the freshly prep solutions. When yeast is placed on the moist test pa reaction occurs in various ways, depending on the typ yeast and its physiological condition. Yeast, freshly drawn from active fermentation, as a rule does not re this fact is due to the presence of a reducing body stronger affinity for oxygen, which masks the reaction the paper. After the vacuole stage of development ha in, the reducing substance appears to be accumulate the vacuoles, and the violet coloration is obtained. Su quently, after about 48 hours' exposure to the air, all reducing body is oxidised, and the reaction of the oxy with the test paper is much more strongly marked. presence of acidity is also an inhibiting cause in "tetra" reaction, and if a yeast gives no reaction with plain "tetra-paper" it may yet give one with the "t soda-paper," and often *vice versâ*, since an exces alkali is likewise destructive. As a rule the top-ferm tion types tend to react with "tetra-soda paper" and with "tetra-paper," and the bottom fermentation to conversely. But no constant difference of rea connected with difference of type could be not as the physiological condition of the yeast preponderat

The nature of the reducing substance is uncertain, extracted by glycerin, and the extract can be mad destroy the reactivity of an otherwise active yeast. formation of this body appears to be intimately conn with the formation of glycogen, and probably also with degree of acidity of the yeast. This reducing substa apparently a product of the sugar, fermented by the y as it is not produced in yeast sown in a solution of s [arabinose or lactose] which are unfermentable. reducing substance and more glycogen are produced like conditions in glucose or cane-sugar media tha fructose solutions. Storage of the yeast brings up oxydase reaction by destruction of this reducing subst but storage at low temperatures, such as 0°C., ten retard the oxydase reaction. The enzyme is dest at about 60°—65°C., and its activity is either weak or destroyed by contact with alcohol, according to c tration.—J. F. B.

Yeast; Invertase and Maltase (Glucase); Action of agents upon the Activity of ——. Th. Bokorny. Ch Zeit. 1901, **25**, [47], 502—504.

The observations of different investigators, conce the influence of chemical and physical agents upo hydrolysing power of yeast towards cane-sugar (inver and maltose (maltase) are, by no means, in accord. this reason the author has made further experiments some of the commoner acids and alkalis, &c., the resu which are now tabulated. In these experiments the itself, and not an extract thereof, was employed. In instances the yeast was soaked in a solution of the re under examination, then transferred to a solution of sugar or maltose, and the action, if any, measured b increased copper reducing power.

Enzyme.	Temperature.	Silver Nitrate and Mercuric Chloride.	Acids.	Bases.	Organic Antiseptics.	Alcol Desicca
Maltase (glucase) in pressed yeast.	Maximum activity at 40° C. At 55° C. the enzyme is killed in ½ hr. (Maize glucase has its maximum activity at 57—60° C.)	Silver nitrate solution of 0·01 per cent. strength destroys the enzyme in 24 hrs. 0·02 per cent. $HgCl_2$ destroys in 24 hrs.	Sulphuric acid of 0·5 per cent. strength almost destroys the enzyme in 24 hrs. 0·1 per cent. H_2SO_4 does not seriously cripple maltase in 24 hrs.; 0·02 per cent. does not destroy in six days. 1 per cent. HCl destroys in 24 hrs.; 0·1 per cent. in 5 days. 1 per cent. oxalic acid destroys in 24 hrs. 1 per cent. acetic acid weakens the enzyme very distinctly in 24 hrs. 0·5 per cent. lactic acid does not destroy in 24 hrs.	1 per cent. NaHO kills within 8 hrs.; 0·1 per cent. or 0·02 per cent. not injurious in 24 hrs.; 0·02 per cent. in fact accelerates the action. 0·5 per cent. does not kill the enzyme in 24 hrs.	1 per cent. formaldehyde destroys in 24 hrs.; 0·1 per cent. strongly cripples; 5 per cent. destroys in ½ hr. 1 per cent. carbolic acid kills in 24 hrs.; 0·1 per cent. does not. Turpentine-water (saturated) cripples greatly in 10 hrs. 0·1 per cent. thymol almost destroys the action. Chloroform-water does not destroy in 10 hrs.	Alcohol harmfu in 10 pe or 5 per solution Desic destroy tase.

Enzyme.	Temperature.	Silver Nitrate and Mercuric Chloride.	Acids.	Bases.	Organic Antiseptics.	Alcohol Desiccation.
ertase in ressed yeast.	A moist heat of 70 rapidly kills invertase; of 50° C. only after some time. Maximum activity at 31° C. according to Mayer, at 52°—53° according to Lintner and Krober.	0·1 per cent. $AgNO_3$ kills within 24 hrs., 0·02 per cent. does not. 0·1 per cent. $HgCl_2$ does *not* kill in 24 hrs., whereas 0·5 per cent. does in the time.	0·5 per cent. H_2SO_4 does not destroy in 24 hrs. 0·5 per cent. lactic acid also not. 5 per cent. oxalic acid kills in 24 hrs., whereas 1 per cent. does not sensibly cripple in 24 hrs. 1 per cent. HCl is injurious, but is not completely destructive in 24 hrs. 1 per cent. acetic acid is not harmful in 24 hrs.	1 per cent. NaHO destroys in 24 hrs.; 0·5 per cent. is not, however destructive even after 4 days.	1 per cent. formaldehyde does not kill in 24 hrs.; even 5 per cent. fails to do so. 1 per cent. carbolic acid does not in 8 hrs. prevent action. Turpentine-water is not injurious; nor is 0·1 per cent. of thymol in 10 hrs. Chloroform water is not harmful in 24 hrs.	Not destroyed by absolute alcohol or by desiccation.

—H. T. P.

ttom Yeasts; Preparation of ——, Fermenting at High Temperatures. G. Jacquemin. Comptes Rend. **132**, 22], 1366—1367.

cultivating successive generations of a bottom-yeast, ginally grown in a neutral wort below 10° C., in worts acidity of which is gradually increased, and the tempeure of which is gradually raised, a yeast is obtained ch will grow and ferment in a wort of acidity equivalent 7 grms. of tartaric acid per litre, and at a temperature ve 25° C.—J. T. D.

d Yeast [Distillery]; Lactic Acidification of the ——. G. Frede. Zeits. Spiritusind. 1901, **24**, [25], 263.

the pure lactic acidification of the mother yeast it is lutely necessary that the temperature should not fall w 47°—50° C. During the daytime, with occasional ation, this temperature can be maintained, but at night necessary to heat the mash up to 59°—62° C., or even er if the temperature is to be kept sufficiently high l the morning. The loss of heat by radiation is more eful if no protection be provided against the cold floor, if the yeast vessels are of small size.

he author describes the arrangement whereby he keeps east tubs at a practically constant temperature. There two sets of tubs according to the quantity of yeast h to be acidified. These are placed on a wooden ing supported on rafters, to prevent loss of heat through floor. Directly over the surface of the mash, a wooden r is wedged to retain the heat which would be lost from surface. Over the whole vessel an inverted cask is d as a cover, resting on the staging, the edge being ed tightly so as to form a perfectly closed space. n the smaller vessels are in use they are placed on len stools in order to bring them close against the top e inverted cask.

this way, if the mash be brought to a temperature of C. in the evening, or 55° C. in cold weather, and red up, the temperature will not have fallen below C. by the morning. Further, the difference in tempee between the outer portions of the mash and the le. will be less than 3° C., as against a difference of aps 15° C. in the case of uncovered vessels.—J. F. B.

t; New Substitute for Meat Extract ("Ovos"), epared from ——. Lebbin. Med. Woche, 1901, 5—197. Chem. Centr. 1901, **1**, [26], 1381.

well-washed yeast is heated by means of steam, eby bursting of the cells and solution of the cell-juice otoplasm is caused. The thick fluid mass obtained is ed, and the expressed juice filtered and evaporated *uo* to suitable consistence. The preparation is of n colour, either of pasty or syrupy consistence, of aut aromatic odour and strong taste. It has the wing composition:—water, 27·36; albumin, 40·27; ral matter (free from NaCl), 10·92; P_2O_5, 5·31; and nitrogenous extractive matter, 21·45 per cent. Almost ae nitrogen occurs in the form of useful albuminous ers.—A. S.

Beer Yeast in Pressed Yeast; Bau's Method for the Detection of ——. A. Langfurth.

See under XXIII., *page* 843.

Arabinoses; Behaviour in the Animal Organism of the Three [Optically Isomeric] ——. C. Neuberg and J. Wohlgemuth. Ber. 1901, **34**, [9], 1745—1749.

The authors found that laevo-arabinose was most readily assimilated in the animal economy, and that when racemic-arabinose was employed there was always a residue of dextro-arabinose in excess unassimilated. This is curious, because the simple enzymes, such as zymase, bring about no such selective splitting up of *r*-arabinose. In the same way, whilst *l*-arabinose is a suitable material for the production of glycogen in the organism, *d*- and *r*-arabinose produced no more than traces. Similar results were obtained in the assimilation of the three arabonic acids, and in the case of the arabites, it was found that *d*-arabite was partly transformed into a sugar, either arabinose or an unknown ketopentose.

These researches show that *l*-arabinose stands physiologically much nearer *d*-glucose than does *d*-arabinose, which is constitutionally related to it. This is in accordance with the fact that *l*-arabinose and *d*-glucose are the naturally occurring forms. The same intimate relations between molecular configuration and physiological action are true for the higher organisms as Fischer has established for the fermentation organisms.—J. F. B.

Malting Process; Some Further Experiments on ——. R. E. Evans. J. Fed. Inst. Brewing, 1901, **7**, 264—283.

The author has previously shown that under normal conditions of germination the production of diastase was much less than when the growth was forced. In the present communication an attempt is made to fix the ratio between the period of growth and the amount of diastase.

The first series of experiments was carried out with English barley malted on the most approved principle. The samples were at once crushed and the extract, moisture, and diastatic power determined. The following results were obtained:—

Day.	Dry Matter.	Water.	Extract (on Dry Solids).		Diastatic Capacity on Dry Solids.
			Per Cent.	Brewers lb. per Qtr.	
			Barley.		
..	79·80	20·2	23·0	29·7	8
			72 hours in steep.		
1	56·1	43·9	18·7	24·2	14
2	54·5	45·5	23·0	29·7	18
3	55·2	44·8	31·3	40·4	18
4	55·1	44·9	33·1	42·7	19

Day.	Dry Matter.	Water.	Extract (on Dry Solids). Per Cent.	Extract (on Dry Solids). Brewers lb. per Quarter.	Diastatic Capacity on Dry Solids.
Roots divided. Growth irregular.					
5	55·7	44·3	57·6	74·3	21
Rootlets well developed. Spire half-way up.					
6	55·9	44·1	67·3	87·0	53
7	55·8	44·2	70·9	91·6	91
Spire three-quarters up in some, rather irregular, much softer.					
8	56·9	43·1	73·40	97·0	58
9	55·9	44·1	74·90	96·80	53
10	57·8	42·2	73·80	95·40	60
11	58·0	42·0	73·70	95·30	52
12	61·9	38·1	72·70	94·90	45
13	80·0	20·0	74·40	96·20	37
14	96·6	3·4	75·60	97·70	38
15	100·0	0·0	69 00	89·00	12
Finished Malt.					
..	98·50	1·2	74·5	96·3	14

In another series of determinations the effect of deficient aeration was shown by diminished extract and diastatic power, this being greater on the former than on the latter.

The author has also studied the influence of various classes of steep liquors on extract and diastatic power. Distilled water, hard water, alkaline water, and ferruginous water were used and generally no great difference was noted. Water containing iron (four grains of ferrous sulphate per gallon) reduced the diastatic power.

—J. L. B.

Barley "Biting Test"; Infection with Actinomycosis ——. M. Rosenberg. Woch. für Brau. 1901, **18**, [23], 298—299.

The author issues a warning against the custom of testing the hardness of barley corns by biting between the teeth. In consequence of this practice he became infected with a complaint diagnosed as actinomycosis caused by an organism known as *Actinomyces* or "ray fungus." After a serious illness lasting for more than seven months, he records his experience and strongly advises the use of a corn tester instead of the teeth by maltsters and brewers.—J. F. B.

Maltol; Presence of ——, *in the Needles of the White Fir* (*Abies alba Mill*). W. Feuerstein. Ber. 1901, **34**, [9], 1804—1806.

Maltol, a well-characterised substance of the formula $C_6H_6O_3$, the constitution of which is still doubtful, was found by Brand (see this Journal, 1894, 896, 1213, and 1895, 378) as a product of the roasting of malt. It gives a reddish-violet coloration with ferric chloride, resembling that produced by salicylic acid The author has discovered this body, to the extent of about 0·5 per cent., in the needles of the white fir.

Fresh fir-needles, gathered in April or May, were dried at 30°—40° C., finely ground, and covered with 4—5 times their weight of water. The mass was triturated and allowed to digest at the ordinary temperature for 24 hours. The extract was pressed out through cloth, filtered, and shaken with chloroform. Crystals were obtained, and purified by recrystallisation with the help of animal charcoal. These were found to be completely identical with the maltol prepared by Brand and by Kiliani an Bazlen from roasted malt.—J. F. B.

Fermented, Non-Alcoholic Beverage; Preparation a ——, *by Means of a New Ferment.* H. F. Pito French Pat. 301,280; through Zeits. Spiritusind. 190 **24**, [25], 267.

The beverage here described is a fermented liquor co taining carbon dioxide and a new assimilable food stuff, bu no alcohol. It is obtained by the fermentation of sacchari media by a fungus described as *Leuconostoc dissilien* This occurs in the form of small cork-like cells surround by an amorphous layer of slime, which is irregularly pol hedral. The cells are arranged in the form of chai embedded in slime, characteristic of the leuconostoc grou The small size of the cells, the shortness of the chains, a the presence of gas-bubbles in the slime layer distingui this particular species. The designation "*dissiliens*" derived from the peculiar manner in which pieces of t growing zooglea are thrown off and burst apart, owi to the generation of carbon dioxide in the interior. T media in which the fungus is grown must be perfect sterile, and the beverage may be prepared from a saccharine solution of about 1·025 specific gravity, f mented under anaërobic conditions. Types of liqu made with cane sugar flavoured with apple, hopped m wort, apple juice, grape and raisin juices, are specified.

—J. F. B.

Rum; Free Sulphuric Acid in a certain ——. G. Meyer. Zeits. öffentl. Chem. **7**, 144. Chem. Centr. 19 **1**, [25], 1347.

The author examined a sample of rum designated " F old Jamaica Rum," but of unpleasant, sour taste, and li brown colour, and found that it contained 0·0708 grm. free sulphuric acid per 100 c.c. After agitating with c bonate of lime, and filtering, the rum had a light yell colour and a very pleasant taste. It is probable tha caramel containing sulphuric acid was used as a colouri material, or that the rum had been subjected to an "age process."—A. S.

Ferments of Vinegar; Biochemical Distinction between two Chief ——. G. Bertrand and R. Sazerac. Com Rend. **132**, [21], 1504—1507.

The authors have examined comparatively the *Mycode aceti* of Pasteur, used almost exclusively in the indust production of vinegar, and the sorbose bacterium, no do identical with Brown's *Bacterium xylinum*, largely used "mother of vinegar" in the household production.

Pure cultures of two specimens of the former, one fr Paris, the other from Orléans, were found to be practic identical in their acetifying power; but while the sor bacterium, as the authors have before shown, oxid glycerin to dihydroxyacetone, neither of the *Mycode* cultures had any such action on it.—J. T. D.

Ammonium Fluoride as a Disinfectant for Hose Pip
F. Schönfeld.

See under XVIII. C., *page* 830.

PATENTS.

Casks and the like, Apparatus for Sterilising and L Wooden —— *with Mineral Wax and other Sui Material.* E. W. Lancaster, London. Eng. Pat. 11, June 23, 1900.

This process consists of heating the cask and introdu into it whilst hot, the melted mineral wax, or other sui material. The filled cask is submitted to internal pres and the superfluous wax removed by pressure or means, cooling being effected by refrigerated air. inventor also claims the use of an elevated reservoir t contain the wax in a molten state, with connection admitting hot and cold air, and the lining material t casks, and also for forcing the excess of the wax ba the reservoir.—J. L. B.

ly Divided Materials; Washing, Cleaning, or Treating ——, especially Fibrous Pulp and other Materials ed as Filtering Media. E. Koppelmann, New York. ng. Pat. 12,027, July 3, 1900.

s process is intended mainly for cleansing the fibrous ring media employed for filtering beer prior to racking for transportation. The finely divided material coned in a suitable vessel is subjected to a tangential ent of air and water under sufficient pressure to cause material to be violently and rapidly agitated. The am may also be applied perpendicularly as well as entially, and steam may be employed either with air e or together with both air and water, thus obtaining desired temperature. Thus the material is kept in nt ebullition in all directions at once, the tangential e causing the particles to revolve and work towards the re, whilst the perpendicular force lifts it upwards outwards again, arrangements being provided for the inuous removal of the dirty water.—J. F. B.

matic Alcoholic Liquors; Method of and Apparatus r preventing Changes in ——, during their Sterilisan. J. F. H. Gronwald, Berlin. Eng. Pat. 14,876, ug. 20, 1900.

: inventor claims that he is able to prevent changes in natic alcoholic liquors during their sterilisation by artilly cooling the space in the sterilising vessel not in act with the liquid. A special cooling apparatus for ying out the process is described.—J. L. B.

it; Process of Rectifying ——, by the Action of efrigeration and Filtration. C. F. von Schlichtegroll, erlin. Eng. Pat. 10,287, May 17, 1901.

spirit is cooled to from − 60° to − 70° C., and the rated impurities removed by passing through a charfilter. By suitable treatment, the impurities, such as oil, &c., may be regenerated from the filtering rial.—J. L. B.

bonated Beverages; Apparatus for Racking ——. A. White, Chicago, U.S.A. Eng. Pat. 7299, Feb. 9, 01.

s invention is characterised by a beverage supply tank ed at a higher level than the receiving vessel, a valved rage supply conduit extending from the supply tank, so arranged that it can be inserted into or withdrawn the receiving vessel. There is also a valved vent age for the receiving vessel subject to a pressure oximately equal to that in the supply tank; this valve osed by the movement of bung driving mechanism. establishing an equilibrium of pressure between the d receiving vessel and supply tank, previous to racking, parate valved primary charge passage is provided, which ened by a movement of parts effecting the sealing of eceiving vessel and closed while the liquid is entering ealed receiving vessel.—J. L. B.

VIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

neal; Composition of ——. B. Dyer. Analyst, 1901, **26**, 153—155.

results of the analyses of 27 samples of oatmeal are . This number comprised 13 samples of fine oatmeal, coarse, and 8 of crushed or flattened oats. The ninoids (calculated by multiplying the percentage of gen by 6·25) varied from about 13 to over 18 per cent. mount of oil was between 7·5 and 12·33 per cent. "fibre" varied from 0·80 to 2·20 per cent. and the rom 1·67 to 4·03 per cent.—W. P. S.

east; New Substitute for Meat Extract ("Ovos") prepared from ——. Lebbin.

See under XVII., *page* 825.

Milk; Approximate Determination of Formaldehyde in ——. J. F. Liverseege.

See under XXIII., *page* 844.

Milk; Detection and Determination of Preservatives in ——. M. W. Blyth.

See under XXIII., *page* 844.

PATENTS.

Milk and other Liquids; Apparatus for the Preservation of ——. T. K. Freeman, London. Eng. Pat. 10,973, June 16, 1900.

This is an apparatus for aerating and sterilising milk by a continuous process. The milk is first aerated under pressure, then run through a pasteurising or heating chamber, afterwards through a refrigerator and finally into storing cans.—W. P. S.

Milk; Method of Solidifying and Preserving ——. H. J. Haddan, London. From E. Passburg, Berlin. Eng. Pat. 12,807, July 16, 1900.

The method claimed consists in first evaporating the milk under reduced pressure in a steam heated vessel until it has lost about 50 per cent. of its water. The thickened milk thus obtained is then further evaporated under reduced pressure in flat dishes until the temperature rises to about 50° C. The heating is then carried on by means of warm water, so that the temperature shall not exceed 60° C., until complete desiccation is attained.—W. P. S.

Butter and other Alimentary Fats; Manufacture of ——. E. von Bühler and A. Bernstein, Berlin. Eng. Pat. 6417, March 27, 1901.

The object of this patent is to impart a flavour to butter and other fats. The butter fat is well worked and washed to get rid of butter milk, and then receives the addition of a mixture consisting of one part of protein matter, one part of sugar, and one-tenth part of sodium bicarbonate; 5 per cent. of this mixture is added to the butter fat. The protein matter used may be obtained from milk as described in Eng. Pat. 29,189, 1897 (this Journal, 1897, 930).—W. P. S.

Peptone; Manufacture of ——. W. R. Mewburn, London, G. R. Mewburn, and H. Robson, London. From Chemische Fabrik von Heyden, Radebeul, Germany. Eng. Pat. 15,172, Aug. 25, 1900.

The process consists in saturating crude peptone solutions with ammonium sulphate or zinc sulphate, filtering and precipitating any remaining albumose by the addition of concentrated sulphuric acid and iron-ammonia-alum. This precipitate is filtered off, more iron-ammonia-alum is added to the filtrate, and then ammonia until the solution is only feebly acid. The resulting iron peptonate precipitate is filtered off and washed with a saturated solution of ammonium sulphate. The iron and sulphuric acid are separated by barium hydrate, and the excess of the latter by means of carbon dioxide. The purified filtrate is then evaporated under reduced pressure.—W. P. S.

Gluten or Glutinous By-products or Mixtures; Treatment of the same with other Albumins to Facilitate their Use for Alimentary or Industrial Purposes. L. Wenghöffer, Berlin. Eng. Pat. 16,734, Sept. 19, 1900.

Ordinary gluten is heated in the form of thin layers by steam for an hour at about 1 atmosphere pressure. The steam is then allowed to escape, when the layers of gluten swell considerably in size. The spongy masses so obtained are cut up and readily cleansed from starch by rinsing with water. When the mass is dried for 12 to 24 hours, at a temperature of 30° to 40° C., and ground to powder.—W. P. S.

Gelatin: Preparation of Food from ——. H. Brat, Berlin. Eng. Pat. 16,708, Sept. 19, 1900.

Gelatin is heated for several hours at a temperature below 100° C., in weak acid or weak alkaline solution. The solution is then neutralised and the inorganic salts removed by dialysis or by precipitating the albuminoid matters with alcohol. The product obtained is dried and pulverised.—W. P. S.

Nuts and Nut-like Substances: Preparation of ——. E. D. Bell, London. Eng. Pat. 13,866, Aug. 2, 1900.

Nuts, such as peanuts, are skinned and ground to a paste with an equal weight of water or milk, containing 1 per cent. of sodium carbonate. After boiling for half an hour, equal weights (from 50 to 100 per cent. of the weight of the nuts) of cheddar cheese and milk containing 1 per cent. of sodium carbonate are added. The heating is then continued for half an hour, when the product is ready for use, or it may be canned. Butter and eggs, with condiments, may also be added.—W. P. S.

Fodder from Peat; Manufacture of ——. H. Borntraeger, W. Wagner, and F. Sahlfeld, Hanover, Germany. Eng. Pat. 4359, March 1, 1901.

The peat is steamed with water for about 4 hours at a pressure of 5 to 6 atmospheres. The treated peat may then be given as fodder wet, dried directly with the fibre, or freed from the fibre by pressure, and made into an extract.—W. P. S.

Table Salt, Manufacture of ——. G. Weddell, Newcastle-upon-Tyne. Eng. Pat. 15,589, Sept. 1, 1900.

The proportion of the deliquescent magnesium chloride and calcium chloride present in the common salt to be treated, having been determined, sufficient sodium carbonate or phosphate to convert these into non-deliquescent carbonates or phosphates is added, and the mixture is dried at 100° C. The phosphate is preferably used as disodium hydrogen phosphate.—E. S.

(B.)—SANITATION; WATER PURIFICATION.

Respiration in Deleterious Atmospheres; Simple Apparatus for ——. A. Chauveau and J. Tissot. Comptes Rend. **132**, [25], 1532—1537.

The apparatus consists of a tube provided with light aluminium valves, at its middle being attached a short transverse tube attached to glass pieces which enter the nostrils of the person using it. The apparatus is attached by cords to a leather cap which fits the head. Air is drawn from one end of the tube and is expelled from the other, and the common passage to and from the nostrils is made as short and small as practicable. Experiments have shown that the inflow tube may be as long as 20 metres or more without producing any sensible difficulty in breathing, and that it is possible, when wearing the apparatus, to remain and work (for certainly more than an hour, possibly much longer) in irrespirable atmospheres such as carbon dioxide or coal gas, without any danger. The same experiments have shown that there is no sensible absorption of these poisonous gases through the skin. The apparatus is easily constructed and transported, extremely light, and easily applied.—J. T. D.

Town Drainage; Purification of ——. Additional Report on the Experiments carried out by the Commission of Experts at the Pumping Station, Charlottenburg, Germany. Nietner, Thiesing, and Baier. Vrtljschr. f. ger. Med. u. öffentl. Sanitatswesen, **21**, suppl. 234—251. Chem. Centr. 1901, **2**, [1], 48. (See this Journal, 1900, 842.)

The experiments carried out related to (1) the further examination of filtering materials; (2) the co-operation of air in the process of nitrification; (3) the effect on the action of the coke of allowing the foul water to previously undergo putrefaction.

Baier found that gas coke in pieces of 3—8 mm. is le suitable as a filtering material than the metallurgical cok used in former experiments. The influence of an artifici supply of air on the revivification of the filtering materi or on the degree of purification of the drainage could n be determined. Allowing the raw drainage to stan (putrefaction before the treatment with coke) had n appreciable influence on the final degree of purificatio attained.

Thiesing found that wood charcoal is not suitable as filtering material for the purification of Charlottenbu drainage, and Nietner found that coal slack is decidedl inferior to coke in this respect.—A. S.

Drinking Water; Sterilisation of ——, by Sodium Hyp chlorite. Hünermann and Deiter. Dtsch. med. Wochsch **27**, [24]. Chem. Centr. 1901, **2**, [4], 318.

It has previously been recommended to use chloride of li for the purification of drinking water (this Journal, 189 45). The author proposes to use sodium hypochlorite f this purpose. Typhus and cholera germs in a water c be killed in 10 minutes by adding to 1 litre of the latter amount of sodium hypochlorite containing 0·004 grm. active chlorine. Sterilisation is effected even if the wat contains much organic matter. The excess of hypochlori is removed by means of sodium sulphite. The author us sodium hypochlorite, prepared by the method of Schmi Dietrich, containing 1·5 per cent. of active chlorine. —A. S.

Water Purification by means of Bromine; Schumburg Process of ——. Schüder. Zeits. Hyg. **37**, 306—32 Chem. Centr. 1901, **2**, [4], 318. (See this Journ 1900, 920.)

In order to ascertain the value of this process, t author examined the whole quantity of water, aft treatment with bromine and removal of the excess of t latter, for the presence of living germs. He concludes th Schumburg's process of water purification fails almo completely as regards cholera and typhus bacteria a probably also as regards other disease germs. The resu obtained by Schumburg and Pfuhl are stated to be doubtful value, as (1) the quantities of water examin for proof of the destruction of bacteria were much t small; and (2) by filtering through a double filter, t investigators named provided conditions which would ve seldom occur in practice in the purification of water bromine. The bromine process applied to a very impu water certainly considerably reduces the number ordinary water bacteria in the latter, and doubtless a effects a considerable reduction in the number of typh and cholera germs, but the degree of purification is such that the water, after treatment, can safely be used drinking water. Even with filtration through a dou filter before treatment with bromine, the method fails the majority of cases.—A. S.

Feed Water; Purification of ——. J. A. F. Aspin Bull. Internat. Railway Congress, May 1900, 11 Proc. Inst. Civil Eng. 1901, **144**, [2], 68—70.

In this communication are given, in tabulated form, answers obtained by the General Manager of the Lancash and Yorkshire Railway to inquiries made by him wit view of ascertaining the practice, as regards purificatio feed water, of the different railways of the world.

The processes used are as follows:—The Argent Railway uses the Tyacke apparatus (this Journal, 18 502), by which, it is stated, 2,000 gallons of water per h are softened by the addition of fixed quantities of quickli and caustic soda.

The Hungarian State Railway uses the Berauger-St and also the Pollaczek apparatus, the reagents being s and lime.

The French State Railroads use three systems —(1) intermittent process, a quantity of water being mixed w

TABLE I.

Countries.	Number of Roads Replying.	Number of Roads using Purifiers.	Average Cost in Pence per 1,000 English Gallons.
entine	2	1	6·0
tria-Hungary	6	5	3·5
gium	3	1	0·8
nce	8	6	2·35
at Britain	22	7	1·0
y	3	1	0·65
way	1	0	..
herlands	3	1	0·55
sia	4	1	13·6
n	1	1	2·5
ted States	5	1	1·65

lime and carbonate of soda, and filtered after standing for 12 hours. (2) Beranger-Stingl purifier. (3) Gaillet purifier.

The Eastern of France Railway.—Up to 35° of hardness, soda is used; above this, milk of lime is added separately to precipitate calcium bicarbonate.

The London and North-Western Railway uses Clark's process, with modifications by Porter (this Journal, 1888, 862) and Howatson (this Journal, 1889, 563), lime alone, or with sodium carbonate being added, with subsequent filtration or subsidence.

The Midland Railway uses the Archbutt-Deeley process (this Journal, 1890, 406), employing as reagents, lime and sodium carbonate.

Netherlands State Railroads.—A solution of soda is added to the feed-water in the proportion of 35·27 lb. per 22,000 gallons.

TABLE II.

Analyses of Water before and after Treatment.

	Railways.									
—	Argentine.		Hungarian State.		French State.		Eastern of France.		London and North-Western (England).	
	Before.	After.	Before.	After.	Before.	After.	Before.	After.	Before.	After.
ium carbonate	10·78	2·32	14·45	6·23	10·15	3·50	21·21	6·02	17·3	1·4
,, sulphate	2·03	Nil	11·76	..	5·25	0·98	10·51	..	1·1	1·0
,, nitrate	2·87	Nil	..	..	..	..	..	..	..	..
nesium carbonate	7·35	5·74	12·11	11·41	5·74	1·05	9·38	7·91	0·8	0·6
,, sulphate	..	..	..	..	2·17	0·84	..	..	..	..
um carbonate	Nil	7·07	..	..	..	..	..	..	..	..
a, &c.	2·52	3·08	0·91	0·77	..	..	..	..	0·3	0·1
aline salts	..	..	..	..	..	..	..	18·97	..	..
l scale-forming matter	21·0	9·5	54·46	47·60	..	..	47·88	37·8	19·5	3·1
olved solids at 212° F.	..	..	..	..	..	..	..	..	28·0	6·5
l solids dried	..	..	..	..	..	..	..	..	..	..
l hardness	25°	9·8°	37·2°	19·7°	31°	8°	46·2°	15·4°	21·2°	3·6°
manent hardness	..	..	13·6°	..	29°	8°	21·7°	8·4°	3·6°	1·6°

—	Midland (England).		Netherlands State.		Vladikavkaz I.		Vladikavkaz II.		Southern Pacific.	
	Before.	After.	Before.	After.	Before.	After.	Before.	After.	Before.	After.
ium carbonate	8·46	2·47	18·76	5·74	9·0	Nil	..	..	17·15	0·80
,, sulphate	3·65	Nil	8·82	7·84	19·41	7·63	39·19	6·02	6·08	0·35
,, nitrate	..	..	..	..	..	..	..	..	..	..
nesium carbonate	1·05	0·21	..	..	6·17	Traces	22·34	Nil	1·46	7·15
,, sulphate	2·89	1·74	11·34	11·34	..	..	25·15	24·94	20·58	1·95
um carbonate	..	..	..	..	..	10·44	..	34·13	..	..
a, &c.	..	..	..	..	..	..	..	..	1·81	0·33
aline salts	..	..	..	..	..	..	..	..	14·77	40·35
l scale-forming matter	13·16	2·68	..	..	..	..	..	..	47·08	10·58
olved solids at 212° F.	22·30	14·30	..	..	..	..	..	..	..	..
l solids dried	..	..	..	..	70·84	50·40	217·56	221·06	61·85	50·93
l hardness	14·7°	4·2°	34·7°	..	30·6°	5·6°	74·2°	24·5°	40·41°	11·25°
manent hardness	..		21°	..	14·3°	5·6°	47·6°	24·5°	21·51°	9·38°

NOTE.—The degrees of hardness are English degrees, and the other figures represent grains per gallon.

ladikavkaz Railroad (Russia).—The Beranger-Stingl aratus, or a modification of the same is used, with stic soda solution as the reagent.

he Southern Pacific Railway uses a method based on chemical principles of the Porter-Clark process, centrated solutions of the reagents being injected into main feed-supply.

he Southern Railway of Austria uses the Beranger-gl apparatus, with milk of lime and soda. The analysis of the water before and after treatment is as shown in the table.

—	Before Treatment.	After Treatment.
e	13·72	1·4
nesia	8·61	3·7
bined carbonic acid	18·02	1·0
l hardness	41·64°	11·7°

There are also given in the original a list of the various substances used as disincrustants in the boilers or tanks of locomotives, and the replies received on the subject of "pitting" and its causes.—A. S.

Waters; Yeast as a Means of detecting Communication with Subterranean ——. P. Miquel.

See under XXIII., *page* 844.

Waters; Determination of Oxygen in ——, in Presence of Nitrites and of Organic Matter. S. Rideal and C. G. Stewart.

See under XXIII., *page* 844.

Water: Detection and Determination of Nitrites in ——. P. Cazeneuve and H. Defournel.

See under XXIII., *page* 838.

PATENTS.

Water; Process for the Purification of ——. C. H. Koyl, New York, U.S.A. Eng. Pat. 11,354, June 3, 1901.

The process described in Eng. Pat. 11,110 of 1900, (this Journal, 1900, 813), is unsuitable for waters containing free carbon dioxide. Such waters are therefore treated, first, with lime water in excess of what is required to combine with the free carbon dioxide, next with sodium carbonate equivalent to the excess of lime, and then with an equivalent of ferrous sulphate.—L. A.

Steriliser; An Improved ——. W. Defries and Y. J. Feeny, London. Eng. Pat. 15,625, Sept. 3, 1900.

The apparatus consists of a closed chamber or heater, above which is placed the sterilising chamber, into which the objects to be sterilised are placed. The heater and sterilising chamber are suitably connected by tubes and valves, and the apparatus is furnished with a heating stove, a draw-off pipe, water gauge, and safety valve. The objects to be sterilised having been placed in the upper chamber, water or disinfectant solution is poured into the chamber to the proper height, and then, by opening a tap, the liquid is caused to pass into the heater, and the tap is closed. The liquid is then heated, and is forced by the steam generated back into the upper chamber through another pipe, and sprayed on to the things therein. When all the liquid has been forced up, followed by steam, and when the steam pressure in the lower chamber has spent itself, the tap is again opened, and the liquid is drawn back into the lower chamber to be once more heated and forced up.—L. A.

Sewage Sludge and other Similar Matters; Treatment of ——. F. M. Spence, D. D. Spence, Manchester, H. Spence, Sale, and M. Royley, Manchester. Eng. Pat. 12,124, July 5, 1900.

The sludge obtained by treating sewage, &c. with aluminoferric and ferric sulphate, instead of being mixed with lime to facilitate pressing, is curdled by heating to about 80° C. The sludge thus treated, when pressed and dried, gives up practically all its fat to benzine, and the residue is a more concentrated and valuable manure than limed sludge. —L. A.

Sewage and Industrial Effluents, Purification of ——; *the Utilisation of Sewage Precipitates and the Manufacture of Filtering Media.* A. Bayer, Brünn, Austro-Hungary. Eng. Pat. 15,720, Sept. 4, 1900.

The sewage is treated with a mixture of finely divided charcoal, lime, and zinc dust. The precipitate, which settles very rapidly, is continually drawn off and pumped into filter presses, and the press cake is subjected to dry distillation, yielding charcoal (which is used for purifying more sewage), tar, ammonia, and illuminating gas. The effluent is filtered through charcoal.—L. A.

Treating Liquids with Ozone for Sterilising and other purposes. A. G. Bloxam, London. From E. Dillan, Berlin. Eng. Pat. 9183, May 3, 1901.

In treating liquids with ozonised air, it frequently happens that a certain concentration of the ozone in the air is essential to produce the desired effect, and at the same time the whole of the ozone is not used up. To prevent the waste which would occur if this ozone were allowed to escape, the apparatus is so arranged that the same air is caused to continuously circulate through, or in contact with, the liquid to be treated, and through the ozoniser, a small proportion of the gas being continuously or intermittently removed from the system, and a corresponding quantity of fresh air supplied thereto, in order to maintain the necessary supply of oxygen.—L. A.

(*C.*)—DISINFECTANTS.

"*Peroxols*"; *Disinfecting Properties of the* ——.
Beck. Zeits. Hyg. **37**, 294–306. Chem. Centr. 1901,
[4], 318.

Under the general name of "peroxols" there has be
prepared mixtures of hydrogen peroxide, containi
salicylic acid, carbolic acid, β-naphthol, thymol, camph
menthol, quinine sulphate, or zinc chloride. The prepa
tions form clear, colourless liquids, that can be diluted
any extent with water. The hydrogen peroxide used is
3 per cent. strength, free from hydrochloric acid, a
containing, for the purpose of preservation, traces of ph
phoric acid. The additions are present in 1 per cen
sometimes in 2 per cent. solution. The preparations al
contain 33—38 per cent. of alcohol. Menthoxol,
example, consists of 1 per cent. of menthol and 33 per ce
of alcohol in 100 c.c. of 3 per cent. hydrogen peroxi
solution. For use, 5 or 10 per cent. aqueous solutions a
prepared. It is stated that the peroxols act strong
germicidal, are permanent, and practically non-poisono
—A. S.

Ammonium Fluoride as a Disinfectant for Hose Pip
F. Schönfeld. Woch. für Brau. 1901, **18**, [2
297—298.

Steam is not a suitable means for sterilising the hose-pip
used for conveying beer; its repeated use causes a perishi
of the rubber, allowing bacteria and other organism
lodge in the cracks. The use of steam, if applied in t
cold cellars, also raises the temperature of the air to
inconvenient extent. Boiling water has not the sa
perishing action upon the hose, and it was used in t
author's brewery for some years, but its action is r
uniformly certain. The water is boiled in a wooden
and passed through the hose and pipes for about 10 minu
and then allowed to remain there for another half-ho
The germicidal properties of hydrofluoric acid and fluori
are well known, and the acid has been applied successfully
distilleries. Although hydrofluoric acid, if used with ca
gives very satisfactory results, the author prefers to
ammonium fluoride, in the form of a 0·4 per cent. soluti
for the treatment of hose. The solution is prepared a
stored in a shallow wooden vat, and the hose-pipes are fill
with it every evening and then left immersed until t
morning. Care must be taken to prevent the loweri
of the strength of the solution by the introduction of wa
with the hose; but apart from this, it is necessary to ren
the solution every two weeks. The efficiency of the soluti
should be tested occasionally by making plate cultures fr
the liquid and the interior of the treated hose. Experie
has shown that all bacteria are readily killed with certain
the only organisms which sometimes survive the treatm
being harmless species of torula. This disinfectant d
not attack the rubber hose nor the hands of the workm
and has very little corrosive action upon metal; the aut
has used it most successfully for two years.—J. F. B.

XIX.—PAPER, PASTEBOARD, Etc.

Limestones; Composition of some Canadian ——.
J. T. Donald.

See under IX., *page* 810.

PATENTS.

Peat Turf; Treatment of ——, *for use in the Manufact*
of Paper. A. Pollak and C. Esser, both of Vien
Eng. Pat. 9589, May 8, 1901.

The invention consists in the production of half-stuff,
use in the manufacture of paper, by subjecting the turf
thin layers to the action of stamps as a preliminary proc
Any suitable apparatus may be used, but a special form
described and illustrated, consisting essentially of a circ
rotary table and a number of mechanically operated stan
the turf, or rather the coarse parts thereof, being cru
between the wooden faces of the stamps and the st
lining of the table.—R. S.

Paper; Manufacture of——. C. Dreher, Freiburg, Germany. Eng. Pat. 12,668, July 13, 1900.

e inventor claims, for the purpose of rendering paper pervious to aqueous, alcoholic, or oily solutions, the dition to the rosin size, containing free rosin, of a dressing iterial, such as "paraffin wax, oil, fats, and the like," oluble or not readily soluble in the said solvents, so that sizing and dressing of the paper are effected simul-reously. He also claims, for the purpose of employing s dressing, the production of a rosin soap containing a ge quantity of free rosin (which is capable of taking up quantity of the dressing material corresponding to the free sin) by adding to the rosin, substances possessing the operties of free rosin, which also lower the melting point the rosin, as, for example, phenanthrene and other drocarbons of low melting point. The resin soap so pared may also be used alone for the sizing of paper thout the addition of the dressing materials.—J. F. B.

per and the like, and Pulp therefor; Manufacture of——. W. M. Callender, Buffalo, U.S.A. Eng. Pat. 20,346, Nov. 12, 1900.

is process for utilising peat moss for the manufacture of per pulp consists in gathering the moss, beating it in a ating engine and brushing or drawing out the fibre, aching, and converting the resultant pulp into paper or ard. Or else the peat moss may be digested in an aline liquor, preferably caustic, and the digestion ntinued under pressure for about 10 hours; the mass is n washed, beaten in the engine, and converted into paper board with or without the admixture of ordinary paper ck.—J. F. B.

aterproof Paper, also Mineral Oil, Grease, Soap, and the like; Manufacture of——. W. J. Ward, Manchester. Eng. Pat. 15,986, Sept. 8, 1900.

e spent liquor from the sulphite treatment of wood is aporated down to 30° Tw. with a definite proportion of lium or potassium bichromate. It is then treated with re bichromate in a steam-jacketted pan, whilst paraffin x or the like, previously melted with 2 or 3 per cent. of low, or 1 per cent. of boiled linseed oil, is mechanically orporated. Finally the gelatinised product is mixed with paper pulp in the beaters at a temperature not exceeding ° F.

A mineral grease or soap is obtained in a similar way by noving the calcium salts from the spent liquor and adding per cent. or more of mineral oil, with 1 or 2 per cent. of low, instead of the wax.—C. A. M.

lluloid-like Material; Process for Manufacture of ——. E. Zühl. Eng. Pat. 10,213, May 16, 1901.

E inventor claims the employment of halogen substitution ducts of the aromatic hydrocarbons as substitutes for nphor in the manufacture of celluloid from nitrocellulose. is found that the entry of one or several halogen atoms o the molecule of benzene or naphthalene yields com-unds which are excellent solvents of nitrocellulose, difying the inflammability of the latter according to the gree of halogenation. The employment of nitro- and ino-halogen derivatives of the hydrocarbons is also imed, the object being to render the more highly logenated compounds readily soluble in alcohol.—J. F. B.

Resinous Soap; Process of Manufacturing ——. M. L. A. Guilbert. Eng. Pat. 12,268, July 6, 1900.

See under XII., *page* 818.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

omine; Proposed Method for the Extraction of ——. A. G. Betts. Eng. and Mining J. 1901, **71**, [25], 783.

r the extraction of bromine from natural brines and ilar solutions, the author proposes a method based on fact that phenol [and other organic compounds give insoluble precipitates with bromine. The bromine is set free from its salts by the addition of chlorine water or by the action of an electric current. As no free chlorine must be present when the phenol is added, the process should be carried out in practice by saturating part of the brine with chlorine or allowing it to flow over anodes of an electric circuit, separated from the neighbouring cathodes by diaphragms; saturating another part of the brine with carbolic acid in a separate vessel, and then introducing the two portions of brine so treated into the main stream of brine. It is stated that the precipitate appears immediately at ordinary temperatures, even if the brine contain only 0·002 per cent. of bromine. Up to 87·5 per cent. of the theoretical amount of bromine can be precipitated. With "rather pure carbolic acid," the precipitate is crystalline and may be readily settled and filtered; but with a very impure mixture of carbolic acid and cresol, the precipitate is tarry, and would have to be collected by settling.

By drying and strongly heating the precipitate, most of the bromine is recovered as hydrobromic acid, and the remainder may be obtained by combustion of the residue and absorption of the products in a solution of alkali or of ferrous bromide. The bromine could also be recovered as ferrous bromide, with simultaneous regeneration of the phenol, by reducing the precipitate with iron and sulphuric acid, according to the equation—

$$2C_6H_2Br_3OH + 3H_2SO_4 + 6Fe =$$
$$3FeSO_4 + 3FeBr_2 + 2C_6H_5OH.$$

—A. S.

Mercury in Italy; Metallurgy of ——. V. Spirek. Berg- u. Hüttenm. Jahrb. der k.k. Bergakad. 1900, 191. Proc. Inst. Civil Eng. 1901, **144**, [2], 43—44.

The author gives a description of the process and plant for the metallurgy of mercury at the works at the Siele, Cornacchino, and Montebuono Mines, Monte Amiata, Tuscany. The ores contain, on an average, 1·2 per cent. of mercury at Siele, 0·6 per cent. at Cornacchino, and 0·4 per cent. at Montebuono, as compared with 8 per cent. at Almaden, Spain; 0·8 per cent. at Idria, Austria; 1 per cent. at Nikitowka, Russia; and from 1 to 3 per cent. in California. The plant at the Siele works comprises one large, one medium-sized, and one small Cermak-Spirek continuous fine-ore furnace, a stack furnace, a double-stack furnace, and a muffle furnace. At Cornacchino, there are one large and one small Cermak-Spirek furnace and a shaft furnace. At Montebuono there are a medium-sized Cermak-Spirek furnace, a muffle furnace, and a shaft furnace. The large Cermak-Spirek continuous furnace has a capacity of 45 tons of ore, but the quantity worked through in 24 hours varies according to the character of the ore. At Siele, it amounts to 12—16 tons, and at Cornacchino, 20—26 tons; at Montebuono, 8—12 tons of ore are passed through the medium-sized furnace in 24 hours. The temperatures that obtain in the furnace are as follows:—In the combustion-chamber, 800°—900° C.; in the first tier of the roasting zone, 700°—800° C.; in the second, 500°—600° C.; in the third, 500° C.; in the fourth, 360°—400° C.; in the discharging and collecting passages, 260°—360° C.; and in the drying chamber, which is merely heated from below by the furnace gases, 100°—200° C. The ore from the mines is sorted into coarse ore over 35 mm. in size, and mixed ore below that size to dust, and then passes direct to the furnace, except that when the proportion of moisture exceeds 7 per cent., the ore is dried, in summer by the sun's heat, and in winter in specially constructed kilns. The coarse ore, over 35 mm. in size, is treated in stack furnaces, of which the more recent ones are double-stack furnaces. At Siele, in the three stack furnaces, 18 tons of ore are treated in 24 hours, with an expenditure of 360 kilos. of hard charcoal. The results of working with the Cermak-Spirek furnaces, since they have been in proper order, show that with an ore charge containing 529·91 tons of mercury, 505·46 tons are recovered, representing a loss of 4·6 per cent. When new condensers are installed, the loss increases to 6 per cent. The mercury absorbed by the plant is, however, recoverable when reconstruction is being carried out.

The cost of the Siele works, where 45 tons of ore can be dealt with daily, was as follows:—Large Cermak-Spirek furnace, 25,000 francs; condenser with 6 cast-iron pipes and 300 clay pipes, 13,000 f.; medium-sized furnace, 22,000 f.; small furnace, 5,000 f.; double-stack furnace, 8,000 f.; single-stack furnace, 4,000 f.; central condensation chamber, &c., 10,000 f.; engines, 8,000 f.; muffle-furnace, 9,000 f.; buildings, 40,000 f.; drying kiln, 6,000 f.; total, 150,000 francs.—A. S.

Bisulphite Compounds of Aldehydes and Ketones; New Method of Decomposing the ——. P. Freundler and L. Bunel. Comptes Rend. **132**, [22], 1338—1340.

The authors have found that the bisulphite compounds of aldehydes and ketones can be decomposed by alkali nitrites, the yield of aldehyde or ketone being at least as great as that when alkali carbonates are used. The authors are studying the other products of the decomposition.—J. T. D.

Ulexite [" Boronatrocalcite"]; Synthesis of ——. A. de Schulten. Comptes Rend. **132**, [25], 1576—1577.

To a large excess of a cold saturated solution of borax, a solution of calcium chloride is added, and the mixture is allowed to stand in a closed flask for 15 to 30 days. The first-formed amorphous precipitate becomes crystalline, and the crystals, washed, and dried in the air, have the composition $Na_2O.2CaO.5B_2O_3.16H_2O$—that of boronatrocalcite or ulexite. The substance is slowly soluble in water, and has a density of 1·955. The crystals lose water when gently heated, and melt at a red heat.—J. T. D.

Bismuth Ores; Assay of ——. T. D. Kyle.

See under XXIII., *page* 839.

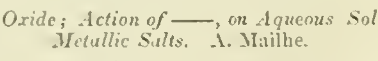
Mercuric Oxide; Action of ——, *on Aqueous Solutions of Metallic Salts.* A. Mailhe.

See under XXIV., *page* 846.

Quinine Basic Saccharinate. H. Défournel. Bull. Soc. Chim. **25**, [11], 606—607.

Well-crystallised basic saccharinate of quinine can be obtained by following the general method of preparing metallic saccharinates (Bull. Soc. Chim. **25**, 322), which consists in effecting a double decomposition between saccharinate of soda and metallic sulphates in aqueous alcohol, the sulphate of the alkaloid replacing the metallic sulphate.

An alcoholic solution of two molecules of saccharinate of soda with an alcoholic solution of one molecule of basic sulphate of quinine are mixed together, the sulphate of soda is precipitated, the whole is allowed to cool and then filtered. By concentration on a water-bath, a light yellowish mass is obtained, which is dried at 100° C., and is then dissolved in pure methyl alcohol. On spontaneous evaporation, beautiful needle-shaped crystals, melting at 194°—195° and then decomposing, are obtained. Aqueous ethyl alcohol, chloroform, and glycerin do not give a crystallised saccharinate, but a syrup. Analysis shows that the crystals correspond to the formula—



$$C_6H_4\left<\begin{matrix}CO\\SO_2\end{matrix}\right>NH.(C_{20}H_{24}N_2O_2.H_2O),$$

giving a slightly fluorescent solution. On cooling aqueous solutions, a snowy precipitate results soluble in warm glycerin. Its taste, sweet at first, becomes bitter, like all the quinine salts. 1 grm. of the salt is soluble in 130 grms. of boiling water. If an excess of ammonia be added to the warm solution, and the latter be allowed to stand for 24 hours, quinine is precipitated.—C. T. T.

d-Cocaine; Transformation of Tropinone into ——. R. Willstätter and A. Bode. Ber. 1901, **34**, [8], 1457—1461.

The transformation of cocaine into atropine is possible, by the oxidation of ecgonine to tropinone and reduction of the latter to tropine (this Journal, 1900, 686). The reverse process—synthesis of an inactive cocaine from tropine—is now possible by means of the action of carbon dioxi and sodium upon tropinone. When the products of th reaction are reduced by sodium amalgam in a feebly aci solution, a number of isomerides of ecgonine are obtaine among which is a true ecgonine. The authors are engage in a complete study of the reaction. The principal produ of the reduction is ψ-tropine-*O*-carboxylic acid, $C_9H_{1}O$ which cannot be esterified; by the action of hydrochlor acid in alcoholic solution, it produces pure ψ-tropine. by-product of the reduction is an inactive ecgonine, whic appears to be the racemic form of *d*-ecgonine (*d*- an *l*-ecgonine are *not* optical antipodes); it is readily solub in water and with difficulty in alcohol, from which latter crystallises in rhombs, melting at 251° C. with decon position. The gold salt is much more soluble than that the *O*-carboxylic acid; it melts at 213° C. Its methyl est forms needles which melt at 125° C.

d-Cocaine is insoluble in water, readily soluble alcohol and ether; it crystallises from petroleum spirit hexagonal plates which melt at 80° C. It forms a nitrat soluble with difficulty. The hydrochloride crystallis from alcohol in transparent rhombic and hexagonal plate which melt at 194° C. with decomposition. The synthet compound acts upon the tongue in a similar manner natural cocaine.—A. C. W.

Antipyrin and its Derivatives. D. C. Eccles. School o Mines Quarterly, 1901, **22**, [3], 259—302.

This is a long and detailed communication, arranged und the following headings:—

(1) Review of the history of antipyrin and its deriv tives.

(2) Descriptions of the three methods devised by Kno for the preparation of antipyrin.

(3) Discussion as to the constitution of antipyrin.

(4) Classification of antipyrin derivatives according their chemical nature.

(5) Tables showing the formulas, characters, and metho of preparation of iso-antipyrin and the homologues a derivatives of antipyrin.

(6) A chronological bibliography.—A. S.

Amine Salts; Action of Bases and Acids on —— A. Colson. Comptes Rend. **132**, [25], 1563—1565.

When piperidine hydrochloride is placed in dry ammoni and the pressure of the latter is gradually raised, reacti sets in (with formation of ammonium chloride and pipe dine) when a minimum pressure is reached (at 0°, 6· and 8·3° C., this pressure is 1,255, 1,595, and 1,698 mm If, after this reaction has proceeded for some time, t pressure be reduced, the minimum pressure is not re-est blished, save where the diminution has been very sligl This, however, arises from the formation of compounds the type $NH_4Cl.nNH_3$; the reaction between piperidine a ammonia is in reality reversible, for when dry piperidine brought into contact with dry ammonium chloride there immediate liberation of ammonia. The reaction is retard considerably if the substances are rigorously dried, or if t reaction be conducted in an atmosphere of dry air; a tra of water vapour, or elevation of temperature, accelerates

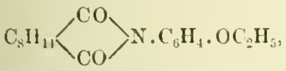
The hydrochlorides of piperidine and of isobutylami absorb dry hydrochloric acid gas in considerable quantiti forming salts which are liquid at 20° C., and in which t dissociation pressure is low (reaching 1 atmosphere at abo 34° C.). The formation of these polyhydrochlorides for an indirect means of liquefaction of such gases as hyd chloric acid, utilisable for their transport. It appears depend on the chemical constitution of the bases, not their thermal properties.—J. T. D.

Borneol; Purification of ——. L. A. Tschougaeff. B Soc. Chim. **26**, [9], 298.

The mixture of borneol and isoborneol is dissolved in xyl and heated for 15—20 hours with the theoretical amou or a little less, of metallic sodium. The alcoholate t formed is then converted into the methyl ester of born xanthic acid, $C_{10}H_{17}.OCS_2.CH_3$ (see this Journal, 19 65). The mixture is steam-distilled to remove excess of ent and the isoborneol, the greater portion of which has ined unaltered by the previous treatment; any methyl-hogenic ester of isoborneol which has been formed, is royed by this treatment. When nothing but water ls over, the oily residue in the retort is crystallised by ng and purified by recrystallisation from alcohol. The methyl ester of bornylxanthic acid melts at 57° C., and the optical rotation $[a]_D = -38°$ in toluene solution. the regeneration of the borneol, the xanthogenic ester is d with excess of alcoholic potash, the solution diluted acidulated with acetic acid, and the separated borneol ied by crystallisation from alcohol and distillation. —A. S.

amphor Derivative; New ——. C. Goldschmidt. Chem. Zeit. 1901, [41], 445.

heating together equal parts of camphoric acid and enetidine in a closed tube at 230° C., a brown gum my is obtained, which, after purification by repeated stallisation, separates from alcohol in the form of a powder. The compound has the composition—



$$C_8H_{14}\left\langle\begin{matrix}CO\\CO\end{matrix}\right\rangle N.C_6H_4.OC_2H_5,$$

at 112° C., and is soluble in ether, toluene, and hot r. It is said to be a powerful antipyretic.—A. S.

ard Oil from the Seeds of Brassica Napus. Sjollema. Rec. trav. Chim. Pays-Bas, **20**, 237—242. em. Centr. 1901, **2**, [4], 299.

author observed that oil cakes prepared from the of *Brassica napus* had a particularly persistent and e odour of mustard oil. On subjecting the seeds, her with white mustard seeds, to distillation with under diminished pressure, he isolated an oil, lighter water, which he found to be *crotonyl mustard oil* CH.CH$_2$.CH$_2$.N : C : S (?). The oil is colourless, gly refractive, and has an odour resembling that of -radish and mustard oil. Specific gravity at 11° C., ared with water at 4° C., 0·9933; boiling point, C. with slight decomposition; vapour density, found ; calculated, 3·914. It reduces permanganate and rises bromine water. The oil is not identical but ric with the compounds described by Hofmann and n (Ber. **7**, 514, and Ann. Chim. Physiol. **17**, [7], —A. S.

mus Oil; Chemistry of ——. H. von Soden and W. Rojahn. Pharm. Zeit. **46**, 243.

ponifying Galician calamus oil, and then fractionating *cuo*, the authors obtained a greenish, thick, oily body, ing at 150° C. On standing for some months, the hich had the sp. gr. 1·02, deposited colourless ls; the latter were purified by recrystallisation from l alcohol. The crystalline compound obtained in this er, melts at 165°—166° C., and sublimes, without loss ter, at 105°—110° C. It gives additive compounds romine and hydriodic acid, but is not acetylated on with acetic anhydride. It is probably a sesqui-ne alcohol of the composition $C_{15}H_{26}O_2$.—A. S.

ssie Flowers; Oil of ——. Schimmel's Report, May 1901, 18—19.

volatile oil of the flowers of *Acacia farnesiana*, red by alcohol from the pomade obtained by the *rage* process, is found to contain, in addition to methyl ate, previously isolated, a ketone with a violet-like allied to ionone, which will probably be ultimately ied as *β*-ionone.—J. O. B.

atara Oil. Schimmel's Report, May 1901, 59.

YL cinnamate is now reported as being a constituent tara oil, in addition to dipentene and *d*-linalool usly found in it.—J. O B.

Galangal Oil. P. K. Horst. Pharm. Zeit. für Russl. **39**, 378; through Schimmel's Report, May 1901, 35.

IN addition to cineol, galangal oil is found to contain about 25 per cent. of eugenol.—J. O. B.

Citral and other Constituents of Essential Oils; New Reagent for the Identification of ——. H. Burgess.

See under XXIII., *page* 844.

PATENTS.

Organic Bromo-Compounds; Manufacture of ——. C. D. Abel, London. From the Actiengesellschaft für Anilinfabrikation, Berlin. Eng. Pat. 14,213, Aug. 8, 1900.

THE patentee claims new organic bromo-compounds, and the processes for their manufacture, which consist in treating tannin-gelatin with bromine, in treating bromo-tannin solutions with albumin or bromo-tannin solutions with formaldehyde and a mineral acid.—A. C. W.

Saponin; Production of ——. H. H. Lake, London. From the firm of Fabrik Chemischer Praeparate von Dr. Richard Sthamer, Hamburg, Germany. Eng. Pat. 13,468, July 26, 1900.

THE addition of formaldehyde to an aqueous extract of quillaia bark effects the precipitation of colouring matters and other impurities, though the filtrate may still be discoloured by calcium compounds. To remove the latter, an acid (such as sulphuric acid) which forms insoluble compounds with calcium, is added, and the liquid again filtered. Or, the quillaia bark may be boiled with water containing formaldehyde and "a suitable acid capable of forming insoluble salts with lime," by which means an aqueous extract with but little colour is obtained. Claim is also made for the residue of saponin left on evaporating such aqueous solutions. It is a nearly white powder, which dissolves readily in water, and keeps well.—C. A. M.

Xanthine; Manufacture of Homologues of ——. G. W. Johnson, London. From C. F. Boehringer und Soehne, Mannheim, Germany. Eng. Pat. 526, Jan. 8, 1901.

THE manufacture is claimed of 8-alkylxanthines by heating uric acid, or those homologues of uric acid in which the alkyl groups are attached to the alloxan nucleus, with acid anhydrides, with or without a condensing agent (pyridine), $C_5H_4N_4O_3 + (CH_3.CO)_2O = C_5H_3(CH_3)N_4O_2 + CO_2 + CH_3.CO_2H$. The products (which are also claimed) are obtained in almost pure condition; they possess the characteristic xanthine properties.—A. C. W.

Alkaline Amides; Manufacture or Preparation of ——. T. Ewan, Oldbury, and J. Pfleger, Frankfort-on-Maine, Germany. Eng. Pat. 15,598, Sept. 1, 1900.

THE invention relates particularly to the preparation of sodium amide. "Into a crucible, charged with melted alkali metal, ammonia is admitted under pressure through a pipe open at its lower end. The ammonia is finely divided by a sieve arranged in the crucible a little distance above the opening of the pipe, or by any other suitable means, and rises through the metal in the form of small bubbles, and in so doing immediately enters into reaction with the alkali metal."—E. S.

XXI.—PHOTOGRAPHY.

Potassium Ferricyanide; Action of Sunlight on Aqueous Solutions of ——. *II.* J. Matuschek. Chem. Zeit. 1901, **25**, [49], 522. (See also this Journal, 1901, 737.)

THESE investigations have now been extended to more dilute solutions of potassium ferricyanide. One series of tests were exposed for five days and another for two days, the latter receiving direct rays during the whole of the daytime. The concentrations ranged from 0·045 to 0·005 grm. per 100 c.c. The results showed that the law of arithmetical proportions observed (this Journal, 1901,

757) holds good for the more dilute solutions, that the decomposition of the ferricyanide by sunlight with precipitation of ferric hydrate is complete at these dilutions, and that the process is more rapid the more intense the illumination.—J. F. B.

Silver Chloride; Action of Solar Radiation on ——, in presence of Hydrogen. Jouniaux. Comptes Rend. **132**, [25], 1558—1560.

When pulverulent silver chloride is sealed up in glass tubes with hydrogen, and exposed to sunlight, it darkens gradually, forming metallic silver and hydrochloric acid. The action is very slow (in the first series of experiments only two-thirds of the hydrogen was converted into chloride after 18 months); its rate is dependent on the surface of silver chloride exposed to radiation, the total mass being kept constant, and also varies with the total mass of chloride when different quantities in a similar state of division are employed. By using a sufficient quantity of silver chloride, the conversion of the hydrogen into hydrochloric acid can be rendered practically complete. Silver, sealed up with dry hydrochloric acid gas and exposed to sunlight, undergoes no change even after many months.—J. T. D.

Diazo-Compounds; Sensitiveness to Light of ——, especially of 3-Diazocarbazole and some new Carbazole Derivatives. O. Ruff and V. Stein. Ber. 1901, **34**, 1668—1684.

The use of 3-diazocarbazole overcomes the disadvantages formerly attaching to the employment of diazo-compounds in photographic printing, namely, the unpleasantness of the tones and the impurity of the whites. If paper the surface of which is moistened with the diazocarbazole is exposed under a positive to the action of light, at those parts attacked by the light, the diazocarbazole is decomposed so that it is no longer capable of combining with phenols or amines. When the exposure is complete, immersion of the paper in an alkaline solution of naphthol develop and fixes the picture. Instead of the unstable 3-diazocarbazole it is better to make use either of one of the stable compounds it forms with metallic chlorides, zinc chloride being the most suitable, or, if a negative is to be printed from, of sodium carbazole-diazosulphonate. The process is carried out as follows:—

(1) *For printing from Positives.*—Well-sized paper hardened with formaldehyde is uniformly coated on one side in the dark with a 2 per cent. solution of the double salt of zinc chloride and 3-diazocarbazole and dried. It is then exposed under the positive to light until the picture appears bright bluish on a yellow ground, after which the print is developed and fixed in a faintly-alkaline 1 per cent. α-naphthol solution. By this means an orange-yellow picture is obtained which in a dilute acetic acid bath assumes a fine brown tone. If in place of α-naphthol the developer used be β-naphthol, phloroglucinol, resorcinol, or *m*-toluylenediamine, the tone obtained will be not brown, but dark red, violet, yellowish-brown, or brownish-violet respectively.

(2) *For printing from Negatives.*—The paper is coated with a solution of 2 grms. of sodium carbazole-diazosulphonate, 2 grms. of α-naphthol, and a just sufficient quantity of sodium hydroxide in 100 c.c. of water, then dried and exposed under the negative. When the picture shows with a distinct brownish-red colour, it is fixed by washing successively in hot water, very dilute soda, cold water, dilute acetic acid, and cold water, a brown tone being thus obtained. The α-naphthol may be replaced by β-naphthol, giving a red tone; 2 : 6 or 1 : 4-β-naphtholsulphonic acid, violet; β-naphtholdisulphonic acid [2:3:6], bluish-violet; or *m*-toluylenediamine, giving a fine brown tone; the paper prepared with the last-named compound does not keep. The colour of the tone is influenced by the quantity as well as the nature of the compounds, also by the concentration of the alkali and the kind of sizing used; it can also be modified after fixing, by immersing the print in a bath of potassium bichromate, ferric chloride, or copper sulphate solution. The colours are quite stable light, showing no change after a year's exposure.

The authors have further made a number of experimer to see if any regularities can be traced in the relati sensitivenesses to light of different diazo-compounds. T results are briefly as follows:—(1) In the case of pa substituted diazobenzene chloride, the sensitiveness to lig is increased by negative substituents; chlorine here behav as if it were positive. (2) The negative nitro-group, whi increases the sensitiveness to light, exerts its greatest acti in the ortho-position, the effect when in the para-positi being somewhat less, whilst in the meta-position the acti is very slight; in the case of the methyl group, the dir nution of the action of light is greatest in the ortho- a para-positions. (3) As a general rule, the sensitiveness the diazotised amine increases with the number of ato in the nucleus. (4) With diazo- and tetrazo-compou of the same nucleus, an equal number of diazo-groups destroyed in the same time.—T. H. P.

Ammonium Sulphide; Influence of ——, on Fine-grai Silver Emulsion Plates. E. Valenta. Phot. Corr. 19 **38**, 302; through Chem. Zeit. Rep. 1901, 164.

When dilute ammonium sulphide solution is allowed to upon the image obtained on developed chloride plates, citro-chloride films produced by exposure only, or on so-called "grainless" bromide plates which are used in Lippmann colour process, it bleaches the picture, wher ordinary bromide plates and wet collodion films are affected. Silver reduced from its halogen compounds strong reducing agents, is darkened by ammonium sulph owing to the formation of silver sulphide; but "colloid silver immediately assumes a paler tint. Thus the act of the sulphide appears to depend on the size of the sil particles. When a plate is treated with ammonium sulph and then fixed, sulphur can still be detected in it; therel the action is not simply what photographers understand a "reducing" [density-diminishing] process, but the p is bleached because the silver is changed into a ligh coloured insoluble compound. With coarse-grained sil ammonium sulphide produces the ordinary sulphide, Ag but acting somewhat slowly upon fine-grained metal apparently causes the formation of a sulphide containin larger proportion of the non-metallic element.—F. H. L

Toning Baths for Gelatino-Chloride Prints. M. Wils British Jour. Phot. **48**, 1901, [2146], 393.

The author has examined toning baths formed with sod picrate, benzoate, and succinate. A bath containing 3 gr of sodium picrate to the ounce gave tones varying t sepia to violet-black; it had the defect of diminishing contrasts, especially when the violet-black tones were duced. Sodium succinate (4 grs. to the ounce) g excellent results, the prints being rich, vigorous, brilliant in tone. A compound bath formed by ad sodium succinate to an ordinary sulphocyanide bath unsatisfactory, and refused to tone beyond an ora brown. Sodium benzoate was comparable in its actio borax; the colour of the prints was appreciably altere the action of the fixing bath. A combined sodium benz and sulphocyanide bath gave very fair results; there however, a loss of vigour and tendency to stain on longed treatment. Chloride of gold was added to all baths in the proportion of $\frac{1}{15}$ to $\frac{1}{12}$ grain to the ounce.
—J. W.

Ozotype; The Chemical Processes of ——. E. J. W British Jour. Phot. **48**, 1901, [2146], 389.

The author shows that Manly's assumption, that primary image of the ozotype process consists of ganese dioxide, is incorrect, and that the equati $3K_2Cr_2O_7$ + gelatin, paper, &c. + $MnSO_4$ = $Cr_2O_3.Cr$ oxidised gelatin, &c. + K_2SO_4 + $MnCrO_4$ — more represents what takes place. The formation of the sec ary image is due to the gelatin being rendered inso by the substances formed through the interaction o hydroquinone, acetic acid and primary image.—J. W.

XXII.—EXPLOSIVES, MATCHES, Etc.

gh Explosives and High Explosive Shells. Engineering, Aug. 2, 1901, 156—157; also Aug. 9, 1901, 195.

ddite shells can be sent through 2-in. or 3-in. plates ore exploding, and occasionally they will go through a t. plate, but that is the limit of their power. The vily-armoured portions of a ship are safe from their on, and they are only intended for the weaker parts, use there are difficulties with the fuze when the losive has been rendered extremely insensitive. Lyd- or picric acid was used extensively in the large guns he South African campaign; but it has been said by high in authority that the artillery experts had used many precautions to guard against accidental explosions, not more than one quarter of the shells exploded at and many of these imperfectly. According to Boer ounts, it appears that a great many of them produced n and yellow vapours, which is a proof that the charge not detonated. This was due to the small size and erfect action of the fuze.

connection with the subject of providing a high losive for armour piercing shells which shall be per- ly safe from accidental explosion, Sir Hiram Maxim, an apparatus like a small pile-driver. At the bottom e cup is a punch of hardened tool steel, of truncated cal form. The face of the punch is about $\frac{3}{8}$ in. in neter, and has circular grooves turned in it to give it a ugated surface. It can be dropped about 10 ft. and into a die of tool steel, not hardened. The pressure een the surfaces may be gathered from the fact that corrugations on the punch imprint themselves on the

This apparatus affords a means of estimating the tive susceptibility of different kinds of explosives. n the die is filled with black powder, and the punch lropped the entire distance, sometimes the powder odes, sometimes not. The conditions of the experi- t are just on the boundary line between success failure. When the arrangement is slightly altered only filling the die half full, the powder explodes y time. Less of the energy of the tup is then ex- led in compressing the powder. When picric acid, h is practically lyddite, is substituted for black powder, ion takes place for certain every time, with a 7-ft. Cordite, the Service smokeless powder, is fired when die falls only 4 ft.; while ballistite, which is known very safe smokeless powder, requires a still less fall. nitroglycerine explodes with quite a short drop of the as might be expected.

scale of comparison by which the qualities of other osives might be gauged, is thus obtained. If they l not be made to go off by the full fall of the tup, they t be assumed to be better than black powder, which d probably satisfy everyone, provided they were not sensitive that they could not be exploded when desired. nature of the explosion which takes place in what are d high explosives is not generally understood, and explanation of a popular kind may be interesting. black gunpowder, the transformation which takes on explosion is very sudden, and the amount of gas derable. But no matter how finely black gunpowder ound, there is always a measurable distance between entre of the particle of nitrate of potash which carries oxygen, and the combustible material to be con- d. It is therefore quite impossible for black owder to be detonated or to explode instantaneously. , however, the combustible material and the oxygen emically combined, the distance between the centre e oxygen group and the centre of the combustible ial may be said to be immeasurably small, probably nore than one-billionth of an inch. Nitroglycerin, acid, dinitrobenzene, and gun-cotton are examples is kind. As a whole, nitroglycerin is the explosive explodes with the greatest violence; after this picric and then gun-cotton, which is also a powerful and t explosive. With all these explosives it is not sary that the flame burns them through from the e, after the manner of black gunpowder; it is possible for a certain molecular wave to be set up which will pass directly through the whole mass, analogous to the case of a wave of light passing through a block of glass. Explosives of this kind can be fired in such a manner that the whole mass is converted into a white-hot gas before any perceptible expansion has had time to take place. It is very evident that, under such conditions, the disruptive effect must be very great indeed; but the actual period of the vibrations, or as one might say, the amplitude of the wave which passes through these substances, is not the same for all. Each one has its own period and its own amplitude. Sir Frederick Abel was the first to show a thorough grasp of the question of detonation, as distinguished from burning.

In 1875 Nobel patented a compound of nitroglycerin which he claimed was slightly less violent than pure nitroglycerin. He sought to "tame" nitroglycerin and to reduce its violence by mixing with it collodion cotton and gum-camphor, both of which are soluble in nitroglycerin. Attempts were made to use this material as a bursting charge in projectiles, but the risk was so great that it was abandoned.

In 1885 Sir Hiram Maxim took out a patent for a powder which contained paraffin wax. In 1886, and the beginning of 1887, this same inventor conducted some experiments in Scotland on licensed premises, and it was here that the first cordite was made from a mixture of nitroglycerin and guncotton. In 1888, a still further advance was made by Sir Hiram, who combined paraffin wax with gun-cotton and gun-cotton with nitroglycerin: and a year later he made smokeless powder with nitroglycerin and guncotton, using castor-oil as a moderator of this explosive.

In writing on this subject as applied to smokeless powder, he said (quoting from the February, 1898, number of the *North American Review*):—

"It occurred to me that it would be very curious if two violent explosives like nitroglycerin and guncotton could have the same amplitude of molecular waves passing through them when the explosion took place. It also occurred to me that if the two substances were intimately combined, made into a liquid, and mixed together and then dried, it might be found impossible for a molecular wave to pass through both of them. For instance, if we should take a plate of ice 2 in. thick, and put it in a glass box 4 in. thick, the light would pass through both the ice and the 2 in. of air space; but if we ground the ice very fine, so that it filled the whole space—*i.e.*, the ice and air being thoroughly mixed together as in light snow, a wave of light would not pass through the two; in fact, the mixture would completely shut out the light, giving a black shadow. I believe that if the nitro-glycerin and guncotton were intimately combined, an explosive wave would not pass through the mixture, and experiments revealed that I was quite correct. All mixtures of from 1 per cent. to 75 per cent. of nitroglycerin were experimented with, the result being that from 10 to 15 per cent. was found to be best, everything considered."

"The experiments also demonstrated that when pressures not exceeding 15 tons were employed, almost any degree of slow burning could be obtained with these smokeless powders; and this, again, led to the suggestion that they might advantageously be employed in throwing aerial torpedoes from large guns."

It is very evident from the above that when two high explosives of the nitrated class, such as gun-cotton, picric acid, nitroglycerin, &c., are mixed together, that their tendency to explode by shock is greatly diminished; and that this may be still further diminished by the addition of castor oil, paraffin wax or oil, or any greasy substance. Another example of the curious effect that hydrocarbons have on high explosives, is found in the fact that common black gunpowder, can be stirred up with a red-hot iron in the presence of gasoline without going off.

Having shown how high explosives may be modified by mixing them with each other, and also by the addition to them of greasy substances, it is very evident that picric acid can be modified to any extent by mixing it with other materials of a similar nature, and then adding to the mass a certain percentage of paraffin wax or vaseline. Picric acid by itself will stand a considerable shock without going off, and it only requires a very small quantity of paraffin wax added to it in order to greatly diminish its sensitiveness. In the experiments referred to, picric acid mixed with castor oil, and also mixed with vaseline, was placed in the die, and in no case did the fall of the punch cause it to explode. Further, a mixture of picric acid with 10 per cent. of nitroglycerin, and 2 per cent. of vaseline, proved equally insensitive; showing that these two heavy and powerful explosives could be rendered as safe, or safer, than black powder.

But every diminution of sensitiveness, either by mixing the explosive with other high explosives or by adding to it paraffin wax, renders it necessary to employ a much stronger detonating charge in order to explode it. In some recent experiments which have been made in a foreign country, it was admitted that the modified forms of picric acid employed could only be set off by an extremely large charge of fulminate of mercury; and in some cases photographs were shown of projectiles which had been burst by the fulminate of mercury without the modified picric acid charge being exploded which they contained. It is very evident that His Majesty's Navy would never employ projectiles loaded with high explosives which had to be provided with fuses containing a large amount of fulminate of mercury; in fact, it is quite out of the question even to suggest the use on shipboard of fulminate of mercury in large shells loaded with high explosives. It has been found by practice that fulminate of mercury is always liable to go off by shock or jar; it never can be rendered perfectly safe. One can imagine how disastrous the effect would be if a large projectile loaded with high explosives were to go off prematurely on board ship. Many ways are known in England of modifying the sensitiveness of picric acid to any extent required. Systems are also well known for reducing its sensitiveness without reducing its strength in the least; in fact, in some cases its strength may be increased. Therefore the question to be solved is, how is this insensitive material that fails to explode in a shell by the shock of passing through a thick armour-plate to be exploded after it passes through the armour-plate without the use of fulminate of mercury?

In 1887 Sir Hiram took out a patent—No. 17,252—on a projectile charged with high explosives. In his patent he appears to have placed the detonating charge at a considerable distance from the main charge, and arranged in such a manner that if it goes off prematurely it will not ignite the main charge. It is also arranged in such a manner that the shock on the detonating charge does not take place at the same time that the projectile strikes, but gives a delayed action. When, however, the projectile strikes, the detonating charge moves forward, and enters the base of the projectile in such a position that in exploding, it bursts the metal and communicates the flame to the contents of the projectile. But it is not shown that this fuse has ever been used in actual practice; though it would appear to be a step in the right direction.

At the present moment, therefore, a high explosive shell may probably be produced, which will go through an armour-plate without its charge being detonated. But it has not yet been demonstrated publicly that the charge can be exploded with certainty, and yet no risks be run from the fuses while they are in store. That is a matter which remains for further experiment, but it should not be beyond the skill of our artillerists.

Sir Hiram Maxim, writing to supplement this article, says:—"I conducted a very long series of experiments in the years 1888, 1889, and 1890. These experiments were with a view to ascertain how high explosives, especially those of the nitro class, could be rendered less liable to go off by shock. All the nitro compounds that could be purchased in London at that time were experimented on. The experiments proved conclusively that the sensitiveness of all these could be reduced to any desired extent by mixing them with various kinds of greases, *viz.*, vaselin, castor oil, paraffin wax, &c. Various mixtures of trinitroglycerin, trinitrocellulose, and trinitrophenol (picric acid) were made, and all were modified in exactly the same manner. The
nitroglycerin, however, was generally mixed with a larg
proportion of gun-cotton, and sometimes with picric aci
Picric acid was also combined with various other high e
plosives of the nitro class, and all were modified in the san
manner. I mentioned this because in your article you d
not mention picric acid as having been experimented on l
me. As to the amount of grease which is necessary
render picric acid insensitive to shock, I should say th
something less than the amount of vaselin, *viz.*, 5 per cen
which is used in Government cordite, would suffice.
think it would always be safe with 4 per cent. The melti
point of picric acid can be greatly reduced by mixing wi
it about 12 per cent. of a similar nitro, *viz.*, dinitrobenzol

Smokeless Powder; Machinery for the Manufacture of—
O. Guttmann. Proc. Inst. Civil Eng. 1901, **143**, [
1—48.

In this paper the author gives a description of the m
recent improvements in the machinery used in the manuf
ture of smokeless powder.

Mixing the Acids.—In mixing the nitric and sulphu
acids for the nitration, processes of mechanical agitati
have been abandoned in many factories, since the autl
has shown that a perfect mixture may be obtained
simply running the sulphuric acid into the nitric ac
Where compressed air, however, is obtainable, he consid
that the blowing process may be advantageously used
conjunction with plant to condense the nitric acid vapou

Nitration of Cotton.—In the author's opinion, ther
still too much handling of the materials in the nitrat
though the introduction of centrifugal nitrating mach
is an improvement. At the author's suggestion, alu
nium baskets have been tried in these machines in pl
of the usual cast-iron baskets, which rarely last
more than a year; but although the aluminium gave g
results as regards its resistance to the acids, it was fo
that the centrifugal force caused the rivets "to draw,"
holes becoming oval. An earthenware basket capabl
being dipped into water has been tried by a German f
but in the author's opinion this is not practicable, for
water would not penetrate the charge of closely-pac
guncotton in a moment, and owing to the heating, the
of igniting the charge would be greater.

Extraction of the Acid.—A new method has recently l
invented by F. J. du Pont, which consists in compres
the nitrocellulose in a cylinder by means of a perfor
piston and displacing the acid by means of water u
pressure. It is stated that the acid is completely rem
without being much weakened.

Immersion.—A drowning arrangement of earthen
has been recently constructed by Selwig and Lange.
cotton is placed in the box, and dropping through
opening, meets a whirling downward stream of water.
usual immersion machines are oval wooden boxes
with revolving paddle-wheels.

Purification from Acid.—On the Continent the cott
usually boiled in a weak solution of soda, after nitration
in England prolonged boiling with water alone is com
used. In some factories all boiling is dispensed with.

Pulping.—In this process the cotton is reduced to
and freed from the traces of acid which its fibres still r
In the modern "beaters" the water is constantly ren
during the pulping, this being effected by a washing
with helical scoops. The author believes that he wa
first to introduce live steam into beaters, whereby the
required for the boiling in the vats before pulping
greatly reduced.

The pulp is frequently pumped over a strain
"knotter" in order to reduce the time of pulping and
further purification. Pulping machinery is still sl
action, since only comparatively small charges c
treated, and their reduction requires a long time.

Drying.—The removal of the water from the fi
guncotton is one of the slowest operations, owing
time required to charge the machines and the small
the charges that can be used. The material is som
compressed into cartridges, which are dried in a cur
warm air, whilst in Continental factories the wa
frequently partially displaced by alcohol, and the exc

e latter expelled by pressure. In other factories the ncotton is dried in a loose state. Passburg's vacuum ying-apparatus has been adopted by some manufacturers.

Nitration of Glycerin.—In the author's opinion the early troduction of better nitrating apparatus is improbable, ough he considers that now that the conditions which ad to decomposition are understood, much larger quantities glycerin might be nitrated than at present.

He is not altogether in favour of mechanical agitators the nitrating apparatus, though Continental manufacturers 1o use them state that they obtain a better mixture by eir means than when the agitation is effected by compressed r alone.

Manufacture of Smokeless Powder.—The incorporation the nitrocellulose with the nitroglycerin or solvent or th is usually effected in a mixing machine. In the case of luble nitrocellulose and nitroglycerin, mere admixture insufficient for incorporation, and the two constituents e therefore agitated in a large quantity of hot water, having been shown by Lundholm and Sayers that comoation is effected under these conditions. This process used in all ballistite factories.

Mixing and Incorporating.—The machines for mixing d incorporating are practically of one type, and, in the thor's opinion, there is still room for improvement in this rection. He states that there is a less thorough admixture the upper part of the trough than in the lower, and that ere is considerable friction in the incorporation. The lling is generally effected in two operations, the material ing first thoroughly incorporated and then reduced to the oper thickness. For powders of the ballistite type, the lls are heated with steam, in order to expel the moisture om the material during the incorporation.

Cutting.—Powder required in strips, like filite, is cut a "guillotine" machine. Legg's machine for cutting bacco has been adapted to this purpose for ballistite owders, and has given satisfactory results. For cutting dinary flake powder the Schiess and Krupp machines e used nearly universally. As the output of the cutting achines is usually small, a large number must be emoyed. The powder is cut into single strips, with the ception of cases in which the Legg machine can be used.

Presses for Cord or Tube Powder.—It has recently been und that plain hydraulic presses are better for cordite an screw presses with hydraulic buffers, which are too mplicated. A further improvement has been the increase the number of cords expressed through the die plate to ; so that the output has been largely increased without y increase in the total pressure in the mould. The author ints out that there is a risk of ignition unless the press d mould are perfectly guided, and that in most of the esses there is insufficient provision for this.

The German Government has recently adopted cylindrical le powder cut from threads instead of the flake powder therto used. Several presses have been designed for the anufacture of this, the Metzger press used by the German overnment works resembling a cordite press with the essing piston attached to the ram overhead.

Another press, manufactured by the Krupp firm, is signed to press the powder from material which has been lled into sheets to prevent air-bubbles. The Austrian le powder is stated to be drawn and not pressed.

As regards the pressure required in these presses, the thor considers that, speaking generally, a pressure of 500 lb. per square inch of nozzle-surface is sufficient. presses in which the cutting and removal of the strands done by manual labour, the maximum practical speed ould not, in his opinion, exceed 60 ft. per minute.

Drying of Smokeless Powder.—Greater attention is now en to the recovery of the solvent, and in some factories e drying rooms are made air-tight, the rooms exhausted means of a fan, and the solvent absorbed by special paratus. In the author's opinion the Passburg vacuum ying apparatus, which is in general use in many industries, the most satisfactory means yet devised.

In the Austrian Government factory 58 per cent. of the vent used is recovered.

Manufacture of Acetone in England.—The price has ently risen by about 20 per cent., and in the author's opinion, a little higher rise in the price would make it profitable for other factories to manufacture acetone.

—C. A. M.

Explosives and Detonating Materials; Examination of New ——. U. Alvisi. Gaz. chim. ital. 31, [1], 221—243. Chem. Centr. 1901, 1, [26], 1393.

The author has made calculations of the potential energy of, and value of gas evolved from explosives containing ammonium perchlorate. For the purpose of comparing the behaviour of ammonium perchlorate as against other oxidising salts when mixed with combustible materials, the author made use of mixtures of potassium nitrate, ammonium nitrate, potassium chlorate, potassium perchlorate, and ammonium perchlorate respectively with hydrogen. By this means the superiority of ammonium perchlorate was shown; its action could, indeed, only be excelled by ammonium chlorate, which, on account of its instability, has no practical value.

On investigating mixtures of ammonium perchlorate with picric acid, mercury fulminate, charcoal, sulphur, charcoal and sulphur (in different proportions), cellulose, nitrocelluloses (with 8, 9, and 11 nitro groups), and also with finely-divided metals, as zinc, it was found that here also the values found by calculation confirmed the results of experiments, namely, that ammonium perchlorate mixtures are to be preferred to the ordinary dynamites (see also this Journal, 1900, 71).—A. S.

Guncotton and Smokeless Powder; New Methods for the Estimation of Soluble Nitrocellulose in ——. K. B. Guinan.

See under XXIII., *page* 844.

PATENTS.

Explosives; Improvements in ——. M. Fiedler, Moscow, Russia. Eng. Pat. 8101, April 19, 1901.

A SAFETY explosive ("Donar") is claimed, consisting of two separate non-explosive parts, (*a*) a mixture of potassium chlorate and permanganate, with or without potassium bichromate, pressed into paper, metal or other cartridges: (*b*) a fluid containing nitrobenzene and turpentine in proportions varying from 4 : 1 to 3 : 2. The dry cartridges are saturated with the fluid shortly before blasting and exploded with "a fulminate of silver or other suitable capsule." In the preparation of the cartridges, the use of cases made of ordinary cotton, paper or similar substance, pasted over with glue to which potassium bichromate has been added, is claimed.—A. C. W.

Picric Acid; Producing ——. A. Gutensohn, London. Eng. Pat. 9398, May 6, 1901.

IMPROVEMENTS are claimed on the process described in Eng. Pat. 16,628, 1900 (this Journal, 1900, 1144). One part of phenol is dissolved with the aid of heat in about 4 parts of paraffin, and the mixture is added to from 3·5 to 4 parts of nitric acid, to which also some sulphuric acid had previously been added. The proportion of sulphuric acid thus added, is recommended as 1·5 parts to 12 parts of the nitric acid. Before adding the phenol in paraffin, a quantity of paraffin is melted and poured upon the surface of the nitric-sulphuric acid mixture.

The operation is best performed on the water-bath at 80° F.

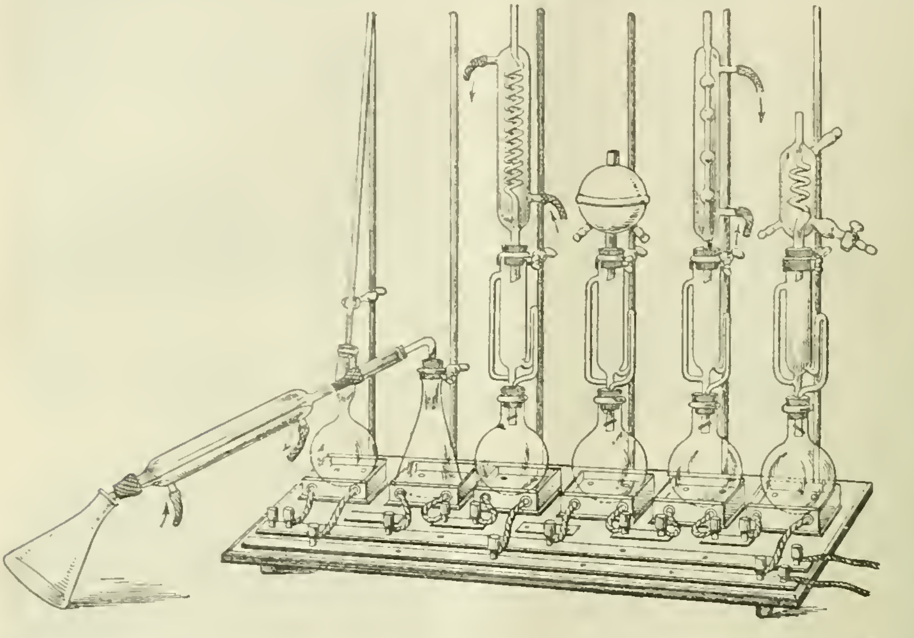
The crude picric acid is recrystallised from water, to which a small percentage of sulphuric acid, or mixture of nitric and sulphuric acids has been added.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

Electrical Heating Apparatus [*for the Laboratory*]. J. Sebelien. Chem.-Zeit. 1901, 25, [45], 485—486.

THE apparatus here described, although available for other purposes, is especially intended for ether extractions, and for other uses in which there are fire risks attendant on the application of flame, directly or indirectly. The accompanying figure illustrates the arrangement in use. Six square heating plates, "each 10 × 10 m.m.," are laid side by side on a strong insulating slate slab. Each plate is surrounded by an iron rim to retain sand or asbestos wool; and through these rims are passed the two ends of the electrical resistance wires within them. These two wires, outside the rim, may be connected by movable plugs either with parallel rods running in front of the plates, and connected, one with each of the terminals of an electricity supply, or with a small plate, by means of which connection may be made with an adjoining plate. Thus all or any proportion of heating resistances may be placed in parallel, or all or any number of them may be placed in series. The resistance for each plate is so calculated that, with a 110-volt supply at the terminals, there will be a current of 0·8 ampère per plate (in parallel), which suffices to bring a flask containing 100 c.c. of water to the boiling point in 25 minutes. When two of the resistances are placed in series, the current is reduced by one half, and the temperature being proportionately less, is suitable for ether distillations, or for light petroleum spirit extractions, whilst with three of the resistances in series, the current is one third, and the temperature obtainable in each case is suitable for ether extractions. The illustration shows the extreme left-hand plate in use alone, for aqueous extraction, the next two in series together, and the remaining three also in series together. This heating arrangement possesses the advantage over the water-bath, that there is no steam condensation on the apparatus in use.—W. G. M.



INORGANIC CHEMISTRY.—QUANTITATIVE.

Water; Detection and Determination of Nitrates in ——. P. Cazeneuve and H. Defournel. Bull. Soc. Chim. Paris, 1901, **25—26**, [12], 639—640.

The dry residue obtained by the evaporation of one litre of the water under examination is treated with 20 c.c. of distilled water and again evaporated in a small flat-bottomed capsule after the addition of 0·05 grm. of brucine. A few drops of crystallizable formic acid are then added to the still warm capsule, together with a few drops of distilled water. If nitrates be present a blood-red coloration is produced. Mere traces of nitrates give a yellow colour which gradually becomes pink after about 12 hours. The test will show one part of nitrate in 100,000, and may be applied quantitatively as a colorimetric method.

—W. P. S.

Phosphoric Acid; Acidimetry of —— by means of Bary. J. Cavalier. Comptes Rend. **132**, [22], 1330—1332.

In titrating phosphoric acid with alkalis, the indication Methyl Orange (one third of total acidity) is very shar that of phenolphthaleïn (two thirds of total acidity) i so satisfactory, but sharp enough for work in most cas The author has investigated the conditions to be observ for satisfactory work when instead of alkalis the alkali earth hydroxides are used. Solutions of baryta, stront and lime (1/10 1/100 normal) we added to phospho acid solution (normal).

(1) The chat with baryta a Methyl Orange very sharp, and best observed w medium dilut (N/50); with stron solutions the f mation of a p cipitate interfe with the observati Instead of Met Orange, paranit phenol may be us

(2) On furt *slow* addition baryta (so that gelatinous trib salt is transforn into the crystall dibasic salt) the dication of phen phthaleïn is v sharp, and occ when exactly t thirds of the t acidity has been saturated. With strong solutions t is best done when hot, the separation of the crystall precipitate being much quicker than in cold solutions.

(3) Strontia in strong (N/10) solutions behaves l baryta; in weaker solutions titration can be carried only in the cold, and very slowly.

(4) Lime gives similar results, but with greater difficu the dilution must not be as great as N/100, and saturation proceeds extremely slowly. Practically, l cannot supersede baryta for this titration.—J. T. D.

Cyanic Acid in Commercial Cyanides; Determinatio ——. O. Herting. Zeits. angew. Chem. 1901, [585—586.

The author's objection to Mellor's method (this Jour 1901, 284) is that the temperature (50° C.) at which mixture of silver cyanide and cyanate is digested with acid, is not high enough. He considers that more reli results are obtained by digesting the mass on the wa bath for at least an hour.

The method recommended is based upon the facts potassium cyanide is converted by hydrochloric or sulph acid into potassium chloride or sulphate; and that potass cyanate is decomposed into potassium chloride or sulpl ammonium chloride or sulphate, and carbon diox according to the equation—

$$KCNO + 2\,HCl + H_2O = KCl + NH_4Cl + CO_2$$

In making a determination, 0·2 to 0·5 grm. of the co mercial cyanide is dissolved in a few c.c. of water, and solution evaporated with hydrochloric or sulphuric acid the water-bath. The residue is dissolved in water, and nitrogen in the solution determined by distillation sodium hydroxide, and calculated into KCNO. In de mining the potassium by the platinum metho commercial cyanides containing ammonium chloride salt should be decomposed with hydrochloric acid tinum basin, the solution evaporated to dryness, and the idue cautiously ignited to expel the ammonium salt.

Potassium Ammonium Cyanide.—The author found that sample submitted to him had the following composin :—Insoluble matter, 0·03; moisture, 0·33; NH_4CN, ·98; KCN, 27·72; K_2CO_3, 9·22; KCNO, 5·06; OH, 9·65; and KCl, 0·92 per cent.

Potassium ammonium cyanide of the above composition ms white amorphous masses which have a strong odour hydrocyanic acid. On ignition in an open crucible, there n increase in weight (formation of cyanate), whilst an eous solution, unlike that of ammonium cyanide, remains changed for several days.

Antidote to Cyanide Poisoning.—In 1899 Kobert and chl described the use of hydrogen peroxide as an antidote, stomach being washed out with a dilute solution, l a 3 per cent. solution subcutaneously injected. This thod is said to have been used for three years with ourable results in the gold-mining districts of South rica.—C. A. M.

ld and Silver Buttons in Quantitative Blowpipe Assays; Measurement of ——. J. W. Richards. J. Amer. Chem. Soc. 1901, 23, [4], 203—212.

ATTNER's original ivory scale, consisting of two slightly ergent straight lines graduated with the aid of blowpipe ays of an ore of known percentage of silver, is apt to be ective (1) through errors in construction (the lines being quite straight, or being rough, or not quite meeting at zero, or not being at exactly the right distance apart); (2) through errors in use. The latter errors may be due he difficulty in determining the outer edge of the white face of the bead, to parallax, or to the difficulty in ting the spherical bead to the exact spot required on a surface. Goldschmidt's method of re-melting the elled beads on charcoal, to render them more nearly erical, and then examining them with the aid of a ided scale under a compound microscope magnifying –100 diameters, is only suited for use in the laboratory, l is not applicable to field work. The author adopts ldschmidt's principle of re-melting the bead on charcoal erever possible, and then he applies a modified scale. s scale consists of two aluminium straight edges, touching h other at one end, lying on a flat surface, and held apart he other by a set-screw, in such a way that at the point rked 100 on the scale, the edges are precisely 1 m.m. rt. In use, several readings are taken with each bead, ause the globules are not strictly spherical; the highest ding occurring with regularity, is accepted as the true surement of the horizontal diameter. A table is given the paper showing the weights of silver and of gold tons corresponding to each division of the scale. Should scale get out of adjustment it can be corrected with the of a piece of wire of known diameter. If the bead be lloy of gold and silver, its composition, and hence its ght, may be determined by comparing it, after flattening, a set of standard beads (also flattened) ranging n 0 to 20 per cent. of Ag by increments of 1 per cent., from 20 to 40 per cent. by steps of 2 per cent., and n that to 56 per cent. (when the alloy becomes silverte) by steps of 4 per cent. A table of specific gravities old-silver alloys is given.

n treating alloys of gold and silver, if the bead contain e than 50 per cent. of Au, and is therefore coloured, the ume should be measured with the aid of the scale. The l is then either colorimetrically gauged against standard ys, or it is mixed with more silver, parted, re-cupelled pure lead, and re-measured. The silver is estimated by rence. If the bead be white it is measured, and then er parted, or re-melted with a bead of pure gold of equal , re-measured and gauged by colour against the standard ys; allowance being made for the added gold, the weight old initially present, is readily found. If preferred, the l may be heated intensely in the point of the oxidising e until it becomes yellowish on cooling, by reason of loss of silver through volatilisation. From one to five utes should suffice. The bead is then measured, ened and gauged colorimetrically, the whole of the loss re-heating being regarded as due to silver. It is not advisable to volatilise too much silver, as the last traces are difficult to remove, and are likely to carry gold with them.

The original fusion should be made on charcoal, the lead can then be poured on to an anvil or (with practice), direct on to the cupel, leaving the fluid slag on the charcoal. In scorifying, the blowpipe tip should be advanced almost to the nearer edge of the flame, whereby a very powerful oxidising flame is produced. 1,800 mgrms. of lead have thus been scorified down to 300 mgrms. in two minutes. For fine cupellation the button may be placed on a freshly struck (not pre-heated) cupel, and a spot under the button strongly heated: the cupel is turned slowly, keeping the button half-way up the far side, and the flame always heating the cupel just beneath it. In this way a gold or silver assay may be made in from 10 to 15 minutes, with an extra five minutes for determining the gold and silver separately, if necessary.—W. G. M.

Gold Ores; Assaying of Complex ——. E. A. Smith. Inst. of Min. and Metall., May 15, 1901.

THE author points out the necessity of employing special methods of assay for the various complex ores, and of not treating all kinds of ore by one general method. He reviews the most suitable processes to be used for certain definite classes of material, although each individual ore must be assayed at the discretion of the assayer. The various details of the assays are fully dealt with, and the ores are classified and the processes summarised as follows:—*Basic Oxidised Ores:* Direct fusion, with special attention to the proportion of charcoal, and to metallic iron if required. *Pyritic Ores (mainly Iron Pyrites):* Roasting previous to fusion and treatment as basic ores, or fusion direct with addition of iron, applicable to ores containing 30 per cent. or less of pyritic material. Oxidation with nitre is satisfactory only with small quantities of pyritic material present. *Arsenical Ores:* Preliminary roasting followed by fusion as for basic ores. *Antimonial Ores:* General oxidation with nitre, either partially or completely. *Cupriferous Ores:* The combined wet and dry methods for ores rich in copper; fusion direct, or after a roasting, with suitable fluxes for comparatively poor ores, special attention being given to the proportion of added lead oxide. If rich in gold and silver, the scorification process is convenient. *Ores with Galena:* Fusion direct with addition of metallic iron. Roasting should not be attempted when much galena is present. *Ores with Blende:* Careful roasting and fusion as for basic ores, but with more flux, which should be varied according to the amount of zinc present. *Telluride Ores:* Fusion direct with very large proportions of lead oxide and ordinary fluxes, scorification on no account being employed. *Bismuth Ores:* Fusion direct as for basic ores, scorification being unsatisfactory if much bismuth is present. The author does not advocate methods of concentration for poor ores, although they may be advantageous in special cases. They are generally tedious and uncertain. Better results are obtained by making two or three independent fusions of 50 grms. of ore, and concentrating the gold and silver in one button of lead by repeated scorification of the poor lead buttons together until of convenient size for cupellation. The paper concludes with a bibliography of English, American, and foreign works on assaying.—A. W.

Bismuth Ores; Assay of ——. T. D. Kyle. Eng. and Mining J. 1901, 71, [23], 717.

IN answer to a correspondent who asked for information on certain points connected with the method for the determination of bismuth given by A. W. Warwick and the author (see this Journal, 1901, 620), the latter states that no advantage is gained by "baking" after evaporating to dryness with nitric acid. The precipitate of basic oxalate, which normally remains white, may turn straw colour or a dingy grey; this is probably due to variation in the character of the precipitate. If the latter be granular, it seems to more readily become straw coloured. As regards incomplete solution of the bismuth oxalate in sulphuric acid, this may be caused by using too much hydrochloric acid to dissolve the oxalate in the first place. On neutralising with ammonia, a considerable quantity of ammonium chloride would be formed, and under these conditions there would be precipitated bismuth oxychloride, which is insoluble in the sulphuric acid subsequently added.—A. S.

Iron and Tin; Volumetric Determination of ——, by means of Stannous Chloride. C. Zengelis. Ber. 1901, **34**, [10], 2046—2050.

In the volumetric determination of iron by titration with stannous chloride, in place of measuring the excess of the latter by titrating back with iodine solution, the author proposes the use of sodium molybdate as an indicator, this salt undergoing reduction by stannous chloride with formation of molybdenum blue. The solutions required are: (1) Stannous chloride solution, prepared by dissolving 11—12 grms. of tin in 250 c.c. of 1·12 hydrochloric acid and diluting to 1 litre. (2) A strongly acid ferric chloride solution obtained by dissolving 10·04 grm. of iron wire in hydrochloric acid, completely oxidising with potassium chlorate and diluting to 1 litre. (3) A solution of sodium molybdate, best prepared by dissolving 1 grm. of molybdenum trioxide in dilute soda, adding a slight excess of hydrochloric acid and diluting to 200 c.c. The determination is carried out as follows: To 20 c.c. of the gently boiling ferric solution the stannous chloride is gradually run in until the liquid has but a faint colour; a drop or two of the boiling solution is added to a drop of the molybdenum solution in a basin, the appearance of a bright blue colour showing that the reaction is finished.

If no colour is formed, another drop of stannous chloride solution is run in, the liquid boiled for a minute and again tested. The method may also be employed for the determination of tin. About 0·8—1 grm. of the tin must be dissolved in 20 c.c. of concentrated hydrochloric acid (1·19 sp. gr.) in presence of platinum foil in a stream of carbon dioxide; the liquid is heated gently at first, more strongly later, so that solution is complete in at most 10 minutes. When this takes place, or shortly before, 80—100 c.c. of the ferric chloride solution are immediately added, the excess being determined by means of the standard stannous chloride solution, sodium molybdate being used as an indicator. Good results are obtained in the determinations of both iron and tin in this way.

—T. H. P.

Copper; Analysis of Commercial ——. A. Hollard. Ann. Chim. anal. appl. **6**, 162—163. Chem. Centr. 1901, **1**, [26], 1389.

The author has considered the objection raised by Truchot (this Journal 1901, 283), and has himself examined samples. He finds that manganese does not occur in the copper, but remains in the slag. When the sample was carefully freed from slag, it gave, after electrolytic separation of the copper, a liquid in which manganese could not be detected. The matter separated at the anode had previously been again brought into solution.—A. S.

Cobalt from Nickel; Electrolytic Separation of ——. D. Balachowsky. Comptes Rend. **132**, [24], 1492—1495.

An acetic acid solution of the metals is employed, to which are added, for each 0·3 grm. of metal, 3 grms. of ammonium thiocyanate, 1 grm. of urea, and 1 or 2 c.c. of ammonia to neutralise the excess of acetic acid, the total volume being made up to about 100 c.c. Electrolysis is conducted with a *maximum* E.M.F. of 1 volt, and a *minimum* current density ND_{100} = 0·8 amp., at 70°—80° C., and is complete in 1½ hours. The cobalt is entirely retained in solution, whilst all the nickel is deposited, partly in the form of sulphide. It is dissolved off the electrode by nitric acid, the solution filtered to separate any sulphur, concentrated to 100 c.c., and neutralised by ammonia. From this solution the nickel is deposited electrolytically, either by Classen's method (for 0·4 grm. of metal, 4—5 grms. of ammonium oxalate, 0·8—1·0 amp. ND_{100}, 60°—80° C., 1½—2 hours) or that of the author (enough ammonium acetate to make an acetic solution, and for 0·3 grm. of metal 1 grm. of succinic acid and 1·5 grms. of urea, 3·5 volts, 0·8—1 amp. ND_{100}, 70°—80° C., 4 hours). latter method is applicable for the deposition of cobalt; same conditions are adhered to, but 2—3 hours only needed.

The remaining cobalt solution is evaporated with 5 of nitric acid to 100 c.c., filtered, neutralised by ammoni carbonate, and electrolysed by Classen's method or by of the author, quoted above.—J. T. D.

Nickel and Cobalt; Quantitative Separation of — A. Rosenheim and E. Huldschinsky. Ber. 1901, [10], 2050—2057.

For the separation of nickel and cobalt, the author ma use of the solubility of the deep blue double sulphocyan (thiocyanate) of cobalt and ammonium in organic solve which do not dissolve the corresponding nickel c pound. Of the solvents tried, a mixture of 25 volu of ether and one of amyl alcohol is found to be best. It is necessary to have the mixed nickel cobalt salts in a concentrated solution, and to ad sufficient quantity of the ammonium sulphocyan otherwise the complex ion $Co(SCN)_4$ becomes dissociat for a liquid containing 0·3 grm. of the two met at least 12 grms. of ammonium sulphocyanate required, and the volume must not exceed 50 The method, which gives good results for mixtures all proportions of nickel and cobalt, is carried out follows:—To the solution of the mixed metals ammonium sulphocyanate is added, and the li evaporated on the water-bath to a volume of at 15—20 c.c. (using 0·3—0·5 grm. of the two metals). deep blue solution is then washed into the extrac vessel (the best being that devised by Rothe for separation of iron from other metals), the whole vol of the liquid being kept below 50 c.c. and extra with the ether-amyl alcohol mixture until all the co is removed, this being indicated by the disappeara of the blue colour. The aqueous solution is evapora to dryness on a water-bath, the residue heated ge at first and afterwards more strongly for 10 minu after which it is digested for 5 or 10 minutes on water-bath with about 10 c.c. of dilute nitric acid, solution filtered and, after neutralisation with amm and addition of ammonium oxalate, the nickel determi by electrolysis. For determining the cobalt, the alcoh ethereal extract is best shaken up with 15—20 c.c. 10 per cent. sulphuric acid, the rose-coloured acid solut of cobalt sulphate, after separation from the now colour alcohol-ether mixture, being evaporated on the water-b carefully heated to expel excess of acid and, a neutralisation with ammonia and addition of ammoni oxalate, electrolysed. Instead of estimating the amount nickel and cobalt in the separated nitrates by electrol this may, of course, be done by treating with brom water and alkali, and reducing the peroxides thus obtai to the metallic state by heating in a current of hydrogen

—T. H. 1

Tungsten in Ores; Determination of ——. O. P. Frit
Eng. and Mining J. 1901, **71**, [23], 720.

0·5 grm. of the finely powdered ore is treated in platinum dish or crucible of about 25 c.c. capacity, wi mixture of equal parts of hydrochloric and hydroflu acids, and gently boiled for about one hour, or until the ore is dissolved, further quantities of the acid mix being added from time to time. The solution is evapora to half its bulk, to expel the volatile silicon fluoride excess of hydrofluoric acid; the dish is covered to prev loss by spirting. Any insoluble tin oxide is then filt off, and the solution treated with 20 c.c. of hydrochl acid and 8 c.c. of nitric acid and boiled down to 10 The concentrated solution is diluted with 50 c.c. of distilled water, and boiled slowly for about half-an-h until the tungsten is completely precipitated as tung acid, H_2WO_4. The precipitate is filtered off on to asbe in a Gooch crucible, washed well with hot water, dr ignited for five minutes at a white heat, cooled, weighed as WO_3.—A. S.

ygen in Waters; Determination of in ——. Presence f Nitrites and of Organic Matter. S. Rideal and . G. Stewart. Analyst, 1901, **26**, 141—148.

: process described by the authors is a modification of ikler's manganese method. Tap funnels and india-ber tubing are dispensed with, the operation being ied out in an ordinary stoppered bottle of known icity (about 300 c.c.). In the case of ordinary river or water, the bottle is filled, 1 c.c. of manganous chloride tion (33 per cent.) is passed to the bottom by means long pipette, and then 3 c.c. of a solution containing er cent. of soda and 10 per cent. of potassium iodide. stopper is inserted, without air-bubbles, and the ents mixed by inversion. The free oxygen is absorbed he manganous hydroxide formed. On standing a few ites the upper part of the liquid becomes clear; the per is then removed for a second, 3 c.c. of pure entrated hydrochloric acid are passed to the bottom he bottle by a pipette, the stopper replaced, and the ents mixed. The manganese oxides dissolve and e is liberated in proportion to the oxygen. After ling in the dark for five minutes, the iodine is titrated thiosulphate solution and starch.

hen nitrites and much organic matter are present (as e case of sewage and effluents), they must be oxidised eans of permanganate in acid solution. The quantity ermanganate necessary to produce a faint pink ation is ascertained by experiment on a separate on of the water. This quantity is then placed together 1 c.c. of concentrated sulphuric acid in the bottle, itter is filled with the water, closed, and the contents d. It is advisable to add 0·1 c.c. of permanganate in s of the calculated quantity, this excess being ved by the addition of 0·5 c.c. of a 2 per cent. ion of neutral potassium oxalate. If more than 10 c.c. cinormal permanganate solution be required for the tion, 2 c.c. of sulphuric acid must be added. The ss is then proceeded with as above, but to balance lphuric acid a larger proportion of soda is required, c.c. of 50 per cent. soda containing 10 per cent. of sium iodide.

the volume of the concentrated solutions added is , a correction for the said volume may usually be cted. When, however, the oxygen is low, that con-l in the reagents will make the results come out too and a correction must accordingly be made.

—W. P. S.

GANIC CHEMISTRY.—QUALITATIVE.

lene; Reactions of ——, with Cuprous Chloride olved in Potassium Chloride. R. Chavastelon. nptes Rend. **132**, [24], 1489—1492. (See also this rnal, 1900, 723 and 863.)

a rapid current of acetylene is delivered just above rface of a solution of cuprous chloride in potassium le, the violet compound $C_2H_2.Cu_2Cl_2.Cu_2O$ appears on des of the vessel where they have been wetted by uid, and at the surface of the liquid; but if the y-tube dips into the liquid, and the liquid is agitated, ellow crystals before described are alone formed. athor's explanation is that the excess of acetylene, first case, removes practically all the cuprous le from the thin layer of liquid in contact with it, to he compound $C_2H_2.Cu_2Cl_2$, which is then acted on water present:—

$$Cu_2Cl_2)_2 + H_2O = C_2H_2.Cu_2Cl_2.Cu_2O + 2HCl + C_2H_2;$$

in the second case, the first-formed compound is t into contact with cuprous chloride, and the a—

$$_2.Cu_2Cl_2 + 3Cu_2Cl_2 + 2KCl = C_2H_2[(Cu_2Cl_2)_2KCl]_2$$

Excess of acetylene will afterwards convert these crystals into the white substance, $C_2H_2(Cu_2Cl_2)_2KCl$. l solutions the results are the same, save that the amount of hydrochloric acid tends to prevent the of water on $C_2H_2.Cu_2Cl_2$ to form the violet nd.—J. T. D.

Phenol; Detection of ——. Maseau. Bull. Soc. Pharm. Bordeaux, **41**, 117.

If a few crystals of pure phenol be dissolved in 1 c.c. of alcohol, and a few drops of ammonia added, followed by an alcoholic solution of iodine, the latter is at first immediately decolorised, later with more difficulty, whilst finally the solution acquires a sea-green colour, which is not destroyed by heating or by the addition of hydrochloric acid. Nitric and sulphuric acids destroy the coloration. The reaction is stated to be absolutely characteristic of phenol, if the directions given be strictly followed. In alcoholic solution, the following are not coloured: phenol, beech-tar creosote, thymol, resorcinol, naphthol, pyrocatechol, quinol (hydroquinone), and pyrogallol. On adding a few drops of ammonia to the alcoholic solutions, the following remain colourless: phenol, beech-tar creosote, thymol, resorcinol, and naphthol. Pyrocatechol is coloured reddish-brown; quinol, saffron yellow; pyrogallol, blackish-brown; and orcin, red to violet. On saturation with iodine, phenol gives the characteristic sea-green colour; beech-tar creosote, greenish-brown; thymol, flesh colour, on addition of excess of iodine, brick red; resorcinol, the colour of old cognac; naphthol, lemon yellow; pyrocatechol, cutch-brown; pyrogallol, black; quinol, saffron yellow, changing to dark red; and orcin, violet.—A. S.

ORGANIC CHEMISTRY.—QUANTITATIVE.

Indigo; Determination of the Value of ——; and Oxidation of Indigo White by Oxygen. W. Manchot and J. Herzog. Annalen, 1901, **316**, [3], 318—330.

Schönbein in 1860 observed the formation of hydrogen peroxide when Indigo White is oxidised in the air, but he did not make any determinations of its amount. The authors, assuming the production of hydrogen peroxide to be due to the principal reaction and not to be formed as a by-product, have determined its quantity. The method employed consisted in effecting the oxidation in presence of baryta water, and determining the barium peroxide formed gasometrically by means of lead peroxide and dilute sulphuric acid. The reaction which takes place is given by the equation, Idgo. $H_2 + O_2 =$ Idgo. $+ H_2O_2$. As in the case of oxanthranol (Annalen **314**, 179) it was to be assumed that a secondary reaction takes place, due to the action of peroxide on unchanged Indigo White when alkalis were employed of which the peroxides are soluble. The authors find this to be the case and have determined the loss due to this reaction in presence of potash, ammonia, and borax. They find that the loss of Indigo White increases with the concentration of the alkali, but it can become a considerable amount even with dilute alkali. These investigations explain so-called "over-reduction," by which is understood the phenomenon that the Indigo vat after acidifying and filtering decolorises permanganate. They confirm v. Baeyer's statement that Indigo is reduced by zinc dust and caustic soda solution only to Indigo White. Alkalis in addition to the above action accelerate the oxygen absorption. This is not due exclusively to increased solubility nor to salt formation and must be described as catalytic.

The method given can be employed for determining the value of an Indigo vat. A measured quantity of the reduced liquor is allowed to run into an excess of dilute sulphuric acid, an excess of baryta water is added, and the oxygen absorption is measured or the leuco compound may be filtered off, washed free from hydrogen peroxide, and determined as above.—T. A. L.

Quebracho Extracts; Analysis of ——. G. Klenk. Leather Trades Review, **34**, [796], 437.

In carrying out an analysis of a quebracho extract by the method adopted by the International Association of Leather Trades' Chemists, the results are often found to disagree, even when the instructions given are followed as closely as possible. Paessler recently showed, in an article published in the Deutsche Gerberzeitung, that the results obtained when making an analysis of a quebracho extract, are influenced by the character of the filter paper, and he proves that considerable differences can arise in the amount of "insoluble," and in connection therewith in the quantity of "tanning matter absorbed by hide," by using different filter papers. He infers that the cause of this lies in the substance of the filter paper; whether the paper is more or less compact or hard.

The author finds that, when using filter papers from the same source, possessing equal hardness and density, considerable differences arise in the results obtained in the analysis of the same sample of extract. When using filter paper, No. 602, Schleicher and Schull, for filtering perfectly clear solutions, which should not have needed filtration, he has found as much as from 3 to 4 per cent. of "insoluble."

On making an analysis of the filter paper, a marked quantity of free hydrochloric acid was detected, which was undoubtedly the cause of precipitation during filtration; a decolorisation of the first filtrate was observed, this pointing to the fact that not only an absorption but also a precipitation of tanning or coloring matter takes place, this b observable when the solution had a slight acid react the solutions with a pronounced acid reaction did precipitate.

It was noticed that only when 500 c.c. were allowe pass through the filter correct results were obtained, sin rejecting 200 c.c. being totally insufficient.

An experiment was carried out, with filter papers o same size and quality, upon a sample of quebracho ext which gave a slight acid reaction, using one filter p washed with a few drops of ammonia and the amm removed by washing with hot water and the filter d and using the other filter paper without any prelimi treatment; the first 50 c.c. of the filtrate were reje each successive 100 c.c. on being collected and anal gave the following results:—

―	1st 100 c.c.		2nd 100 c.c.		3rd 100 c.c.	
	I. Unwashed.	II. Washed.	I. Unwashed.	II. Washed.	I. Unwashed.	II. Wash
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Ce
Tanning matter absorbed by hide.....	33·16	35·22	33·91	34·84	34·47	34·63
Soluble non-tanning matter	10·11	10·11	10·11	10·11	10·11	10·11
Insoluble............................	2·73	0·67	1·98	1·05	1·42	1·24
Moisture	54·00	54·00	54·00	54·00	54·00	54·0

As each filtration took an equal length of time, it is presumed that the filter papers will have each absorbed the same amount of tanning matter, but a difference is shown of 2·06 per cent. apparently of more tanning matter, this being the excess amount absorbed by the unwashed filter paper during the filtration of the first 100 c.c., and is evidently caused by the free hydrochloric acid contained in the paper.

The question as to whether a filter paper should first be washed and then rendered air dry deserves consideration.

—M. C. L.

Sugar Beets; Analytical and other Notes on ——. P. F. Trowbridge. J. Amer. Chem. Soc. 1901, **23**, [4], 216—223.

Obtaining the Tare.—The tare (including adherent dirt) is found by taking a 20 or 25 lb. sample, weighing it, and then either brushing with bristle brushes, or washing in a revolving washer and draining for a few minutes. After re-topping, if the whole of the crown has not been removed, the sample is re-weighed, and the loss is reported in terms per cent. The second method is more rapid, and presents the advantage that frozen beets may be tared at once (using warm water). A comparison of the two methods on nine samples (with tares ranging from 5 to 22·5 per cent., but averaging 10 per cent.) showed maximum differences of + 2·5 and − 1·25 per cent., and an average difference of 0·14 per cent., which is negligible.

Analysis of the Sample.—In all the Michigan factories the method of juice analysis is used, employing a factor to convert the result into percentage of sugar in the beets. Longitudinal quarters of six or eight tared beets are pulped in a revolving grater and pressed; the resulting juice is analysed, three different methods being in common use: (1) The sample stands for 15—20 minutes to allow air-bubbles to escape, the Brix reading is then taken, with correction for temperature; 100 c.c. are next run into a double-graduated flask (100—110 c.c.) and 10 c.c. of basic lead acetate are added, foaming being checked by means of a drop of ether or alcohol. After mixing well and passing through a dry filter, the solution is polarised. From Schmitz's tables the percentage of sugar in the juice is calculated, and the factor is used to show the percentage in the beets. (2) After the Brix reading a double normal sample, 52·1 grms. is measured with a sucrose pipette (graduated on the stem for the different degrees Brix), poured into a 100 c.c. flask, to which 6—8 c.c. of lead acetate are then introduced; after filling to the mark, filtering and polarising, one half the reading multiplied by the factor gives the percentage of sugar in the beets; (3) a double normal sample of the juice is weighed on a ba sensitive to 10 mgrms. and is then treated as in (2). these methods give commercially accurate results.

The Factor used to show the Relation of Sugar in to Sugar in Beet.—This factor has been the cause of dispute. German chemists originally accepted 0·9 correct, because 5 per cent. of marc (insoluble fibre) usually found to be present. In the case of 25 sa tested in 1899, the factor ranged from 0·875 to 0 the average being 0·919 (sugar in juice = 15·4, sug beet = 14·1 per cent.). The hot alcohol method was for the direct determination of the sugar in the root methods above described for the tests of the juice. on eight tests found a range of 0·902 to 0·945, an average of 0·927. More recent tests show averag 0·91, 0·913, 0·912, and 0·917 for this factor. Th alcohol and hot water processes are too slow for factor and although the Pellet instantaneous diffusion method be made rapid enough, it does not appear to have super the indirect method (requiring the use of the facto America. In two samples tested, while the marc wa and 5·2 per cent. respectively, the factor was only (and 0·785.

Variation of Sugar contents in Beets grown apparently uniform Conditions.—Great variations ar with, but are at present unexplained. In one case average of one farm of 60 acres was 14 per cent. of s yet two loads from the same field showed 11·8 and 1 cent. respectively. In an experimental patch of planted in rows 16 inches apart, and thinned to 9 i apart, 120 individual roots contained the foll percentages:—two beets showed 8·7—10 per cent showed 10—11 per cent.; 22 showed 11—12 per 39 showed 12—13 per cent.; 19 showed 13—14 per 18 showed 14—15 per cent; 4 showed 15—16 per and 2 showed 16—18·2 per cent. The average was per cent. The purity (percentage of sugar in total s in ten samples from the same patch ranged from 7 84·7 and averaged 80·5 per cent. From these fig is clear that similar portions of several beets shou taken for the sample, rather than the whole of one beets.

Comparison of Analyses by Digestion with Hot A and Hot Water.—The German chemists have adopt former, French chemists the latter method; 19 compa tests showed that in five cases the water digestion ga higher result (maximum difference, 0·43 per cent 12 cases the reverse was the case (maximum diff 0·4 per cent.), whilst in two cases there was no diff The average difference = 0·02 per cent.

e *Richest Portion of the Beet.*—Ten individual tests the following averages:—Upper portion of the beet ·9; middle portion = 12·2, and lower portion = per cent. of sugar. Hence, if only portions of beets sed for test, longitudinal sections should be taken, and me fractional portion of each beet.—W. G. M.

oot Juice; Determination of the Purity of ——. Claassen. Bull de l'Assoc. des Chim. de Sucr. et de t. 1901, **12**, [11], 984. From Centralbl. Zuckerind.], 557.

RDING to Claassen the differences found by Hinze en the results of aqueous and alcoholic digestion are errors of execution, for it is now admitted that the methods give results sensibly concordant when rly manipulated.

use's method carried out always under the same ions allows of a rigorous control of the process of ion, but not, as some have thought, a direct ciation of the commercial value of beetroots.

—L. J. de W.

oot Juice; Krause's Method for Determining the ity of ——. A. Hinze. Bull. de l'Assoc. des Chim. Sucr. et de Dist. 1901, **18**, [11], 923—924. From tsch. Zuckerind. 1901, [9], 329, and [11], 409.

uthor first criticises the different quotients that have to been used for judging the value of beetroots. He Krause's calculation inexact, but the latter refutes observations (see preceding paper). The application of e's method would not suppress, in Germany, the use oholic digestion. Krause finds an average difference 8 per cent. between the results of his tests by aqueous lcoholic digestion. With the figures of aqueous ion he has calculated, by means of the richness of d juice, the proportion of juice, which was on an ge 94·7 per cent., a figure which excludes the ility of the presence of colloidal water; the author ers this conclusion to be singularly rash.

finds that the dilution of the juice affects the Brix and consequently the quotient of purity, the Brix diminishing with increased dilution; Krause's s places one, therefore, in unfavourable conditions taining the strength of the juice expressed in Brix s. Tests have also been made on the effect of the of division of the pulp; it is not advisable to employ o fine, for aqueous digestion is then not possible. digestion lasted half-an-hour, the differences found ue to errors of observation, the temperature being The operation is finished in half-an-hour, but this nimum.

tables given by the author do not lead to these sions, for, as in Ehrlich's tests, if the contents of are generally concordant, the degrees Brix, and uently the purity, show contradictory differences. in particular is in contradiction with Ehrlich on the ce of the duration of digestion, for he states that no nce is found on prolonging the operation. He, like , tried the application to Krause's method of the ation of Sachs and Le Docte to aqueous digestion; antity of water to be added varies with the strength juice expressed in Brix degrees, and differences may nd to the extent of 4 c.c. in extreme cases. As found, he likewise finds that cold digestion leads to higher expressions for purity than the hot process L. J. de W.

t Juice; Determination of the Purity of ——. Krause. Bull. de l'Assoc. des Chim. de Sucr. et de 1901, **18**, [11], 924. From Deutsch. Zuckerind. , [12], 456.

NG to the criticisms of Hinze the author justifies his of calculation. Let the real Brix of the juice be d 9·5 the polarisation obtained; the latter refers to grms. of pulp, or 25 grms. of juice per 100 c.c. of n liquor; the quotient of the juice is then calculated ws: $9{\cdot}5 \times 26{\cdot}048 \div 25 = 9{\cdot}898$, the polarisation uice; $100 \times 9{\cdot}898 \div 11 = 89{\cdot}98$, the quotient.

To avoid this double calculation and make use of the saccharine contents of the beetroot to calculate the purity, the degree Brix on the graduation of the hydrometer is corrected. To pol. 9·898, the 11 Brix corresponds, but to pol. 9·5, the polarisation of the beetroot (25 c.c. of juice), we have $11 \times 25 \div 26{\cdot}048 = 10^{\circ}{\cdot}557$ Brix-Krause. The figure 11° Brix-Krause is marked to the Brix of the liquid 2·8288 and 10·557 Brix-Krause to 2·715, so that if the quotient be calculated with the figures read, we have $100 \times 9{\cdot}5 \div 10{\cdot}557 = 89{\cdot}98$ as before.

The original juice showing 11° Brix has then, according to Krause's method, 10·557, which does not represent the dry matter of the juice, but the soluble matters per 100 of the beetroot.—L. J. de W.

Invert Sugar; Determination of ——. F. Stolle. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**, [11], 913—914. From Zeits. Ver. Deutsch. Zuckerind. 1901, 111.

FOR the rapid determination of glucose according to Herzfeld's method, it is proposed to titrate the copper not precipitated by Parke's method, which is based on the decolorisation of an ammoniacal solution of copper by potassium cyanide. 10 or 5 grms. of the sugar to be tested are made up to 100 c.c. and 50 c.c. of Fehling solution added. The mixed liquid is boiled for exactly two minutes, then removed from the flame and 50 c.c. of cold de-aërated water added. The whole is poured into a 250 c.c. flask, cooled, made up to the mark, and filtered. 50 c.c. are heated to 80° or 90° C., and 40 c.c. of an ammoniacal solution added, and the mixture titrated with a quarter normal solution of potassium cyanide to complete decolorisation. From the calculated amount of copper present, the amount precipitated by the sugar is found, and from Herzfeld's table the amount of invert sugar.

The ammoniacal solution is made by adding 100 c.c. of strong ammonia and 50 grms. of pure ammonium carbonate in water to 500 c.c.

To prepare the cyanide solution, 100 grms. of commercially pure potassium cyanide (98 per cent.) are made up to a litre with water. This normal liquor serves to prepare the quarter normal liquor used. 7·867 grms. of freshly prepared crystals of sulphate of copper are dissolved to 500 c.c., ammoniacal liquor added until a dark blue colour persists, and the solution is then made up to a litre. 50 c.c. of this solution are placed in a capsule and the cyanide solution added. When a violet colour is observed, the end of the reaction is near. The number of c.c. required is equal to 0·2 grm. of copper.—L. J. de W.

Pentosans; Determination of ——. G. S. Fraps. Amer. Chem. J. 1901, **25**, [6], 501—508.

ON distilling vegetable materials with dilute hydrochloric acid, for the determination of pentosans by the phloroglucinol method, the distillate may contain, besides furfural, fatty acids, a substance which, on standing, separates as a black precipitate, and a substance or substances ("furaloid") which can be destroyed by distilling again. The three latter bodies may all appear in the phloroglucide precipitate.

All the materials tested contained bodies which yielded "furaloid," the amount of the latter contained in the crude furfural in the distillate varying between 7 and 23 per cent. The bodies which yield "furaloid" are hydrolysed by boiling with 1·25 per cent. sulphuric acid and are destroyed on subsequent evaporation. The "furaloid" is not formed by the action of dilute hydrochloric acid on pentose sugars.

—A. S.

Beer Yeast in Pressed Yeast; Bau's Method for the Detection of ——. A. Langfurth. Zeits. offentl. Chem. 7, 198. Chem. Centr. 1901, **2**, [3], 236.

THE author states that Bau's method (see this Journal, 1898, 937) only gives perfectly reliable results if actual pure culture top fermentation yeast be used; with commercial yeasts, wholly false results are obtained. Lindner also has arrived at this conclusion. Bau's method is therefore useless as a means of determining whether beer yeast is present in a sample of pressed yeast.—A. S.

Formaldehyde in Milk; Approximate Determination of ——. J. F. Liverseege. Analyst, 1901, **26**, 151—152.

The reagent used is pure concentrated sulphuric acid containing 2·5 c.c. of normal ferric chloride solution per 100 c.c., 10 c.c. of milk are placed in a stoppered 25 c.c. cylinder, and the reagent added 1 c.c. at a time. The larger the proportion of formaldehyde present, the sooner does the violet tint appear, and increases up to a certain point on the addition of more reagent. By comparing the tint with that produced by milks containing known quantities of the preservative, an approximate estimation of the amount present in the milk may be obtained.—W. P. S.

Preservatives in Milk; Detection and Determination of ——. M. W. Blyth. Analyst, 1901, **26**, 148—151.

The following method is put forward with the primary object of allowing a large number of milk samples to be tested for preservatives without waste of time. 10 c.c. of each milk are measured into clean test-tubes, and at the same time 10 c.c. of a sterile milk, known to be free from preservatives, are also placed in a tube. To each tube and to the control tube, 2 c.c. of very strong, slightly alkaline solution of litmus are added. If any of them, as is the case with old milks, are not of the same blue tint as the control tube, half normal soda solution is added until the correct shade is obtained. The tubes are then plugged with cotton wool and heated to 80° C. in a water-bath for 10 minutes. After cooling, each tube, including the control, is inoculated with 0·5 c.c. of sour milk in water (0·5 c.c. milk to 100 c.c. water), mixed, and allowed to stand at the ordinary temperature for 24 hours, or until the control tube is white, or nearly so. Those tubes which contain preservatives remain blue or pink, whilst the tubes containing no preservative become white, like the control tube. The quantities of preservative which may be detected by this method are 0·005 per cent. of borax or boric acid, 0·05 per cent. of salicylic acid, and 0·0003 per cent. of formaldehyde.

The method may be applied quantitatively for the estimation of preservatives in milk by using control tubes containing known amounts of the preservatives.—W. P. S.

Yeast as a means of detecting Communication with Subterranean Waters. P. Miquel. Comptes Rend. **132**, [24], 1515.

Compressed yeast (10 to 40 kilos. according to circumstances) diffused in 10 to 20 times its volume of water, is thrown upon absorbing surfaces, into wells, streams, cesspools, &c., suspected of communicating with a given source of water; and the water of this source is periodically tested, for some time previously and subsequently, by adding samples to nutritive fluids containing some 200 grms. of saccharose to the litre. If yeast be present, colonies develop, and as a rule energetic alcoholic fermentation has set in before bacteria have invaded the liquid to any disturbing extent. The author has thus proved communication between waters 6 to 10 miles apart, and has found that the yeast retains its vitality after traversing more than 60 miles of aqueduct, and after a sojourn in the earth or in watercourses of over two months.—J. T. D.

Citral and other Constituents of Essential Oils; New Reagent for the Identification of ——. H. Burgess. J. de Pharm. **13**, [6], 283.

The reagent, which consists of a solution of 10 grms. of mercuric sulphate in 1,000 c.c. of 25 per cent. sulphuric acid, gives characteristic colorations with various constituents of essential oils. 2 c.c. of the substance under examination are shaken in a small test tube with 5 c.c. of the reagent; or small quantities of the substance and the reagent are mixed together on a white tile.

The following reactions have been observed:—

Citral.—Bright red colour, rapidly developed on shaking, but fugitive, leaving white flakes floating in the aqueous layer.
Citronellal.—Bright yellow colour, fairly persistent.
Limonene.—Fugitive pale rose colour, changing to white.
Linalyl acetate.—Permanent violet colour.
Linalool.—Immediate deep violet colour.
Caryophyllene.—Yellowish tint.
Eugenol.—Slight violet coloration on standing.
Terpineol.—Flesh colour and a precipitate.
Cassia Oil.—Yellowish compound floating on the
Cinnamon Oil.—Brown compound; aqueous coloured light violet; the whole, after some ti transformed into a solid black mass.—A. S.

Guncotton and Smokeless Powder; New Method fo Estimation of Soluble Nitrocellulose in ——. Quinan. J. Amer. Chem. Soc. **23**, [4], 258—264.

About one grm. of the finely divided dry sample analysed is placed in an aluminium cup 1·9 diameter and 4½ in. deep. It is covered and well with 50 c.c. of alcohol, 100 c.c. of ether are then and the mixture is stirred for several minutes. removing the stirrer, the cup is lightly covered wi aluminium lid, and is then placed in the steel cup centrifugal machine, which is gradually got up to a of 2,000 revolutions per minute, the total cent force at the position occupied by the cups (which b horizontal when in rapid rotation) is about 4 They are rotated at the full speed for 10—12 minute the machine is then gradually stopped. By this tim whole of the insoluble matter will be at the bottom cup, and the supernatant solution will be clear; it is off to within a quarter of an inch of the bottom (w disturbing the sediment), with the aid of a vacuum p Care must be taken that the solution thus withdra perfectly clear. About 10—15 c.c. of colloid sc and a film of insoluble matter remain at the bottom cup; these are stirred up well, the stirrer is rinse ether-alcohol, about 50—75 c.c. of fresh ether-alcoh added; the mixture is again treated in the cent apparatus for about eight minutes; the whole w process is then repeated until all soluble matter ha removed. This may require about seven or eight (samples with much insoluble matter 10 or 12 or washings, but as the extraction proceeds, the per rotation may be somewhat reduced. After extrac completed, the insoluble matter is transferred to a crucible with the usual asbestos pad, dried at 100 weighed. The residue may, if wished, be drie weighed in the aluminium cup, but then it cannot be i The whole time for an analysis, exclusive of that r for drying, is from one to two hours, the average tim 1¼ hour. The results are satisfactory both accuracy and rapidity. The centrifugal apparatus sketched and minutely described; it is provided wi arms, so that two tests may be made simultan Acetone-soluble nitrocellulose may be determined same method. Care must, of course, be taken tl solvents employed are free from all matter not vol 100° C.—W. G. M.

XXIV.—SCIENTIFIC & TECHNICAL N ES.

Light; Chemical Action of ——. G. Ciamician P. Silber. Ber. 1901, **34**, [8], 1530—1543.

The authors have continued their work commence 15 years ago on the action of sunlight on quin alcohol in tubes or sealed flasks, by which they o hydroquinone and aldehyde. The following summarises their subsequent results:—

Alcohols and Formic Acid (Reducing Agent).	Carbonyl Compounds (Oxidising Agent).	Products obtain
1. Ethyl alcohol	Quinone	Aldehyde and hydro
2. ,, ,,	Thymoquinone	Aldehyde and hyd quinone.
3. ,, ,,	Benzophenone	Aldehyde and benzo
4. ,, ,,	Acetophenone	Aldehyde and aceto pinakone.
5. ,, ,,	Benzoïn	Aldehyde and hydro hydrobenzoïn (much).

hols and ic Acid ing Agent).	Carbonyl Compounds (Oxidising Agent).	Products obtained.
yl alcohol	Benzaldehyde	Aldehyde and hydro- and iso-hydrobenzoin and gum (little).
"	Anisaldehyde	Aldehyde and hydroanisoin and gum.
opyl cohol.	Quinone	Acetone and hydroquinone.
erin......	"	Quinhydrone and glycerose.
hrite.....	"	" " erythrose.
nite......	"	" " mannose.
ite.......	"	" " dulcitose.
ose......	"	" " glycosone.
mic acid..	"	Hydroquinone and carbon dioxide.

—T. A. L.

iboluminescence." L. Tschugaeff. Ber. 1901, **34**, [9], 1820—1825.

triboluminescence" is understood the property
ed by certain crystalline bodies of emitting a peculiar
orescent light when rubbed or struck. This has
en known to be the case with sugar-candy, uranium
, and tartaric acid. The author has examined 510
substances by grinding in a glass mortar in an
ely dark room. According to an arbitrary scale,
boluminescence of uranium nitrate is taken as the
gree, that of tartaric acid as the second, and that
onium oxalate as the third. Out of 400 organic
examined, 121 were found to possess this property,
of 110 inorganic substances only six were active.
clic or closed ring configuration of atoms apparently
this phenomenon and certain radicles such as OH,
and tertiary and secondary N may be regarded as
ophores"; the alkaloids as a class are remarkably
The majority of substances were of the second and
degrees; amongst those of the first degree were
n nitrate, quinine valerate, cocaïne salicylate, cin-
ine, cumarin, and aniline hydrochloride. The
of the light varies with different substances; the
orescence generally lasts only as long as mechanical
applied, but in some cases, notably acetanilide and
nilic acid, there is a gradually disappearing after-
In the case of optical isomerides a curious rule
served, that, where both the optical antipodes were
riboluminescent in themselves, the racemic mixture
two entirely lacked this property.—J. F. B.

n; *Physiological Action of the Radiation from* ——. ecquerel and P. Curie. Comptes Rend. **132**, [22], —1291.

ction of the radiation from radium on the skin,
ced by Walkoff and by Giesel, has been confirmed
and Mme. Curie, and by Becquerel. Preparations
am, carried next the arm or in the waistcoat pocket
iods of two to six hours, gave rise to inflammation,
ing very gradually, but lasting many days, and
after treatment and recovery, little permanent
The intensity of the physiological action depends
activity of the radium and the duration of its
tion. When handling radium and its compounds
ger tips become hard and painful: the pain often
s long after the inflammation has disappeared.

—J. T. D.

; *Magnetic Analysis of the Radiation from* —— *of the Secondary Radiation excited by it.* H. Becel. Comptes Rend. **132**, [22], 1286—1289.

diation from a narrow strip of radium, enclosed
imes in glass, sometimes directly) in a block
, and placed in and parallel to a magnetic field,
ceived on a photographic plate placed normally
field: screens of lead or copper could be placed
the radiating substance and the plate, light was
by an aluminium plate, and a second aluminium
as in contact with the photographic plate. The non-
e, as well as the slightly deviable radiation passing
through the glass, passed directly through the aluminium, and gave rise to no secondary radiation. The deviable rays, partly absorbed, passed through the aluminium without change of direction, but gave rise, at both surfaces, to intense secondary radiation. The analysis of the secondary rays emitted by metallic screens has not given such satisfactory results, but part of this radiation is certainly deviable, and the secondary radiation is capable of giving rise in turn to tertiary, quaternary, &c., radiation.

—J. T. D.

Radium. P. Besson. Eng. and Mining J. 1901, **71**, [23], 726.

At the works of the "Société Centrale de Produits Chimiques," 1 ton of the uranium minerals, which form the raw material, yields about ½ oz. of radium, with an expenditure of about 6 tons of reagents, and 50 tons of water for washing purposes. The author considers the luminescence of radium does not arise like that of phosphorus from oxidation, but is due to a continuous emission of electrified particles. It is stated that although the charge carried by these particles is enormous, yet their mass is so small, that the loss of weight of the radium would be only about 1 mgrm. in 100,000,000 years.—A. S.

"*Inorganic Ferments*"; *Gold Catalysis of Hydrogen Peroxide.* G. Bredig and W. Reinders. Zeits physik. Chem. **37**, 323—341. Chem. Centr. 1901, **2**, [2], 87. See also this Journal, 1900, 1155, and 1901, 376.

By subjecting gold to the action of the electric arc under water, the authors obtained a solution of colloidal gold (see this Journal, 1899, 281). The disintegration of the gold did not succeed so well in pure water as in faintly alkaline solution, and, moreover, neutral or acid solutions of colloidal gold did not cause any notable decomposition of hydrogen peroxide. The experiments as to the influence of solutions of colloidal gold on the decomposition of hydrogen peroxide were, therefore, carried out with alkaline solutions. As regards the influence of alkalinity: with a given weight of gold, it was found that the velocity of the decomposition of hydrogen peroxide by colloidal gold is accelerated by increasing quantities of alkali up to a maximum, after which further additions of alkali have a retarding effect. In faintly alkaline solution, 0·0003 mgrm. of gold in 1 c.c. has a distinct catalytic action. With increasing amounts of colloidal gold, the acceleration of velocity of the decomposition of hydrogen peroxide is not directly proportional to such increase, but greater. Potassium chloride and sodium phosphate retard the action of the gold slightly but distinctly. Sodium sulphide and potassium cyanide have a strong toxic effect on the catalytic action of colloidal gold. The quantity of the poison which has a prejudicial action is so small in proportion to the quantity of gold that the "toxic" action cannot be attributed to a chemical alteration of the gold. The catalytic action of the gold is less injuriously affected by sodium thiosulphate and sodium sulphite, whilst it is accelerated by an addition of corrosive sublimate. This latter effect is due to the fact that the mercuric chloride is reduced by hydrogen peroxide to metallic mercury, which is probably present in the colloidal form and itself acts as a catalytic agent, causing decomposition of hydrogen peroxide.—A. S.

Boron; Impurities in Commercial, Amorphous ——. N. A. Orlow. Chem.-Zeit. 1901, **25**, [43], 465.

In 1895 Moissan found that a sample of amorphous boron, prepared by himself by the commercial method, contained about 50 per cent. of the pure element. The impurities consisted of the hydride, the nitride, boric acid, and sodium and iron borides. A specimen supplied by Merck was found by the author to contain small transparent granules of the trioxide, a small amount of iron, and about 9 per cent. of water. The latter is not expelled at 110° C., but only at a much higher temperature. The water-content was determined by heating a weighed portion in a current of air in the usual apparatus employed for organic combustions, the temperature being kept below the igniting point of boron.—E. H. T.

Wood Charcoal; Secondary Products of the Action of Sulphuric Acid on ——. A. Verneuil. Comptes Rend. **132**, [22], 1340—1343.

The author has isolated from the products of the reaction of strong sulphuric acid on wood charcoal, first, mellitic acid, which is readily separated as ammonium salt, and, second, benzene-pentacarboxylic acid, which is isolated by fractional precipitation of the remaining liquor by baryta. The latter shows a yellowish-green phosphorescence; but this is due to impurity, though the author has not been able to isolate the substance producing it, nor to restore the phosphorescence by additions to the pure acid. The formula of the acid is $C_6H(CO_2H)_5.5H_2O$.

From the amorphous precipitates of the later fractions, pyromellitic acid, $C_6H_2(CO_2H)_4.2H_2O$, is separated; it retains some colouring matter, which can only be removed by conversion into lead salt and decomposition of the latter. After separating this, a further quantity of benzene-pentacarboxylic acid can be obtained.

The wood-charcoal employed, after drying at 130° C., contained carbon 87·62, hydrogen 2·55, oxygen 8·38, ash 1·43. The attack by sulphuric acid of wood charcoal heated to whiteness is very slow; the acid is not discoloured, the charcoal does not disintegrate, and the residue gives up hardly anything to water.—J. T. D.

Gold and Silver; Alloys of ——, and certain other Substances from Egyptian Tombs. Berthelot. Comptes Rend. **132**, [22], 1282—1286.

Analyses of a number of small fragments of metal, chiefly thin plates or leaves, are given as under:—

——	Gold.	Silver.
1	92·7	4·9
2	14·94	74·52
3	80·1	20·3
4	78·7	20·9
5	77·3	22·2
6	78·2	21·1

(1) Beaten leaf or foil, from tomb of Horus, of the 13th dynasty. One surface pure gold-colour, the other red and tarnished, probably from contact with the body.

(2) "Silver," from a packet of metallic leaves, from a tomb of the 11th or 12th dynasty, discovered at Berchèh.

(3) Yellow "Gold" from the same packet.

(4) Red "Gold" from the same packet.

(5) Yellow "Gold" from a second packet from the same tomb.

(6) Dark red "Gold" from the same packet.

The specimens of gold, though differing in appearance, have approximately the same composition, save the first one; these analyses agree with these of former specimens of ancient Egyptian gold, which the author always found to contain either about 20 per cent. or about 5 per cent. of silver.

The author adds analyses of some miscellaneous objects from the same source:—

(7) Solid matter, said to be a perfume: a brownish-yellow, compact resin, having all the properties of ordinary colophony.

(8) Two whitish round balls, about 22 mm. in diameter: they appeared to consist of powdered glass, with a little chalk apparently serving as cement.

(9) A little metallic plate, about 60 × 6 × 0·66 mm., covered with verdigris: copper 87·7, oxidised crust 12·3 per cent., with a trace of tin.

(10) Among the gold from Berchèh were three small glass rings, of circular section, the external diameter being about 3 mm., and the internal 1·5 mm. What purpose these served, and how they were made, are matter for conjecture.

(11) A sample of Chaldean metal from the statue of the King Rim-Sin, about 2,200 B.C.: copper 92·9, oxidised crust 8·9, sand 0·2 per cent.—J. T. D.

Zinc: Its Action on Plants. L. Laband. Zeits. Unter Nahr. u. Genussm. 1901, **4**, 489—492.

The author has collected together the literature de with the action which salts of zinc have on plants absorbed by the latter. M. Freitag (Vierteljahres prakt. Pharm. **19**, 127) found that all plants take up without actually having their growth destroyed, bu later (Jahresber. Agric. Chem. **26**, 208) comes to conclusion that zinc does injuriously affect vegetable li it does not bring about its destruction.

C. Krauch (Jour. Landwirthschaft. 1882, **30**, 271) s as the result of his experiments, that plants were l when the amount of zinc in the nutrient solutions in they were grown exceeded 0·1 mgrm. per litre.

F. Nobbe, P. Baesler, and H. Will (Landw. Vers. 1883, **30**, 381) found that a proportion of 1/1000 pa zinc caused plants to fade in three days.

A. Baumann (Landw. Vers.-Stat. 1884, **31**, 1) ascert that plants would still grow in solutions containing 1 m of zinc per litre, and that the poisonous limit lay bet 1 and 5 mgrms. per litre.

According to the observations of Risse (Sachs' "Ex mentalphysiologie"), zinc is found in all plants gr in the zinc-laden soils of Altenberg, near Aachen. I case of *Thlaspi alpestre* the root contained 0·167, the 0·385, and the leaves 1·50 per cent. of zinc oxide, c lated on the dry substance.—W. P. S.

Potassium Hydroxide; Absorption of ——, by Sili Rumpler. Deutsche Zucker-Ind. 1901, 585, Through Zeits. angew. Chem. 1901, [24], 592—593.

The following is a brief summary of the results o author's experiments on this subject:—

1. Every fertile soil contains silicates capable of changing their sodium, calcium, or magnesium hydro with potassium hydroxide (or, *vice versa*, their pota hydroxides with these bases) when brought into co with the corresponding solutions. The power of s absorb potassium hydroxide depends on the prese such silicates.

2. Silicates of this nature are: the acid-soluble d silicates of aluminium with calcium, sodium, &c.; weat clay (bolus); cement in combination with water; artificially prepared double silicates. As it has never proved that there is a considerable amount of alumi these, the author is inclined to think that pure ca silicate, *e.g.*, has the power of interchanging part of its with other bases, especially potassium hydroxide. oxide appears to be capable of taking the place of al in these silicates.

3. In the sugar industry such silicates may be preju by yielding their potassium or sodium to the juice th the action of the lime. In like manner the diffusion may be impaired by the absorption of potassium hydro

4. The juice may be freed from potassium hydrox other alkalis by suitable treatment with such silicates.

5. A simple admixture of the silicate with the juice not remove the whole of the potassium hydroxide pr but only sufficient to establish a chemical equilibrium, varies in each case.

6. The liquid containing the potassium hydroxide deprived of the whole of that alkali (theoretically at by filtering it through a silicate free from pota hydroxide.

7. All silicates of this nature can be freed from interchangeable alkalis by systematic extraction with tions of calcium compounds, and thus made capa absorbing potassium or sodium hydroxide. Or the s may be deprived of their magnesia, &c. by treatmen solutions of sodium compounds.—C. A. M.

Mercuric Oxide; Action of ——, on Aqueous Solut Metallic Salts. A. Mailhe. Comptes Rend. 1901 [21], 1273—1275.

By acting on aqueous solutions of metallic salts mercuric oxide, the author obtained results quite di from those given by Rose in 1859.

Solution acted on.	Composition of Precipitate obtained.
$ZnCl_2$	$ZnCl_2$, $3ZnO$, $3H_2O$.
$ZnBr_2$	$ZnBr_2$, ZnO, $8H_2O$.
$ZnSO_4$	No action.
$Zn(NO_3)_2$	$Hg(NO_3)_2$, ZnO, H_2O.
$NiCl_2$	$HgCl_2$, $NiCl_2$, $7NiO$, $10H_2O$.
$NiSO_4$	No action.
$Ni(NO_3)_2$	$Hg(NO_3)_2$, $3NiO$, $8H_2O$.
$CoCl_2$	$HgCl_2$, $3CoO$, $\frac{3}{4}H_2O$.
$CoSO_4$	No action.
$Co(NO_3)_2$	$Hg(NO_3)_2$, CoO, $3H_2O$.
$CuCl_2$	$CuCl_2$, $3CuO$, $4H_2O$.
$CuBr_2$	$HgBr_2$, CuO, $3H_2O$.
$CuSO_4$	Scarcely any action.
$Cu(NO_3)_2$	$Hg(NO_3)_2$, CuO, $4H_2O$.

—J. S.

imary Alcohols ; Oxidation of ——, by Contact.
A. Trillat. Comptes Rend. 1901, **132**, [20], 1227.

s a preliminary note describing the behaviour of
t fatty alcohols when exposed to the action of an
escent platinum spiral, or to platinum black. All
mary fatty alcohols are oxidised by the spiral. The
may be limited to the formation of the corresponding
le. Presence of water assists rather than hinders
dation. Porous bodies and platinum black tend to
cids in place of aldehydes. At least with the lower
rs of the series, acetals are always produced; and
tion is reversible.—F. H. L.

y Alcohols ; Action of Calcium Carbide on ——. P.
efebvre. Comptes Rend. 1901, **132**, [20], 1221.

URING his previous researches (this Journal, 1900,
he author has investigated the action of calcium car-
on the four common primary alcohols—methyl, ethyl,
l, and amyl—at a temperature of about 500° C. The
ts were very similar in all cases, containing hydrogen,
68·5 per cent.; ethane, 9·6 to 13·8 per cent.;
e, 0 to 9·1 per cent.; hydrocarbons of the ethylene
0·3 to 8·6 per cent.; acetylene, 0 to 3·8 per cent.;
monoxide, 4·5 to 8·6 per cent.; and carbon dioxide,
4·4 per cent. Except in the case of methyl alcohol,
responding aldehyde was discovered among the liquid
ts; but only in amounts of 10 per cent. or less,
n proportions of 30 or 50 per cent., such as have
ound by Ipatieff when primary alcohols were led
empty tubes at 660° to 750°. In comparison with
hat existing in the alcohol examined, the hydrogen
ficient in the liquid products, in excess among the
products. It would, therefore, appear that the
le is formed from the alcohol by removal of hydrogen,
on which is assisted by the presence of nascent
ne, the latter tending to combine therewith to yield
e. With methyl and ethyl alcohol, the ethylene
rbons perhaps consist of ethylene itself only; with
l alcohol they are principally isobutylene; with amyl
$\frac{1}{2}$ to $\frac{3}{4}$ of them are propylene, the rest being
ylethylene with traces of butylene.

vre has observed the formation of valeraldehyde
nyl alcohol is led at a dull red heat through a glass
tube either empty or packed with broken porcelain.

—F. H. L.

Action in the case of Secondary and Tertiary
ols. A. Trillat. Comptes Rend. **132**, [24],
–1497.

cohol vapour, mixed with air, was passed over a
platinum spiral. In all cases the heat of reaction
fficient to maintain the spiral at the requisite
te. Dimethyl-, methylethyl-, diethyl-, and
exyl-carbinols yielded in each case the correspond-
one; in the case of the first two, abundantly.
yl- and dimethylethyl-carbinols yielded acetone
maldehyde, the latter arising in part directly, in
m the oxidation of the acetone, the possibility of
as proved by direct experiment on acetone.

—J. T. D.

Glucamine : New Base derived from Glucose. L. Maquenne and E. Roux. Bull. Soc. Chim. **25**, [11], 586—591.

GLUCAMINE, $C_6H_{15}NO_5$, is prepared by reducing glucosoxime in a 10 per cent. aqueous solution with 3 per cent. sodium amalgam, added to it in portions of 50 grms. at a time. About 1·5 kilos. of amalgam to 70 grms. of crystallised oxime are required.

In the free state glucamine forms a white mass, hard and crystalline, which melts at about 127° to 128° C., and then commences to decompose. It is very soluble in water, soluble sparingly in alcohol, and almost insoluble in ether. An aqueous 10 per cent. solution is levo-rotatory $[\alpha]_D = -7°\cdot95$, without multi-rotation. Its taste is both sweet and caustic. It presents all the characters of a strong base, absorbs carbon dioxide, and neutralises sulphuric acid. It is a mono-acid. The neutral oxalate is the only salt of glucamine which the authors have succeeded in crystallising. The solutions are levogyrate, like those of the base. Glucamine displaces ammonia and decomposes metallic salts, like the fixed alkalis. It does not readily combine with hydrates of zinc and aluminium, but gives with ferric hydrate, a red-brown solution.

Mercuric chloride forms with glucamine an insoluble metallic derivative.—C. T. T.

New Books.

RESEARCHES ON CELLULOSE. 1895—1900. By C. F CROSS and E. J. BEVAN. Longmans, Green, and Co., 39, Paternoster Row, London; also of New York and Bombay. 1901. Price 6*s*.

8vo volume, with preface, table of contents, list of errata, and subject-matter filling 175 pages. An alphabetical index of subjects ends the work. The subjects treated of are as follows, and in the following order:—I. General Chemistry of the typical Cotton Cellulose. II. Synthetical Derivatives, Sulpho-carbonates, and Esters. III. Decompositions of Cellulose throwing light on the problem of Constitution. IV. Cellulose group, including Hemicelluloses and Tissue Constituents of Fungi. V. Furfuroids, *i.e.*, Pentosans, and Furfural-yielding Constituents generally. VI. Ligno-Celluloses. VII. Pectic Group. VIII. Industrial and Technical.

THE MANUFACTURE OF ALUM, AND THE SULPHATES AND OTHER SALTS OF ALUMINA AND IRON: Their Uses and Applications as Mordants in Dyeing and Calico Printing, and their other Applications in the Arts, Manufactures, Sanitary Engineering, Agriculture, and Horticulture. By LUCIEN GESCHWIND. Translated from the French by CHAS. SALTER. Scott, Greenwood, and Co., 19, Ludgate Hill, London, E.C. 1901. Price 12*s*. 6*d*.

THIS work, large 8vo, is divided into four parts:—(1) A Study of Iron, Aluminium, and their Compounds. (2) Manufacture of the Sulphates of Aluminium and Iron. (3) Applications of the Sulphates of Aluminium and Iron; and (4) The Analysis of the Iron and Aluminium Compounds. The subject of the uses of the aluminium and iron sulphates, also receives full attention. The text is illustrated with 195 engravings, fills 375 pages, and is supplied with a table of contents and an alphabetical index. As stated in the preface, "the work is designed to meet the requirements of chemical manufacturers, chemical engineers, works managers, and others engaged in the various chemical industries producing or using alum, aluminium sulphate, the sulphates of iron, &c.

PAPERMAKERS' POCKET BOOK. Specially compiled for Paper Mill Operatives, Engineers, Chemists, and Office Officials. By JAMES BEVERIDGE. Wood Pulp, Ltd., 10, Godliman Street, London, E.C. 1901. Price 10*s*.

SMALL volume, pocket-book size, gilt edged, containing preface, table of contents, 154 pages of text, and an alphabetical index. The subject-matter is divided into chapters with numerous tables, formulæ, &c. I. Tables of Weights and Measures, &c. II. Formulæ for Calculating the Amount of Steam for Heating Liquids; for Hot Bleaching;

for Digesting Esparto, Straw, &c.; for Digesting Wood (Soda Process and Sulphite Process); for Drying Pulp and Paper on the Machine. Yaryan Evaporator Trials. Soda Recovery. III. Chemical Treatment of Rags; Jute; Esparto, Straw, &c. IV. Coloured Papers. Dyeing Paper Pulp. Dyes, Mordants, &c. V. General Paper Mill Analyses, and Methods. VI. General Tables, and Composition of Chemicals used in Paper Making, &c. VII. Speeds, &c. of Paper Mill Machinery. Rag-, Straw-, and Esparto-Boilers; Soda Wood-pulp Digestors; Sulphite Pulp Digestors. Kollergangs, Pochers, Refiners, &c. Steam Engines, Back-water Pumps, Stuff Pumps, Vacuum Pumps, &c. Roll Calender.

Handbook on Petroleum. For Inspectors under the Petroleum Acts and for those engaged in the Storage, Transport, Distribution, and Industrial Use of Petroleum and its Products and Calcium Carbide; with suggestions on the Construction and Use of Mineral Oil Lamps. By Captain J. H. Thomson, His Majesty's Chief Inspector of Explosives, and Boverton Redwood, Adviser on Petroleum to the Home Office, &c. Chas. Griffin and Co., Ltd., Exeter Street, Strand, London. 1901. Price 8*s.* 6*d.*

8vo volume, with preface, table of contents, 288 pages of subject-matter, illustrated with 18 engravings, and two plates, and the alphabetical index. The treatment of the subject may be gathered from the following headings:—I. Definition of "Petroleum." II. Sources of Supply. III. Production, Refining, &c. IV. Commercial Products of Petroleum, Shale-Oil, and Coal-Tar. V. "Flash-Point" and "Fire-test." VI. Testing, Flash-Point, Fire-test, &c. VII. Legislation relating to Petroleum (Historical). VIII. Existing Legislation relating to Petroleum. IX. Precautions necessary for Petroleum. X. Petroleum Oil Lamps. XI. Carbide of Calcium and Acetylene. Appendix III. is devoted to a series of "Directions for Drawing the Sample and preparing it for testing in Tropical Climates," &c., and Appendix XIII., to a "Suggested Model Code of Harbour Byelaws for Carbide of Calcium."

Manufacture of Paint. A practical Handbook for Paint Manufacturers, Merchants, and Painters. By J. Cruickshank Smith, B.Sc. Scott, Greenwood, and Co., 19, Ludgate Hill, London, E.C. 1901. Price 7*s.* 6*d.*

8vo volume, containing preface, table of contents, list of illustrations, 61 in number, 196 pages of subject-matter, and the alphabetical index. The work is divided into three parts, these being again subdivided, as follows:—I. (i.) Preparation of Raw Material. (ii.) Storing of Raw Material. (iii.) Testing and Valuation of Raw Material. (iv.) Plant and Machinery. II. (v.) Grinding of White Lead. (vi.) Of White Zinc. (vii.) Of other White Pigments. (viii.) Of Oxide Paints. (ix.) Of Earth or Staining Colours. (x.) Of Black Paints. (xi.) Of Chemical Colours—Yellows, Blues, Greens, Reds, and Lakes. (xvi.) Of Colours in Water. (xvii.) Of Colour in Turpentine. III. (xviii.) The Uses of Paint. (xix.) Testing and Matching Paints, &c.

Blowpipe Analysis. By J. Landauer. Authorised English edition by James Taylor, B.Sc., A.R.S.M. Macmillan and Co., Ltd., London. The Macmillan Company, New York. 1901. Price 4*s.* 6*d.*

Treatise on blowpipe analysis of small 8vo size. Contains 168 pages of subject-matter and an alphabetical index, and is supplied with numerous tables. The text is illustrated with 18 woodcuts.

Prizes.

Generator Gases Produced by Means of "Linde" Air.

Foreign Office Annual Series, No. 2671.

The "Verein zür Beförderung des Gewerbefleisses" in Berlin has offered a prize of 150*l.* (3,000 marks) and the large gold medal for the best work on the results of experiments with generator gases, produced by concentrated oxygen ("Linde" air). The work must be given in by November, 1901.

The new methods of producing heating gases, and t combustion with "Linde" air, methods which have l theoretically developed by Hempel, are to be investig experimentally with a view to their practical use. production of generator gases by means of "Linde" air heating or power purposes is the principal part of the ta

Trade Report.

TARIFF CHANGES AND CUSTOMS REGULATIONS.

(From the Board of Trade Journal.)

France.

Cotton Coated with Nitro-Cellulose.

A circular, dated the 26th June last, notifies that co tissues coated with a preparation the basis of whic nitro-cellulose, and used chiefly for carriage makers' w bookbinding, morocco dressing, and for covering furnit the said tissues being known as "pegamoid tis "kératrol," "corrioïde," "Victoria leather," "pantas &c., are not to be dutiable as waxed cloth, but as "tis of cotton, plain, dyed, according to class," under No. of the Tariff.

Germany.

Customs Decisions.

Metal Cement, consisting usually of square tablets of a mixture of sulphur and sand melted together, sulphur and some other duty-free mineral substance, for fixing iron railings, gratings, &c. into stone, is t admitted free of duty under No. 5 m of the Tarif "sulphur preparations not specially mentioned."

Japanese Ware made of Antimony.—Cups, tablets, trays, &c., made of a composition of zinc or lead antimony, intended as imitations of gold and silver art and silver-plated in parts, are to pay duty as silver-p goods of base metal under 20b 2 of the Tariff at the ra 175 marks per 100 kilos. (4*l.* 8*s.* 11*d.* per cwt.).

Mangrove Bark.—The bark of the mangrove tree, a substance used in tanning, is to be classed under No of the Customs Tariff, and admitted duty free when co from countries entitled to most-favoured-nation treatm

Barbados.

Opium Regulations.

The "Trade Act Amendment Act, 1900," provides such limited quantity as may be fixed from time to ti the Governor in Executive Committee, of opium, extr opium, cannabis Indica, and its extracts and prepar thereof, may be imported by chemists, druggists registered medical practitioners dispensing their own cines, "at the current *ad valorem* rate of duty." O &c., so imported must be kept by chemists, &c., on business premises, to be used in the preparation of med only, and must be accounted for to the satisfaction o Comptroller.

United States.

Customs Decisions.

Gold Powder. — So-called gold powder compo gold, silver, and copper, used in a solution of gelat water, is dutiable, as a pigment, at the rate of 30 pe *ad valorem*, under paragraph 58 of the Tariff.

Sheep Dip of Soluble Creosote.—A chemical com and medicinal preparation, composed of creosote o an alkali, described variously as "sheep dip," " creosote," &c., and chiefly used in bathing sheep to d parasites, and to prevent and cure scab and foot rot, to be dutiable at the rate of 20 per cent. *ad valorem*, paragraph 15 of the Tariff.

Ochre or Ochre Earth containing Lead.—Oc ochre earth containing lead is dutiable at the rate of cent. *ad valorem* as a colour, under paragraph 58 Tariff.

Glycerin in Iron Drums.—The usual coverings of subject to a specific rate of duty are perfectly free, dutiable by some express provision of law. Iron s are, and long have been, the usual and necessary ings of crude glycerin, and are therefore entitled e entry as such, crude glycerin being dutiable at the of 1 cent per lb., and refined glycerin at 3 cents

Netherlands.

Admission of Crystallised Acetic Acid for Butter and Cheese Factories.

)utch Royal Decree, dated the 5th ultimo, provides rystallised acetic acid for use in butter and cheese ies, is to be exempt, subject to certain restrictions, payment of Custom Duties on importation into id.

Russia.

rt Duty on Burned Magnesite and Magnesite Brick.

order of the Imperial Council, published in the m "Bulletin des Lois" of the 22nd June/5th July, es that burned magnesite and magnesite brick shall ject to Customs duty on importation into Russia at te of 15 cop. per pond (11¾d. per cwt.).

Greece.

Importation of Indigo.

reek Royal Decree, dated the 1st/14th June last, aws the prohibition against the importation of indigo reece, provided that it is shipped from ports from the importation of merchandise is not forbidden.

OFFICIAL NOTICES.

Carriage of Carbolic Acid.

Marine Dept., Bd. of Trade, Aug., 1901.

attention of the Board of Trade has been called to port of a Court of Inquiry recently held into the stances attending a casualty to the British ship nigan," in which three seamen lost their lives while ouring to secure some casks of carbolic acid which oken adrift, and been stove in. The Court were of that their death was due to absorption of carbolic rough the skin, and found that the barrels contain- acid, being what is known in the trade as second- arrels, were not up to the usual standard, and that, stowed properly and in the usual manner, they were fficiently secured from shifting by being tommed from the upper deck. The Court considered that care should be taken in connection with this acid; e casks in which it is shipped should be thoroughly and fitted to withstand the risk of bad weather; that ould be taken as to the manner and place of stowage, t in the event of bad weather the danger and risk minimised, and that all those who are called upon dle such cargo should be made aware of the special incurred by absorption of the acid through the skin.

I.—GENERAL.

ical Instruction and Chemical Industries in Germany.

F. B. Rose, H.B.M. Consul, Stuttgart. Foreign Office Miscellaneous Series, No. 561.

first portion of this report deals with the whole and history of German chemical instruction, and the portion gives some account of the several important ies, *e.g.* potassium salts for artificial manures, common lphuric acid, saltpetre, beet sugar, starch sugar, artifi- eetening substances, aniline dyes, alizarin and indigo, ves, cellulose, synthetic phenol, carbide of calcium, d carbon dioxide. Tables are given of the import sport of the products of the principal chemical ies, also of raw materials, and of pigments and glue, table is added of the capital and dividends of some of ger German chemical works.

The Consul gives the history of the foundation of the German universities, which commenced to devote attention to chemical technology about the middle of the 17th century. The advance in industries soon rendered the establishment of special technical schools necessary. At first polytechnic schools, and then technical high schools, were founded in the 19th century. The University of Göttingen introduced the first regular lectures on technical chemistry and technology, and it was here that the first German manual of technology was written. The circumstance that the technical high schools are mostly situated in the capitals of the German States, and are thus brought into immediate contact with the respective Governments, has without doubt greatly assisted in their rapid development. The courses of lectures and laboratory work in the Universities of Berlin and Heidelberg, Darmstadt, Karlsruhe, and Stuttgart are set forth in detail. Subjects for examination for various degrees in chemistry, cost to students, as well as information as to number of professors and assistants, and expenditure at the various schools, are given.

During the last 17 years the students at technical high schools have increased 206 per cent., those at the universities only 12 per cent. Of 15,838 students at Prussian universities in 1899, 18 per cent.; and of 5,115 students at Prussian technical high schools, 13 per cent. were foreigners, of which a comparatively small number were Englishmen. In 1899 the total expenditure of technical high schools was 117,315*l.*, of which the State provided 65,350*l.*, which corresponds to an expenditure per student of 23*l.* provided by himself, and 12*l.* provided by the State. According to Prof. Fischer, Germany possessed in the year 1897, 4,000 thoroughly trained chemists who had passed through the full courses of the universities or technical high schools. The number for the present year may be estimated at 4,500. This estimate applies to chemists residing in Germany; it does not include German chemists in foreign countries—numbering, probably, from 700 to 1,000—nor professors, lecturers, and assistants at universities and technical schools, and private chemists.

Instruction in inorganic and technical chemistry is better at the technical high schools than at the universities; for organic chemical industries of all descriptions, however, the preference must be given to the university chemist, whose knowledge of pure chemistry, especially organic, is much more extensive and profound. Dr. Rose remarks: "I have been, above all things, most favourably impressed by the signal capacity of the German student of chemistry for independent chemical research work, and it is beyond doubt that to it the great advance of German technical science and industry is due." At the outset the research work was principally devoted to minerals and inorganic substances, but in 1838 came the first organic synthesis by Wöhler, the pioneer of the uninterrupted series of triumphs achieved by Germany in organic chemistry; then the discoveries of Runge, Hoffmann, and Perkin, in aniline dyes; and finally, in 1865, the famous benzol ring theory of Kekulé. From this time the German chemical industries have advanced irresistibly, in spite of many grave internal crises, until they have attained at the present day the foremost place in the world. Expressed in figures, the importance of the German chemical industries at the present day is best shown by the fact that in 1897 the total annual production amounted to 47,391,132*l.* Dr. Rose devotes some 30 pages of his report to tables and comments on the production, values, imports, and exports of various chemicals, comparing the same over various periods of time, showing the enormous increase in exports and decrease in imports. The production of potash from potassium chloride, which, compared with other kinds of potash, had greatly increased since 1875, has now probably reached its highest point, owing to the electrolytic process, by means of which chlorine and caustic potash are now made directly from potassium chloride. This was clearly shown in 1898, when 600 tons less potash were manufactured from potassium chloride than in 1897. The manufacture of bromine from the mother liquor of the potassium chloride process was commenced about 1873. The progress made is shown by the following figures:—In 1873 the production was 20 tons; in 1890 the value of the excess of export over import of bromine and bromine salts was 50,000*l.*; in 1891 the production was 463 tons, valued at 55,000*l.*; in 1898 the excess of export over import of bromine was 95 tons, of bromine salts 303 tons, valued at 80,350*l.* Concurrently with this increase in the production of bromine and its salts in Germany the production in America has declined. In 1890 it was 673 tons of bromine salts, in 1897 about 221 tons, in 1898 about 207 tons.

The production of soda was 100,500 tons in 1882, of which 44 000 tons were ammonia soda. In 1900 the production was 250,000 tons, of which only 30,000 tons were Leblanc soda.

The production of sulphuric acid from the home production of iron pyrites, &c., and the imports from abroad for 1897 was 815,582 tons. Of the large quantities of acid manufactured, only about 25,000 tons are annually exported, the rest being consumed in Germany for various purposes.

Fuming sulphuric acid, used principally by the aniline dye works, was valued at 16,219*l.* for 3,963 tons in 1890, and 32,075*l.* for 14,000 tons in 1898.

In 1871–75, 3,175,852 tons of beet were treated in 327 works, yielding 270,898 tons of raw sugar, the percentage of sugar yielded being 8·53; whilst in 1899, 12,810,738 tons of beet were treated in 400 works, yielding 1,664,677 tons of raw sugar, a percentage of 13·00 of sugar yielded. The advance in the percentage yield of sugar is one of great significance as showing the influence of improved chemical methods.

It is not possible to ascertain the value of the aniline dyestuffs annually used in Germany, but the progress of the industry may be gauged from the value of the excess of the export over the import:—

Year.	Aniline Oil and Salts.	Aniline and other Dyes.	Alizarins.
	Tons.	Tons.	Tons.
1876		175	..
1880	345	1,640	3,781
1885	1,271	4,213	4.145
1890	3,411	6,695	7,892

The value of the excess of the export over the import for 1890 was:—

	£
Aniline oil and salts	341,150
" and other dyes	1,731,200
Alizarin	631,400
Total	2,703,750

For 1898 the total value of the manufacture of organic dyes in Germany was estimated at 6,000,000*l.*, whilst the excess of export over the import was 4,891,100*l.*

The approximate values created by the German dyestuffs industry were, in 1874, 1,200,000*l.*; in 1898, 6,000,000*l.* In considering these values, the fact must be taken into account that prices have declined more than one-half.

The discovery of a practical process of preparing artificial indigo has now taken place, and Germany instead of importing has begun to export it. This is the result of the work of many years by many German chemists:—Von Baeyer, 1880–82; Meyer, 1883; Heumann, 1890–96; further, Heymann and Knietsch. The German military authorities are now making experiments with artificial indigo for the uniforms of the German army, in which dark-blue greatly predominates. Should these prove successful, a further blow will have been dealt to the Indian indigo industry.

There are at present 57 large dyeworks in Germany, employing 20,000 workmen, and over 500 academically trained chemists. A further triumph of organic chemical research work has been the discovery and manufacture of artificial perfumes. They are at present manufactured on a large scale, but details of consumption and export are not yet available. Pharmaceutical products, the results of organic research work by German chemists, have created important values; for example, chloral, chloral hydrate, chloroform, acetanilide, antipyrin, and sulphonal. Germ produces about 70 per cent. of the world's total quin of which she exported about 65 per cent. In 1898, 3, tons of quinine bark, worth 112,000*l.* were imported, 197 tons of quinine valued at 325,550*l.* were exported.

In the dynamite, smokeless powders, and explo industries great advances have been made. In 1890, works in Germany were engaged in the manufactur guncotton; the production then was 573 tons, value 138,825*l.* The export of explosives, &c. in 1898 8,997 tons, valued at 908,250*l.* The Consul also g statistics of the cellulose, soluble glass, ultramarine, ste acid, glycerin, margarine, matches, oxalic acid, salicylic and paraffin industries, with tables showing values, imp and experts of the principal chemical products. synthetic production of phenol from benzol is noted. high price for phenol caused by the British prohibition the low price of benzol were instrumental in giving impetus to the endeavours of German chemists to disc a cheap working method of preparing phenol synthetic from benzol, and thus rendering Germany independe the import from the United Kingdom.

In the incandescent mantle, calcium carbide, and c pressed gas industries, Germany also takes the lead.

Dr. Rose, in conclusion, remarks that there are branches of human industry for the successful prosec of which chemical science in some form or other is n paramoun timportance. If the bearing of this esse fact were adequately appreciated, it would be realised those countries which possess the greatest number of, the best trained chemists will, if the further nece conditions are given, in course of time become the ri and most powerful. Having attained the highest pos in the world in chemical industries, Germany is not ab her efforts. On the contrary, it is universally recog that the efforts made hitherto must be increased, and carefully and judiciously applied, if the German che industries are to maintain and strengthen their positi the future.—C. T. T.

GERMAN PATENTS IN 1900.

Foreign Office Annual Series, No. 2671.

The annual report of the Imperial Patent Office that the number of applications for patents in 190 21,925, being 1,000 more than in the previous year these 8,784 patents were granted, 3,244 of this numb foreigners. Since the enactment of the Patent Law (1 285,372 applications have been made, and 117,977 p have been granted.

The total income of the office accruing from annc ments, prolongations, and annual payments, amount 5,016,282 marks (245,896*l.*), of which 116,055*l.* come the working expenses of the office, leaving a balan 129,841*l.*

CHEMICAL IMPORTS OF GENOA.

Foreign Office Annual Series, No 2681.

The principal imports as received from different co are as follows:—

Articles.	From	Qu
Copper and brass (raw)	United Kingdom	
	Germany	
	Other countries	
Dyestuffs	France	
	United Kingdom	
	Spain	
	Turkey	
	North America	
	Central America	
	British Possessions in Asia	
	Other countries	
China clay, chalk, and lime	Belgium	
	France	
	Germany	
	United Kingdom	
	Holland	

Articles.	From	Quantity.
		Tons.
clay, chalk, and —*cont.*	Tunis	2,087
	Algeria	22,941
	North America	29,340
	Other countries	4,544
....	Austria-Hungary	105
	France	89
	Germany	109
	Belgium	101
	United Kingdom	133
	Other countries	82
and caustic soda...	Belgium	97
	France	6
	Germany	62
	United Kingdom	5,014
	United States	68
	Other countries	62
....	United Kingdom	5,464
	British Possessions in Asia	12[illegible]
	North America	3,131
	Central America	5,311
	Australia	193
	Other countries	864
....	Belgium	312
	Germany	1,107
	United Kingdom	436
	Holland	6,417
	British Possessions in Asia	3,007
	Other countries	2
lastic, gutta-percha,	France	11
	Germany	43
	United Kingdom	354
	Other countries	147
nd resins..........	France	809
	Germany	131
	United Kingdom	977
	Spain	145
	Russia	329
	British Possessions in Asia	138
	North America	6,111
	Other countries	214
n, zinc, &c.........	Spain	1,417
	British Possessions in Asia	1,022
	Other countries	1,810
s (phosphates), &c.	France	5,107
	United Kingdom	2,094
	Other countries	712
d cocoa-nut oils...	France	1,464
	United Kingdom	578
	Other countries	2

COMMERCIAL MUSEUM AT SAN FRANCISCO, CAL.

Foreign Office Annual Series, No. 2673.

Pacific Commercial Museum, on the lines of the on at Philadelphia, was organised in October last.

bjects and scope of the museum are as follows :—

gather and give information that will assist in ing commerce with foreign countries, also to establish ection with the Philadelphia Commercial Museum, an Asiatic Association, and other like institutions by information may be obtained from the rest of the which would be of advantage to the producers, cturers, and merchants who may be members of this on.

collect and exhibit all those raw products—or partly ctured products—of foreign countries which might l in American manufactures.

collect and exhibit the various raw and manufactured imported into the different countries with which it d to extend and develop trade.

make, with the aid of the University of California, examinations, analyses, and tests of these products, ublish such information concerning them as may general understanding of their usefulness.

acilitate, by such other means as may be deemed and proper, the foreign trade of the United

TRADE OF PORTLAND, OREGON.

Foreign Office Annual Series, No. 2666.

principal imports from Germany were: Cement, ; chinaware, 2,090*l.*; essential oils, 620*l.*; glass-8*l.*; mineral water, 638*l.*

Belgium was received: Cement, 8,153*l.*; window 304*l.*; chemicals, 406*l.*

The principal articles of direct import were: Earthenware, 7,703*l.*; cement, 1,266*l.*; coal, 136*l.*; spirits, 1,224*l.*; malt liquors, 2,750*l.*; salt, 997*l.*; sulphur, 314*l.*; soda ash, 292*l.*; other salts of soda, 160*l.*; fire-bricks, 826*l.*; clays, 234*l.*; fixed or expressed oils, 1,328*l.*; paints, 622*l.*; chemicals, 570*l.*

Coal tar was imported from Germany during the year, but the quality was not satisfactory, and orders are being filled for British at a higher price; the trade is limited.

In malt liquors the trade increased about one-third and all was of British manufacture.

In fire-bricks there is a steady trade.

CHEMICAL TRADE OF CUBA.

Foreign Office Annual Series, No. 2674.

The imports of drugs and chemicals show a falling off in 1900 of nearly 15 per cent. The principal sub-divisions are :—

Drugs and medicinal preparations, worth 288,000*l.*, chiefly from the United States and Spain, and in a less degree from France and the United Kingdom.

Oils, of all kinds, worth 232,000*l.*, over 60 per cent. of which amount represented vegetable oils, almost exclusively from Spain, the remainder being animal and mineral oils from the United States. Paints worth 44,000*l.*, were imported principally from the United States and the United Kingdom in nearly equal quantities. The falling off referred to above occurred almost entirely in oils imported from the United States.

In drugs and chemicals the returns for 1900 are not so satisfactory, showing a falling off of over 25 per cent. in the British imports, which were supplanted to that extent by French and Spanish goods.

TRADE OF UNITED KINGDOM WITH AFRICA.

Bd. of Trade J., Aug. 1, 1901.

British West Africa.

Value of Imports into United Kingdom from—	1899.	1900.
	£	£
Nuts for oils	365,000	268,000
Palm oil	855,000	870,000
Caoutchouc	346,000	262,000

French Africa.

Caoutchouc forms 71 per cent. of the imports from French West Africa.

German Africa.

The total value of imports from German Africa, consisting of palm oil and caoutchouc, amounted in 1900 to 95,000*l.*

RETURN OF PRINCIPAL ARTICLES OF EXPORT FROM JAVA AND MADURA DURING THE YEARS 1897—1900.

Foreign Office Annual Series, No. 2665.

Articles.	Quantity.			
	1897.	1898.	1899.	1900.
Sugar (all kinds) Tons	506,237	672,680	796,324	712,210
Hides .... Pieces	435,290	504,058	499,703	522,038
Nutmegs .... Lb.	81,600	182,784	241,400	231,472
Indigo .... „	2,107,921	2,555,133	1,784,553	1,537,149
Gum damar... Cwt.	28,347	31,379	36,137	30,284
India-rubber... Lb.	59,840	67,728	78,880	213,112
Tin—				
Private ..... Tons	5,436	5,194	5,248	6,045
Government „	8,137	8,934	11,359	14,410
Cinchona bark—				
Private....... Lb.	7,901,502	11,273,877	11,698,871	11,349,577
Government.. „	597,224	849,433	715,531	719,141
Sulphate of quinine Oz.	..	468,800	301,600	766,400
Gutta-percha... Lb.	3,128	25,704	146,744	646,544
Coprah .... Tons	5,541	2,467	45,331	34,637

TRADE OF BEIRUT (SYRIA) IN 1900.

Foreign Office Annual Series, No. 2662.

Demands for bitumen from America increased exports and 4,000 cases were shipped, against 2,100 cases in 1899.

As regards imports, 1,500 cases of window-glass came from Belgium and cost 12*s.* per case. Zinc came from Vieille-Montagne at an average price of 5*d* per lb. Caustic soda came solely from the United Kingdom, 150 tons were imported at 9*l.* per ton. Common glass-ware came from Austria-Hungary, and found a readier sale than the better French glass. Aniline dyestuffs from Germany caused a decrease in the indigo trade, as only 600 chests were imported as against 980 in 1899. Earthenware came from Belgium and Germany, and the higher qualities from France.

Linseed oil (400 barrels of 3 cwt. each), turpentine (30 barrels), and dry colours (200 barrels), came from Liverpool. White lead (1,000 barrels of 1 cwt. each), came from the United Kingdom, and dry colours (110 barrels) from Belgium.

In the Tripoli district there was an increase in alum, copper, copper sulphate, china, and glassware from the United Kingdom.

TRADE OF WUCHOW (CHINA) IN 1900.

Foreign Office Annual Series, No. 2658.

Import of oil was checked by a good crop of ground-nut oil, which has been scarce for some years. Aniline dyestuffs and foreign medicines showed a slight increase, and there was an increasing trade in aerated waters, cod-liver oil, drugs, and scented soap.

The most important exports were star anise seed (31,952*l.*), wood-oil (22,787*l.*), liquid indigo (9,662*l.*), antimony (1,271*l.*), and resin (202*l.*).

The antimony ore is found in surface deposits near Fenchow, and there are also large deposits at Sailum on the Kweichow border.

II.—FUEL, Etc.

COKE MANUFACTURE IN THE UNITED STATES.

Foreign Office Misc. Series, No. 562.

The Census Office at Washington has recently published a report, prepared by Mr. Edward W. Parker, Expert Special Agent, on the manufacture of coke in the United States.

Mr. Parker says (1899) that since taking the last census there has been a development of coke manufacture in the United States as to which no comparison can be made with previous statistics. This is the introduction of the retort or by-product oven, whereby the volatile constituents of the coal, other than gases consumed in the distillation process, are recovered. These constituents are wasted in the ordinary bee-hive ovens.

Three classes of by-product ovens, the Semet-Solvay, the Otto-Hoffman, and the Newton Chambers, are now in successful operation in the United States. The Newton-Chambers ovens are bee-hive ovens with apparatus for receiving the tar and ammonia contents of the coal, but consuming the gas during the process.

The first ovens of the by-product class to be constructed in the United States were built at Syracuse, New York. They were completed in 1893, and produced in that year 12,850 short tons of metallurgical coke. At the close of 1899 the number of by-product ovens in existence in the United States 1,020, and the amount of coke produced by them amounted to 906,534 short tons.

The product of coke in 1899 from all the ovens included in this report amounted to 19,640,798 short tons, valued at 34,633,418 dols., as compared with an output of 10,008,169 short tons, valued at 16,494,454 dols. in 1889, and with 2,752,475 short tons, valued at 5,359,489 dols. in 1880. The output in 1899 increased 9,632,629 tons, or 96·2 per cent. over that of 1889, and was more than seven times that of 1880. The value of the coke produced in 1899, as compared with that of 1889, shows an increase of 110 per cent., and as compared with 1880, an increase of 546·2 per cent. The average price per ton obtained in 1899 11 c. (or 6·7 per cent.) higher than that obtained 10 ye before, but 19 c. (or 10·8 per cent.) less than that obtai in 1880. The average yield of coke per oven in 1899 417 short tons, while in 1889 it was 306 tons, and in 18 283 tons. While the production has increased 96·2 cent., the number of active ovens has increased only 4 per cent.

There has been an increase in the percentage yield of coal in coke. This has been partly due to the introduct of the by-product ovens, which yield a larger percentag coke than the ordinary bee-hive ovens, partly to impro practice in manipulation of the bee-hive ovens, and pa to the preparation of the coal itself, by washing or otherw before being charged into the ovens. In 1889 the amo of coal washed before being charged into the coke ov was 968,329 short tons, whereas in 1899 the total amoun coal washed was 4,276,517 short tons.

The value of the coal tar, ammonia, and surplus obtained as by-products in retort or by-product oven 1889 amounted to 952,027 dols., and the total value of products for that year to 35,585,445 dols.

By far the greater portion of the coke manufacture the United States is made in the ordinary bee-hive ov of which there were 45,680 out of a total of 47,142 ac ovens in 1899.

The amount of coal used in 1899 for making coke creased 90·9 per cent. as compared with 1889, whereas value only increased 65·2 per cent.

Number of Ovens and Quantity and Value of Coke

——	1899.	1889.	18
Ovens, active	47,142	32,659	
Coal used, short tons	30,157,829	15,795,087	4,36
Coke produced, short tons	19,640,798	10,008,169	2,75
Total value of coke at ovens in dollars.	34,633,418	16,494,454	5,35
Average yield of coke per oven, short tons.	417	306	
Value of coke at ovens, per ton, in dollars.	1·76	1·65	
Yield of coal in coke, per cent	65·1	63·4	

Practically all the coal used in the Connellsville re of Pennsylvania (52·9 per cent. of the entire coke pr of the United States) is unwashed run-of-mine, the being charged directly from the mine, without prepara into the ovens. The amount of unwashed slack coal in 1899 was 57·6 per cent. more than that used in whereas the amount of washed slack used in 1899 was five times as much as that used 10 years before, c increase of 415 per cent.

There were 22 States in which coke was produce 1899, as against 18 States in 1889, and nine in 1880.

Comparative Summary: Relation of Coal Used to C Produced.

——	1899.	1889.	1
Total coal used, in tons	30,157,829	15,795,087	4,3
Total cost of coal, in dollars	18,355,252	11,110,700	2,7
Average cost of coal per ton, in dollars.	0·61	0·70	
Tons of coke made	19,640,798	10,008,169	2,7
Value of coke made, in dollars	34,633,418	16,494,454	5,
Average value of coke per ton, in dollars.	1·76	1·65	
Quantity of coal per ton of coke, in lb.	3,070	3,156	
Average cost of coal to ton of coke, in dollars.	0·93	1·11	0

The amount of coal used in 1899 was 30,157,82 yielding 19,640,798 tons of coke, indicating a loss in by the coking process of 34·9 per cent. The amo coal necessary to make a ton of coke was less in 188 in 1880 and was reduced in 1899, as compared with indicating a greater efficiency in the coking operation

By-Products, 1899.

Description.		Quantity.	Value.
			£
....	Lb.	194,687,330	207,952
onium sulphate	„	11,984,931	330,921
onia liquor	Galls.	1,572,325	180,642
lus gas sold	Cb. ft.	1,171,942,697	225,022
ssified	..	..	7,490
Total		..	952,027

cording to the American Iron and Steel Association Connellsville region shipped, during the year 1900, 6,234 net tons of coke, for which the operators ved an estimated average price of 2 dols. 70 c., making alue of the product at the ovens reach the enormous egate of 27,448,932 dols. This is one-third more than mount estimated to have been received for the product 399, though in volume it was practically the same, the it that year being 10,129,764 tons. The value of the output in 1900 is double the value of that of 1898, f any other year in the history of the Connellsville a.

e price of furnace coke ranged from 2 dols. 50 c. dols., and foundry coke from 2 dols. 50 c. to 4 dols.

ring the 10 months ending April last the amount of exported was 301,305 tons, valued at 1,160,717 dols., lols. 85 c. per ton. For the corresponding period last the amount was 302,926 tons, valued at 1,035,286 dols., lols. 41 c. per ton.

Coal in Washington State, U.S.A.

Foreign Office Annual Series, No. 2666.

e following information is taken from the report of C. F. Owen, State Inspector of Coal Mines:—The n vein in Kittitas county was opened in 1886, and produced 5,000,000 tons. It is estimated to contain 0,000 tons.

e Puget Sound coal basin covers an area of about square miles, and there are several distinct districts lds within it, the character of coal differing in each and varying from a lignite to rich bituminous coking

e representative analyses vary as follows:—

Lignites, moisture, 8 to 12 per cent.
Volatile hydrocarbons, 35 to 45 per cent.
Fixed carbon, 30 to 45 per cent.

bituminous lignites, or steam coals, in which the re is reduced to 5 per cent. or less, and the fixed ns range from 40 to 50 per cent., will evaporate 7 lb. of to 1 lb. of coal.

bituminous coking coals are represented as fol-—

Moisture, 1 to 3 per cent.
Volatile hydrocarbons, 25 to 35 per cent.
Fixed carbons, 50 to 60 per cent.

se coals make a variety of coke equal to Connells-

lignites are hard; bituminous lignite softer, but The bituminous coking coals are soft and require ng.

Liquid Fuel in Java.

Foreign Office Annual Series, No. 2665.

Shell Transport and Trading Company, Limited, are ng at Sourabaya an installation for the handling of fuel. The tank will have a capacity of 4,000 tons, e works will be connected by a double pipe line with gs in the roads and the oil pumped direct from tank rs to the tanks on shore.

mers requiring liquid fuel may either be moored ide special buoys and have the oil pumped direct e bunkers, or they can have it delivered alongside in s.

Patent Fuel at St. Malo.

Foreign Office Annual Series, No. 2670.

The existing works of the "Société des Agglomérés" seem to have stopped work, the Western Railway importing patent fuel from the United Kingdom to a great extent, to supply the 60,000 tons required annually.

Alcohol *v.* Coal in Germany.

U.S. Cons. Reps., Vol. LXVI., No. 250, *July* 1901.

According to a German technical publication, alcohol cannot be profitably used for making steam. It is stated that one kilo. of coal, costing 2½ pfennigs, produces from 7,000 to 8,000 calories, while one kilo. of alcohol, valued at 22 pfennigs, produces only 6,000 calories. In spite of the number of good alcohol lamps on the market, alcohol is only used where a very strong light is necessary without reference to economy. Only in one instance is alcohol preferable to coal or benzine, and that is in motors run on the explosion principle. Alcohol leaves no residue in the motor and from 23 to 24 per cent. of its heating power is utilised, while steam utilises only 13 per cent., and benzine, petroleum, and gas from 14 to 18 per cent. As the number of minor establishments requiring relatively small power is constantly growing, alcohol motors are in demand. The automobile industry has lately given preference to alcohol motors, especially in the construction of freight automobiles. The price, in Germany, of alcohol for motor purposes is at present 4.80 dols. for 110 quarts.

Calcium Carbide in Germany.

Foreign Office Annual Series, No. 2671.

The calcium carbide industry is suffering from a crisis brought about by over-production. Prices have steadily decreased, so that all the factories in Austria-Hungary, Italy, Switzerland, Scandinavia, and Germany are obliged to stop working for some years. Calcium carbide is principally used for the manufacture of acetylene gas. The production has amounted to 50,000 tons, of which only 12,000 to 13,000 tons are required for the production of acetylene. A few firms who have binding contracts to deliver calcium carbide are the only firms working. These are the works of the Aluminium Industrie Gesellschaft, in Neuhausen, in Switzerland. This company has a two years' contract with the Prussian Government, who require calcium carbide for producing acetylene gas for the illumination of railway carriages. A number of accidents have lately occurred, which it is feared will somewhat hinder the development of acetylene gas.

Calcium Carbide in Norway.

Foreign Office Annual Series, No. 2659.

The British Vice-Consul at Skiensfjord reports that the manufacture of calcium carbide has been started on a considerable scale in that district, but that the industry is suffering from the evils of over-production. In consequence of the crisis thus produced, the German, Swiss, Austro-Hungarian, Swedish, and Norwegian carbide manufacturers have made an agreement, which nearly every maker of importance has signed, whereby they have bound themselves to stop all production for the present until stocks are reduced. The united production has been about 50,000 tons yearly, and as the consumption up to the present has only reached 12,500 tons, the position can easily be understood. In France, Italy, and other countries, where the above-named agreement has not been signed, the consumption of calcium carbide is less than the production, so under such circumstances it has, of course, been impossible to maintain prices.

Acetylene for Lighthouses.

Foreign Office Annual Series, No. 2671.

The use of acetylene by the Hamburg authorities for the illumination of river lighthouses has been attended with success. The lighthouse of Groden, near Cuxhaven, has been hitherto lighted with petroleum, but the light was not sufficiently intense. Experiments with acetylene have been eminently satisfactory.

ENRICHED WATER-GAS.

Foreign Office Annual Series, No. 2671.

The generation of water-gas and its mixture with coal-gas is attracting much attention in Germany. In the United Kingdom and America water-gas has been already largely made, because the naphtha refuse necessary for its enrichment can be cheaply obtained, but in Germany this substance is subject to a high import duty. As a substitute to increase the illuminating power, recourse was had to benzol. Benzol is, however, only produced in small quantities on account of the low price obtainable for it, and the comparatively high cost of its production. There is a prospect of better prices being obtained, as a Westphalian and Upper Silesian syndicate has been formed for that purpose. The disadvantages, however, under which this industry laboured, led the Union of Gas and Water Experts, at their 40th annual meeting, to come to the conclusion that benzol could not be depended upon as a substitute for naphtha refuse; they therefore advocate the free import of this substance as indispensable for the production of enriched water-gas.

BLAST FURNACE GASES UTILISATION IN GERMANY.

Foreign Office Annual Series, No. 2680.

Already in the years 1885–6 top-gases were made use of in Germany to heat boilers of blast furnaces. Soon after they were successfully used in cokeries; during the last years, cokeries were nearly invariably erected in connection with blast furnaces and a rational working at a minimum cost was obtained by making use of the otherwise valueless top-gases.

The first top-gas motor in Germany was erected in 1898; it was of British make and had 250 horse-power. The power developed was utilised to start a dynamo of the Berge-Borbeck Mine, where calcium carbide was produced. This motor showed many deficiences, and a rational working was impossible. It had to be started by a small coal-gas motor; its primings were irregular in number and power; the ventilation could not be controlled, &c. Besides, the waste gases were laden with dust carried with the air current, and the result of which on the sliding parts resembled that of emery.

Dr. von Otto first tried the purification of blast furnace gases, and his cleaning apparatus are now being manufactured by the International Hochofengas Company, at Dortmund, and the Maschinenfabrik, Breuer and Company, at Höchst-on-Main. The top-gases are now cleaned by sawdust hurdles before reaching their destination. The construction of these purifying apparatus is uncommon, because, owing to the minimum pressure of top-gases, it would be impossible to pass them by compression, and again the use of gas suckers would much increase the cost of plant and possibly render it unremunerative. These apparatus purify so successfully that the contents of dust in blast gases is reduced to only 3 per cent.

The top-gas motors, too, have been much improved by the Deutz Gasmotor Factory at Deutz and others, who within the last year successfully constructed motors of 1,000 horse-power and lately even such of 1,500 and 2,000 horse-power. These have proved very serviceable for all intents and purposes. The demand for these large machines corresponded to the available amount of top-gases at the various concerns and which it was intended to exhaust as cheap energy. In the United Kingdom the energy developed by the Thwaite-Gardner system is utilised for the generation of electric light and power; in Scotland for electric lighting, and in Germany for the production of calcium carbide.

The top-gas motor is also used to drive blast engines. This requires the greatest precaution, because, when top-gases gather in quantity difficulties still present themselves to effect its uninterrupted working, which is absolutely indispensable. Blast furnace gas has not yet been altogether successfully analysed with regard to combustibility and the explosive and effective power; this will have to be the next task, for as long as the iron production is the main object and the utilisation of the blast furnace gas remains se dary, an installation will be necessary which will pay regard to them.

When the production of iron shall have become incide the raw material will be so chosen as to ensure a good furnace gas and the by-product will be sold for what worth.

ENRICHED AIR.

Eng. and Mining J, *Aug.* 10, 1901.

A recent issue of *Le Genie Civil* publishes a short describing a machine for increasing the oxygen co of air before using it in furnaces. The machine is sa be due to M. Mazza, an Italian engineer, and is mer centrifugal separator. On passing air into this centri machine the oxygen molecules, being heavier than nitrogen ones, tend, it is stated, to concentrate at periphery of the machine, and on drawing off the air a surface it is found to be considerably richer in oxygen normal air. In fact the oxygen content can, it is sa readily brought up to 26 per cent. of the total. Co air, it will be remembered, contains but 23·2 parts by w of oxygen. The centrifugal machine used acts at the time as a blowing fan, the enriched air being deli under a slight pressure, while the impoverished air is d off continuously from near the centre of the ma About 2 h.p. are needed, it is stated, to operate a sep capable of delivering 18,000 cb. ft. of enriched air per This enriched air has been used for supplying the fur of a boiler, and has led, it is stated, to an increase of evaporated per lb. of coal from 9·5 lb., with natural dr to over 12 lb. with the Mazza apparatus.

III.—TAR PRODUCTS, PETROLEUM,

TAR PRODUCTS AT LYONS.

Foreign Office Annual Series, No. 2668.

In many articles the Lyons producers not only hold own on this market, but export largely. On the band, in many others, the foreign competition is great. The most important competitor is German its imports are increasing, not only to the detrim French producers, but also of British trade.

The products in which this competition is the str are hydrocarbons, benzol, toluol, xylol, carbolic acid, colours, and a certain number of intermediate pr derived from coal-tar, such as naphthol, naphthyl toluidine, benzidine.

THE SHALE-OIL WORKS AT OREPUKI, NEW ZEAL

R. Dunlop. N.Z. Mines Record ; through En and Mining J., July 13, 1901.

A plant laid down at Orepuki is of the latest and improved type. The shale-field has been tested over area and found to be nearly uniform in thickness, and more oil than the average shale in Scotland. Th tunnel has been put down over 900 ft. at a decli 1 in 4, and is in the centre of a basin, so that the sh water will go to the bottom without much expendi power. When the shale comes out of the mine, it into a breaking machine, and when broken is rai elevators and put into the hoppers on top of the The shale in the retort is kept in continuous mot machinery at the bottom, and when exhausted run at the bottom. By means of a fan the oily va drawn from the retorts through a series of con where the gases are cooled, and the liquid portion (water) runs into a large receiving-tank. The gas is on through two large towers, where it is first scrubb water, which robs it of its ammonia gas, and then which robs it of its spirits. The gas then goes o retorts, where it is used for firing. Sulphate of a is extracted from the water which comes over alo the crude oil, and the crude oil is pumped up into tank, separated from any water which it may cont then run into the still. The still is then heated up, oil-vapour passes over, and is again condensed and ceiver. During the distillation steam is passed through still to bring over the oil at a lower temperature, and erve the paraffin. After the distillation is finished there coke left in the still, which is used for making moulds, king, and for burning in fires, as it gives a good heat practically no ash. The oil in the receiver is then ted in the usual way for the production of oils and ffin wax.

IV.—COLOURING MATTERS, Etc.

Indigo Competition in France.

Foreign Office Annual Series, No. 2668.

digo.—The struggle between natural and artificial o continues to excite interest. The British Consul-eral at Marseilles reports that the latter is killing the er on the French market. The artificial dye already lates prices. The Badische Company have for two s been making indigo near Lyons for local consumption, the Höchst Farbwerke are manufacturing synthetic o by another process in the same city. Artificial o is classed for Customs duty with natural indigo, and goods dyed with it are not required to be declared as , they are sold at similar prices to goods dyed with al indigo. Lyons dyers of cotton and woollen goods Lyens dealers in indigo say that natural indigo has ousted from many dyeworks, especially since artificial o has been prepared by crushing. Small dyers favour etic indigo, because they can buy small quantities as red, and prices do not violently fluctuate. But, as the able dye gives more solidity to the cloth, it is still to be used for military uniforms. It is stated that etic indigo, which is delivered free at consumers' for 6*s.* 4*d.* per lb., costs the manufacturer only 3*s.* 7*d.* . Dr. Calmette, of Lille, is said to have patented a ss for extracting indigotine from vegetable indigo up rice the quantity produced by the more primitive ds. It is curious that the Bengal Chamber of Com- have recently had to ask the Havre Chamber to h a rule under which indigo tendered in that im-nt terminal market must be guaranteed to be manu-ed by the "old" process—a serious restriction in of the many new processes recently introduced. The t has been complied with, and certificates will not be d after April 1 next.

Indigo in Germany in 1900.

Foreign Office Annual Series, No. 2680.

struggle between natural and synthetic indigo has e keener, as both parties are trying to reduce the cost duction.

"Badische Soda und Anilin Fabrik" has lately ht out a loan of 12,000,000 marks, with the avowed of increasing the production of synthetic indigo and educing its cost price. It can now supply one-sixth world's demand.

"Höchster Farbwerke," too (at Höchst-on-Main), are r extending their synthetic indigo business. During t year, both natural and artificial were used in equal ties throughout Germany and Austria-Hungary. rice of both to-day is about 10 per cent. cheaper than last year, the price of the artificial following but idding the price of the natural article, for it is the of the manufacturers of artificial indigo that its hould always remain a trifle below the price of the l dyestuff.

production of synthetic indigo in Germany is said correspond to the average yield of about 250,000 n India, but the German production is independent nate, famine, and other accidents of nature.

Indigo in Java.

Foreign Office Annual Series, No. 2665.

Vice-Consul Dowie writes under the heading of as follows:—

e total export during 1900 amounted to close upon 00 lb., mostly from Middle Java. The bulk of this was bought by exporters for the Russian, German, Italian, and Japanese markets.

"The export to Europe declined as compared with previous years, whilst Japan took a much larger quantity than usual, at prices above what Europe was willing to pay. Half the crop found its way to Japan, and owing to the high prices paid in that market the results to planters were much better than usual.

"The production in Europe of artificial indigo progresses with large strides and is coming more and more in favour with consumers, while the future of natural indigo is becoming yearly darker.

"Even now it can be foreseen that prices this year will rule much below those of last year, quotations both from Japan and Europe showing a sharp decline."

V.—TEXTILES.

Pine Fibre Industry in Oregon, U.S.A.

Foreign Office Annual Series, No. 2666.

A new industry is the manufacture, from pine needles, of a fibre used in mattress making. There are two small factories engaged in this, producing about 2 tons per day, and the business seems to be growing. The needles are boiled, beaten, and put through some secret process, whereby a brown curly fibre with a balsamic odour is produced; there are also by-products, one resembling turpentine and another a powder resembling snuff. A fourth product is used as a wood stain.

VII.—ACIDS, ALKALIS, AND SALTS.

Alkali, &c. Works Regulation Bill.

In the House of Commons, on August 14, the order for this Bill was discharged, and the Bill was withdrawn.

Corundum in Canada.

Bd. of Trade J., Aug. 15, 1901.

The United States Consul-General at Montreal, in a recent report, writes that corundum was, until recently, very little used, as the expense of its mining and its rarity kept its price too high for general use. The deposits discovered in Ontario are, however, of such value and are so easily worked that it is expected it will henceforth be placed on the market at a cheaper price.

These deposits lie north of Kingston, and cover a large area, and occur along with mica and other substances. It is tamped up into powder and separated from the rest of the rock by washing, its weight being much greater than that of the other constituents of the rock.

A company is starting to work some of the deposits purchased from the Government. The specimens so far tested have proved rich, and the extent of the deposits is probably large, though that has not been thoroughly investigated.

It is stated that corundum of a very high grade, *viz.*, 95 per cent. pure, is now being produced at Combermere by the Canada Corundum Company. Manufacturers have heretofore been satisfied with an 80 per cent. product.

The Canadian deposit is found in the Apalachian Mountains which run through the eastern townships of Quebec, and as the rock formation is the same as in North Carolina, there is every reason to believe that corundum exists there also.

Borax in Oregon.

Foreign Office Annual Series, No. 2666.

In the county of Harney, Oregon, borax has been mined for some years past. It costs between 12*s.* and 16*s.* per 100 lb. to produce and the production is alleged to be about 80,000 lb. per month.

Bauxites from the Var, France.

Foreign Office Annual Series, No. 2668.

Germany has hitherto been the principal buyer of both red and white bauxites, the former containing a less proportion of "alumina." These south of France bauxites have been somewhat neglected, because they have hitherto required more expensive treatment than the bauxites of Ireland and of the United States of America, which had held the British Markets. Recent discoveries have cheapened the process of extraction of alumina, and will bring the French bauxites on the market.

CARBONIC ACID IN GERMANY.

Foreign Office Annual Series, No. 2671.

Twenty-five firms, owning 39 carbonic acid works, have formed themselves into the Deutsche Kohlensäure Gesellschaft. This union does not include the largest works in this branch (Sondre), which alone are capable of supplying all Germany; several other works are also excluded. These works not included in the union are able to do much more than supply the home demand, so that competition remains as sharp as before. A limitation of production for those works which produce artificial carbonic acid (from coke or lime and coke) is not advantageous, as their only chance of existence lies in producing to the utmost of their capacity. The Württemberg industry for the production of liquid carbonic acid is attracting more and more attention. This industry has developed itself in a small valley (Eyachthal) on the Upper Neckar.

The carbonic acid there wells up from the earth, mixed with steam, so that a chemical purification is unnecessary. The carbonic acid is simply carried through pipes to a drying apparatus, freed by calcium chloride from steam, and then liquefied by pressure. The machinery for this is driven by the falls of the Neckar. After liquefaction the carbonic acid is filtered through charcoal, and filled into bottles previously tested to bear a pressure of 3,620 lb. per sq. in. (240 atmospheres). The company possesses a store of 30,000 iron bottles, and has four special railway wagons, each capable of holding 10 tons, by means of which the carbonic acid is transported direct, and only drawn off into bottles at the place of destination. An immense quantity is thus sent to Berlin, Vienna, and Zurich. It should be mentioned that though the railway takes 10,000 litres (2,200 gallons) at a time in one single vessel not a single accident has yet occurred.

POTASH IN GERMANY.

Foreign Office Annual Series, No. 2671.

The impetus given to the chemical industry in Germany is shown by the increase in the potash industry, which, with its various works, represents a capital of 400,000*l.* The constantly increasing use of this substance in agriculture might seem to protect it from over production; but fresh borings are yearly being made. At the general meeting of the potash works at Aschersleben it was pointed out that a continuous addition to the number of works would in the end endanger the prospects of the trade. It remains to be seen how far the new works will be able to exist, as for the development of the industry considerable capital is necessary.

KELP EXPORTS, STAVANGER (NORWAY).

Foreign Office Annual Series, No. 2659.

The burning of seaweed into kelp for use in the iodine manufactories is carried on along the coast of Jæderen and at the Karmö. The export of kelp from Stavanger has been as follows:—

Year.	Quantity.	Year.	Quantity.
	Tons.		Tons.
1891	422	1896	1,054
1892	862	1897	2,749½
1893	1,045	1898	1,147
1894	1,056	1899	1,687
1895	1,161	1900	1,709

CHEMICALS AT GENOA IN 1900.

Foreign Office Annual Series, No. 2681.

Chemicals consisting of acids, oxides, sulphate of soda, and other sulphates and products, principally from France and the United Kingdom, as well as from the United Sta increased from 286 tons in 1899 to 634 tons in 1900.

VOLCANIC PRODUCTS OF THE SOLFATARA (NAPLES)

Foreign Office Annual Series, No. 2678.

In the Solfatara certain chemical industries are car out on a large scale by natural agencies. The volcan situated near Naples, above the port of Pozzuoli. crater has been in eruption within the historical period, still continues to emit jets of steam charged with sulphu vapours from fumaroles among its rocky walls. The l continued passage of hot acid fumes through the ordi volcanic rocks constituting the walls of the crater, during the course of time so acted upon them that in s places they have become rocks of an entirely new chara and suitable for a variety of useful purposes.

Many of the products of the Solfatara have been lected and employed for various purposes for a long past. They may be conveniently classified under the t heads of solid, liquid, and gaseous products.

Solid Products:—1. *Lava.*—Quarries have been op up in the lava flow, and being close to the sea are extensi worked for stone employed in submarine constructions.

2. *White Earth or "Bianchetto."*—Another produ the Solfatara is the "bianchetto," a white earth w consists largely of china clay impregnated with sul The earth is submitted to a process of lixiviation water—the heavier particles sink to the bottom while lighter remain in suspension in the water, forming a m fluid. This is run off into a second tank, where its tained particles are slowly allowed to precipitate as a w paste. This paste is then scraped together into lum the size of cottage loaves, which are slowly dried exposure to the air. In this form the product is sol make stucco, and also to mix with common colo matters. From the first precipitate of the heavier part a hydraulic mortar may be madu by a proper admi of lime.

3. *Grey Earth or "Piombina."*—This earth is foun a depth of about 13 yards below the floor of the crater, is, therefore, moistened by the mineral water (see bel which is found at that depth. The name piombina is g to this earth on account of its grey colour due to presence of a small quantity of iron salts. When the is left in contact with air and raio for some days it los grey colour and becomes white like the bianchetto alr mentioned. This is due to the oxidation of the iron and its subsequent solution in water. The piombina to a less degree the bianchetto, are used for the manufa of alum.

4. *Sulphur Earth.*—The earth in the imme neighbourhood of the fumaroles is strongly impreg with sulphur and arsenic, occurring as minute cry interspersed throughout the porous earth. In the seventies it was discovered that this earth has a beneficial action on the vine by destroying or keepin insect pests, in making the foliage more healthy, an increasing the weight of grapes produced. Its effica combating the phylloxera is as great as its powe extirpating other insect pests.

5. *Mineral Specimens.*—The sulphur hardly occu sufficient quantity to render its separation successful the commercial point of view, but the discovery of l deposits is possible.

Chief among the other minerals are kaolin or china free silica, alumina, and barium sulphates which occ the form of halotrichite, voltaite, coquimbite, gypsum copiapite.

Liquid Products.—The Fontes Leucogæi, known as "I Pisciarelli," are mineral springs containing sulp of aluminium, calcium, and iron, with sulphurous aci sulphuretted hydrogen in solution. Of late years Pisciarelli have ceased to flow, but by sinking wells depth of 6 fathoms in the floor of the crater, an abun of hot mineral water at a temperature of 45° to 50 C. be found.

The density of the water is 1·002. An analysis by Signor S. de Luca showed that 1,000 parts of eral water contained the following proportions of stances :—

Sulphates	1·473
Chlorides	0·0085
Ferrous oxide	0·111
Calcium oxide	0·1015
Magnesium oxide	0·023
Potassium oxide	0·017
Aluminium oxide	0·335
Silica	0·3155
Ammonia	0·014
Sodium oxide, manganese, organic substances, arsenic (traces), &c.	0·3325
Water	997·269
Total	1000·0000

aseous Products.—From two of the caves near the side ne Solfatara hot vapours arise which are chiefly comd of steam and carbonic acid gas, but which also contain l quantities of sulphuretted hydrogen and sulphurous and small traces of arsenic.

II.—GLASS, POTTERY, AND ENAMELS.

ARTHENWARE AND CHINA AT PORTLAND, OREGON.

Foreign Office Annual Series, No. 2666.

earthenware the United Kingdom has lost ground h American potteries have gained, and this is likely to ı, as American earthenware is improving steadily and a showy article is being turned out. British potters tly raised their prices nearly one-third, while Americans advanced theirs 5 per cent. It is suggested that the sh should use more gold in decoration. Germany comı more with France than with the United Kingdom, ucing cheap and showy chinaware, and the trade in this increased. More chinaware has been imported from n than in 1899.

IX.—CEMENTS, Etc.

ENT IN CANADA UNDER THE PREFERENTIAL TARIFF.

Comm. Intelligence, Aug. 10, 1901.

e annual report of the Ontario Bureau of Mines shows the manufacture of cement is expanding, the total ıction of 1900 being much larger than in any previous The home market is not wholly supplied by the ıct of Ontario works. During the fiscal year ended 30, 1900, the imports of cement into Canada amounted 112,170 cwt., as follows :—

	Dols.
From Great Britain	249,280
„ United States	55,569
„ Belgium	156,213
„ Germany	59,331
„ other countries	200
Total	520,593

marked change took place during the year in the proon of cement imported from the several countries of ı. In the twelve months ended June 30, 1899, the ts were :—

	Dols.
From Great Britain	125,778
„ United States	52,878
„ Belgium	232,434
„ Germany	73,135
„ other countries	146
Total	484,371

rill be seen that the imports of Belgian and German ıt, which had risen from 79,370 dols. and 15,603 dols. ctively in 1896, received a decided check, while those Great Britain were almost doubled, and constituted a larger proportion than in 1896, when they were 36 worth out of a total importation of 252,882 dols. usly the preferential tariff is aiding British cement.

CEMENT IMPORTS OF PORTLAND (OREGON), U.S.A.

Foreign Office Annual Series, No. 2666.

The largest trade is in cement, and it is principally in this that German trade has gained.

There is little that is encouraging in the outlook for trade in commodities of British manufacture. The cement trade has largely gone to Germany and Belgium, and this year China and Japan have entered as competitors. Some of the Chinese brands of cement are reported to be of good quality and well up to the best brands, but the Japanese cement is not favourably reported upon.

A feature of interest in the statistics is the import of barrels of "Portland" cement manufactured in Hong Kong; the indications are that Hong Kong will make constantly increasing shipments to the Pacific Coast of this article, which has been subjected to Government and railway tests with excellent results.

CEMENT AT SAN FRANCISCO, CAL.

Foreign Office Annual Series, No. 2673.

The following table shows the quantity of cement imported during the last two years :—

From—	Quantity.	
	1900.	1899.
	Lb.	Lb.
Belgium	122,182,290	59,234,000
Germany	75,412,551	27,005,200
United Kingdom	69,442,000	37,541,000
China	2,964,146	..
Japan	981,200	..
Total	270,982,187	123,780,200

A few years ago British cement had almost a monopoly of this market, but last year the imports fell from second to third place. This is attributed to the manufacturers' refusal to regard the advice of importers, who urged them to produce a finer article. This they neglected to do until the Continental makers had firmly established themselves in the business. The British cement now sent here meets the requirements in quality and price, as compared with the Continental article, but has lost its prestige and no longer commands the market.

Several local companies for the manufacture of cement have been incorporated, and one of them, backed by large capital, is expected to commence operations by the end of the current year. Those that can produce a good article and are situated within a radius of 50 miles from this city have excellent prospects of success. The entire needs of the State will probably be supplied from local sources in the near future.

PORTLAND CEMENT INDUSTRY IN CALIFORNIA.

G. P. Grimsley. Eng. and Mining J., July 20, 1901.

Nearly 650,000 barrels of Portland cement were imported from England, Germany, and Belgium into the port of San Francisco during the year 1900, on which the import duty was about 206,000 dols.; and from the present outlook more will be imported during the year 1901.

The only cement plant now in operation in California is at Colton, on the Southern Pacific Railroad. This mill of the Californian Portland Cement Company was started in 1893 and produced 600,00 bbls. in 1900. The lime quarries are located on the side of Slover Mountain, where the stope is loaded into cars and hauled through a 400-ft. tunnel. There it is dumped into a chute 370 ft. long, which delivers the rock to the jaw crusher in the upper part of the mill. The limestone contains 98 per cent. lime and about 1 per cent. alumina and iron.

The clay is brought from Perris, 30 miles away, and contains 84·6 per cent. silica and alumina with about 4 per cent. of lime. It is dried by exposure to the air. The clay and crushed limestone are weighed and dumped into an elevator boot, which discharges the mixture into hoppers above the four Griffin mills. After grinding, the material is delivered to screw mixing conveyors that discharge into large storage rooms. The mixture is then fed by a screw conveyor to two rotary kilns 75 ft. long, and heated by petroleum gas with blast from fan blowers. All this machinery has been invented and patented by the company's chemist, Mr. E. Duryee, who is in charge of the mill.

The clinker, after cooling, is reduced to a flour in Krupp ball and tube mills, and the cement is carried by a screw conveyor to the warehouse. Colton Portland cement has a tensile strength of 418 lb. in seven days, and 586 lb. in 28 days. The capacity of the plant is 375 bbls. per day and the total cost of construction has been 160,000 dols.; over 150,000 bbls. have been sold on the Pacific Coast.

Both steam and electric power are used. The kilns and blowers are run by individual steam engines, while the crushers and Griffin mills are run by a 100 h.p. motor. The machinery of the clinker grinding room is run either by engine or by a 175 h.p. dynamo, and the buildings are lighted by electricity.

X.—*METALLURGY.*

DISCOVERY OF OSMIUM IN NEW ZEALAND.

Imp. Inst. J., Aug. 1901.

The *New Zealand Herald* states that osmium has been found associated with strontium nitrate in a mineral found in the Waratea claim.

MINERAL PRODUCTION OF QUEENSLAND IN 1900.

Bd. of Trade J., Aug. 8, 1901.

The following table showing the mineral production of Queensland during the year 1900 is compiled from the official report of the Queensland Under Secretary for Mines, recently received at the Board of Trade:—

Mineral.	Quantity.	
	1899.	1900.
Gold—	Oz.	Oz.
Crude	946,894	963,189
Standard	729,006	737,515
Refined	668,227	676,029
Silver	145,325	112,990
	Tons.	Tons.
Tin	1,308	1,123
Lead	56	205
Coal	494,009	497,132
Copper	161½	384
Wolfram	259	189½
Manganese	735	175
Bismuth	2	8
Antimony	40	..
Molybdenite	..	11
Lime	..	3,664

THE PRODUCTION OF IRON ORE IN THE UNITED STATES OF AMERICA.

The *Iron Age* of 11th July states that the United States Geological Survey has completed the annual report upon the production of iron ores in 1900, prepared by John Birkinbine, of Philadelphia.

A total output of 27,553,161 tons causes the year 1900 to repeat the records of the years 1898 and 1899 with a production of iron ore in excess of the amount previously reported in any year for this or any other country. The following figures illustrate the increase in the output of iron ores in the last three years:—1898, 19,433,716 tons; 1899, 24,683,173 tons; 1900, 27,553,161 tons.

Of the above, no less than 24,329,567 tons, or 88·3 per cent. of the total, was produced by 110 mining undertakings, *viz.*, 42 situated in Michigan, 31 in Minnesota, 10 in Alabama, 6 in Wisconsin, 4 each in New York and Colorado, 3 each in Tennessee, New Jersey, and Virginia, 2 in Pennsylvania, and 1 each in Georgia and Wyoming. Eighty-five of these important mining undertakings contributed 21,594,640 tons of red hematite ore, 15 brown hemati mines yielded 1,342,974 tons, 9 mines of magnetic ore ga 1,234,183 tons, and 1 mine contributed a mixture of 157,7 tons of red hematite and magnetite.

CHEMICAL AND METALLURGICAL INDUSTRIES OF NEW YORK.

Eng. and Mining J., Aug. 10, 1901.

The smelting and refining of copper and lead, gold a silver are well represented in the vicinity of New York. Perth Amboy, the terminus of some anthracite coal ro there are the great plants of the American Smelting a Refining Company (formerly the Guggenheim Smelti Company), and the Raritan Copper Company, while the opposite side of the Arthur Kill, at Tottenville, on Stat Island, a new copper refinery is being erected. T Guggenheim Works receive silver-lead and crude copp from Mexico, whence shipments are made by steamship Tampico, and from plants of the American Smelting a Refining Company in Colorado. They produce electroly copper, desilverized and antimonial lead and refined g and silver. The Raritan Works receive crude copper fr Jerome, Ariz, and the various Lewisohn interests in seve parts of the West, and produce electrolytic copper a refined gold and silver.

Not far away from the works at Perth Amboy are th of the Mountain Copper Company, at Elizabeth, N. where the matte from Keswick, Cal., is converted into cru metal, which is shipped in the form of anodes to oth works for refining. In Elizabeth also are the works of Waclark Copper Company, where the copper from United Verde Mines is worked up into wire, etc. Newark there is the plant of the Balbach Smelting a Refining Company, which does the same kind of work the Guggerheim plant at Perth Amboy, but in additi turns out electrolytically refined nickel; while at Irvingt a suburb of Newark, the Irvington Smelting and Refini Company receives crude copper from various sources a produces electrolytic copper and refined gold and silv At Constable Hook the Orford Copper Company tre matte from Sudbury, Ont., and ore from New Caledon producing copper anodes. crude and refined nickel a nickel oxide. The works of the Nichols Chemical Compa at Laurel Hill, on Long Island, complete the list of cop refineries; they receive crude copper, ore and matte fr many sources, including ingot from Mt. Lyell, Tasmani matte from Newfoundland, and ore from the Province Quebec, and besides refined copper, gold and silver prod sulphuric acid, copper sulphate, alum and a long line chemical compounds. It is said that special works are be built on the Hackensack Meadows behind Jersey C to treat mohawkite from the Mohawk mines in Michigan

The Mathieson Smelting Company reduces antimony from remote sources at Chelsea, Staten Island. The S. White Dental Company, at Prince's Bay, Staten Isla and Baker and Company, and C. F. Croselmire, both Newark, refine crude platinum obtained from Russia, w the Orford Copper Company refines it as a by-product fr the Sudbury nickel-copper matte. In New York C proper, C. S. Platt refines crude gold and silver. Newark and Jersey City the Jersey Zinc Company plants where zinc, zinc oxide and spiegeleisen are p duced, but these are to be abandoned eventually in fav of the larger and more modern plant at Palmerton, Pa.

The non-metallic mineral products which are worked n the vicinity of New York are as important as the metal. Sulphuric acid, which is the great staple of the chemi industry, is produced at Laurel Hill, L.I., and at Bayon Passaic, Newark and Lodi, N.J. A large part of crude petroleum of Pennsylvania is brought by pipe li to Bayonne, where are the great refineries of the Stand Oil Company, whence the finished product is loaded dire on vessels for export. At Bayonne there is also the bo refinery of the Pacific Coast Borax Company, which car thither the crude mineral from Southern California. Carteret, N.J., there are large works for manufactur acid phosphate of lime, which use rock from the South States as one of their raw materials.

Mercury Exports of San Francisco, Cal.

Foreign Office Annual Series, No. 2673.

he exports of mercury declined in 1900, 2,813 flasks than in 1899 having been sent away. Trade with xico increased, but was more than offset by the decrease the China business, which only absorbed one-fourth of amount taken in 1899. The production of the metal increased slightly by the opening up of new and the scitation of some old properties. Good prices prevailed ing the year.

Smelting Works at Tacoma.

Foreign Office Annual Series, No. 2666.

uring the past year the Tacoma Smelting and Refining opany has added three blast furnaces to its works, each able of roasting 70 tons of ore per diem, and has spent 00*l.* in increasing the capacity of its plant, which is smelting 325 tons of ore daily; 250 men are employed. reported that the gross weight received during the past was 111,025,536 lb., which contained 47,773·86 oz. of , 929,688·03 oz. of silver, 18,992,310 lb. of lead, 516,348 lb. of copper, the output was 200,650 bars taining 50,015·41 oz. of gold valued at 206,763*l.*, ,199·63 oz. of silver valued at 112,928*l.*, 18,984,917 lb. ead valued at 161,371*l.*, and 250,000 lb. of copper ed at 8,000*l.*

"Bismarck" Steel in Germany.

Foreign Office Annual Series, No. 2671.

. new patent steel (Bismarck patent steel) is manufacd by the Bismarck Ironworks, which will cut Bessemer l at a velocity of 36 ins. per second, thus offering a new tion of the problem of increasing the speed at which l can be turned

Minerals of Diarbekir (Asiatic Turkey).

Foreign Office Annual Series, No. 2657.

here was an increase of more than 100 per cent. in the e of the export of copper in 1900, as compared with of the year 1898. The ore, which is found in abunce at Bakir Maaden (*i.e.*, copper mine), about 16 hours' ant to the north of Diarbekir, is smelted in furnaces wood, although coal is to be found in the neighbourhood. coal mining, however, is carried on in the province.

lver exists in the same district of Maaden, and also jezireh, a district on the right bank of the Tigris, about hours' distant to the south-east of Diarbekir, but no rts are made to extract the ore.

lica is found in great abundance at Bisherri, distant 18 rs to the east of this city; sulphur at Tchermukh near ir Maaden, and coal both at Pallu on the Upper hrates and at Djezireh.

ith the above exception no attempt is made to utilise mineral wealth of the province. One of the chief ons for this neglect is defective means of communion, rendering cost of transport to the nearest ports ost prohibitive.

Copper in Java.

Foreign Office Annual Series, No. 2665.

he imports of British copper show a noteworthy increase gainst an important decline in the quantities of Dutch er which have arrived here during 1900; only a few s ago principally Dutch copper was imported here.

XII.—OILS, Etc.

Castor Oil Manufacture at Marseilles.

Bd. of Trade, Comm. Dept., Aug. 10, 1901.

n July 22 last an inquiry was addressed from this ety to the Commercial Department of the Board of le, 49, 50, Parliament Street, S.W., asking for informaas to the manufacture of castor oil at Marseilles. On . 10 a report from Consul-General Gurney, dated Aug. 2, of which the following is an abstract, was furnished by the Department in response to the inquiry :—

Castor Seed Imports.

Quantities. — 25,584 tons of castor oil seeds were imported during 1900 at Marseilles from India, out of a total import of 25,599 British tons, the remaining 15 tons having come from Java.

Qualities.—The quality of the Indian seed has deteriorated since 1898. The crops have been very variable. Imports from India might be improved and increased by better cultivation. The Java seed was considerably superior in quality. The variations in quality are a source of great trouble to the manufacturer of the oil. Much of his success depends on his being able, by careful manipulation, to make up for the inferior quality of some of the seed.

Competition in Castor Oil Milling.

British Competition.—Marseilles has been considerably influenced by the erection of castor oil mills in Lancashire and elsewhere in the North of Europe. The mills at Hull and near Liverpool are working satisfactorily. They are said to be as well equipped, and possess as good, if not better, plant than the Marseilles firms.

Indian Competition.—India now manufactures castor oil for export. Calcutta sends home castor oil first grade, from first pressing for pharmaceutical purposes.

German Competition.—Germany manufactures castor oil at Mannheim, but without apparent success. The oil is good, but the business does not pay.

American Competition.—The United States are about to start castor oil milling for home consumption.

Methods of Manufacture of Castor Oil.

Shelling and Crushing.—The seed is shelled, and is crushed under hydraulic presses similar to those used for all oil seeds. Different results are secured by more or less careful manipulation of the seed after shelling. It is here that the skill of the manufacturer tells.

The above refers to castor oils of first and second pressing for industrial purposes. (Cotton printing, machinery oil, &c.) In the second pressing some water is added.

Clarification.—The oil is clarified by filtration through fuller's earth.

Pharmaceutical Castor Oil.—The North cannot compete with Marseilles in the manufacture of medicinal castor oil. The secret of the success of Marseilles millers is due in great measure to the climate, the air, and the sun, which last greatly assists in the bleaching of the oil. Marseilles millers also claim that the quality of the water used by them in the second pressing of the seed is in their favour.

No Chemical Process.—No chemical operation is resorted to in the process of manufacture at Marseilles. Recent improvements in manipulation alone have increased the output and make up for the mixing of inferior with superior qualities of seed. This skill in manipulation is in reality the manufacturer's secret; even his local competitors being ignorant of his manner of working. But any expert miller ought to easily work out the problem for himself.

Economic Advantages favouring Marseilles.

Cheap Labour.—There are, in addition to the climate, two great advantages possessed by Marseilles millers over British manufacturers of castor oil for industrial purposes. These are, cheap labour and a ready sale for oil seed cake. Labour costs very little. Italians are employed, working 11 hours in the 24, for a wage of from 2*s.* 5*d.* to 3*s.* 3*d.* per diem. The men work at day and night shifts, alternating weekly.

Demand for Cake.—But the main cause of success is the local demand for oil cake as manure. The residue amounts to 60 per cent. of the seed used. Thus, 15,000 to 18,000 tons of castor oil cake are annually consumed, within a short radius of Marseilles, by market gardeners for the raising of early vegetables. There is unfortunately no such demand for this cake in England. Some oil cake of British manufacture has even been put on the Marseilles market. In the matter of prices Great Britain is thus seen to be at a disadvantage.

Cod-liver Oil; Production of ——.

E. Lepinois. J. Pharm. Chim. 1901, **13**, [11], 518—524, *and* [12], 555—560.

The yield of oil is not proportional to the number of fish captured. Thus, in certain years, 1,000 cod are required to produce a barrel of about 100 litres of oil, whilst at other times from 1,500 to 2,000 are necessary. This depends partially upon the weather, for if extreme cold be experienced during the earlier part of an expedition, the livers freeze, and are then less suitable for the production of oil.

Certain traders assert that each vessel should obtain 40 barrels of oil, but in the author's opinion this estimate is too high, as regards the medicinal oil, at least.

A long series of tabular statistics are given, and from these it appears that the cod fishery in Newfoundland has slightly increased during the last few years, this increase corresponding to the increase in the number of vessels. In 1898, 171 vessels captured 26,082,896 kilos. of codfish, probably yielding 3,835 barrels of medicinal oil.

Since 1895, the fisheries of Iceland and Dogger's Bank have decreased considerably, although the number of vessels has increased. Thus, in 1890, 96 vessels captured 9,265,192 kilos. of codfish off the east and west coasts of Iceland, whilst, in 1898, 186 vessels captured only 9,239,470 kilos.

In the Norwegian fishery there appears to be a similar disappearance of the codfish. In 1899, only 37,584,000 fish were caught as against 70,338,000 in 1894. This decrease, however, is to be attributed to the falling off in the Lofoden Islands fishery. On the other hand, whilst the mean annual yield of oil from the Lofoden Islands from 1857 to 1893 was 14,300 barrels, and from 1893 to 1900, 13,168 barrels, its value has steadily risen, and within the last decade its price has been doubled or even trebled.

The yield of oil from the French fisheries has remained almost stationary for 10 years. In 1898, 483 vessels captured 36,102,686 kilos. of codfish producing 5,310 barrels of oil.

In Japan about 330,000 vessels are engaged in sea-fishing. The cod-fishery is of considerable importance, and can be greatly developed. The codfish is found notably off the coasts of the island of Hokkaido and the provinces to the north of the island of Nippon and Hokouyétsou. In 1897 the value of the codfish captured was 1,009,425 francs. The oil amounted to 67,123 kilos. and was worth 8,930 francs or 0·35 franc per kilo. in Japan.—C. A. M.

Oil and Soap Works in South Italy.

Foreign Office Annual Series, No. 2678.

A large mill for producing sulphur oil has been erected at Gioja, as well as a manufactory of soap. These should both do good work when the olives recover their normal productiveness.

An important oil-making plant has been established at Battipaglia, a small village near Salerno. The fruit is treated chemically and excellent results are obtained. This method of manufacture by experts on a large scale is superior to the old plan of individual peasants making their own oil by rough and antiquated methods. As the factory has been established in a district where olives are very abundant and land is cheap, this industry should succeed very well if capital enough is put into it.

Lubricating Oils in Germany.

Foreign Office Annual Series, No. 2671.

The Royal Railway Administration is continuing its experiments with lubricating material for locomotives. The use of common mineral oils for the lubrication of those parts of a locomotive which do not work under steam has greatly increased. As mineral oil is so much more economical, the proportion of vegetable oil used could be in some districts lessened and a more economical mixture substituted for it. It might be a good plan to use a prope chosen mineral oil (so-called cylinder oil) for the pa working under steam pressure.

Linseed Oil in Portland, Oregon.

Foreign Office Annual Series, No. 2666.

Linseed oil mills crushed about 100,000 bushels of last year. This is about one-fourth of its capacity, there has always been difficulty in procuring sufficient The company shipped several hundred tons of cake British Columbia, and seem to expect, if prices of oil k high, that they can ship oil into that market now contiol by British makers.

Soap in Van (Asiatic Turkey).

Foreign Office Annual Series, No. 2657.

The small quantity of British soap which appeared year does not seem to find favour nor to be able to comp with the native article. For laundry purposes, "pere the mixture of alkaline salts formed by evaporation from waters of the lake, is exclusively employed.

Earth-Nut Trade of Gambia.

Bd. of Trade J., Aug. 1, 1900.

In 1900 over 35,000 tons were exported, but the tot not expected to reach 25,000 tons in 1901. Incidentall is mentioned that the rubber industry has now failed great extent.

XIII.—PIGMENTS, PAINTS, Etc.

Lacquer Exports of Japan.

Bd. of Trade J., Oct. 8, 1900.

The following particulars regarding the production export of lacquered ware from Japan are taken f *Commerce* (Tokio), the organ of the Japan For Trade Association.

In 1894 there were 4,407 factories, employing 1 men, and producing lacquered ware valued at 2,584,701 but in 1899 the number of the factories decreased to 4, while the men employed and the value of products incre to 20,373 men and 5,640,228 yen. The producing dist are 40 in all. With regard to the exports the v amounted to 17,065 yen in 1867; in 1877 it was value 185,261 yen; in 1887 at 630,724 yen; in 1897 at 783 yen; and in 1900 at 1,066,638 yen. The following t shows the quantity produced and exported during the 5 years—1896–1900.

Year.	Production.	Exports.
	Yen.	Yen.
1896	3,295,947	948,733
1897	4,116,077	767,400
1898	4,885,432	784,134
1899	5,640,228	988,662
1900	No figures	1,066,638

Note.—Yen = 2*s*. 0½*d*.

Paints and Colours in Madeira.

Foreign Office Annual Series, No. 2677.

As in former years the greater proportion of oiln stores is of British origin. Small quantities of colou powders come from Germany, whilst zinc white and si preparations are furnished by Belgian houses, importe the United Kingdom and entered in the Customs ret here as British goods.

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

Leather Trade of Germany in 1900.

Foreign Office Annual Series, No. 2680.

The short-lived convention of the North German tan of sole leather, instead of securing higher prices, seen

driven up prices to such an extent that their produce
onger found customers; when this convention was dis-
ed, after an existence of only one year, the supply of
leather was so great that its price dropped lower than
ıd been before the formation of the convention.

he leather manufacturers have chiefly suffered from the
prices for raw material, which rendered impossible
itable sales of the leather itself. While the market for
s and skins is international, the market for leather is
ed. German tanners no longer control the skin market,
foreign countries (especially America) buy largely in
nany. Another drawback lies in the long credit which
ts in the German leather trade.

t present the leather industry is threatened by the
ease in the duty on tannins. A duty, *e.g.*, of 10 marks
100 kilos. is demanded by the agrarians on quebracho
d, though the actual cost of the wood to-day in Germany
ıt about 8 marks per 100 kilos.

eather manufacturers claim a much heavier duty on
gn leather, by which they hope the American manu-
ırers will be prevented from throwing their over-
uction upon the European, more especially the German,
ket.

ısiness in fancy leather goods during 1900 was good.
United Kingdom is Germany's best customer for these
s.

German Export of Leather in 1900.

—	Total Export.	Export to United Kingdom.	Total Value.
	Metric Centners.	Metric Centners.	1,000 Marks.
er for gloves, varnished her.	53,533	8,567	51,392
eather	22,285	7,066	4,680
h leather goods	14,495	1,560	7,972
leather shoes	5,840	764	7,300
„ goods	15,898	9,083	19,078
„ in connection with er materials (albums, &c.)	17,270	5,782	8,635
er gloves	4,189	679	7,121

TANNERIES IN NAPLES.

Foreign Office Annual Series, No. 2678.

ere is a depreciation in the hides cured at Naples
ıse the methods used are old-fashioned. The
olitans dress their hides with lime alone, which
ges the surface, as it has to remain so long soaking;
this the hide hardens because it absorbs carbonic
le from the atmosphere, and it loses its sheen and
nes less marketable. A better method is to mix
ic and kennel sweepings with the lime, which pulls the
nore quickly off the hide, and as the latter remains for
less time in the bath, it suffers less from saturation
he subsequent action of carbonic dioxide.

LEATHER TRADE OF MINORCA.

Foreign Office Annual Series, No. 2651.

British Vice-Consul at Port Mahon calls the attention
itish leather and patent leather manufacturers to the
tance that that trade has in Minorca, not less than
ons of leather and patent leather, representing a value
,087*l.*, having been imported into Mahon during the
1900, the greatest part coming from the United
, Germany, and France, and none from the United
lom.

XV.—MANURES, Etc.

MANURES AT ST. MALO.

ım. Intelligence, Aug. 10, 1901; *and Foreign Office Annual Series, No.* 2670.

ow will be found in two parallel columns two reports,
from our Vice-Consul at St. Malo. One is for 1899,
her for 1900.

1899.	1900.
Manures show an increase of 600 tons odd, and I am sure that there is a possibility of extension if the country is rightly canvassed. I spoke of this matter in Report No. 2,035 for 1897, and as I said then, the use of artificial manure is in its infancy here, and it is little used except for early potatoes. . . . . I have been told many prefer British artificial manures, but, like others, try to get the most they can for their money, and French manufacturers have reduced their prices considerably.	Manures are now almost entirely produced by French firms. The Syndicat Agricole d'Ille et Vilaine still supplies to its members hereabouts manures guaranteed to contain 5 per cent. ammonia, 10 per cent. soluble phosphoric acid, and 10 per cent. potash, at prices from 7*s.* to 7*s.* 6*d.* per cwt. The Phospho-Guano Company, through its Paris house, has advanced its sale immensely during the past few years, and prices are so fine now that British manures must show evident quality to be preferred. There was a time when a few opportunities given to farmers to try manures, and a little pushing would have yielded a good return.

The Foreign Office publishes both reports in one cover in July 1901. *Commercial Intelligence* asks why the 1899 report was not published early in 1900.

FERTILISERS AT CHERBOURG.

Foreign Office Annual Series, No. 2670.

Chemical manures were, formerly, almost exclusively imported from the United Kingdom; Cherbourg now, however, receives a large quantity from Honfleur, the British trade in manures having been much reduced in consequence of the establishment of works for their manufacture at Cherbourg and in the immediate neighbourhood of Octeville. Works have also been established at Nantes and Granville. Phosphates are derived chiefly from the Department of La Somme, whilst nitrate of soda is imported direct from Chili; sulphate of ammonia is imported from England. Some large firms at Nantes and Granville manufacture the manures, and mix them in various proportions according to the particular vegetable to be grown. Phosphates have also been found in the neighbourhood of Chef du Pont and Valognes, near Cherbourg.

BASIC SLAG IN GERMANY.

Foreign Office Annual Series, No. 2671.

The demand for basic slag is steadily increasing, and as the production is somewhat limited on account of the cessation of work in some of the Thomas steel works, it is thought in the trade that the supply will not be adequate to the demand. This opens good prospects for the British export of it.

GUANO AT THE CAPE.

Bd. of Trade J., July 25, 1901.

During the year to 31st December, 3,183 tons of guano were brought up from the Colonial and Ichaboe Islands, *viz.*, 1,904 tons from the former, and 1,279 tons from the latter. All the guano from the Colonial Islands, together with 1,139 tons from the Ichaboe group, was sold locally.

The *Cape Argus* of 3rd ult., states that there is no guano stored at present on the Colonial Islands, and the outlook for the coming collecting season is not encouraging. The stock of guano stored upon the Ichaboe Islands is about 3,000 tons.

CHEMICAL MANURES IN MADEIRA.

Foreign Office Annual Series, No. 2677.

Chemical manures are imported in considerable quantities from the United Kingdom—by far the largest importer being a British firm—but lately manures of both French, German, and Portuguese manufacture have been advertised for sale. The trade, however, is confined to a few merchants. These manures are employed for treating the sugar-canes, vines, bananas, and vegetables, and excellent results are being obtained through their use. As the native sees the advantage to be obtained by the employment of artificial fertilisers these may be used more generally, and the trade be developed to a considerable extent.

Phosphates at Genoa in 1900.

Foreign Office Annual Series, No. 2681.

These quantities of phosphates that arrived were all in excess of those imported during the preceding year, especially with respect to phosphates of lime for chemical manures. These articles are drawn principally from Sfax, Bona, &c.

Fertilisers at Batavia (Java).

Foreign Office Annual Series, No. 2665.

H.M. Consul at Batavia reports that, with the increase in the area of the sugar plantations a steady growth in the use of fertilisers is noticeable. Supplies of sulphate of ammonia and blood manures nave neen receivea in large quantities from Europe and Australia, whilst ground nut cake from China and British India is imported in larger shipments each year.

XVI.—SUGAR.

Beet Sugar Exports of Germany in 1900.

Foreign Office Annual Series, No. 2671.

The falling-off of the sugar export from Germany to the United Kingdom, already noticed in 1899, has intensified in 1900.

The small increase of the export of refined sugar, and the large decrease of the raw sugar export, is due to the sugar duty regulations for 1896, which provide for the refiner a premium on refined sugar of about 6*d*. (50 pf.) on every 50 kilos. (about 110 lb.). The premium is not declared, but it can be discovered by examining the following rates of export reimbursement:—Raw sugar receives 125 marks, and refined sugar 177½ marks for 50 kilos.

The refiner pays the raw sugar manufacturer when he buys 125 marks per 50 kilos. export reimbursement, and receives back again when he exports refined sugar 177½ marks for 50 kilos. The value of this premium is lessened by the fact that only 90 per cent. of refined sugar can be produced from the raw material. The competition of British refineries in the sugar markets of the world was difficult enough without this hidden premium, and now the German sugar "Cartel," will make it almost impossible. The "futures" trade between the United Kingdom and Germany has been by the action of the Börse Law reduced to a minimum The London "futures" trade now goes to France, Austria-Hungary, Belgium, and Holland.

In the statistics of raw sugar, quantities of by-products are included which the British manufacturer requires for the production of certain special kinds (by mixture with cane sugar). That this premium system makes German sugar cheaper for foreign countries, and by this means furthers the interests of other industries, can be seen by the fact that German sugar returns from the United Kingdom to Germany in the form of marmalade or jam, which, in spite of the high duty, is imported in large quantities. A reduction in sugar freights came into force in April, 1901—

(1) For the export of sugar of all kinds over the trading places on inland waterways or over the frontier.

(2) For raw sugar to refineries, which export it as refined sugar.

(3) For all kinds of sugar intended for export to foreign lands.

Beet Sugar at Los Angeles (Cal.), 1900.

Foreign Office Annual Series, No. 2673.

The production of beet-sugar has been very limited owing to the drought. The Oxnard factory reports the product of 1900 at 19,400,000 lbs., estimating their product for the present year at 50,000,000 lbs. They are about to instal the "osmose" process in addition to their Steff plant, and this, with other improvements, will cost ab 40,000*l*. The Chino factory was not operated in 1900.

XVII.—BREWING, Etc.

New Wine Law in Germany.

Foreign Office Annual Series, No. 2680.

The law of 1892, which still permitted the manufact of artificial wine, if so styled, had for years been attacl by the wine-growers because it did not abolish the a teration of wine. The new Bill prohibits altogether manufacture of artificial wine and introduces the control the wine dealers' cellars and offices.

By Section 1 of this new law wine is defined as " beverage produced from the juice of grapes by alcoh fermentation." The customary cellar treatment is per sible upon the condition that the addition of alcohol d not exceed 1 cb. part on 100 cb. parts. Blending of w with wine and the addition of refined sugar, concrete dissolved, is permitted, if such addition intends only improvement of wine and not a material increase of quantity. The wine so sugared must not be redu either in quality or in its composition, below the aver of the non-sugared wine of such wine district to wh according to its label, the wine claims to correspond. I unlawful to offer such wine for sale under a name wl would infer that such addition had not been made; it not be sold as genuine natural wine.

This law will come into force on Oct. 1, 1901. infringement may be visited with six months' imprisonm or a fine of up to 3,000 marks.

XVIII. A.—FOODS.

Preserving Fresh Fruit in Victoria.

Comm. Intelligence, Aug. 3, 1901.

The Agricultural Department of Victoria has recently m experiments in the preservation of fresh fruits. Pears peaches as packed for shipment were subjected to vapours of hydrocyanic gas. The fruits were t taken out of the boxes and separately wrapped in tis paper. Some of them were again treated with the gas, the whole was placed in a dry room at a temperatur 40° F. and kept there for seven weeks. When the fr were taken out they were in an excellent state of prese tion, especially those that had been treated with the g second time. Not only the pears, but the peaches, hard to the touch, retained their fresh appearance, showed no decayed spots, germs having all been ki by the gas.

Albumin Trade of Wuhu (China).

Foreign Office Annual Series, No. 2667.

The trade in preserved egg albumin and egg yolks sh a satisfactory recovery, the values rising from 673*l*. 779*l*. in 1899 to 1,565*l*. and 1,957*l*. in 1900. The prol tion of the import of "boracic mixture," which is enforced by the Chinese authorities, prevents the deve ment of the business, as native salt is too dirty and expensive to use in this trade.

Only one firm, Messrs. Smith and Meyer, is now eng in this line of business at Wuhu, the Chinese Albu Factory, Limited—a German house—having been wo up, and the two Chinese-owned factories having cease work. The Chinese factories have completely failed produce a satisfactory quality of albumen owing to t carelessness in the preparation, although in the preserva of yolks they have met with more success.

Vegetaline: Substitute for Margarine.

Foreign Office Annual Series, No. 2668.

A new fatty substance to take the place of margari called vegetaline. It consists of the oil extracted coprah (dried cocoanut), refined, and has the consistenc lard.

XVIII. B.—SANITATION, &c.

Antidotes for Cyanide Poisoning.

F. S. Tuttle. Eng. and Mining J., July 13, 1901.

or external poisoning by cyanide the author recom-
ds a warm bath containing sodium bicarbonate and
am chloride. Any eruptions caused by cyanide
oning will rapidly disappear after bathing as described
e. One very good antidote for internal cyanide
oning is to put two drops of ammonia on a lump of
sugar and eat it immediately.

The Commission on Sewage.

Public Health Engineer, July 27, 1901.

e interim report of the Royal Commission on Sewage
inted in 1898 has just been issued as a Blue Book.
commissioners were appointed to inquire and report :—

(1) What method or methods of treating and disposing
ewage (including any liquid from any factory or
afacturing process) may properly be adopted, con-
atly with due regard for the requirements of the
ing law, for the protection of public health, and for the
omical and efficient discharge of the duties of local
orities; and (2) if more than one method may be so
ted, by what rules, in relation to the nature or volume
wage, or the population to be served, or other varying
mstances or requirements, should the particular
ed of treatment and disposal to be adopted be
mined; and

To make any recommendation which may be deemed
able with reference to the treatment and disposal of
ge.

c commissioners have arrived at conclusions on three
ions which appear to be of urgent importance, and
a preliminary report thereon.

e three questions are :—

Are some sorts of land unsuitable for the purification
rage? (2) Is it practicable uniformly to produce by
ial processes alone an effluent which shall not putrefy,
o create a nuisance in the stream into which it is
arged? (3) What means should be adopted for
ing the better protection of our rivers?

c Commission answers these questions as follows :—

We doubt if any land is entirely useless, but in the
of stiff clay and peat lands the power to purify sewage
to depend on the depth of the top soil. We are,
ver, forced to conclude that peat and stiff clay lands
enerally unsuitable for the purification of sewage, that
use for this purpose is always attended with difficulty,
hat where the depth of top soil is very small, say six
s or less, the area of such lands which would be
red for efficient purification, would in certain cases be
eat as to render land treatment impracticable. Further
nation will be available when our investigation is
eted.

We are satisfied that it is practicable to produce by
ial processes alone either from sewage or from certain
res of sewage and trade refuse, effluents which will
utrefy, which would be classed as good according to
ary chemical standards, and which might be discharged
a stream without fear of creating a nuisance. We
, therefore, that there are cases in which the Local
rument Board would be justified in modifying the
it rule as regards the application of sewage to land.
l, probably, always be necessary that each case should
nsidered on its own merits.

The simplest possible means should be provided for
ately protecting all our rivers, and scientific experi-
should be carried on to ascertain the real dangers of
ion, against which they should be protected. In the
it state of knowledge, and especially of bacteriology,
ifficult to estimate these dangers with any accuracy,
: seems quite possible that they should be either
erated or undervalued according to the predisposition
se who have to deal with them. The general pro-
n of our rivers is a matter of such grave concern as
nand the creation of a separate commission, or a new department of the Local Government Board, which shall be a Supreme Rivers Authority, dealing with matters relating to rivers and their purification, and which, when appeal is made to them, shall have power to take action in cases where the local authorities have failed to do so.

XIX.—PAPER, PASTEBOARD, Etc.

Paper Industry of Germany.

Ch. of Comm. J., Aug. 1901.

Hitherto the paper industry has been the least affected, says *Bürgel*, by the general economic depression from which the entire German industry has been suffering since the middle of last year. Within recent weeks, however, a most violent retrogression has become manifest, the speciality printing-paper excepted. Manufacturers have lately received hardly any orders, and dealers who gave enormous orders last year when the prices rose very high, are now not in a position to take up the goods ordered. The stocks in the large factories are heavily accumulating. In Berlin and in Saxony manufacturers are endeavouring to dispose of their productions at any price, and reductions of prices of 15 to 35 per cent. on the principal sorts have already been agreed to. To this must be added the competition which threatens from America. A representative of the Paper Trust of the United States of America, which includes 72 factories, is travelling in Germany, and endeavouring to secure orders and to appoint agents. In spite of the existing import duty, the Americans are still making offers under the present market price. Thus, for instance, in spite of the import duty of 6 M. per 100 kilos., to which have to be added the freight and charges from Hamburg to Berlin of 1 M. per 100 kilos., American paper has been offered here up to 40 pfennig per 100 kilos. below the German price. Notwithstanding this the American factories have not been able to do much business in Germany, because the German manufacturers follow up the prices. The American factories have, however, the advantage of cheap water-power and of perfect machinery, so that their competition will, in course of time, make itself strongly felt in Germany. Under these circumstances, the abolition of the import duty, which is favoured in several quarters, would most seriously affect the entire German paper industry.

Paper in Germany in 1900.

Foreign Office Annual Series, No. 2671.

The steadily decreasing price of paper in 1899 was followed in 1900 by a general rise in prices caused by the great demand in the United Kingdom for the daily Press on account of the Boer War. A scarcity of paper in the United Kingdom and the British colonies came together with the dearness of coal and with a dry year in Scandinavia and the United States, so that all paper-producing countries had to make great efforts to supply the increased demand.

The best market was the United Kingdom, which took 267,908 cwts. Quantities of "grease-proof" parchment paper, for sending victuals to South Africa, and all fine qualities, as well as paper goods and cardboard went to the United Kingdom. As the woods of Scandinavia and Finland and those of the Erzgebirge and the Vogtland can no longer provide sufficient wood-pulp for paper manufacture, a return must be made to straw and esparto grass. Esparto grass can be cultivated in any climate with very little cost, and it is intended to plant the mountain districts of the East Vogtlands and the Erzgebirge with it.

The paper manufacture is using from year to year more cellulose, and the gloss of which paper so manufactured is capable, renders it a favourite article. The cellulose factories of Germany can look back upon several prosperous years, and have considerably enlarged their works. The export was considerable; that to the United Kingdom was 12 per cent. of the whole export.

Blotting Paper in Germany.

Comm. Intelligence, July 27, 1901.

The American Consul at Stettin thinks that there is a market in Germany for foreign blotting paper. He suggests sending samples so labelled that every German printer or stationer could easily understand them.

The following form, in German, is suggested :—

Lösch Papier, Muster AA1.

Länge, 60 cm.

Breite, 48 cm.

Netto Gewicht von 500 Bogen, 51 kilo.

Farbe nach Belieben.

Preis pro kilo., inclusive Packung und frei an Bord Schiff, New York.

Samples of white, red, buff, gray, and pink of each weight should be sent.

The German import duty on blotting paper is 10 marks (10*s*) per 100 kilos. (220·46 lb.). If packed in cases, a tare of 11 per cent. of gross weight is allowed ; if in bales, 6 per cent.

German blotting paper sells at from 60 to 70 pfennig (6*d*. to 7*d*.) per kilo. (2·2046 lb.).

WOOD PULP IN NORWAY.

Foreign Office Annual Series, No. 2659.

The production of pulp, especially mechanical pulp, was not much larger in 1900 than in the preceding year, owing to the scarcity of water, but prices were very high—on the average about 55*s*. per ton, compared with 28*s*. to 29*s*. in the summer of 1899, while as much as 65*s*. was paid for prompt delivery—and, as the demand was very great, manufacturers were masters of the situation. Only about half of the production profited by the rise in prices, the rest having been sold in advance. As formerly, the United Kingdom was the largest customer, with Germany, France, Belgium, Spain, and others in order of precedence.

The quantity exported was :—

Year.	Quantity.	
	Dry.	Wet.
	Tons.	Tons.
1900	21,546	301,545
1899	19,768	284,023

Of which from Christiania :—

Year.	Quantity.	
	Dry.	Wet.
	Tons.	Tons.
1900	6,670	38,052
1899	8,741	31,265

The same conditions applied to cellulose, added to which the high price of coal is said to have been felt in no small degree by those works dependent on its use, so that 1900 is characterised as only a fairly good year, some factories doing well, others badly. The total export was 94,885 tons dry and 10,288 tons wet (of which 68,525 tons went to the United Kingdom), compared with 75,731 tons dry and 7,490 tons wet in 1899. The quantity exported through the port of Christiania was 31,403 tons dry and 4,020 tons wet, compared with 17,814 tons dry and 3,948 tons wet in 1899. The foregoing figures include a little re exported Swedish cellulose.

XX.—*FINE CHEMICALS, Etc.*

PHARMACEUTICAL CHEMICALS IN GERMANY IN 1900.

Foreign Office Annual Series, No. 2680.

In pharmaceuticals great disappointment was expressed at the commercial results of 1900.

In 1899 the import of raw material had increased by 245,300 tons, the export by 69,000 tons ; or, expressed in values, the increase in import of raw material amounted to 35,000,000 marks, the increase in export to 32,000,000 marks ; the value of imported manufactured goods increased by 4,200,000 marks, and the value of exported manufactured goods to 26,200,000 marks ; the number of establishme increased by 4·89 per cent., and though wages increas by 7·75 per cent., the average dividends of chemi concerns amounted to 13·52 per cent., as against 12·69 cent. in the preceding year.

In 1900, while the cost of manufacture was increased the price of coal and wages, the troubles in China and t plague and famine in India considerably reduced the mark Competition has become keen, and owing to the number new pharmaceutical preparations which are brought into t market, the introduction of even the best becomes difficu The medical world can hardly keep pace, and the public less inclined to pay high prices for new patented medicin

PERFUMERY IN GERMANY.

Foreign Office Annual Series, No. 2671.

The export business in perfumes has greatly developed Germany ; that of toilet soaps on the contrary has fallen the competition, both at home and in foreign countr being keen in this article. French and British soaps generally preferred. This is seen by the following figu In the year 1900 we see a falling-off of the trade of soap cakes from 250,000*l*. in 1899, to 195,000*l*. in 1900 ; the tr in perfumed soap in bars has increased to 45,000*l*. export of soft soap has remained the same, and amount 25,000*l*. The export of perfumed toilet soap goes p cipally through Hamburg to the United Kingdom and colonies.

CASCARA SAGRADA IN OREGON.

Foreign Office Annual Series, No. 2666.

In some counties of this State, particularly Linn, Ben and Lincoln, chittim bark or *Cascara Sagrada* is gath to some extent. It sells at about 12*l*. per ton.

SAN THOMÉ BALM.

Chamber of Commerce J., Aug. 1901.

According to the *Moniteur Officiel du Commerce*, name of Balm of San Thomé is given to an indige product of Portuguese West Africa, and its mercantile v is so great on the spot where it is produced that it n reaches Europe. The balm tree, which attains a heigt 60 to 80 ft., is generally found in the interior of the isl at an altitude of 1,100 m. The balm exudes naturally f the tree through the chinks in the bark, and in abundance that it accumulates like crusts on the soil. natives who are anxious to avoid any loss of the prec product, obtain it by incisions made at the bottom of trunk. At every incision is placed a receptacle, ordin the half of a cocoanut, which sells at 400 to 500 reis (48 c. to 1 fr. 85 c.). It is reputed to be a remedy wounds, and is used in urinary and bronchial dise while the bark is renowned as a tonic.

QUININE SULPHATE IN JAVA.

Foreign Office Annual Series, No. 2665.

The quantity of quinine sulphate produced by Bandong manufactory and sold at auction at Batavia d the past year was 1,040,800 oz. The average price was equivalent to $1\frac{7}{8}$*d*. per unit.

The bulk of the quinine found its way to London the United States. Small consignments of the article made to Australia, British India, Japan, China, an Straits Settlements.

ANISE SEED AT PAKHOI, CHINA.

Foreign Office Annual Series, No. 2683.

The export of star aniseed, the centre of supply of is Nanning, has almost ceased from Pakhoi, the West having superseded this route. As this commodity is into bales weighing over 1 cwt., it is more cheaply c by water than by coolies. Aniseed oil, on the other still travels *viâ* the Pakhoi route. Because of its valne, it is used as a convenient medium of exc between the Nanning and Ch'in Chow markets. It is portable, and less likely to excite the cupidity of r its corresponding value in sycee. It will most likely e of the most permanent of the exports from Pakhoi.

ERRATUM.

Cocoa Shipments from Mollendo (Peru).

This Journal, July 1901, *page* 776, *col.* 2.

r "cocoa" read "coca" throughout.

XXI.—PHOTOGRAPHY.

OTOGRAPHIC GOODS AND CHEMICALS IN MADEIRA.

Foreign Office Annual Series, No. 2677.

the last report reference was made to the increasing that was being done with Germany in photographic and chemicals.

otographic plates and papers continuo to be a British poly, but mounts, chemicals, and photographic acces- are largely imported from Germany.

XXII.—EXPLOSIVES, MATCHES, Etc.

COTTON AND ACETIC ETHER PURCHASE BY SPAIN.

Bd. of Trade J., July 25, 1901.

Madrid Gazette of 18th inst. contains Royal Orders ising the purchase by direct negotiation of 11,500 kilos. ncotton from the Rheinisch Sprengstoff Actiengesell-, and 8,700 kilos. acetic ether from the Chemische k auf Actien vorm. E. Schering, for the use of the r factory of Granada, and of a number of machines ted with the making of quick-firing field guns from s. Pratt and Whitney, of Hartford, United States of ca, for the Artillery Factory of Trubia.

BOARD OF TRADE RETURNS.

SUMMARY OF IMPORTS.

Articles.	Month ending 31st July	
	1900	1901.
	£	£
....	2,815,408	3,012,157
als and dyestuffs	374,455	465,733
....	877,557	987,139
naterials for non-textile in-ies.	6,744,060	6,705,852
otal value of all imports	10 811,480	11,170,881

SUMMARY OF EXPORTS.

Articles.	Month ending 31st July	
	1900.	1901.
	£	£
(other than machinery)	3,562,531	3,206,718
als and medicines	652,604	696,277
aneous articles	3,025,840	3,217,417
otal value of all exports....	7,240.975	7,120,412

PORTS OF METALS FOR MONTH ENDING 31ST JULY.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
:—				£	£
....	Tons	7,573	9,557	91,428	135,857
lus	„	6,937	10,284	308,183	429,539
ought	„	6,784	7,080	493,909	498,393
ig and sheet	„	12,743	17,807	218,803	222,315
....	„	64,952	52,856	107,682	91,812
lver	Lb.	15,000	496,460	1,900	60,425
re........	Value £	..	..	50,872	91,417
....	Cwt.	56,459	66,841	386,620	424,392
....	Tons	6,347	6,195	130,369	94,778

IMPORTS OF CHEMICALS AND DYESTUFFS FOR MONTH ENDING 31ST JULY.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Bleaching materials	Cwt.	35,234	21,508	17,465	7,528
Soda compounds...	„		23,998		8,678
Borax, &c.	„	22,559	40,810	11,975	22,199
Brimstone	„	34,171	37,480	8,379	8,626
Nitrate of potash..	„	13,551	17,106	11,854	15,092
Chemicals, other.	Value £	..	..	121,577	156,244
Cutch and gambier.	Tons	906	904	15,773	17,195
Dyes :—					
Alizarin.......	Value £	..		12,163	18,701
Aniline and other	„	..		13,348	49,205
Indigo	Cwt.	336	1,313	5,889	20,813
Bark..............	„	21,043	60,240	8,448	26,370
Valonia	Tons	854	1,359	9,234	13,930

IMPORTS OF RAW MATERIAL FOR NON-TEXTILE INDUSTRIES FOR MONTH ENDING 31ST JULY.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Bark, Peruvian ..	Cwt.	1,897	4,296	4,744	11,019
Caoutchouc	„	42,642	40,549	502,918	416,425
Gum :—					
Arabic	„	7,757	12,020	14,981	26,885
Lac, &c.	„	9,730	3,144	30,188	8,862
Gutta-percha	„	11,261	6,134	152,893	83,184
Hides, raw :—					
Dry............	„	74,316	32,417	196,610	86,391
Wet	„	16,896	71,594	111,091	162,893
Ivory	„	861	686	31,412	27,382
Manure :—					
Guano	Tons	260	2,044	2,335	8,478
Bones..........	„	3,173	2,631	13,595	11,900
Paraffin..........	Cwt.	43,865	31,039	65,752	36,699
Linen rags	Tons	1,365	1,161	13,388	11,553
Esparto	„	11,771	14,989	44,124	62,288
Pulp of wood.....	„	46,877	46,942	248,618	227,168
Rosin............	Cwt.	104,745	159,449	28,627	39,156
Tallow and stearin	„	203,654	173,347	261,353	218,717
Skins :—					
Goat	No.	816,469	2,480,797	74,298	228,941
Sheep..........	„	1,086,640	1,665,214	106,221	146,713
Nitrate of soda...	Tons	7,752	9,538	62,608	81,326
Phosphate of lime	„	35,955	32,525	62,443	53,179

IMPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 31ST JULY.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Cement..........	Tons	9,439	22,215	18,806	38,243
China and earthenware.	Cwt.	27,054	30,785	71,662	78,025
Drugs	Value £	..	..	111,322	80,859
Glass :—					
Sheet	Cwt.	91,069	128,063	51,836	69,703
Plate	„	9,499	43,201	12,847	47,864
Flint	„	45,181	54,580	79,527	90,887
Bottles	Gross	145,925	126,931	58,218	58,004
Other..........	Cwt.	28,354	25,586	50,980	50,069
Glue, size, gelatin	„	16,024	18,430	37,659	38,597
Leather, unmanufactured.	„	109,634	113,828	677,729	733,941
Oil-seed cake	Tons	21,497	35,012	135,124	220,914
Paints and pigments.	Value £	..	..	117,318	119,394
Paper, pasteboard	Cwt.	560,401	514,237	385,231	374,949
Scientific instruments.	Value £	..	..	58,000	60,311
Soap and soap powder.	Cwt.	18,656	28,357	21,128	29,562
Zinc manufactures.	„	37,146	34,945	48,206	39,531

IMPORTS OF OILS FOR MONTH ENDING 31st JULY.

Articles.		Quantities.		Value.	
		1900.	1901.	1900	1901.
				£	£
Cocoa-nut	Cwt.	29,756	43,157	33,155	53,167
Olive	Tuns	875	2,114	24,690	76,755
Palm	Cwt.	93,574	107,358	107,197	121,095
Petroleum :—					
Illuminating..	Gall.	15,789,392	17,775,052	317,101	304,901
Lubricating...	„	1,600,100	2,886,938	54,313	87,917
Seed	Tons	2,585	2,589	66,133	66,838
Train, &c.	Tuns	2,777	3,410	49,826	60,099
Turpentine	Cwt.	88,989	100,704	140,918	128,728

EXPORTS OF METALS (OTHER THAN MACHINERY) FOR MONTH ENDING 31st JULY.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Brass	Cwt.	9,004	10,210	47,074	50,816
Copper	„	51,525	80,677	206,545	302,833
Lead	Tons	2,638	3,243	49,744	45,737
Plated wares...	Value £	..	..	38,294	19,769
Tin	Cwt.	7,370	8,570	52,171	55,888
Zinc	„	11,685	12,331	12,138	11,212

EXPORTS OF DRUGS AND CHEMICALS FOR MONTH ENDING 31st JULY.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Alkali	Cwt.	267,185	..*	85,625	..*
Bleaching materials	„	79,094	79,783	23,982	26,737
Copper sulphate ..	Tons	488	873	11,686	19,429
Chemical manures	„	36,500	44,258	173,618	194,674
Medicines	Value £	..	..	104,997	107,841
*Soda compounds :—					
Ash	Cwt.	..	128,473	..	29,091
Caustic	„	..	93,282	..	47,418
Bicarbonate	„	..	22,763	..	7,800
Crystals	„	..	15,368	..	2,595
Sulphate	„	..	64,377	..	4,671
Other sorts	„	..	23,270	..	8,337

EXPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 31st JULY.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Gunpowder. ...	Lb.	965,300	Cwt.5,867	18,892	16,965
Candles	„	1,844,100	1,702,300	32,932	32,980
Caoutchouc.....	Value £	..	..	116,268	99,919
Cement	Tons	39,256	24 716	74,151	47,658
Products of coal.	Value £	..	..	110,227	62,379
Earthenware ...	„	..	..	135,697	172,345
Stoneware	„	..	..	16,387	12,404
Glass :—					
Plate	Sq. Ft.	181,207	Cwt.3,882	12,319	7,615
Flint	Cwt.	8,459	10,134	19,371	22,019
Bottles	„	68,702	64,512	34,755	33,966
Other kinds ...	„	19 677	18,541	20,131	20,823
Leather :—					
Unwrought	„	10,636	9,880	112,209	100,642
Wrought......	Value £	..	..	33,049	39,707
Seed oil	Tons	3,521	2,847	101,447	85,148
Floorcloth.......	Sq. Yds.	2,034,600	2,012,800	103,306	93,590
Painters' materials	Val. £	..	..	176,206	183,857
Paper	Cwt.	64,333	56,503	94,749	87,113
Rags	Tons	5,061	5,605	34,260	34,421
Soap	Cwt.	65,302	82,027	76,421	88,104

Monthly Patent List.

* The dates given are the dates of the Official Journal which acceptances of the Complete Specifications are advert Complete Specifications thus advertised as accepted are op inspection at the Patent Office immediately, and to oppos within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY

APPLICATIONS.

14,389. F. Strickeisen. Improvements in evapora apparatus. Complete Specification. July 15.

14,391. V. Posno. Improvements in vessels for hol volatile inflammable liquids. July 15.

14,403. P. M. Knopp. Improvements in apparatu filtering or purifying liquids. Complete Specifica July 15.

14,513. C. Karfunkelstein. Improved constructio carburating apparatus. Complete Specification. July

14,567. W. Engels. Improvements in the manufa of crucibles, retorts, receivers, muffles or other like proof articles for metallurgical or similar uses. July

14,577. P. Naef. Process and apparatus for co and refrigerating, and the utilization of heat, appli also to crystallizing or freezing solid substances liquids and for other purposes. Filed July 17. applied for Dec. 18, 1900, being date of applicati United States.

14,679. J. Stumpf. A new and improved conde July 18.

14,756. T. A. Higginbottom and A. B. Lennox. provements in or relating to the drying of wet or l materials and means employed therein. July 19.

14,766. A. H. Tyler. Improvements in apparatu making ice. July 20.

14,806. A. E. Dobbs and J. Johnston. Improve in carburettors. July 20.

14,846. A. J. Howfield and G. V. Colliver. A s heated steam pan for boiling fat, sugar, and sundry materials July 22.

14,904. F. H. de Veulle. Improvements relati condensers. July 22.

14,989. C. Friesleben. Improvements in centr separators. Complete Specification. July 23.

15,687. F. Fanta. An improved system or proce means used therein, for the production of vacuum. A

15,696. W. Pirrie. Improvements in apparatu storing liquids under pressure. Aug. 2.

15,760. G. Machlet, junior. A new and improve buretting apparatus. Complete Specification. Aug.

15,895. J. G. W. Hartmann. Improvements relating to clarifying vats. Aug. 7.

15,989. A. F. P. Hayman. Improvements in st for inclined retorts. Complete Specification. Aug.

16,071. E. Stauber. Improved apparatus for r drying moist material. Complete Specification. Au

16,109. J. R. Dawn and J. Godfrey. Improve relating to mechanical calcining or roasting fu Aug. 10.

16,176. H. Paatz. Improvements in drying app Aug. 12.

16,234. H. O. Brandt. Improvements in apparat drying yarn textile fabrics, paper and other a Aug. 13.

16,390. W. J. Jones. Improvements in apparat carbonating liquids. Complete Specification. Aug.

16,493. J. Bernfeld. Improved treatment of a goods to enable them to resist liquids. Aug. 16.

15,534. J. R. Richmond. Improvements in con with surface condensing apparatus. Aug. 17.

16,585. D. Stewart. Improvements in apparat separating liquids from solids. Aug. 17.

Complete Specifications Accepted.*

1900.

,905. E. Claude. Apparatus for the manufacture of d air. Aug. 21

,404. A. J. Boult.—From A. Molet, Argentine ıblic. Apparatus for mixing gases. July 31.

,696. G. Allsebrook. Centrifugal separators. Aug 21.

,701. J. McRae. Apparatus for use in refrigerating, ıg, drying, impregnating, or otherwise treating goods. 24.

,956. W. S. Simpson. Construction of apparatus for ing off liquids. Aug. 8.

,646. C. Steffen. Process and apparatus for producing ur at any desired pressure from liquids heated under ure but not boiling. July 31.

581. J. O. Hamilton. Compound or composition for ving scale from boilers. July 24.

794. J. Fraser, P. Fraser, and N. Fraser. Evaporative ce condensing apparatus. Aug. 14.

919. P. A. Newton.—From The Phœnix Investment pany, United States. Attachments for feeding fuel in verised or powdered state to steam boiler and other ces. July 31.

362. D. Stewart. Process of and apparatus for sepa- g liquids from solids. Aug. 21.

051. K. S. Markel and J. J. Crosfield. Apparatus for ating solid matters from liquids. Aug. 21.

1901.

4. R. Scheuffgen. Apparatus for preventing explo in vessels containing explosive fluids. Aug. 14.

2. E. E. Murphy. Carbonating apparatus. Aug. 21.

503. E. C. H. Pape and W. S. Henneberg. Filters. 11.

584. P. M. Justice. From The Brunswick Refrige- Company, United States. Compressers for air and July 31.

594. O. Guttmann. *See* Class VII.

II.—FUEL, GAS, AND LIGHT.

Applications.

180. A. Delsemme. An improved process for manu- ng carbonic acid gas destined to be liquefied. 15.

83. J. A. Leneauchez. Improvements relating to rification of gases such as those obtained from gas ting furnaces, high furnaces, and so forth. July 16.

43. J. Pointon. Improvements in or connected with regenerating, and in apparatus or plant therefor. 7.

53. A. J. Boult.—From J. E. Goldschmid, Germany. vements in or relating to the manufacture of water- July 18.

68. C. C. Carpenter and W. H. Y. Webber. Im- nents in gas manufacture. July 18.

59. A. M. Clark.—From J. E. Goldschmid, Germany. provement in the manufacture of gas. July 19.

63. D. H. Treichler. Improvements in acetylene tors. July 19.

83. A. G. Bloxam.—From O. Mannesmann, Ger- Improvements in regenerative incandescence gas s. July 22.

05. J. Y. Johnson.—From The Wellman-Seaver ering Company, United States. Improvements in tus for charging and discharging coke ovens or . Complete Specification. July 23.

72. O. N. Guldlin. Improvements in gas washers. 4.

88. C. Paulitschky. An improved process and tus for preparing homogeneous dry and solid fuel eat. July 24.

15,171. C. Lowe. Improvements in fuel compositions. July 26.

15,188. P. Bonjour. Improvements in and relating to mantles for incandescent lighting. July 26.

15,259. N. Beck and R. Dior. An improved mode of and apparatus for lighting and heating by carburetted air Filed 27 July. Date applied for 18 Feb. 1901, being date of application in France.

15,397. W. R. Herring. Improvements in or relating to retort settings combined with the gas producer and regenerative chambers for heating secondary air supply by means of the waste gases leaving the setting of the retort. Complete Specification. July 30.

15,428. E. J. E. Hélie. Improvements relating to candles, night lights, and the like. July 30.

15,489. W. Speakman. Non-explosive incandescent gas burner. July 31.

15,511. C. Joly and E. J. Richardson. New and improved system for the liquefaction of air and other aeriform fluids. Complete Specification. July 31.

15,537. A. Meydenbauer. Improvements in acetylene apparatus. Complete Specification. July 31.

15,597. A. H. Beasley, sen., A. H. Beasley, jun., and V. W. Beasley. Improvements in gas-making apparatus. Aug. 1.

15,606. W. P. Warren. Improvements in and relating to apparatus for the generation of acetylene. Aug. 1.

15,646. F. J. Duff. Improvements in gas producers. Complete Specification. Aug. 2.

15,667. L. Mond. Improvements in gas producers. Aug. 2.

15,730. M. Blake, R. H. Smart, and W. Ewing. Improvements in hot coke conveyors. Complete Specification. Aug. 3.

15,750. L. Mond. Improvements in the construction of and method of operating gas producers. Aug. 3.

15,751. F. J. Collin. An improvement in coke ovens. Aug. 3.

15,846. J. J. Hendler. Improvements in apparatus for the manufacture of acetylene and other gases. Complete Specification. Aug. 6.

15,875. G. Sutton. An improved process and machine for producing a coal-like fuel from peat or turf or other analogous substance. Aug. 7.

15,976. J. F. Hoyne. Improvements relating to the production of ozone. Aug. 8.

16,043. W. J. Dibdin and H. C. Woltereck. Process of producing fuel gas. Aug. 9.

16,055. H. H. Lake.—From "Selas" Gesellschaft mit beschränkter Haftung, Germany. Improved method of and apparatus for producing a mixture of gas and air. Aug. 9.

16,134. J. W. Mason. An improved process for purifying hydrocarbon oils and rendering them non-explosive. Complete Specification. Aug. 10.

16,211. J. Y. Johnson.—From The Deutsche Continental Gas-Gesellschaft and J. Bueb, Germany. Improvements in the manufacture of gas and coke. Aug. 12.

16,239. C. B. Tully. Improvements in the manufacture of producer and water-gas. Aug. 13.

16,275. W. T. Sugg. Improvements in incandescent gas-lighting apparatus. Aug. 13.

16,347. H. H. Lake.—From P. Jebsen, Norway. Improvements relating to the treatment of peat. Complete Specification. Aug. 14.

16,356. P. A. Fichet and R. M. J. Heurtey. Improvements in or relating to gas generators. Complete Specification. Aug. 14.

16,449. T. H. Oswald and F. E. Bowman. Improvements in gas-producing plant. Aug. 16.

16,491. W. S. Gilbert. Improvements in or relating to incandescent gas lighting. Aug. 16.

16,586. J. Imray.—From H. L. Mitchell, France. Improvements in the manufacture of artificial fuel. Aug. 17.

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* *See* note (*) on previous page.

Complete Specifications Accepted.

1900.

8434. F. Dannert. Process for the production of electric incandescence bodies. Aug. 14.

11,953. G. J. Atkins. Process and apparatus for the manufacture of gas. July 31.

12,994. F. Thuman. Apparatus for treating liquor obtained from the washing, scrubbing, or cooling appliances of carburetted water gas and other plant, so as to separate the tar from the water. July 12.

13,239. E. Fajole. Acetylene gas generator. July 31.

14,661. F. McNamee. Peat fuel and the like. Aug. 8.

14,781. A. J. Boult. — From W. Kraetke, Germany. Ignition devices for incandescent gas burners. July 31.

15,092. M. Ziegler. Coking of peat or the like, and apparatus therefor. July 3.

15,550. A. Martini. Gas-igniting devices. July 24.

15,645. F. K. Kurz. Apparatus for carburetting a gas by the vapour of a liquid. July 24.

15,868. Sir W. G. Armstrong, Whitworth, and Co., Ltd., and E. L. Orde. Means or apparatus for separating fuel oil from water. July 31.

15,962. F. J. Collin. Horizontal coke ovens. July 31.

16,303. J. A. Lewis. Manufacture of artificial fuel. Aug. 14.

16,598. T. E. Clark. Acetylene gas generators. July 24.

17,330. B. Hiscocks, J. Lock, and C. Bubb. Illuminating power of burners for oil and like lamps. Aug. 8.

17,999. J. M. Coghlan. Acetylene gas-generating apparatus. July 31.

18,181. G. W. Johnson.—From the firm of A. Wolf, jun., and Co., Germany. Treatment of acetylene gas. Aug. 21.

19,711. N. M. Henderson, D. R. Steuart, and J. Calderhead. Purification of paraffin. Aug. 21.

22,694. J. Blasco de Lery. Incandescent gas lighting, and manufacture of burners and incandescible elements therefor. July 31.

23,251. A. Scholl. Hydralic gas-compressing apparatus. July 31.

1901.

1482. O. Imray.—From W. J. Donaldson, W. A. Mears, and G. S. Emerick, United States. Apparatus for borning pulverised fuel. Aug. 8.

5149. F. Dannert. Means for enriching lighting and heating gases with oxygen. Aug. 21.

5689. S. Danner and G. Kubelka. Process of and means for the purification of gases. Aug. 8.

5742. R. Hanson. Generating heat and consumption of smoke. July 31.

6364. S. Falk.—From E. Hildebrandt, Germany. Incandescent gas burners. Aug. 8.

7000. A. A. MacCallum. Incandescent smokelesss coal-gas fire. Aug. 8.

9222. J. Fischer. Incandescent gas burners. Aug. 8.

9822. H. Koppers. Coke ovens. July 13.

10,023. J. A. Rey and J. M. B. Rey. Apparatus for burning hydrocarbons, alcohols, and other combustible liquids for heating purposes. Aug. 14.

10,336. H. Koppers. Method for the heating of by-products saving coke ovens. Aug. 8.

10,337. H. Koppers. Coke oven adapted to be worked with or without saving of by-products. Aug. 8.

10,632. F. C. W. Timm. Manufacture or production of oxygen gas. Aug. 14.

11,145. G. A. Bronden. Gas-retort charging apparatus. July 31.

12,858. P. R. van der Made. Process and apparatus for carburetting air with carburetted hydrogen. Aug. 21.

13,675. J. Greenwood and J. Greenwood, jun. Fuel, and manufacture thereof. Aug. 21.

13,788. J. E. Prégardien. Apparatus for purifying gas. Aug. 14.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Complete Specification Accepted.

1900.

14,892. L. Luyten and E. Blumer. Manufacture purification of anthracene. July 3.

IV.—COLOURING MATTERS AND DYESTUFF

Applications.

14,390. O. Imray. — From Fabriques de Pro Chimiques de Thann and de Mulhouse, Germany. provements in the manufacture of orthotoluenesul chloride. July 15.

14,575. C. D. Abel. — From Actiengesellschaft Anilinfabrikation, Germany. Manufacture of mor dyeing mono-azo dyestuffs. July 17.

14,669. J. Y. Johnson. —From The Badische Anilir Soda Fabrik, Germany. Improvements in the man ture and production of colouring matter containing sul July 18.

14,734. R. B. Ransford.—From L. Cassella and Germany. The manufacture of blue cotton dye July 19.

14,735. R. B. Ransford.—From L. Cassella and Germany. The manufacture of blue cotton dye July 19.

15,062. O. Imray. -- From The Farbwerke vc Meister, Lucius, and Brüning, Germany. Imp manufacture of a black produced by oxidation or stea July 24.

15,064. R. B. Ransford.—From L. Cassella an Germany. The manufacture of new dyestuffs acridine group. July 24.

15,127. A. G. Bloxam. From Société de Laire et France. Manufacture of homologues of α- and β-i July 25.

15,307. R. Holliday and Sons, Ltd., J. Turn Dean, and J. Turner. Improvements in the manuf of dyestuffs containing sulphur. July 29.

15,678. J. Y. Johnson.—From The Badische Anili Soda Fabrik, Germany. The manufacture and prod of new disazo colouring matters and intermediate pr relating thereto. Aug. 2.

15,682. H. E. Newton. — From The Farbenfa vormals F. Bayer and Co., Germany. The manu or production of new derivatives of the anthracene Aug. 2.

15,706. R. J. Urquhart.—Fram The Chemische Fa vorm. Weiler-ter Meer, Germany. Improved proc reducing nitro-, azoxy-. azo-, and hydrazo-comp Complete Specification. Aug. 3.

15,708. R. J. Urquhart.—From The Chemische Fa vorm. Weiler-ter Meer, Germany. Improved proc manufacturing permanent dyestuffs containing s Aug. 3.

15,924. R. B. Ransford.--From L. Cassella a Germany. Improvements in the manufacture of dy Aug. 7.

15,927. G. W. Johnson.—From C. F. Hoehring Soehne, Germany. Improvements in the produc amines from nitro-genated aromatic bodies. Aug. 7

16,170. H. E. Newton.—From The Farbenf vormals F. Bayer and Co., Germany. *See* Class VI.

16,173. C. D. Abel.—From Actiengesellschaft für fabrikation, Germany. Manufacture of colouring belonging to the triphenyl- and the diphenyl-na methane series. Aug. 12.

16,210. G. W. Johnson.—From W. Epstein Rosenthal, Germany. Improvements in the manu and production of colouring matters. Aug. 12.

16,345. R. B. Ransford.—From L. Cassella a Germany. Improvements in the manufacture of co matters. Aug. 14.

109. O. Imray.—From Farbwerke vormals Meister, s, und Brüning, Germany. Manufacture of orange- r to red mono- azo-dyestuffs suitable for the prepara- f lakes. Aug. 15.

117. H. E. Newton.—From The Farbenfabriken ls F. Bayer and Co., Germany. Improvements in anufacture or production of new basic dyestuffs. 15.

120. J. Y. Johnson.—From The Badische Anilin und Fabrik, Germany. Improvements in the manufacture tial materials relating to the production of indigo ing matters. Aug. 15.

84. C. D. Abel.—From Actiengesellschaft für Anilin- ation, Germany. Manufacture of colouring matters ing to the triphenylmethane series. Aug. 17.

92. G. W. Johnson.—From Kalle and Co., Germany. vements in the manufacture and production of ing matters containing sulphur. Aug. 17.

93. J. Y. Johnson.—From The Badische Anilin und fabrik, Germany. The manufacture and production azo-colouring matter. Aug. 17.

Complete Specifications Accepted.

1900.

36. R. B. Ransford.—From L. Cassella and Co., ny. Manufacture of dyestuffs. July 24.

85. J. Y. Johnson.—From Badische Anilin und Soda , Germany. Manufacture and production of new ffs of the anthracene series. July 31.

66. B. Willcox.—From Badische Anilin und Soda , Germany. Manufacture and production of new ediate products related to the indigo group, and indigo colouring matters and indigo therefrom. 4.

21. B. Willcox.—From The Badische Anilin und Fabrik, Germany. Manufacture of 1·8-amino- ol 4-sulpho acid, and of intermediate products thereto. July 24.

08. B. Willcox.—From Badische Anilin und Soda , Germany. The manufacture and production of louring matters, and of new products for use in the cture of colouring matters. July 31.

07. C. D. Abel.—From Actiengesellschaft für Fabrikation, Germany. Manufacture of orange- dyestuffs belonging to the acridine series. July 31.

56. B. Willcox.—From the Badische Anilin und abrik, Germany. Manufacture and production of o-colouring matters. Aug. 21.

18. H. E. Newton.—From The Farbenfabriken F. Bayer and Co., Germany. Manufacture and ion of new dyestuffs of the triphenylmethane series. 1.

4. O. Imray.—From Farbwerke vormals Meister, und Brüning, Germany. Manufacture of a dyestuff d. Aug. 8.

6. C. D. Abel.—From Actiengesellschaft für Anilin ation, Germany. Manufacture of a brown colouring directly dyeing cotton Aug. 8.

7. C. D. Abel.—From Actiengesellschaft für Anilin ation. Germany. Manufacture of a brown colouring directly dyeing cotton. Aug. 8.

1. O. Imray. From Farbwerke vormals Meister, und Brüning, Germany. Manufacture of directly sulphurised dyestuffs from 1:8 and 1:5-dinitro- lene trinitro-naphthalene and derivatives thereof. 1.

7. C. D. Abel.—From Actiengesellschaft für Anilin ion, Germany. Manufacture of a sulphurised dye- ectly dyeing cotton. Aug. 14.

6. O. Imray,—From Farbwerke vormals Meister, and Brüning, Germany. Manufacture of orange- o red mordant dyestuffs. Aug. 14.

1. O. Imray.—From Farbwerke vormals Meister, und Brüning, Germany. Manufacture of indigo.

1901.

11,359. L. Aloy. Manufacture of dyeing compositions. Aug. 8.

12,985. G. W. Johnson.—From C. F. Boehringer und Soehne, Germany. Manufacture and production of diacetyl-diamido-uracil. July 31.

V.—TEXTILES: COTTON, WOOL, SILK, Etc.

Applications.

15,015. W. Woodhead. Improvements in or relating to the treatment of fibrous substances. July 23.

15,736. F. Rushworth. A new or improved method of and apparatus for waterproofing textile fabrics. Aug. 3.

16,204. G. C. Marks.—From T. H. Blair, U.S.A. A material for belting or other purposes. Aug. 12.

16,429. A. Cohn. Improvements in glossing leather, paper, textile fabrics, and the like. Aug. 15.

16,543. D. H. Thornton and Thornton, Hannam, and Marshall, Ltd. Improvements relating to the finishing of certain "embossed" textile fabrics. Aug. 17.

Complete Specifications Accepted.

1900.

16,525. A. M. Posener and F. W. Clerke. Artificial leather floor covering and the like, and method of manufacturing the same. July 24.

16,526. A. M. Posener and F. W. Clerke. Floor coverings, artificial leather, and the like, and method of manufacturing the same. July 24.

VI.—DYEING, CALICO PRINTING, PAPER STAINING, and BLEACHING.

Applications.

14,430. J. H. Gartside and W. G. Buckley. Improvements in or relating to kiers for bleaching textile and other materials. July 16.

14,618. The Major Wood Syndicate, Ltd., and J. Major. Improvements in or applicable to apparatus for dyeing, bleaching, or otherwise treating cops of spun yarn. July 18.

14,619. W. E. Heys.—From A. Masseron, J. Pivert, F. Chaplet, E. J. Mueller, and J. Caquelin, France. Improvements in apparatus for dyeing, sizing, and slashing warps. Complete Specification. July 18.

15,038. R. W. Goddard. Improvements in the method of and apparatus for dyeing warps for weaving. Complete Specification. July 24.

15,948. J. Auchinvole, of the firm of Johnston and Farie. Improved method of and means for washing, bleaching, dyeing, sizing, and similarly treating yarns or like fibrous materials and fabrics. Aug. 8.

16,017. J. Auchinvole, of the firm of Johnston and Farie. Improved method of and means for washing, bleaching, dyeing, sizing, and similarly treating yarns or like fibrous materials and fabrics Aug. 9.

16,061. H. Ferguson. Improvements in washing, softening, and dyeing machines for Rhea filasse or hanks of yarn and similar material. Aug. 9.

19,170. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in the manufacture and production of white and coloured discharges on cotton dyed with sulphurized dyestuffs. Aug. 12.

16,395. E. L. Thorp. Improvements in the electrolytic production of bleaching solutions, and in apparatus therefor. Aug. 15.

16,421. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in indigo reserve printing and means to be employed therein. Aug. 15.

16,538. H. E. Aykroyd, J. Graham, and F. W. Burgess. An open machine for mercerising, bleaching, preparing, dyeing, and washing off. Aug. 17.

Complete Specifications Accepted.

1900.

15,759. F. L. Bartelt. Compounds for washing and bleaching vegetable fibres and textile materials, and for softening and purifying water without the addition of soap or saponifiable water. Aug. 8.

17,701. H. H. Lake.—From Farbwerke Mülheim vormals A. Leonhardt and Co., Germany. Fixing of dyeings obtained with substantive colouring matters on vegetable fibre. July 24.

18,166. C. D. Abel.—From Actiengesellschaft für Anilin Fabrikation, Germany. Dyeing wool. July 31.

VII.—ACIDS, ALKALIS, and SALTS.

Applications.

14,582. W. Noad. Improvements in the obtainment of metallic salts in solution. July 17.

14,812. G. N. Vis. Process for purification of brine containing salts of calcium. July 20.

14,953. K. Dementjeff and J. Ouschkoff. Improved method for the industrial working of the mineral called Eleaolith, for the production of water glass, alumina, sulphate of alumina, alum alumina, and of the chlorides and sulphates of the alkali metals. Complete Specification. July 23.

14,976. P. Naef. Improvements relating to the treatment of solid material with gas as in the carrying out of catalytical reactions. Filed, July 23. Date applied for, May 10, 1901, being date of application in United States.

11,977. P. Naef. Improvements relating to the treatment of solid material with gas, especially applicable to catalytical reactions. Filed, July 23. Date applied for, May 10, 1901, being date of application in United States.

15,468. G. Wilton. Improvements in and relating to the treatment or utilisation of sulphuretted hydrogen and other bye-products from alkali and other works. Complete Specification. July 30.

15,527. O. Imray.—From The Basle Chemical Works, Switzerland. Improvements in the manufacture of phthalic acid and benzoic acid. Complete Specification. July 31.

16,337. C. D. Abel.—From Siemens and Halske Aktien-Gesellschaft, Germany. An improved process for converting into sulphates magnesium, nickel, copper, and the like in their ores. Aug. 14.

16,506. W. Smethurst. Improvements in and relating to the treatment of substances with nascent carbon dioxide, to produce a chemical reaction particularly applicable to the production of borax and boracic acid. Aug. 16.

Complete Specifications Accepted.

1900.

13,493. J. Hargeaves. Treating and obtaining metallic chlorides and oxides. July 3.

17,485. H. J. W. Palas and F. A. J. Cotta. Process for making copper sulphate and other metallic sulphates. Aug. 8.

19,322. A. Brand. Manufacture of caustic soda. July 26.

20,271. G. N. Vis. Process for the purification of brine. Aug. 8.

1901.

13,403. C. N. Waite. Manufacture or production of purified lactic acid from crude solutions containing lactic acid. Aug. 8.

13,694. O. Guttman. Condensing apparatus used in the manufacture of nitric acid and for other purposes. Aug. 14.

VIII.—GLASS, POTTERY, and ENAMELS.

Applications.

14,356. R. Zsigmondy. Improvements in producing a coating of metallic lustre on ceramic objects, enamels, glasses, base metals, and the like. July 15.

14,945. W. Wade. Improvements applicable to kiln mutlles for "hardening-on" or "firing" earthenw July 23.

IX.—BUILDING MATERIALS, CLAYS, MORTAR and CEMENTS.

Applications.

14,446. H. W. Kasten. Procedure for making a cem like material. July 16.

14,926. B. H. Thwaite. Improvements in the ro process of manufacturing Portland cement clinker. Jul

15,029. N. T. Ashton, J. Crompton, and J. D. K Improvements in or connected with the manufactur Portland or hydraulic cement. July 24.

15,214. E. Kreft. Improvements in digester for manufacture of artificial stone. Complete Specifica July 26.

15,316. C. A. Allison.—From C. S. Lawrence an McConick, United States. Improvements in preser wood. Complete Specification. July 29.

15,353. W. L. Wise.—From C. Bade, United St Improvements in apparatus for treating wood and material, and in substances to be used therefor. July

15,402. G. Feyerabendt. Method of preserving by treating it with natrium aluminate. Complete S fication. July 30.

15,884. E. Jacobson. Artificial grave stones. Aug

15,913. H. Trynes. An improved material adapte the manufacture of floor slabs, paving stones, roof sleepers, and other articles. Aug. 7.

16,172. F. Walton. Improvements in the manufa of lincrusta, and apparatus therefor. Aug. 12.

16,508. L. Lobis and A. Wenzel. An improved position for use as concrete. Aug. 16.

Complete Specifications Accepted.

1900.

14,278. H. Passon. Process for producing first- cement. Aug. 14.

17,120. W. W. Pilkington and W. R. Ormandy. M facture of fire and other bricks or building blocks, cement or mortar therefor. July 31.

19,392. K. Müller. Manufacture of cement. Aug.

1901.

10,448. G. F. Lebioda. Apparatus for impregn wood and the like with preservative or other f July 31.

11,045. J. Pfister. Processes of dyeing or prese timber. July 31.

11,927. H. H. Lake.—From S. Giussani, Italy. Pr for the preservation of wood. Aug. 21.

X.—METALLURGY.

Applications.

11,363. W. W. Fyfe. Improvements in and con with furnaces for converting metallic oxides into July 15.

14,801. A. Prister. A new or improved process f precipitation of gold and precious metals from their tions in cyankalium, cyannatrium, and bromocyan. Ju

14,868. R. B. Wheatley. An improvement in alloys. July 22.

15,132. R. B. Ransford. — From G. L. Cabot, U States. Improvements in the manufacture of Bes steel. July 25.

15,250. E. P. Peyton. Improvements in utilisin waste products from the pickling of iron and other July 27.

15,342. A. J. Boult.—From J. Miskolczy, United Improvements in hardening and tempering metals. Ju

5,471. J. Breedon. An improved method with appa- is therefor, for treating kaolin, slimes, saponaceous, thy matter, and the like, preparatory to the extraction, either amalgamation, chlorination, leaching, or such like cesses, of the precious metals contained therein. Com- e Specification. July 30.

5,526. A. S. Elmore. Improvements in apparatus for separation of minerals by the selective action of oils and substances. July 31.

5,534. T. L. Willson. Manufacture of iron and steel. y 31.

5,538. E. Maruhn and E. Uhthoff. Device for trimming metal castings. Complete Specification. July 31.

5,539. F. Maruhn and E. Uhthoff. Improvements in ing machines with swinging moulds. Complete Specifi- on. July 31.

5,540. E. Maruhn and E. Uhthoff. Improved device projecting the casting out of the mould in metal-ca ting hines. Complete Specification. July 31.

5,541. J. B. de Alzugaray. Improvements in the mode and means for extracting gold, silver, and other metals their ores. July 31.

5,595. B. H. Thwaite. Improvements in the treatment last furnace gases, and the utilisation of their heat, and pparatus therefor. Aug. 1.

5,620. W. H. Martin. Improvements in and relating to recovery of precious metals from cyanide solutions aining them. Aug. 1.

5,831. E. Ferraris. Improvements in or relating to or other distillation furnaces. Complete Specification. . 6.

5,922. T. L. Willson. Manufacture of iron and steel. . 7.

5,984. P. Eyermann. Process and apparatus for the uction of malleable iron by means of blast-furnace gas. . 8.

5,131. R. A. Hadfield. An improved method of aling steel. Aug. 10.

5,132. R. A. Hadfield. Improvements in the manu- ure of steel. Aug. 10.

5,133. R. A. Hadfield. An improved manufacture of our plates. Aug. 10.

5,171. P. Eyermann. Improvements in apparatus for ging blast furnaces. Aug. 12.

,178. W. H. Hyatt and W. H. Ashton. Improvements e manufacture of iron and steel. Aug. 12.

,336. C. S. Bailey. Improvements in the treatment of ores. Aug. 14.

,338. A. Watzl and L. Frankenschwert. Improved od of metallically coating metals. Aug. 14.

,359. H. H. Lake.—From A. Scheidel, New South es. An improved process for the extraction of metals their ores. Complete Specification. Aug. 14.

Complete Specifications Accepted.

1900.

,653. A. G. Greenway. Process for purifying or ving impurities from iron or steel while in a molten , and apparatus therefor. Aug. 8.

,657. B. Harlow. Tapping and stopping the flow of en metal from iron foundry or blast furnaces during rocess of casting. Aug. 21.

,879. J. Armstrong. Obtaining volatile metals, cially mercury, antimony, and cadmium. July 31.

,179. L. Rousseau. Portable furnaces for melting and other metals. Aug. 21.

,611. J. Swinburne and E. A. Ashcroft. Treatment lphide ores. Aug. 8.

,612. J. Swinburne and E. A. Ashcroft. Treatment lphide ores. Aug. 8.

1901.

75. G. Grunauer. Manufacture of cast iron. July 31.

63 H. Elmqvist. Smelting process for casting metal. 21.

12,274. W. B. Middleton and the Non-Injurious White Paint Syndicate, Ltd. *See* Class XIII.

13,012. A. F. Cothias. Crucible for moulding under pressure alloys and fusible metals of all kinds. Aug. 21.

13,365. C. E. Steinweg. Process for separating the matrices from galvanoplastically precipitated metals. Aug. 8.

13,705. J. H. Michelsen. Oil concentrators. Aug. 14.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

Applications.

14,367. J. T. Niblett. Improvements in or relating to, and in the manufacture of elements for electric storage batteries or accumulators. July 15.

14,466. P. Stiens and P. J. Smith. Improvements in electrical storage batteries or accumulators, and in electrolytes for electric batteries. Complete Specification. July 16.

14,474. A. E. Greville. Improvements relating to electric batteries. July 16.

14,486. J. Imray.—From La Société Electro-Metallurgique Francaise, France. Process and apparatus for the manufacture of wrought iron, steel, and cast iron by electric heating. July 16.

14,576. J. Imray.—From La Société Electro Metallurgique Francaise, France. Process and apparatus for utilising the waste heat of metallurgical operations. July 17.

14,643. J. Imray.—From La Société Electro-Metallurgique Francaise, France. Electric furnace arranged for being oscillated or tipped. July 18.

14,751. C. J. Tossizza. A process of electro-metallurgic treatment of ores of copper and other metals with depolarised insoluble anodes. July 19.

14,767. A. Stevenson. Improvements in tanks, cells, and connecting pipes for electrolysis and like purposes. July 20.

14,822. J. G. A. Rhodin. An improvement in electrolytic apparatus. July 20.

14,825. C. J. Tossizza. Electro-metallurgical treatment of zinc ores, and especially blend. July 20.

14,946 M. Haas. Improvements in and connected with electrolytic apparatus. Complete Specification. July 23.

14,967. H. H. Lake.—From A. G. Betts, United States. Improvements in apparatus for refining metals by electrolysis. Complete Specification. July 23.

15,192. J. W. Elliott and G. H. Jefford. An improved secondary battery for electric lighting or other purposes. July 26.

15,427. P. Marino, Q. Marino, G. Marino, and A. Ratchkowsky. An improved process for the electrolytic deposition of metals. July 30.

15,463. B. Kuettner. Improvements in secondary battery plates. July 30.

15,579. A. J. Boult.—From The American Alkali Company, United States. Improvements in or relating to electrolytic apparatus. Complete Specification. Aug. 1.

15,674. A. Gabitti. Improvements in the construction of storage batteries Filed Aug. 2. Date applied for Jan. 2, 1901, being date of application in Italy.

15,816. R. M. Lloyd. Storage batteries and alarms therefor. Complete Specification. Aug. 6.

15,818. R. M. Lloyd. Storage batteries and insulation thereof. Complete Specification. Aug. 6.

15,819. R. M. Lloyd. Storage batteries and ventilation thereof. Complete Specification. Aug. 6.

15,876. J. H. West. Improvements in or relating to electrical storage batteries. Aug. 7.

15,902. A. O. Jones. Electric battery cells, the better construction of, for the removal of deposits. Aug. 7.

15,909. R. W. James.—From J. J. Heilmann, France. Improvements in and relating to the electrodes of electrical accumulators. Complete Specification. Aug. 7

16,072. M. Daseking and A. Brandes. Improvements in or connected with electric accumulators or storage batteries. Aug. 9.

16,122. A. Dorsemagen. Working zinc and substances containing silicic acid in electric furnaces. Aug. 10.

16,128. A. Tribelhorn. Improvements in electric accumulator batteries. Complete Specification. Aug. 10.

16,566. A. T. Davies. Improvements in storage battery plates. Complete Specification. Aug. 17.

Complete Specifications Accepted.

1900.

12,977. P. E. Francken. Electric battery. July 3.

14,463. P. Schoop. Apparatus for electrolysis. Aug. 8.

16,293. J. Imray.—From La Société Electro-Metallurgique Française, France. Electric furnaces. Aug. 8.

1901.

3416. W. Erny. Construction of electrodes containing zinc for use in electric batteries, and method of producing and employing the same. Aug. 21.

3417. W. Erny. Galvanic batteries. Aug. 21.

8985. L. Bénier. Thermo-electric battery. Aug. 8.

10,505. T. A. Edison. Storage batteries. Aug. 21.

10,974. P. M. Justice. — From Castner Electrolytic Alkali Company, United States. Electrodes for electrolytic cells. Aug. 21.

14,086. R. J. Gülcher. Construction of electrodes for accumulator batteries, and moulds therefor. Aug. 14.

XII.—FATS, OILS, and SOAP.

Applications.

14,603. C. Kremer and R. Schilling A process of and apparatus for the recovery of fats and the like. July 17.

14,617. N. Kilvert and Sons, Ltd., and A. L. Robertson. Improved apparatus for disintegrating and melting lard, soap, tallow, and other substances soluble by heat. July 18.

14,797. W. Hill and R. W. D. Pinney. A new or improved liquid lubricant. July 20.

14,975 H. H. Lake.—From J. S. Stewart-Wallace, France. Improvements in and relating to the utilisation of petroleum, mineral, or shale oils and their distillates for soap making or other purposes. July 23.

15,531. H. Arledter and R. J. Whitney.—F. Arledter, Germany. Improvement in purifying and decolorising resins, oils, and fats. Complete Specification. July 31.

15,602. A. M. Clark.—From L. Rissmuller, United States. Improvements in the treatment of whale and seal material. Complete Specification. Aug. 1.

15,603. A. M. Clark.—From L. Rissmuller, United States. Improvements in bleaching whale and seal oils. Complete Specification. Aug. 1.

15,906. A. H. Crosfield, R. F. Jones, and J. Barker. A process for the oxidation and saponification of mineral oil. Aug. 7.

16,134. J. W. Mason. *See* Class 11.

16,177. R. Meldrum. An improved process for producing homogenous solidifications and semi solidifications of anhydrous glycerine, aqueous solutions of glycerine, and mixtures of glycerine and carbon compounds. Aug. 12.

16,189. L. J. Davis. Improvements in the purification of petroleum and other oils. Aug. 12.

16,483. J. Rank. Improved method of separating vegetable oils from ground seeds. Aug. 16.

Complete Specifications Accepted.

1900.

13,991. J. W. Mackenzie. — From Die Direction der Gesellschaft der Rigaer Eisengiesserei und Maschinenfabrik vormals Felser and Co. Pressing plates for hydraulic oil presses. Aug. 14.

17,278. F. A. Hulme. Manufacture of soft so
Aug. 14.

22,867. M. S. Hudnall and H. Calvert. Lubricant, a
process of making the same. July 24.

1901.

2817. L. M. B. Raynaud. Composition for the ma
facture of soap for use in sea water. 31 July.

11,419. The Cotton Seed Company, Ltd.—From J. C.
Stanley, United States. Bleaching of oleaginous mat
Aug. 8.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, Etc.

Applications.

14,456. W. L. Shooter. An improved process and me
used in connection therewith for dissolving shellac a
obtaining varnish or composition therefrom. July 16.

14,555. J. F. Butterworth and C. Marter. A new
improved substitute for leather, india-rubber, gutta-perc
and similar materials and articles made therefrom. July

14,707. T. S. Mullay. An improved preserving
anti-fouling composition or coating, particularly applica
for the bottom of ships. July 19.

15,784. E. Wege. Improved manufacture of vulcani
lacquers and varnishes. Aug. 6.

Complete Specifications Accepted.

1901.

6959. C. Paulitschky, R. Paulitschky, and F. W
Manufacture of rubber substitutes. Aug. 8.

9828. S. Ammundsen. Varnish substitute and
process for producing same. Aug. 21.

10,962. C. A. Day.—From The Coleman Internati
Ship and Pile Coppering Company, United States. A
fouling coating for metal structures. July 31.

10,963. C. A. Day.—From The Coleman Internati
Ship and Pile Coppering Company, United States. A
fouling coaring for metal structures. July 31.

12,274. W. B. Middleton and The Non-Injurious W
Paint Syndicate, Limited. Treatment of zinc and o
ores, chiefly for the direct production of zinc white,
furnaces therefor. July 24.

XIV.—TANNING, LEATHER, GLUE, and SIZE

Applications.

14,516. Lepetit Dollfus and Gansser. Improvement
combined dyeing and tanning baths. Filed July 16.
applied for Jan. 15, 1901, being date of applicatio
Italy.

15,547. R. Thomlinson. Improvements in the treatm
of skins. July 31.

15,856. L. L. Kelsey. Apparatus for making g
Aug. 6.

16,204. G. C. Marks.—From T. H. Blair, U.S.A.
Class V.

16,208. H. Aitken. Improvements in the treatmen
hides, skins, or leather. Aug. 12.

Complete Specifications Accepted.

1900.

13,361. H. R. Riches and The Wool, Hide, and
Syndicate, Ltd. Process for treating and preserving hi
skins, furs, and the like. July 24.

16,525. A. M. Posener and F. W. Clarke. *See* Clas

16,526. A. M. Posener and F. W. Clarke. *See* Clas

XV.—MANURES, Etc.

Complete Specification Accepted.

1900.

12,895. C. Roth. Artificial manures. July 24.

XVI.—SUGAR, STARCH, AND GUM, ETC.

APPLICATIONS.

,614. J. O. Schweitzer. Improvements in the manu-ure and refining of sugar. Aug. 1.

,853. G. Hallenscheid. An improved twisted auger. plete Specification. Aug. 6.

,148. M. Cabidos and J. M. Abram. Improvements the manufacture of starch. Complete Specification. . 12.

5,153. H. Sureties. A new mineral adhesive. Aug. 12.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

3,906. H. Wilhelm. Method of producing an easily stible peptonised preparation of albumen. Aug. 8.

,428. W. H. Uhland. Manufacture of starch. July 24.

XVII.—BREWING, WINES, SPIRITS, ETC.

APPLICATIONS.

,732. E. Canziani. Improvements in the drying of als in the manufacture or production of malt. July 19.

,886. L. I. N. Norman. Improvements in the manu-re of brewing syrup. Aug. 7.

,032. P. Meura. Improvements in brewing appliances. plete Specification. Filed Aug. 9. Date applied for 10, 1901, being date of application in Belgium.

,049. O. E. Nycander. Improvements in and means pparatus for the alcoholic fermentation of liquids. . 9.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

,687. L. Denayrouze. Manufacture of solidified rated spirits. Aug. 21.

,507. H. Sue. Apparatus for aerating wines and other ds. Aug. 14.

1901.

,314. J. Schaefer. Steam boiling apparatus for brewing oses. Aug. 8.

XVIII.—FOODS, SANITATION, ETC., AND DISINFECTANTS.

APPLICATIONS.

A.—Foods.

,222. W. Helm. An improved process for preserving . July 26.

,987. A. Zimmermann.—From H. Nicolai, Germany. ovements in the manufacture of coffee free from ine. Aug. 8.

,110. J. Imray.—From Société "Le Lait," France. ocess for preserving milk. Aug. 10.

,207. C. de Beck. Improved process and apparatus sterilising and pasteurising milk, butter, and other ances. Complete Specification. Aug. 12.

,431. M. Julien. A novel process for the production ilk rich in cream or other similar fatty matter. Aug. 15. Date applied for Feb. 14, 1901, being date plication in France.

B.—Sanitation. Water Purification.

,547. J. Howden and J. H. Hume. Improvements in elating to refuse destructors. Complete Specification. 17.

C.—Disinfectants.

,809. T. Voile. An improved powder for disinfecting oses. July 20.

,150. M. Cohn. An improved process for the manu-re of of an antiseptic containing iodine. July 20.

271. C. Spengler. Improvements relating to the facture of a disinfectant. Complete Specification. 27.

COMPLETE SPECIFICATIONS ACCEPTED.

A.—Foods.

1900.

13,475. L. Aubry. Manufacture of a food extract from yeast dregs, settlings, or like waste materials from breweries, distilleries, and wines. July 31.

15,649. M. Poppe. Manufacture of artificial butter. July 24.

17,768. A. Flügge. Process for the manufacture of nutritious food from the seeds of the horse-chestnut, and for the extraction of the bitter resinous principle contained therein. Aug. 14.

1901.

8937. W. L. Wise.—From B. Bache-Wüg, Norway. Preservation of eggs and other articles of food. Aug 8.

9091. A. Herzen. Process for the preparation of pepsinogenous meat extract. Aug. 8.

B.—Sanitation; Water Purification.

1900.

14,417. A. Harris. Apparatus for softening or purifying water. July 24.

14,505. W. Warner. Apparatus for the treatment of towns' refuse. June 26.

17,674. F. Ball. Apparatus for consuming smoke in furnaces for the destruction and incineration of ash bin and other refuse. Aug. 14.

1901.

11,353. C. H. Royl. Apparatus for softening and purifying water. July 31.

11,944. J. C. Miller. Process and apparatus for sterilising and cooling liquids. July 24.

XIX.—PAPER, PASTEBOARD, ETC.

APPLICATIONS.

14,903. H. E. Franquet. Improvements relating to the manufacture of celluloid. July 22.

14,981. H. E. Franquet. A new or improved compound for use as a substitute for shell, ivory, and the like. July 23.

15,815. H. R. Romney. Improvements in and relating to the manufacture of paper. Aug. 6.

15,954. C. R. Jackson. An improved method for producing and applying solutions, or a solution of xylonite, celluloid, and the like substances. Aug. 8.

16,240. W. Pinkerton. Improved process for the recovery of vaporised alcohol, and other vapours, in the manufacture of celluloid and other manufactures. Aug. 13.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

17,948. E. Zühl. Manufacture of celluloid. July 24.

19,039. H. H. Lake.—From Fabrik Chemischer Präparate von Dr. R. Stahmer, Germany. Production of hydrocellulose. July 31.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

APPLICATIONS.

14,366. F. Boehm.—From E. Merck, Germany. An improved process for preparing alkyl-ethers of morphine. July 15.

14,507. H. Froehling. Improved process and apparatus for extracting alkaloids and oils from vegetable substances. Complete Specification. July 16.

15,447. J. M. Schutz and C. G. Hawley. An improved coffee compound or composition, and process of producing the same. Complete Specification. July 30.

Complete Specifications Accepted.

1900.

13,468. H. H. Lake. — From the firm of Fabrik Chemischer Praeparate von Dr. R. Sthamer, Germany. Production of saponin. July 3.

1901.

9091. A. Herzen. *See* Class A.

13,745. M. Dinesman. Process of manufacturing thymol. Aug. 21.

XXI.—PHOTOGRAPHY.

Applications.

12,421A. H E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. The preparation and employment of new photographic developers. Filed 22 July. Date claimed 18 June 1901, being date of original application. (Re-numbered from 14,896, A.D. 1901, which number is cancelled.)

14,510. L. Drefus. An improved method of photography, and apparatus therefor. Complete Specification. July 16.

15,633. W. N. L. Davidson. An improved photographic method of printing in colour (or colours) on paper (or other substances). Aug. 2.

15,716. S. G. Fry. An improved non-inflammable photographic film. Aug. 3.

Complete Specifications Accepted.

1900.

11,213. A. Sauve. Improved apparatus for viewing the superposed images of multible diapositives with colour screens. June 26.

1901.

9120. W. E. Evans.—From La Société Anonyme des Pellicules Françaises, France. Manufacture of photographic films. July 31.

10,524. S. E. Page.—From The Grenier Art Company, United States. Photographic fabrics. Aug. 21.

XXII.—EXPLOSIVES, MATCHES, Etc.

Applications.

14,525. J. W. Mackenzie.—From The Robin Hood Powder Company, United States. Improvements in explosives. Complete Specification. July 16.

14,676. E. Steele, C. J. Bower, and H. E. Pochlu Improvements in explosives. July 18.

15,141 C. F. Hengst. Improved manufacture of smo less powder, or explosive material. July 25.

15,926. H. Christensen. Improvements in matches machinery for their manufacture. Complete Specificat Aug. 7.

15,983. F. L. Nathan, J. M. Thomson, and W. Rint Improvements in apparatus for the manufacture of ni glycerin. Aug. 8.

16,509. H. H. Lake.—From F. C. Dininny, jun United States. Improvements in match-making machin Complete Specification. Aug. 16.

Complete Specifications Accepted.

1900.

14,583. H. Ziegler. Priming compositions. Aug. 8.

1901.

11,400. E. Edwards.—From W. Kent, United St Smokeless powders. Aug. 8.

XXIII.—GENERAL ANALYTICAL CHEMISTR

Application.

14,546. H. F. Julian. Improvements in testing solul July 17.

PATENTS UNCLASSIFIABLE.

Applications.

14,420. J. Philipps, H. Lebel, and R. Grimoin-Sa An improved fabric or material. Complete Specifica July 15.

15,153. A. E. Cummer. Process of treating hyd compounds. Complete Specification. July 25.

15,308. C. S. Rolfe. Modifying and controlling che reactions. July 29.

Complete Specification Accepted.

1900.

17,119. A. Ludwig. Process for the artificial produ of diamonds and the like. Aug. 21.

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Printed and Published by EYRE and SPOTTISWOODE, East Harding Street, London E.C., for the Society of Chemical Industry.—P

THE JOURNAL
OF THE
# ociety of Chemical Industry.
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). 9.—Vol. XX.] SEPTEMBER 30, 1901. [Non-Members 30/- per annum; Members 21/- per Set of extra or back numbers; Single Copies (Members only) 2/6, all prepaid.

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Friday, Oct. 25th, 1901.—Messrs. S. A. Tucker and H. R. Mo
(1) "Reduction of Alumina by Calcium Carbide."
(2) "Production of Ethylene from Inorganic Sources."

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SESSION 1901—1902.

Wednesday, Oct. 30th, 1901:—
Mr. Arthur Adams. "Heat-producing Power of Fuel." Ds
cussion.
Dr. J. Gordon Parker. "Effect of Extracts containing S
Bisulphite on Leather."

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Communications.

Authors of communications read before the Society, or y of its Local Sections, are requested to take notice that der Rule 43 of the Bye-laws the Society has the right of ority of publication for three months of all such papers. fringement of this Bye-law renders papers liable to be ected by the Publication Committee, or ordered to be stracted for the Journal, in which case no reprints can furnished to the author.

Arsenic.

In view of the great public interest which has been used by the Arsenic Epidemic, it has been decided to ublish, in pamphlet form, uniform with the Journal, the ers, discussions, and abstracts dealing with the detection l determination of Arsenic and other associated elements, ich have appeared in the Journal since the beginning of year. To these have been added extracts bearing on subject from other sources, including a description, from inklyn's new book on Arsenic, of the Marsh test, in the entor's own words, and dated 1836. Copies, price 1*s.* n, may be obtained from Messrs. Eyre and Spottiswoode.

Arsenic Committee.

he Joint Committees of the Societies of Chemical lustry and Public Analysts have circulated a number of iples containing definite quantities of arsenic, and have efully considered the results returned by the members. he Committee believe that these results justify them in scribing a method for dealing with the various substances, before taking this course think it desirable to submit method to somewhat more extended trials.

Foreign Office Reports.

Vith reference to the notice from the Foreign Office ch appeared on page 761 of this Journal, inviting imbers of Commerce and other bodies to suggest special jects upon which H.M. Consular Officers might be ected to report, it should be noted that such suggestions uld be addressed to the Commercial Department of the eign Office. On page 859 of the Journal for this year be found a report furnished by Consul-General Gurney, ugh the Foreign Office, at the request of this Society, "Castor Oil Manufacture at Marseilles." It is hoped members will avail themselves, through the Society, of facilities thus placed within their reach by the Foreign ce.

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Obituary.

HUGH BARCLAY.

Member of the Scottish Section of the Society of Chemical Industry.

Hugh Barclay was born at Millhouse in 1861, a small village in the Kyles of Bute. His father was manager of the powder works of Messrs. Curtiss and Harvey. Having completed his earlier school education, he studied chemistry whilst residing for a lengthened period with a brother in Newcastle-on-Tyne. Going to Glasgow later on, he practised commercial chemical analysis in the laboratory of Messrs. Wallace, Tatlock, and Clark, the city analysts. In 1880 he obtained the appointment of chemist at the Harrington Ironworks of Sir James Bain and Co., and thenceforth devoted himself to the metallurgy of iron and its cognate branches. Having become a blast-furnace specialist, he was appointed manager of the Calder Ironworks of Messrs. William Dixon, Ltd., in 1890, and after ten years he became general manager, with an interest in the business—a cogent tribute both to energy and ability. His increasing success, unfortunately, was accompanied by increase of ill health, which his unfailing vivacity caused him to make light of; but the malady was an insidious one. He died, after a fortnight's illness, August 6, 1901, from heart failure, leaving a widow and two children. He was a Fellow of the Chemical Society, and a Vice-President of the Iron and Steel Institute in the West of Scotland. He had a very large circle of friends, and to them the world seems the poorer for the loss of a man of such high character and accomplishments.

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I.—PLANT, APPARATUS, AND MACHINER

PATENTS.

Incrustation, Scale, or other Foreign Matter from Ste Boilers, Tubes, and other Vessels or Objects; Remo of ——. C. Elliott, Sunderland. Eng. Pat. 7951, April 1900.

The object to be cleaned is wholly or partially filled wi or enclosed in, salt water or other suitable electrolyte, which one or more electrodes are suspended or arrang connected to one pole of a dynamo or its equivalent, wl the other pole is connected to the shell or body of vessel or object. The electric current through the obj generates gas beneath the incrustation, scale, or ot foreign matter, which is consequently loosened and f off.—G. H. R.

Scale from Boilers; Improved Compound or Composit for Removing ——. A. O. Hamilton, Dundee, N Eng. Pat. 16,581, Sept. 18, 1900.

The composition is prepared by dissolving 126 lb. caustic soda in 40 gallons of water. According to modification, 1 lb. of burnt sugar may be added to solution; and according to another, in addition to the su 1 to 4 lb. of "zinc" and 1 gall. of "paraffin oil" may also added.—E. S.

Heating, Cooling, Evaporating, or Condensing Liquid Gases; Apparatus for ——. H. B. Kershaw, St bridge, Lancashire. Eng. Pat. 15,455, Aug. 30, 1900.

A tube for heating, cooling, or like apparatus is constru of a main tube having annular or spiral grooves or co gations, an internal tube, and a spiral tube of small diam around the exterior. The internal tube may be omitted —R.

Vapour at any Desired Pressure from Liquids He under Pressure, but not Boiling; Process and Appar for Producing ——. C. Steffen, Vienna. Eng. 15,646, Sept. 3, 1900.

The following two modifications of the process describe Eng. Pat. 12,805 of 1900 (this Journal, 1901, 562) the subject-matter of the present invention:—(1) motor, which produces the cycle of flow and the increa pressure of the liquid, is worked by any source of en external to the system, instead of by the energy of moving liquid. (2) The speed of flow of the liquid thr the heater is regulated, and the valve between the he and the vapour generator is loaded, so that the va evolved is of higher pressure than is required at the of consumption, such excess of pressure being employe working the motor.—R. A.

High-Pressure Gases; Vessels for the Reception of A. Ludwig, Bernburg (Anhalt), Germany. Eng. 16,908, Sept. 22, 1900.

The vessel consists of a cylindrical metal receiver hav cover carrying the connections. A strap surrounds vessel and cover, and wedges are driven between the and the cover to secure the latter. A similar stra wedge arrangement may be employed for securing the connections, &c. The vessel may be surrounded refrigerator, which may consist of an arrangement of having annular channels for the passage of the co liquid.—R. A.

Boiling Pans and Similar Apparatus. H. Cox, Eng Eng. Pat. 7996, April 18, 1901.

The boiling pan is provided with one or more perfo reticulated, or similar plates, connected to the pan so be removable. The plates serve to effect the mixing various ingredients treated, or, in the case of jam maki separate the stones, seeds, &c., from the jam.—R. A.

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* Any of these specifications may be obtained by post by remitting 8*d*.—the price now fixed for all specifications postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

ectric Furnace with Two Bed Plates. C. A. Keller, aris. Under Internat. Conv. First Foreign Application (in France), May 21, 1900. Eng. Pat. 22,584, Dec. 11, 1900.

e furnace is provided with two movable sole plates, med of a number of fixed carbons, which receive the rent by contact, on their faces, by means of thin copper ductors, and transmit it to small electrodes placed sely on them, these being the only replaceable electrodes. ey are preferably composed of the fragments of electrodes erwise useless in the industry. The sole plates are pectively connected to one of the terminals of a source electricity in such a way that the current flowing from sole plate to the other, through the material to be treated, heat the latter to incandescence and fusion. A melting is so arranged between the two mobile sole plates that the resistance of the furnace can be regulated by moving them towards or from each other, and the contact of the material treated with the carbon of the sole plates, is avoided if necessary. The metallic contact pieces of the sole plates pass through channels formed in the brickwork of the furnace bed in such a manner as to prevent the falling down of the conducting body, or of the material to be treated.

—G. H. R.

II.—FUEL, GAS, AND LIGHT.

Water-Gas; Comparison of ——, with other Combustible Gases. J. Körting. Zeits. Ver. deutsch. Ing. 1900, **44**, 1301—1308, 1345—1348.

In the following table various gases used for power and lighting purposes are compared:—

—	Producer Gas.	Dowson Gas.	Water-Gas.	Coal-Gas.	Carburetted Water Gas.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
....	23—30	23—27	40	6—8	23—28
....	2—7	6—7	3—7	1—1·5	0·2—2·2
....	2—6	17—18	50	46—48	34—38
....	50—65	47—52		..	2·5—5
....			3·6	..	..
, &c.	traces	0·5—2		34—38	17—21
, &c.				3—5	13—16
ific Gravity	1·0	0·83	0·51	0·4	0·58—0·6
ries per cb. m.	850—1,000	1,200—1,400	2,350—2,600	4,800—5,200	6,000
perature of flame	below 2,000° C.	below 2,000° C.	2,700°—2,800° C.	2,300°—2,400° C.	..

he author also describes, with diagrams of the plant and details as to consumption of coal and coke for heating gas generating, the four principal methods for the ufacture of water-gas, namely, Fischer's, Humphreys Glasgow's (this Journal, 1895, 646; 1897, 720), wik's (this Journal, 1896, 642; 1897, 900; 1899, 1003; 1900, 647), and Strache's (this Journal, 1896, 441). efficiency of each process is worked out and given as ratio of the heat value of the fuel to that of the corresponding amount of gas. In the following table the author compares the different gases, together with Dowson gas (this Journal, 1896, 892; 1898, 495; 1900, 523) and coal-gas, the figures referring to the latter being the average ones obtained from the statistics of 200 installations for town supply. The figures given in the table are the results of actual working, and are based on the following prices of raw materials and by-products:—Prices per 100 kilos.: steam coal, 1·7 marks; gas, 1·8; coke, 2·0; tar, 4·0;

—	Calories per cb. m.	Efficiency.	Cost of Fuel.		Cost of 1,000 Candle-Hours.	
			Per cb. m.	Per 1,000 cals.	Batswing Burner.	Welsbach Burner.
phreys and Glasgow's process:		Per Cent.	Pfennige.	Pfennige.	Pfennige.	Pfennige.
e water-gas	2,500	55	1·77	0·71	..	3·54
carburetted with German oil ...	5,000	..	4·0	0·80	37·5	7·4
" " foreign oil	5,000	..	6·2	1·24	57·0	11·0
ik's process:						
e water-gas	2,350	51	1·66	0·71	..	3·48
carburetted with German oil ...	5,000	..	4·21	0·87	40	7·7
" " foreign oil	5,000	..	6·32	1·28	60	11·6
" " benzoline	3,700	..	4·62	1·24	44	8·5
he's process:						
e water-gas	2,500	35	2·24	0·90	..	4·48
carburetted with German oil ...	5,000	..	4·47	0·90	42	8·81
" " foreign oil	5,000	..	6·67	1·32	63	11·4
" " benzoline	3,700	..	5·20	1·40	49	9·4
as:						
hout by products	5,000	33·5	..	..	..	..
h by-products	5,000	66	1·9	0·38	17·8	3·4
l coal- and water-gas	3,670	..	2·35	0·64	..	4·25
on gas	1,250	70	0·51	0·44	..	..

onia, 18·0; benzoline, 25·0; German gasoline, 8·0; foreign gasoline, 14·0 marks. All incidental losses included in the consumption of fuel, and, in the case of gas, the costs include the addition of carbylamine or substance to odorise the gas. The carburetting ried on till the gas has an illuminating value of ndle-power.

e cost of plant is slightly higher for coal-gas than for -gas, and about four times as much for the latter as for on gas, whilst for labour, the cost is about the same for -gas and coal-gas, and slightly lower for Dowson gas. e author concludes that for industrial purposes where h temperature is required, water-gas is preferable to Dowson gas. For town lighting, carburetted water-gas can compete with coal-gas only in very small installations, and where by-products are unsaleable; a carburetted water-gas plant can, however, often be of advantage as an auxiliary to a coal-gas installation.—A. S.

Gas-Washer; Rotatory ——, with Loose Filling Material. G. Zschocke. J. für Gasbeleucht. **44**, [23], 413—414.

The washer described is of the "Standard" type, and its construction is clearly shown in the annexed figures. It consists of a cylindrical casing divided by partitions into compartments. The several compartments communicate by openings alternately in the middle and in the upper part of the partitions A shaft, which traverses the middle of the casing and is rotated by gearing, carries a number of perforated vanes in each compartment. The compartments are packed with a number of perforated balls, which are carried forward by the vanes, and roll upon one another as the shaft is rotated. The liquid used for washing the gas enters by a stand pipe at one end of the casing, and on reaching a given level in the first compartment, overflows into the next compartment, and thence through the remaining compartments to an outlet at the other end of the casing. The gas enters at the top, at the end at which the liquor leaves the washer, passes down the first compartment to the opening in the middle of the partition, through which it passes to the next compartment, up which it travels to the opening near the top of the next partition, and so on through the several compartments in a reverse order to that in which the washing liquid traverses them. The rolling of the balls on one another cleanses them of tar and particles which would tend to obstruct a fixed filling. The filling may be renewed, if necessary, through suitable doors in the casing, without dismantling the whole washer.—J. A. B.

Fig. 1.

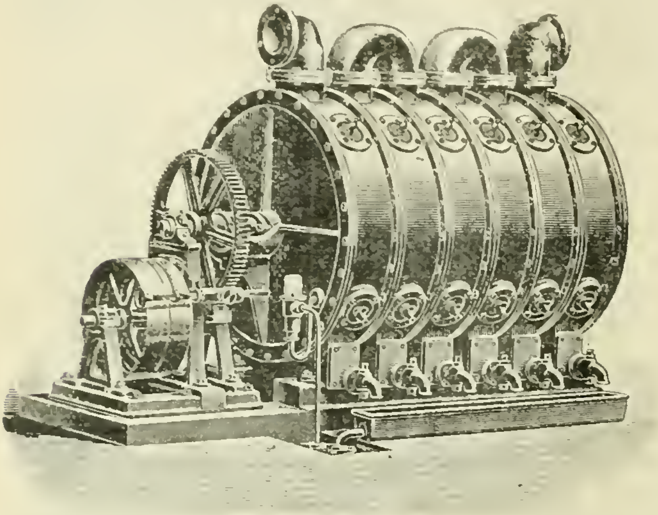
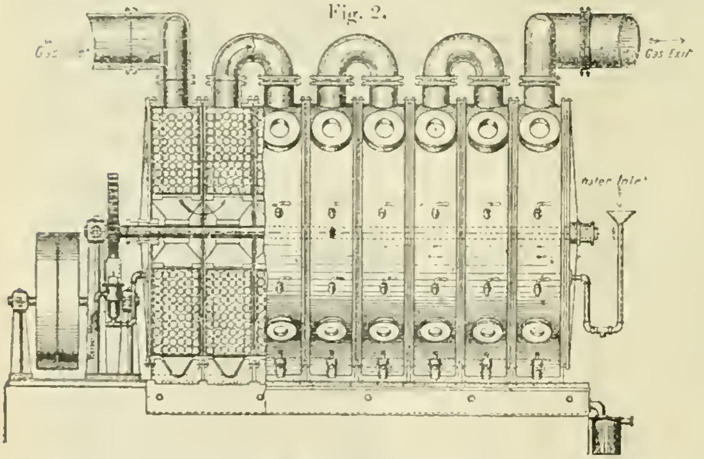


Fig. 2.



Gases; Determination of the Calorific Power of ——. W. Hempel. Zeits. angew. Chem. 14, [28], 713—716.

Junker's gas-calorimeter gives very satisfactory results when a considerable quantity of the gas, of uniform composition, is available for the determination. It cannot be used, however, with small quantities of about 2—3 litre
and is therefore not suitable for following the changes
composition which often occur in the course of a fe
minutes during the process of gas-production. The auth
has devised the apparatus shown in Fig. 1 for makin
rapid calorimetric determinations.

A burner, A, is so arranged that both oxygen, from th
holder O, and the gas to be examined, from the reservoir
can be supplied to it. The products of combustion are
small in volume that they are complete
cooled within the copper tube, B (18 c
long, and 3·3 cm. in diameter), which
closed by a plate at its upper end, and
soldered into a tripod. The glass cylind
E (31 cm. long and 5—6 cm. in diamete
capable of holding 500 c.c. of water,
fixed over the copper tube by means of
rubber stopper. A stirrer, F, serves f
mixing the water during the combustio
The thermometer G is divided into tent
of a degree, and can be read to with
about 0·02° C. The gas reservoir H
made of sheet zinc, and is provided wi
brass stopcocks, *i* and *k*.

The ignition of the gas to be examin
is brought about by a very small hydrog
flame, fed by an ordinary hydrogen ge
rator L. To ensure the use of exactly t
same quantities of hydrogen and oxyg
in all determinations, the stopcocks of
and L are opened just so far that
bubbles of gas escape from the tubes *r* a
s in the cylinders *p* and *q*; *m* and *n*
very narrow capillary tubes.

The burner A is shown in detail
Fig. 2. A brass tube *h*, attached to t
iron sole *g*, is provided with a small s
tube *c* for the oxygen supply, and is fit
at its upper end with the porcelain piec
to prevent the conduction downwards
the heat of combustion. The inner tub
which also terminates in a porcelain
earthenware tube *e*, serves for the co
bustion of the gas under examinati
The very narrow copper tube *b* supp
hydrogen for the igniting flame.

In testing a sample of gas, the reserv
H is filled with it, at slightly more th
atmospheric pressure. The temperat
and barometric pressure having been not
the stopcock *i* is momentarily opened
bring the sample to atmospheric press
and then the three-way tube *r* is attach
to connect the reservoir with the bottl
The bottle is fitted with the tightly-inser
thermometer *s* and a glass tube *t*, so t
the water may flow out at an equal p
sure. By opening the pinch-cock *u*,
connecting tubing is filled entirely
water.

The cylinder E, not yet placed over the burner, is fi
with 500 c.c. of water, and, after stirring, the tempera
is carefully noted. A small hydrogen flame, about the
of a mustard seed, is now lit upon the burner, and a str
of oxygen, the flow of which must be determined once
for all by preliminary trials, is turned on. The suppl
oxygen must be such that, during the combustion of
sample, a glowing splinter held at the mouth of the cop
tube B will burst into flame. The cylinder E is now pla
over the burner, the cocks *k* and *i* are opened, and aft
few seconds the hydrogen is turned off. The hydro
flame should be maintained within the calorimeter for
same number of seconds in all tests. The ignition of
sample is indicated by a slight odour, and the stirrer is
kept going continuously. As long as water is flowing into
reservoir H, air-bubbles will be seen to rise from the tub
and the end of the experiment is indicated by the appear
of water in the connecting tube at *v*. The stirrer is
operated until the maximum temperature is indicated by

The apparatus is standardised by the combustion of re hydrogen in precisely the manner indicated. For ample, the author found, for one reservoir-full of drogen, measured at 6·1° C. and 755·2 mm., an average e of temperature of 10·838° C. On testing a sample of ducer gas, measured at 12·9° and 753·2 mm., the rise temperature was 4·21°, the duration of the igniting (hydrogen) flame being 30 seconds. Allowing for the difference in tension of aqueous vapour, and then correcting for temperature and pressure, the rise in temperature which the sample would have given, if measured in the reservoir at 6·1° and 755·2 mm., becomes 4·35°. Taking the absolute calorific value of a litre of hydrogen as 3,087 calories, that of the sample is—

$$10{\cdot}838 : 4{\cdot}35 :: 3{,}087 : x = 1{,}239 \text{ calories.}$$

Fig. 1.

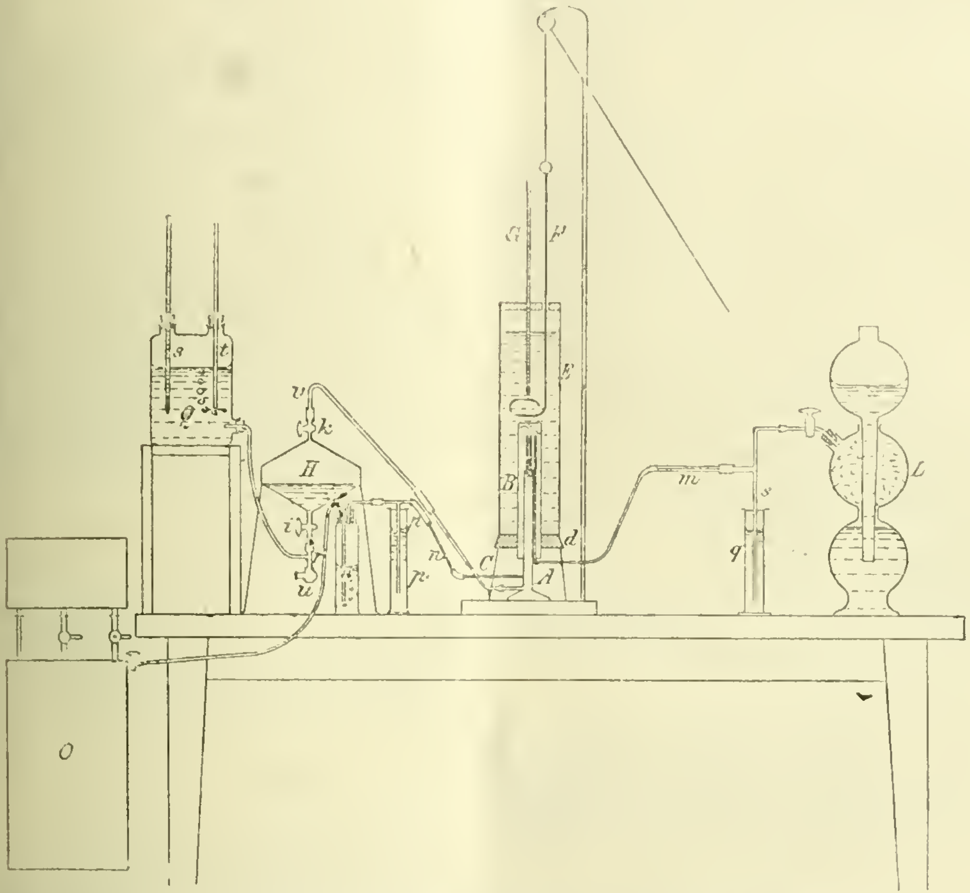


Fig. 2.

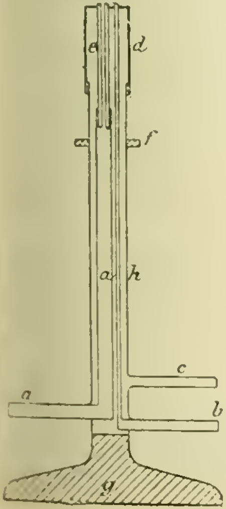
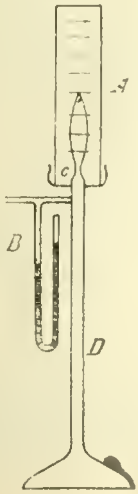


Fig. 3.



The Flame Calorimeter.—For the continuous control of gas manufacturing operations, the apparatus shown in Fig. 3 gives useful indications of the heating power of the gas. It consists of the stand D, a burner *c*, a graduated chimney A, and a manometer B, and it is based upon the principle that the greater the heating power of the gas, the longer is the flame, because a greater amount of oxygen is required for combustion. In making a determination, the gas is brought to the standard pressure, as indicated by B, and the height of the flame then gives directly the calorific power. The apparatus may first be standardised by means of gas of known calorific power. Variations in the specific gravity of the gas and in the atmospheric pressure influence the height of the flame.—H. B.

PATENTS.

Coal Powder; Apparatus for Aërating and Feeding ——. A. A. Day, New York, U.S.A. Eng. Pat. 6556, March 28, 1901.

Powdered coal is fed from a hopper to an aërating chamber, and from the latter to an ejecting chamber, from which the mixture of air and powder passes to the furnace to be burned. The apparatus used consists in the combination of the ejecting chamber, the ejecting mechanism with independent mechanism for positively regulating its speed, the separate aërating chamber on one side of the ejecting chamber and communicating with it by a central aperture, a series of revolving blades in the aërating chamber, positive feeding mechanism, an independent air supply to the aërating chamber, with regulating devices, and a deflector in the aërating chamber for throwing the entering coal towards the inner periphery thereof.—R. S.

Peat Fuel and the like ; Impts. in ——. F. McNamee, Dublin. Eng. Pat. 14,661, Aug. 16, 1900.

The peat is first freed from water by draining and by means of hydro-extractors. It is then disintegrated or broken up, and mixed with stated proportions of unburnt pulverised or granulated limestone, mixed or blended with pitch, tar, creosote, oil, grease, or sugar. The mass is heated or passed through a pug mill, then cut or moulded into briquettes, which are afterwards dried, stamped, and, if desired, perforated to assist combustion.—R. S.

Fuel Blocks or Briquettes ; Utilising for the Preparation of ——, *the Sludge or Scum produced during the Treatment of Sewage by Biological or Bacterial Purifying Processes.* C. J. Whittaker, Lytham, Lancaster. Eng. Pat. 16,104, Sept. 11, 1900.

The sludge or scum is dried, mixed with coal dust or small coal, &c., and moulded into briquettes.—L. A.

Fuel ; Apparatus for Burning Pulverised ——. O. Imray, London. From W. J. Donaldson, W. A. Mears, and G. S. Emerick, all of Philadelphia, U.S.A. Eng. Pat. 1482, Jan. 22, 1901.

For pulverising and burning fuel there is employed a combination of a pulverising mill, a separator, a fan, a regulating feeding worm, a speed-changing mechanism actuating the worm, and means for automatically controlling the speed-changing mechanism.—R. S.

Coke-Ovens ; Horizontal ——. F. J. Collin, Dortmund' Prussia. Eng. Pat. 15,962, Sept. 7, 1900.

In horizontal coke-ovens in which by-products are extracted, the heating flues are arranged so that the heating gases circulate only in horizontal and ascending directions, never in a descending direction. Several such arrangements of flues are illustrated.—R. S.

Coke-Ovens. H. Koppers, Carnap, Germany. Eng. Pat. 9822, May 11, 1901.

To remedy certain defects in coke-ovens of the Coppée type, the tops of the heating flues are provided with cover plates, each of which has a central boring for the passage of the gases of distillation. Within the boring is a projection upon which rests an air tube. On the outside of the latter are projections to regulate the quantity of the distillation gases admitted to the flues or to entirely close the openings in the cover plate. Small openings for the passage of distillation gases connect the distilling chambers with one another. A large aperture in each outer cover stone allows the insertion and turning of the air tubes from outside the oven. When the air tubes are removed, closing plugs can be inserted to entirely shut off communication between the adjacent distillation chambers.—R. S.

Coke-Ovens ; Heating of By-product-saving ——. H. Koppers, Carnap, Germany. Eng. Pat. 10,336, May 18, 1901.

Coke-ovens adapted for the recovery of by-products are worked either with cold or hot air. In the former case, a quantity of air, about twice the volume of the heating gas, is supplied to the gas at one place for the whole plant; while in the latter case, a quantity of an inert gas, such as smoke from the chimneys, is added. This accelerates the combustion in the former case, but delays it in the latter, whereby in each case the heat is more completely utilised. To effect this, several single fireplaces are arranged one beside the other, and are connected with common distributing passages and partition walls on the bottom of the heating flues. The gas and
jets are arranged horizontally and parallel to each otl
and the ignition takes place at a point above the nozzles.
—R. S

Coke Oven adapted to be worked with or without Sav
of By-products. H. Koppers, Carnap, Germany. E
Pat. 10,337, May 18, 1901.

The coke-ovens are constructed with two independ
heating devices, so as to save by-products or not, as desi
Beneath the heating flues is a channel, and curved chan
connect this with the vertical heating flues terminat
above the partition wall arranged on the bottom of
flues. Beneath the channels referred to are two sets
separate channels for the supply of heating gas and air
combustion, to a number of single fireplaces.—R. S.

Liquid-Fuel Furnaces and Muffle Ovens. M. Ennso
Glasgow. Eng. Pat. 15,052, Aug. 23, 1900.

The muffle has an outer shell with flat or arched roof,
the floor of the muffle is supported on bricks arranged s
to form flues for the passage of the flame and hot g
rising from a fire-chamber situated underneath and fi
with a liquid fuel burner. The latter may consist
shallow flat pan, divided into compartments by partit
walls, and provided with baffles for the inflowing oil.
or more openings are provided for the admission of ai
the burner (of which several modifications are describ
and arrangements are made for the supply of oil from
oil tank to the burner.—C. S.

Fuel-Oil ; Means for Separating ——, *from Water.*
W. G. Armstrong, Whitworth and Co, Ltd., and E.
Orde, Newcastle-on-Tyne. Eng. Pat. 15,868, Sept.
1900.

The combination claimed is that of an oil receptacle an
flexible suction pipe, fitted with a float adapted to rise
fall with the level of the oil, thus keeping the nozzle of
pipe at a constant distance below the surface of the
also of a steam coil for heating the oil in or surrounding
suction pipe.—C. S.

Mixing Gases ; Apparatus for ——. A. J. Boult, Lon
From A. Molet, Buenos Ayres. Eng. Pat. 13,4
July 25, 1900.

The apparatus is adapted for mixing and supplying tw
more gaseous fluids (*e.g.*, acetylene and air), irrespec
of their nature and pressure, in predetermined proporti
and also for regulating the supply according to the
sumption of the mixed product. It consists essentiall
two drums revolving together on the same shaft,
being provided with a series of cells at its circumfere
terminating at their opposite extremities in tubular
longations or extensions arranged in opposite directi
The drums are partially immersed in water, &c. wi
a closed cylinder, and are driven by a gas passed thro
a central chamber and the cells of one of them,
other drum serving as a suction device to draw a
from another source of supply into its central cham
This chamber is in communication with the cells at the
cumference of the motor drum, and is provided with a
for drawing off the gases. By enclosing one of the drum
a bell, the gases may be delivered separately and m
outside the apparatus. By combining the apparatus
a speed-indicator, it will serve as a gas-meter to indicate
amount of gas used.—R. A.

Carburetted Water-Gas and other Gases ; Apparatus
Treating Liquor obtained from the Washing, Scrubb
Cooling, or Condensing of ——, *in order to Separate*
Tar therefrom. F. Thuman, London. Eng. Pat. 12,
July 18, 1900.

The apparatus consists of a primary settling tank, div
into compartments by a series of partitions descend
nearly to the bottom, and also provided with open
about half way up, which openings are on opposite s
of the tank, in adjacent partitions, so as to cause
contents to traverse a zigzag course. The tar depo

the various compartments runs into a sump and ascends upcast pipe leading to a secondary separator, where it eated by suitable means, to liberate the retained water, l is delivered to a settling tank. In the case of light s, which rise to the surface of the primary settling tank, ustable surface overflows are provided, leading to the ondary separator. An additional separator may be vided for clarifying the effluent water, if required.—C. S.

porised Oil and Air ; Producing and Utilising ——, for Heating, Lighting, and Motor Purposes. J. Wilkinson, Burton-in-Lonsdale. Eng. Pat. 13,113, July 20, 1900.

e inventor prepares "self-burning" gas by passing air ough a cylinder partly filled with a mixture of about e parts of light petroleum spirit (sp. gr. 0·650–0·680) one part of petroleum (sp. gr. about 0·797). The nder is provided with an arch of absorbent material, which omes impregnated with the oil and is traversed by a tion of the air driven through the vessel by a fan, the ainder of the air passing, in adjustable quantities, above arch, so as to enable the richness of the mixture to be trolled. Arrangements are made for warming the ining air, so as to counteract the reduction of temperature luced by the vaporisation of the oil.

he improved method claimed for the utilisation of the consists in projecting the same against the object to eated, at a greater speed than the rate of propagation lame, whereby the combustion ensues, with little or no e, on the surface of the article in question. The gas so suitable for use in gas engines.—C. S.

burelting a Gas by the Vapour of a Liquid ; Apparatus r ——. F. K. Kurz, Lucerne. Eng. Pat. 15,645, pt. 3, 1900.

gasifier contains a cylinder built up of superimposed of porous material, containing porous packing in ves in the contiguous surfaces, down which cylinder les the liquid to be vaporised. The gasifier is counteraced, and, in descending, automatically opens the valve tting the carburetting liquid, the converse operation g performed when the gasifier reascends.—C. S.

bustible Gases from Hydrocarbon Liquids ; Generator the Manufacture of ——. P. Lazareff, Derbent, ssia. Eng. Pat. 15,813, Sept. 5, 1900.

generator consists of the combination of a firebox, with a steam injector (pulveriser) for the hydron; a decomposition chamber and superheater above irebox; a second chamber, surrounding the first, for the gas produced in the latter, whilst both are ded with "openwork stacks of fireproof bricks, and y pipes above the inner chamber for feeding liquid ocarbon in such a manner that the production of gas be obtained either by heating the interior of the ator periodically to incandescence by means of the ocarbon and by subsequently admitting steam at the riser and of hydrocarbon by the supply pipes, or in tinuous manner by means of an incomplete combustion e hydrocarbon injected by the steam at the pulveriser by the admission of liquid hydrocarbon through the y pipes to carburet the gas."—C. S.

Burners for Heating Purposes. H. Heidemann, lin, and G. Axdorfer, Innsbruck. Eng. Pat. 17,709, t. 5, 1900.

ANSVERSE bar is arranged within the burner tube and the mouths of the gas and air nozzles to assist in g the gas and air, to prevent back-burning and sion, and to produce a thin pointed flame.—C. S.

lene Gas ; Process and Apparatus for the Manufac- of ——. G. J. Atkins, Tottenham. Eng. Pat. 953, July 3, 1900.

IDE is pulverised in apparatus from which atmospheric s been expelled by hydrogen or other suitable gas, passed therefrom either directly into the generating atus or into storage receptacles. The generating atus may be one of a number of different forms which are described. All aim at bringing the pulverised carbide into contact and intimate admixture with a decomposing agent in requisite amount proportional to the consumption of gas. For instance, a closed chamber, divided by shelves on which carbide and decomposing material are placed, is so suspended that it is tilted, and predetermined quantities of carbide and material are thereby mixed, through the movement of an expanding gas chamber or a gasholder through which the generated gas passes.—J. A. B.

Acetylene Generators. E. W. Sprott, Mayfield, Sussex. Eng. Pat. 12,993, July 18, 1900.

CARBIDE is discharged through a valve operated by the movements of the gasholder into a sludge tank immersed in water contained in a vessel in which the gasholder and a fixed bell set eccentrically over the sludge tank are sealed. The levers operating the valve on the carbide container are on that side of it on which the eccentric disposition of the bell gives the greater clearance. A purifying and condensing chamber is placed beneath the gasholder within the seal tank.—J. A. B.

Acetylene-Gas Generator. E. Fajole, Rouen, France. Eng. Pat. 13,239, July 23, 1900.

CYLINDERS containing perforated metal carbide holders stand in a tank of water having two compartments, from the bottom of the upper one of which a pipe leads to the lower part of the lower one. Water passes from the tank to the cylinders through a valve-controlled pipe, and the gas evolved passes into a receptacle placed within the tank, where it is washed, and thence through a purifier containing coke impregnated with iron sulphate into a regulator, by which the operation of the apparatus is controlled according to the consumption of gas. Safety valves and gauges are provided.—J. A. B.

Acetylene Gas Generators. T. E. Clark, Sudbury, Suffolk. Eng. Pat. 16,598, Sept. 18, 1900.

A GENERATING chamber containing water is fed with carbide through an open hopper, provided with a "splayed" plate to prevent gas entering the hopper. A series of boxes containing carbide, and having hinged bottoms, are arranged above the hopper, and the bottoms are opened in turn through levers operated by a drum with a spirally arranged series of projecting teeth. The drum is moved forward by means of a ratchet wheel, which engages a catch on the gasholder into which the gas evolved passes, so that each time the gasholder descends to a given point, the bottom of a carbide box is opened and carbide is discharged into the hopper.—J. A. B.

Acetylene Gas Generating Apparatus. J. M. Coghlan, Sayville, U.S.A. Eng. Pat. 17,999, Oct. 10, 1900.

A FIXED cylinder, open at the bottom, and containing carbide, dips into water in a tank which is raised or lowered according to the movements of the bell of the gasholder into which the gas evolved passes. A blow-off device is provided to prevent accident from over-pressure of gas. —J. A. B.

Acetylene Gas Generator. S. Csáky, J. Sárkány, and S. Centiàn, all of Budapest. Eng. Pat. 19,853, Nov. 5, 1900.

A GENERATOR, in which cells containing carbide are arranged spirally, is supplied with water from the tank in which it is immersed, through a valve which is closed by the action of a float, until such float is depressed by a rod attached to the bell of the gasholder into which the gas evolved passes, whereupon the valve opens. The cells are exhausted in turn from the lowermost upwards, and on the last cell coming into action a bell is rung.—J. A. B.

Gas Generators. H. Poetter, Dortmund, Germany. Eng. Pat. 16,077, Sept. 10, 1900.

THE lower part of the generator, in which the grate is situated, is inclosed by an encircling jacket sealed above and below in water, and adapted to be raised so as to leave the grate exposed for cleaning purposes. The grate cone is movable up and down by means of rack and pinion gearing, so that cinder or slag can be crushed or loosened, and the free annular space between the cone and the fixed portion of the grate can be regulated to suit the degree of fineness of the fuel.—J. A. B.

Purification of Lighting and Heating Gas. S. Danner and G. Kubelka, both of Kladno, Bohemia. Eng. Pat. 5689, March 18, 1901.

The gas is forced by a blower or otherwise at great velocity against a stream of cleansing agent, which is delivered at great velocity from a jet. Preferably, the passage is reduced in cross sectional area where the streams first impinge on one another. The impurities accumulate in vessels at the base of the passage or chamber in which the streams of gas and purifying agent meet, and may be removed therefrom. —J. A. B.

Acetylene and other Combustible Gases; Determination of Phosphorus and Sulphur in ——. P. Eitner and G. Keppeler.

See under XXIII., *page* 938.

Gas Igniting Devices. A. Martini, Berlin. Eng. Pat. 15,550, Aug. 31, 1900.

The pill, with attached platinum wires, is suspended from a hinged plate counterpoised so that the dynamic force of the gases tips up the plate when the jet is lighted, and removes the pill from contact with the flame. A modification for use without a chimney is also described.—C. S.

Incandescent [Nernst] Lamps; Glow Bodies for Electrolytic ——. B. M. Drake and Nernst Electric Light, Ltd., Westminster. Eng. Pat. 13,839, Aug. 2, 1900.

To harden the refractory filaments of Nernst lamps before use, they are baked at a high temperature in the electric arc. The carbons are separated about three eighths of an inch and the rod is passed across between them so that the arc plays upon it and heats it uniformly to a very high temperature. The filament is given a large radiating surface, for a given cross-section, by shaping it "with a solid section, which is flat, being elliptical, or flat with rounded edges, or flat with square corners Another form is like pinion wire in section, or like pinion wire with a central hole, or tubular with three or more leaves."—H. B.

Electric Illuminating Bodies; Manufacture of ——. W. Boehm, Berlin. Eng. Pat. 12,2[illegible]1, June 15, 1901.

Glow-bodies of the Nernst type, made of lime, magnesia, zirconia, thoria, or the like, generally become the more conductive at a higher temperature the purer they are. By adding small quantities of the oxides of chromium, manganese, uranium, titanium, niobium, &c., glow-bodies are produced "which are considerably resistant against outer influences, are capable of being excited at a low temperature, are very fire-resistant and possess a high illuminating power." For instance, a suitable mixture consists of:—zirconia, 90 parts; magnesia, 5 parts; lime, 4 parts; sesquioxide of manganese, 1 part. These may be made into a paste with a solution of sugar, and then squirted into threads or rods.—H. B.

Incandescent Gas Lighting and the Manufacture of Burners and Incandescible Elements therefor. J. B. de Lery, London. Eng. Pat. 22,694, Dec. 12, 1900.

A number of burner nozzles are arranged in a circle about a common mixing chamber, and a mantle is suspended over each nozzle. This burner is adapted for use with mantles which have not previously had the cotton fabric burned out. In one form of burner the tubes constituting the nozzles pass outwards radially from the mixing chamber and then curve upwards for a short distance. Mantles suitable for use with this form are made of fabrics which have one or more slits reaching half-way up the mantle; these slits enable the mantle, when suspended over the burner, to straddle the nozzle, and on igniting the gas, the mantle shrinks up to the required dimensions, the pressure of the gas within the burning fabric preserving its cylindrical shape satisfactorily. In another form of burner the nozz stand up vertically from the mixing chamber, and for t form the mantles are not slit, no "straddle" being requir —H. B

Incandescent Gas Lamps. W. P. Thompson, Lond From S. Zielenziger, Berlin. Eng. Pat. 23,222, Dec. 1900.

The lamp described is intended for use with ordinary l pressure gas; but it is provided with a chimney ab 25 ins. in length, in order that the induced strong drau of air may produce the effects of high-pressure gas. T portion of the chimney which surrounds the mantle enlarged into a globular form; and the lower end of chimney is closed in almost entirely round the Bunsen t so that no material quantity of air shall have access to outside of the flame. The gas-inlet nipple at the foo the Bunsen tube is of the usual size, but the tube h cross-sectional area of at least double the usual size, enabling a volume of air, more than sufficient for the c plete combustion of the gas, to be drawn in and min with the latter. The lower part of the lamp is enclose an outer globe, above which rises a chimney surrou the burner chimney.—H. B.

Incandescent Gas Burners. J. Fischer, London. E Pat. 9222, May 3, 1901.

The chimney of an ordinary incandescent gas burn dispensed with, and upon the gallery base is arrange openwork or perforated gallery, which carries a g The globe and gallery are fixed at such a height tha additional air supply passes directly to about the lo level of the flame. The air-supplies to the mixing tube to the base of the gallery remain as in ordinary burner —H.

Incandescence Mantles; [Acetylene] Gas Burners for with ——. G. F. Law, Cleveland, Ohio. Eng. 12,521, June 19, 1901.

In the Bunsen burner described, the acetylene gas an pass upwards into a mixing tube, the top of which is vided with a screw-threaded cap, which carries the wire gauze diaphragm, and which has a contracted or ignition nozzle above the diaphragm. The height o diaphragm above the air and gas inlet can be adjuste screwing up or down the cap. The chamber at the f the burner is provided with a gas inlet nozzle and ai holes, as usual, with a perforated sleeve for adjustin air inlets. Between this chamber and the mixing tube is fixed concentrically a tube or chimney, which proj short distance into the mixing tube ("for the purp assisting the induction of air"), constituting a narrov sage connecting the lower chamber and the mixing With such a burner the mantles employed are prefera greater length than those used with ordinary incande gas burners.—H. B.

Osmium Filaments of Electric Incandescent Lamps Im proved Means for Supporting the ——. O. Imray don. From Oesterr. Gasglühl. und Electric. schaft, Vienna. Eng. Pat. 20,277, Nov. 10, 1900.

Osmium filaments are rather fragile while cold, and brought to a white heat are so flexible as to tend t their shape. To obviate these dangers, a support, con of sintered or fritted refractory oxide, non-adher and chemically indifferent towards incandescent osmi prepared in the form of a filament, which is then into a hollow glass stem. The latter is mounted the lamp bulb in such a position that the free end oxide filament (which may have any desired shap engage and sustain the osmium filament against sagg vibration. The support consists preferably of a of 10 parts of thoria and 1 part of magnesi other refractory oxides may be used. In formi support, a paste is made from the ground oxides organic viscous binding material, and filaments p therefrom are first dried and burned in free air, an raised to a high temperature until fritted.—H. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

leum, Large Spouting Well at Beaumont, Texas. A. Lucas. Trans. Amer. Inst. Min. Eng. Chem.-Zeit. p. 25, [26], 236.

strata pierced by the boring which produced the large her" at Beaumont, contained fossil Ostrea, Turritella, Macra species. The sp. gr. of the oil is 0·925 at 15° C.; ulphur content is 2·04 per cent. The fractions obtained istillation are:—At 150°—200° C., 6 per cent. (sp. gr. 1); at 200°—250°, 13·5 per cent. (sp. gr. 0·867); at -300°, 28 per cent. (sp. gr. 0·886); at 300°—400°, 50 ent. (sp. gr. 0·914); residue and loss, 2·5 per cent. its properties the chief use of the oil would appear to heating purposes.—C. S.

etroleum Refining with Lime. K. Charitschkoff. Naphta, 9, (11), 211—213.

move the difficulties said to be met with in the use of n the alkali treatment of petroleum distillate and fully the advantages afforded by this reagent, the author mends that the distillate should be thoroughly cooled the introduction of the sulphuric acid, and proposes abine the cooling process with the lime treatment by g up the milk of lime with the distillate for about an in the settling reservoir, allowing the sediment to le, and then blowing in air until the cooling is ete.

distillate contains the acids originally present in the oil, their proportion being greater in oil that has iong exposed to the air; further, the acids formed distillation, and the acid products formed during the ric acid treatment, together with the residual free acid rom. By neutralising with lime previous to the acid ent, the two first classes of acids are removed, g only the third for neutralisation by the ordinary treatment with caustic soda. The resulting saving in tter reagent may be gathered from a comparative ment made by the author with one litre of distillate, lf of which was refined with acid in the ordinary hilst the other half was first treated with milk of On titrating 25 c.c. of each with alcoholic decinormal potash, the untreated portion consumed 3·9 c.c. of whilst the treated portion required only 1 c.c. for its lisation.

erroneous to assume that freshly collected crude free from organic acids, and that these are formed the oil has been exposed to the air; the author has succeeded in finding a neutral oil, though in some he proportion of acids may be very small. Even the e water issuing from oil wells contains these petro-cids. During distillation, the pre-existing acids pass and are augmented by those produced during that , or rather during the condensation of the distilled s, this being the only stage at which oxidation can —C. S.

simeter; The Engler-Ragosine ——. A. Ragosine.

See under XXIII., *page* 933.

tums and Bituminous Chalks of Palestine; Sulphur ——. C. Elschner. Chem. Rev. Fett- u. Harz-Ind. , 8, [8], 159—160.

ount for the amount of sulphur in these asphaltums, thor suggests the theory that the organic substance l part of the sulphates present to sulphides; and en the sulphur was forced, by the immense pressure predominated, into the organic mass and became a al constituent thereof. Possibly ammonium carbon- organic nitrogenous bases, derived from the decom- of the albuminous substances, also played a part in cess.—C. A. M.

Brown Coal Tar; Use of Superheated Steam in the Distillation of ——. P. Huth. Chem. Rev. Fett- u. Harz-Ind. 1901, 8, [8], 158—159.

In the distillation of brown coal tar with superheated steam, attempts have already been made to rapidly remove the gaseous products from the cylinder by means of bellows and exhausters; but in spite of this, the gases and vapours undergo still further decomposition on the hot walls of the retorts. To obviate this the author introduces double concentric bells into the cylinder, so that the coal tar only comes into contact with these bells and not with the external over-heated wall. The steam is introduced between the external wall and the outer bell, and in particular at the bottom of the retort where the over heating would naturally be the greatest.—C. A. M.

Brown Coal Tar; Constituents of ——. T. Rosenthal. Zeits. angew. Chem. 1901, 14, [27], 665—667.

Among the products of the dry distillation of brown coal-tar, the author has identified the following classes of compounds:—(1) Aldehydes saturated and unsaturated, acetaldehyde being isolated among the former. (2) Ketones, of which acetone and methylethyl-ketone were isolated. (3) Methyl alcohol; and (4) Acetonitrile.
—C. A. M.

Wood Distillation; Impts. in and Suggestions for ——. F. A. Bühler. Zeits. angew. Chem. 1901, 14, [25], 610—621.

The author refers to an earlier communication on the distillation of wood (this Journal, 1900, 234), in which he showed that the advances in the price of the raw material and in wages rendered it necessary to secure the highest attainable yields of products and to replace manual labour by machinery wherever possible. He now describes by the aid of detailed diagrams a machine for charging horizontal retorts, comprising a shell which is packed with the charge of wood and is then introduced into the retort, which is of slightly greater diameter. The shell is then withdrawn and the charge left in the retort. The packing of the shell and the operation of charging, &c., occupies half-an-hour, so that one machine serves for charging 32 retorts, in which the charge is worked off in 16 hours. Its weight, when packed with a charge of about 2·2 cb. m., is about 4,600 kilos. and its cost is about 5,600 marks.

Much attention has been directed to the distillation of waste wood, such as the refuse from saw-mills, carpenters' and coopers' shops, and factories where tanning extracts are prepared. The chief difficulty lies in drying such refuse preparatory to distillation, as saw-dust, &c. contains 40 to 60 per cent., and refuse from extract factories 60 per cent. and upwards of moisture. Drying by means of steam is too costly, and direct heating is liable to cause loss of acetic acid and methyl alcohol as well as of moisture, owing to local overheating. The time of carbonisation becomes unduly prolonged if the refuse or wood contain more than 25 per cent. of moisture. Five days, with high heats, do not suffice to carbonise the core of a charge of sawdust containing 50 per cent. of moisture. The spent gases from the boiler and retorts might be utilized for drying the material. A works having 30 retorts should deal with about 30,000 kilos. of wood residues per diem, in 16 hours charges, and the flue gases from the boiler would amount to about 140,000 kilos. escaping at 250° C., and those from the retort installation to about 150,000 kilos., escaping at 350° C. Taking the specific heat of the escaping gases at 0·22, and assuming that they leave the drying plant at 50° C., it will be seen that they can give 16,000,000 calories, while 16,605,000 calories are required to reduce the percentage of moisture in the wood residues from 50 to 10. Hence it is clear that the flue gases are capable of furnishing about the required amount of heat if properly applied. It is most advantageous to bring the hot gases into direct contact with the material to be dried. The author gives diagrams of an apparatus for drying wood residues in this manner. The hot gases are driven by means of blowers into a long conduit, into which the residues are fed and are carried forward by the force of the current of hot gases. The lighter particles, which part with their moisture most readily, are carried forward more quickly than the heavy ones, and consequently the hot gases play on the latter for a longer period. The rapid motion of the gases greatly increases the efficiency of the process, as it is well known that evaporation of liquids is promoted by strong currents of air. There is thus an ample margin of heat in the flue gases for drying the wood residues. The conduit may be arranged so as to convey the residues from the receiving place to the carbonising plant. The cost of the drying plant does not exceed 10,000 marks. 12 to 14 horse-power is required to work the blowers.

Wood residues may be carbonised in the ordinary vertical or horizontal retorts, but the author recommends, as economising space and labour, an arrangement of two retorts inclined at an angle of 45°, and uniting at the top in a common charging opening. He gives detailed diagrams of this arrangement. Likewise, for the sake of economy of space, he recommends vertical tubular condensers, one form of which he describes by the aid of diagrams.

The residues naturally yield the same volatile products as billets of wood, but the charcoal from them has a far more limited application. It has been made into briquettes, which serve well for some uses, but not for metallurgical purposes. They, however, are more costly than lump charcoal. The author has found that it is feasible to produce good serviceable briquettes by carbonising blocks pressed out of a mixture of equal parts of powdered charcoal and sawdust agglomerated with tar. He describes an arrangement of two inclined retorts, specially adapted for dealing with a charge of these briquettes in ten hours.

The distillation of wood tar is usually conducted in stills of cast iron, which suffer less than wrought iron from the action of the vapours of acetic acid. The author gives illustrations of distilling plant adapted to deal with the tar from a works carbonising 45,000 kilos. of dried wood residues per diem, that is to say, with about 4,000 kilos. of tar containing 10 per cent. of water. One still works off a charge of 2,000 kilos. in 12 hours. The charge must be heated gradually at first, otherwise it froths up and boils over to the receivers. Fires are not infrequent in the distilleries, and the tar stills should be placed at a distance from the other plant. A special form of still head, devised to minimise mishaps from frothing and explosions, is described by the aid of diagrams. The upper half of the still can be rapidly cooled by water, and is provided with a safety valve. The distillate is collected in a vessel with sight box, and three-way tap, which admits of the water and oil being drawn off into separate receivers. The aqueous portion of the distillate from the tar contains as a rule more acetic acid than the crude acid. The oily portion of the distillate boils between 120° C. and 330° C., and is usually separated into light and heavy oil, the first coming over below 170° and yielding benzol, while the latter is worked up to creosote, guaiacol, &c., or is used for impregnating wood.

Plant for the distillation of 100 tons per diem of dried wood residues, containing originally 50 per cent. of water, according to the methods advocated by the author, would comprise 24 double retorts. The yield of charcoal would be 30 per cent. of the wood if the water left in the latter were taken at 10 per cent. The charcoal, mixed with an equal amount of dried wood residues and $33\frac{1}{3}$ per cent. of tar, would be carbonised in 12 settings, and the total yield of residual charcoal in a marketable condition would be 38,500 kilos. per diem. The crude acid and crude wood spirit would make up a yield of about 4 per cent. of acetic acid and 1 per cent. of methyl alcohol. A staff of only 120 to 150 men would be needed. The capital cost of boilers, engines, and apparatus would be about 650,000 marks; that of buildings, foundations, &c., about 400,000 marks. 25,000 kilos. of coal would be required per diem as fuel. 8,000 to 10,000 kilos. of wood tar would be produced daily. The expenses would vary greatly with local conditions, and hence it is not possible to give a general estimate of the returns. The yields given apply to hardwood residues (logs and cuttings); pine-wood residues would give the same amount of charcoal, but only 2 per cent. of acetic acid, and at the most $\frac{3}{4}$ per cent. of methyl alcohol.—J. A. B.

IV.—COLOURING MATTERS AND DYESTUFFS.

Indigo from the Indigo Plant ; New Method of Extrac of ——. Calmette, Director of the Institut Past Lille, France. Fr. Pat. 300,826, May 31, 1900. M Scient. 1901, **15**, [716], 192.

The plant is crushed and the pulp introduced into deep containing water which has been freed from calcium in order to prevent precipitation of indigo; the vats provided with agitators. The mixture is filter-pressed solution passed into covered tanks, and the indigo pre tated by means of a current of air, the precipitation b facilitated by the addition of a very small quantity of baryta, magnesia, or an alkali or alkaline-earth carbo The indigo is collected, and dried at 75° C.; it con 5—7 per cent. of water. The liquid is returned to oxidation vats. By this process, 6·6—8 kilos. of in containing 80—81 per cent. of real indigo, are obt from 1,000 kilos. of the plant, whilst even as mu 10 kilos. can be obtained from plants of superior qu gathered immediately after blossoming.—A. S.

Indigo Plant; Treatment of ——, *by Diastase.* Geu and Valette, Paris. Fr. Pat. 302,169, July 13, Monit. Scient. 1901, **15**, [716], 194.

The claim is for the addition to the indigo plant of la or other oxidising ferment, and even of a small quanti hydrogen peroxide.—A. S.

Indigo in an Anhydrous Medium; Reduction of A. Binz. J. prakt. Chem. 1901, **63**, [11 and 497—516.

When Indigo is dissolved in 50 times its weight of b naphthalene and treated with five times its weight of dust, preferably in an atmosphere of nitrogen, hydroge coal-gas, the original deep violet-blue colour becomes g From a number of experiments under different condi the author concludes that this colour is due to the form of zinc-indigo white, which can be extracted from the c of naphthalene to a certain extent, although the gr part is decomposed. That zinc-indigo white is the product of the reaction is shown by the fact that whe mass is treated with soda lye it is converted into hydrate and sodium-indigo white, part of the being decomposed by the hydrogen evolved. Sinc reaction takes place in absence of moisture and zinc not act on naphthalene, no hydrogen is evolved, an formation of zinc-indigo white is not due to inter between indigo white and zinc oxide. Moreover, it c be assumed that zinc abstracts oxygen from Indigo, yi reducing products, since in that case more Indigo wo decomposed than analysis shows; and, further, zinc reduces Indigo derivatives at a red heat, and then onl difficulty.

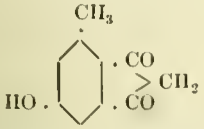
The paper contains the description of a metho obtaining dry *indigo white.* Precipitated with an from an Indigo vat, the precipitate is shaken with ben hyde added drop by drop. The stable green substanc formed is dried on a porcelain plate, and subseq extracted in a Soxhlet's apparatus with light petroleum This removes the benzaldehyde, leaving indigo whit dry powder, which only turns blue slowly in the air. product contains impurities, and on an average about cent. of indigo white. It is noteworthy that indigo dissolves in naphthalene with a brilliant red colour. —T. A

Indigo containing Notable Amounts of Indirubin ; A of Samples of ——. W. M. Gardner and W. Dent

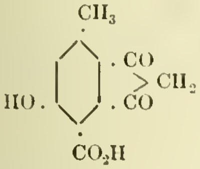
See under XXIII., *page* 939.

Carminone Compounds. C. Liebermann and J. La Ber. 1901, **34**, [10], 2153—2163.

In further continuation of work on the ketohydr derivatives of cochinellic acid, the authors find an pleto parallelism between the cochinellic ester hydrin- derivatives and those of phthalic ester. With a view mplifying the nomenclature of these derivatives, they ose the name Carminone, represented by the formula—

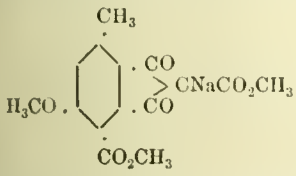


he radicle of cochinellic acid diketohydrindene *minus* arboxyl group, whence cochinellic acid diketohydrin- itself—

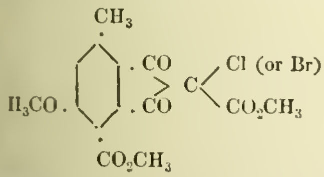


rminone carboxylic acid.

ith regard to the preparation of the tetramethyl ester chinellic acid, they now find that an 80 per cent. yield is substance is obtained by heating together an intimate ure of cochinellic acid (1 mol.) and silver oxide t mols.) with an excess of methyl iodide in a sealed for 25 hours to 100° C. Unacted-on cochinellic acid be removed by washing the ether extract with dilute m carbonate solution. The action of iodine on the thyl ester of sodium Carminone dicarboxylic acid—



the dimethyl ester of dioxytriscarminone carboxylic a white powder melting at about 175° C., and behaving ds an excess of alkali similarly to trisdiketohydrindene. solves in cold alkali with a yellow colour, which turns eal red on shaking the hot solution with air. Acids precipitate a red substance soluble to a red solution re water, dyeing unmordanted or chrome-mordanted a pink shade. Chlorine or bromine react with the thyl ester of sodium Carminone dicarboxylic acid, ng colourless needles, the chloro compound melting at . and the bromo compound at 170° C. having the ula—

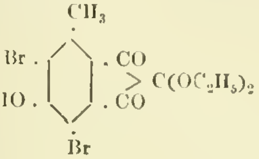


latter exhibits the same phenomenon as the corre- ing compound of ordinary diketohydrindene—

$$C_6H_4:(CO)_2:CBrCO_2C_2H_5,$$

, when treated with sodium iodide, exchanges bromine dium. When heated in a sealed tube with aqueous l alcohol for five hours to 100° C., it yields a white r, melting at 276° C., of which the analysis best with the formula of the dimethyl ester of an oxytris- none carboxylic acid. This product, on boiling with bly strong potash lye, gives a red solution, from a red substance, soluble in pure water, is precipitated ds. It dyes unmordanted wool a faint red, and chrome- nted wool a very faint pink. The product appears st in two tautomeric modifications.

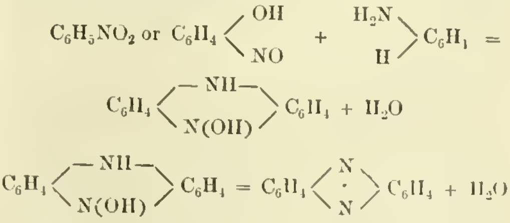
The further bromination in acetic acid solution of the trimethyl ester of bromocarminone dicarboxylic acid yields dibromocarminone carboxylic acid dimethyl ester melting at 143° C., from which the bromine can be removed by heating with methyl alcohol and silver oxide. Thus the two bromine atoms in this product react in the same way as two of the four bromine atoms in α-bromocarmine, which in the nomenclature proposed is tetrabromocarminone. This latter product, when warmed with sodium carbonate solution, decomposes into dibromo-oxyhomophthalic acid and a dyestuff giving brownish-red shades on unmordanted and a faint pink on chrome-mordanted wool. The same two bromine atoms can also be replaced by ethoxy groups by boiling α-bromocarmine with alcohol and silver oxide. The product has the formula—



and separates from dilute alcohol in yellow needles, melting at 184° C. It does not dye on mordants, but gives faint yellowish shades on unmordanted wool.—T. A. L.

Nitrobenzene on Aniline in Presence of Alkali; Action of ——. A. Wohl and W. Aue. Ber. 1901, **34**, [11], 2442—2450.

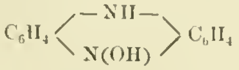
According to A. Wohl (Ber. **32**, 3486; this Journal, 1900, 138), nitrobenzene is converted at a high temperature by the action of alkalis into o-nitrophenol, and with a view of investigating the course of the reaction, among other substances, aniline was added to the melt, in order to combine with any quinone derivatives which might possibly be formed. It is found under these conditions, when a mixture of about equal volumes of aniline and nitrobenzene is heated with powdered potash or soda and the melt, after washing with water, is extracted with dilute hydrochloric acid, that about 30 per cent. of the aniline is converted into phenazine. With β-naphthylamine, nitrobenzene, and alkali, α-β-naphthophenazine is formed, whilst *m*-nitrotoluene and β-naphthylamine yield a new tolunaphthazine. The reaction therefore is a condensation between the nitro- and the amino-compound, and the authors have succeeded in isolating an intermediate product, from which it appears probable that the aniline condenses with a hitherto unknown transformation product of nitrobenzene in the sense of the following equations :—



$$C_6H_5NO_2 \text{ or } C_6H_4\left\langle\begin{matrix}OH\\NO\end{matrix}\right. + \left.\begin{matrix}H_2N\\H\end{matrix}\right\rangle C_6H_4 = C_6H_4\left\langle\begin{matrix}-NH-\\N(OH)\end{matrix}\right\rangle C_6H_4 + H_2O$$

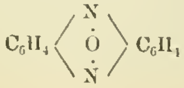
$$C_6H_4\left\langle\begin{matrix}-NH-\\N(OH)\end{matrix}\right\rangle C_6H_4 = C_6H_4\left\langle\begin{matrix}N\\\cdot\\N\end{matrix}\right\rangle C_6H_4 + H_2O$$

They have hitherto failed to isolate the product—



$$C_6H_4\left\langle\begin{matrix}-NH-\\N(OH)\end{matrix}\right\rangle C_6H_4$$

but by conducting the operation with very dry powdered caustic soda and at a low temperature, they have separated from the melt a substance containing one atom of oxygen more than phenazine, to which they assign the formula—



$$C_6H_4\left\langle\begin{matrix}N\\O\\N\end{matrix}\right\rangle C_6H_4$$

and term phenazine-N-oxide. It appears very probable that such a substance would be formed under the conditions existing in the melt, from the product of which the formula is given above, since from analogy the imino-hydrogen and the hydroxyl hydrogen of the secondary hydroxylamine would in alkaline solution be very readily oxidised On the other hand, at a high temperature and with a rapid reaction, water would be split off to form phenazine. For the preparation of phenazine, equal parts of nitrobenzene and aniline are mixed with 4 parts of coarsely powdered sodium hydrate and heated to about 140° C. The melt becomes fluid, the temperature rising 10°—20° C., and solidifies in about 1—2 hours. The temperature is then raised to 160 C., and the black residue separated from the aqueous soda lye. After washing with water it is extracted with 20 per cent. hydrochloric acid, this solution warmed with dilute nitric acid, diluted with water, and precipitated with ammonia. The weight of the crude product is about 30 per cent. of that of the aniline taken, and, after subliming over iron filings, it yields yellow needles of phenazine, melting at 171° C. About 60 per cent. of the weight of the aniline can be recovered as azobenzene.

In order to isolate the intermediate compound, the same quantities of the ingredients are taken, the caustic soda, however, being perfectly dry and very finely-powdered. The mixture is warmed to 110°—120° C., until it becomes fluid, when the temperature is raised to 125° C., the operation being stopped when the melt turns viscid. It is then dissolved in about 10 times its weight of water and the residue filtered off. The hydrochloric acid extract on neutralisation with ammonia gives 2·7 grms. of crude product from 10 grms. of aniline. After several recrystallisations from alcohol, the product is obtained in yellowish-red needles melting at 226°·5 C., and subliming at 240°—250° C. If iron filings be added at this temperature, or if the temperature be raised to about 280° C., a sublimate of phenazine melting at 171° C. is obtained. Phenazine-N-oxide is not attacked by boiling for a short time with acetic anhydride, and on reduction with stannous chloride gives, like phenazine, the green double compound of phenazine and dihydrophenazine corresponding to quinhydrone.

Similarly a mixture of β-naphthylamine (10 grms.), nitrobenzene (8·3 grms.), and sodium hydrate (50 grms.), heated to 115°—140° C., yields naphthophenazine-N-oxide, melting at 182° C., and separating in green crystals, soluble in all solvents with the exception of water, together with more or less α-β-naphthophenazine, melting at 144° C.

By heating together β-naphthylamine (10 grms.), *m*-nitrotoluene (10 grms.), and dry sodium hydrate (50 grms.) to 135°—140° C., and treating the melt as above, about 3·5 grms. of a green to brownish coloured base is obtained. The product does not contain oxygen, and, after sublimation and recrystallisation from benzene, melts at 208°·5 C., and has the formula of a tolunaphthazine. In this case no intermediate product could be separated.—T. A. L.

Fluorescein, its Substituted Derivatives and their Leuco-bases; Sensitiveness of ——, to Light. O. Gros. Chem.-Zeit. Rep. 1901, **25**, 190.

The leuco-bases of the triphenylmethane dyestuffs are extremely sensitive to light; the rate of oxidation in the dark is considerably increased by the entry of a nitro group. The bleaching of the dyestuffs on exposure to light is due to oxidation. It is probable that the ions of leuco bases and dyestuffs take the first part in the reactions due to light. In the case of a leuco-base, the resulting dyestuff accelerates the oxidation so long as its concentration does not exceed a certain limit. The sensitiveness to light of both leuco-bases and dyestuffs is considerably increased by the presence of other dyestuffs. The reaction between mercuric chloride and ammonium oxalate is also accelerated by dyestuffs; this catalytic action is evident with exceedingly small proportions of the dyestuff, and with increasing concentration passes through a maximum. The catalytic action of the dyestuffs is probably due to the absorption of light; thus, the sensitiveness to light of the leuco-bases is caused by the light absorbed by the resulting dyestuffs.—A. C. W.

Chromogen, Producing a Carmine-Red Colouring M ——— in Schenckia Blumenaviana. H. Molisch. botan. Ges. Ber. 1901, **19**, 149; through Chem.-Rep. 1901, **25**, [23], 201.

The leaves of this plant are dark green when living, change after death to carmine-red. Thus, a sprig place a cylinder of chloroform vapour undergoes this chang every part after a few hours, and the production of colour still occurs after extracting the chlorophyll from leaves with alcohol. If, however, the leaves are tre with 20 per cent. alcohol, the chromogen is extracted, after several days is converted in the exterior liquid i carmine-red colouring matter with a strong orange fluorescence. Since the change does not take place in f leaves thrown into boiling water, it is not improbable the chromogen, or a ferment which acts upon it, is destr at that temperature. The conversion occurs in the abs of oxygen, and even in an atmosphere of pure hydr The constitution of the colouring matter is not settled it is not ruberythric acid, nor is it closely relate Alizarin, Purpurin, &c.—C. A. M.

Sodium Tetrazotolylsulphite; Compound of —— Ethyl β-naphthylamine, and its Transformation i Dyestuff. A. Seyewetz and Blanc. Comptes 133, [1], 38—41.

Sodium tetrazotolylsulphite reacts with ethyl-β-naph amine to form an orange-yellow crystalline comp which, by the action of light or by prolonged boiling alcohol, yields a red powder, soluble in alcohol, aceto acetic acid, and decomposing without fusion at 15 This substance is identical with the dyestuff obt directly by acting on tetrazotolidine chloride with hydrochloride of ethyl-β-naphthylamine. The foll formulæ show the relations of these substances:—

$$\begin{array}{l} C_6H_3(CH_3).N:N.SO_3Na \\ | \\ C_6H_3(CH_3).N:N.SO_3Na \end{array}$$

Sodium tetrazotolylsulphite.

$$\begin{array}{l} C_6H_3(CH_3).NH.N(SO_3H).C_{10}H_6.NHC_2H_5 \\ | \\ C_6H_3(CH_3).NH.N(SO_3H).C_{10}H_6.NHC_2H_5 \end{array}$$

Non-dyeing compound.

$$\begin{array}{l} C_6H_3(CH_3).N:N.C_{10}H_6.NHC_2H_5 \\ | \\ C_6H_3(CH_3).N:N.C_{10}H_6.NHC_2H_5 \end{array}$$

Dyestuff.

—J. T

Light; Chemical Action of ——. II. G. Ciamicia P. Silber.

See under XXIV., *page* 943.

PATENTS.

Orange-Yellow Dyestuffs belonging to the Ac Series; Manufacture of ——. C. D. Abel. L From The Actiengesellschaft für Anilinfabril Berlin. Eng. Pat. 18,107, Oct. 11, 1900.

The dyestuffs obtained from tetra-aminoditolylmetha analogous compounds, according to Eng. Pat. 5114 of (this Journal, 1896, 349), only produce dull shad leather or tannin-mordanted cotton. The patentee find that when tetra-aminoditolylmethane is heated pressure with methyl or ethyl alcohol in presence of chloric acid, it is converted into bright orange acridine dyestuffs, the shade varying from yellow to according to the quantity of alcohol employed. instance, 20 kilos. of tetra-aminoditolylmethane (fr tolylene diamine and formaldehyde), 32 kilos. of alcohol, and 36 kilos. of concentrated hydrochlor (20° B.) are heated together under pressure to 150°— After cooling, the excess of alcohol is distilled residue is dissolved in water, and precipitated with zinc chloride. The dyestuff forms an orange-powder, insoluble in ether or benzene, scarcely sol ial acetic acid, readily soluble in water or alcohol with llowish-green fluorescence. The product gives bright ge-yellow shades on tannined cotton.—T. A. L.

wn Colouring Matter Directly Dyeing Cotton; Manu-icture of a ——. C. D. Abel, London. From The etiengesellschaft für Anilinfabrikation, Berlin. Eng. at. 18,826, Oct. 22, 1900.

eating 2.4.6-trinitrotoluene with eight times its weight rystallised sodium sulphide, three of sulphur, and 10 of r for several hours to 180°—220° C., a product is ined which dissolves in sodium sulphide and gives yellowish-brown shades on unmordanted cotton.

—T. A. L.

wn Colouring Matter Directly Dyeing Cotton; Manu-cture of a ——. C. D. Abel, London.. From The etiengesellschaft für Anilinfabrikation, Berlin. Eng. at. 18,827, Oct. 22, 1900.

azo dyestuff obtained by combining diazotised nitro-ephenol ($OH : NH_2 : NO_2 = 1 : 2 : 4$) with *m*-tolylene ine, when heated with sulphur and sodium sulphide, nverted into a new product dyeing unmordanted cotton olive brown. The shade is almost unchanged by subse-it treatment with copper or chromium salts, but by ting with *p*-nitrodiazobenzene salts, bright yellowish-rn shades are produced.—T. A. L.

uring Matters [Blue-Green] of the Anthraquinone eries and of Intermediate Products relating thereto; npts. in the Manufacture and Production of ——. Y. Johnson, London. From The Badische Anilin und da Fabrik, Ludwigshafen, Germany. Eng. Pat. 15,185, ug. 25, 1900. (Second Edition.)

specification is supplementary to Eng. Pat. 8051 of and to Eng. Pat. 21,572 of 1899 (this Journal, 1900, and 311). The patentees now find that brown deriva-of 1.1′- or 1.3-diamino-anthraquinone or of mixtures ese can be obtained, and that these intermediate pro-on treatment with a primary aromatic amine yield tuffs of the anthraquinone series. For example, ilos. of *p*-toluidine are fused and mixed with 1 kilo. of product obtained by brominating the sulphonic acid ion of 1.1′-diaminoanthraquinone in presence of r. The melt is heated to boiling until the original colour becomes bluish-green. After cooling, the melt eated with alcohol, and the resulting dyestuff obtained ystalline form can be rendered soluble by sulphonation.

—T. A. L.

go Group and of New Indigo Colouring Matters, and digo therefrom; The Manufacture and Production of ew Intermediate Products related to the ——. B. llcox, London. From The Badische Anilin und Soda brik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. ,566, Sept. 17, 1900. (Second Edition.)

EN anthranilic acid is condensed with chlor-acetic acid the preparation of phenylglycocoll-*o*-carboxylic acid, -product is occasionally formed having the formula $C.C_6H_4.N(CH_2CO_2H)_2$, which may be termed an-ilodiacetic acid. It is produced in good yield by ing anthranilic acid with two molecular proportions of racetic acid or by condensing equimolecular proportions hloracetic acid and phenylglycocoll-*o*-carboxylic acid, condensations being effected in presence of alkalis. By ing the condensation product with an alkali or alkaline in aqueous solution, an indoxyl acetic acid is obtained, h on oxidation in alkaline, neutral, or acid solution s Indigo diacetic acid.

the dry salts of anthranilo-diacetic acid be heated in the tic alkali melt (at 280°—330° C.), with or without the tion of quicklime, the melt finally yields indoxyl. umably, however, intermediate products, such as yl indoxyl, are formed in this process, since at certain eratures (200°—280° C.), the melt on oxidation yields oduct consisting at least in part of dimethyl Indigo.

—T. A. L.

1.8 *Amido-naphthol-4-sulpho Acid and of Intermediate Products relating thereto; Impts. in the Manufacture of* ——. B. Willcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 16,921, Sept. 22, 1900.

By treating the *a*-sulphonic acid of 1.1′-naphthylene diamine with bisulphite in presence of acetone, it is converted into 1.1′.4-aminonaphthol sulphonic acid, that is the amino group which is ana to the sulphonic acid group, is replaced by hydroxyl. The sulphurous acid ester of 1.1′.4-amino-naphthol sulphonic acid is formed as an intermediate product. The method is illustrated by the following example: About 238 kilos. of the *a* sulphonic acid of 1.1′-naphthylene diamine are dissolved in 1,000 litres of water, together with the requisite quantity of calcined soda and mixed with 2,000 kilos. of sodium bisulphite solution (40° B.) and 60 kilos. of acetone. The mixture is stirred and heated for about half an hour to 60°—65° C., and then raised to 95°—100° C. until a sample is readily soluble in dilute hydrochloric acid. The reaction proceeds slowly and requires 2—3 days for its completion. A slight excess of hydrochloric or sulphuric acid is added, and the sulphurous acid liberated is boiled off. The brownish-yellow solution obtained containing the sulphurous acid ester of 1.1′.4-aminonaphthol sulphonic acid is treated with sodium carbonate, lime, or caustic soda, when the sulphurous acid ester is decomposed after a short time, and a crystalline precipitate of the 1.1′.4-aminonaphthol sulphonic acid is obtained on acidifying the solution.

—T. A. L.

Colouring Matters [Blue] and of New Products for Use in the Manufacture of Colouring Matters; The Manufacture and Production of New ——. B. Willcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 16,998, Sept. 24, 1900.

WHEN 1.3.4.6-dinitro-dichlorobenzene is treated with an alkaline thiocyanide (thiocyanate) in presence of a suitable solvent or menstruum (for example acetone), both chlorine atoms are replaced by the thiocyanogen group. The new product so obtained reacts (preferably in alcoholic solution and in presence of sodium acetate) with aromatic compounds containing a free amino group, such as *p*-amino-phenol, its sulphonic and carboxylic acids, one of the thiocyanogen groups being replaced by the radicle of the aminophenolic compound. On heating these derivatives with sulphur and an alkaline sulphide, products are obtained which dye unmordanted cotton greenish-grey-black shades. These on oxidation with sodium peroxide, alkaline potassium ferricyanide alkali permanganate, alkali persulphate, or alkali hypochlorite, give deep blue shades fast to washing, alkalis, and acids.—T. A. L.

Dyestuffs [Violet]; Manufacture of ——. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 14,836, Aug. 18, 1900.

HYDROXY derivatives of substances containing an azine nucleus when heated with alkaline sulphides and sulphur yield violet to claret cotton dyestuffs. The presence of amino groups is advantageous, but not essential, whilst alkyl or alphyl groups attached to one of the azine nitrogens yield purer and brighter shades. For example, 10 kilos. of amino-hydroxyphenazine (Ber. 28, 2975) are gradually added to 50 kilos. of crystallised sodium sulphide, 20 kilos. of sulphur, and 10 litres of water, and slowly heated to 90°—100° C. The temperature is then raised to 140°—150° C., and the heating continued until the melt dissolves in water with a blackish-violet colour, and no yellow border bleeds out when spotted on filter paper. The melt is then dried at 170° C. It can be employed directly for dyeing purposes, and gives on cotton from a bath containing sodium sulphide, brownish-violet shades of great intensity and fastness to washing and milling.—T. A. L.

Dyestuffs [Blue]; The Manufacture of ——. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 16,247, Sept. 12, 1900.

WHEN *p*-dimethylamino-*p*-oxydiphenylamine is heated with sulphur and alkaline sulphides under certain conditions, a pure blue dyestuff is obtained which gives fast shades on cotton from a bath containing sodium sulphide or caustic alkalis. The following are the characteristics of *p-dimethylamino-p-oxydiphenylamine*, which is a new substance. It separates from water in greyish-white needles and from benzene in prismatic crystals, melting at 162° C. It is sparingly soluble in ordinary solvents at low, more readily at high temperatures. It gives easily soluble colourless salts with mineral acids, and dissolves in caustic alkalis in presence of air with a fine blue colour. For the production of the dyestoff, 25 kilos. of the product are gradually stirred into 50 kilos. of crystallised sodium sulphide, 12·5 kilos. of sulphur, and 10 litres of water heated to 90° C. The temperature of the melt is then raised to 110° C., and kept at 110°—115° C. by gradually adding water. After 24 hours, the melt is stirred into 500 litres of water and 50 kilos. of salt are added. The precipitate is filtered off, washed, and dried. The dyestuff thus obtained forms a shining coppery powder, soluble with a pure blue colour in concentrated sulphuric acid. It is incompletely soluble in pure water, but dissolves readily on the addition of sodium sulphide or caustic alkalis. The shade produced is similar to Methylene Blue, whilst the dyeings are fast to milling, light, acids and chlorine, and are said to surpass Indigo both in shade and fastness.—T. A. L.

Dyestuffs [*Violet-red, Blue*] *of the Anthracene Series; The Manufacture or Production of New* ——. H. E. Newton, London. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 15,391, Aug. 29, 1900.

According to Eng. Pat. 23,927 of 1894 (this Journal, 1895, 1041), when quinizarin is heated with primary aromatic amines, one or both of the hydroxyl groups are replaced by alphylamine radicles yielding blue and green dyestuffs. The patentees now find that when α-nitroquinizarin is treated in the same way, the nitro group is replaced, giving derivatives having the general formula $1'.RNH.C_6H_3:(CO)_2:C_6H_2(RNH)_2$ 1.4, where R represents any alphyl radicle. These products on sulphonation yield dyestuffs which give red to violet shades on unmordanted and blue to bluish-green shades on chrome mordanted wool. By further treating the condensation products from α-nitroquinizarin and aromatic amines with aromatic amines, valuable green dyestuffs are obtained.—T. A. L.

Dyestuff [*Brown, Black*] *for Wool; Manufacture of a* ——. O. Imray, London. From the Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 18,624, Oct. 18, 1900.

The *o-o*-diaminophenol sulphonic acid obtained by reducing *o-o*-dinitro-*p*-phenol sulphonic acid gives a tetrazo compound which combines with two molecular proportions of β-naphthol yielding a bluish-black powder soluble in water to a violet solution which is turned red by mineral acids. The dyestuff gives reddish-brown shades on wool which on subsequent treatment with chromium become fast violet-black.—T. A. L.

Carbazole from Nitrosocarbazole; Manufacture of a Nitro-derivative of ——. E. Wirth, Dortmund, Germany. Eng. Pat. 2899, March 25, 1901.

When nitrosocarbazol (Eng. Pat. 14,462 of 1900; this Journal, 1901, 464) is treated in ten times its weight of benzene with its own weight of nitric acid (sp. gr. 1·36) and gently warmed, it is converted into nitro-carbazol, which is a yellow powder nearly insoluble in the ordinary solvents, readily soluble in boiling nitrobenzene or aniline, and not melting at 320° C. On reduction it yields the corresponding amino compound.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Soda-Cellulose; Composition of, and the Action of Ammonia upon ——. E. Thiele. Chem.-Zeit. 1901, **25**, [57], 610—612.

The compound produced by the action of strong caustic soda solution upon cellulose is assigned different formulæ in the literature—$C_{12}H_{20}O_{10}.2NaOH$, $C_6H_{10}O_5.2NaOH$, a $2C_6H_{10}O_5.NaOH$—although analyses do not appear to ha been published.

In investigating the action of ammonia on merceris cotton, figures were obtained from which the compositi of the cellulose-soda compound could be inferred. Stran of yarn, well boiled and purified, of 2—4 grms. weig were dried at 105° C. to constant weight, and then me cerised for 20 minutes in strong caustic soda of kno strength (about 30 per cent.). After squeezing betwe rubber rollers and estimating the increase of weight, th were washed for three periods of five minutes each strong ammonia (25 per cent.) and squeezed after ea wash, the superfluous liquid being carefully collected. T caustic soda removed by each portion of ammonia was th determined; finally the cotton was boiled with water a the alkali estimated in the solution without removing t cotton. Assuming the formula $C_{12}H_{20}O_{10}.2NaOH$, theoretical quantity of combined soda was deducted fr the increase in weight, thus giving the caustic sc solution mechanically absorbed, the caustic soda in wh *plus* the theoretical amount of combined soda should equal to the total quantity of soda found in the four e mations. The agreement is good considering the process and the most divergent case agrees much better by cal lating from the above formula than by $C_{12}H_{20}O_{10}.NaOH$.

Water and aqueous salt solutions convert soda-cellul into cellulose hydrate—$C_{12}H_{20}O_{10}.2H_2O$ the parchm like appearance of the soda-cellulose changes at the sa time to that of ordinary cotton, the fibres contracting crinkling. Even after three to four washes with fr ammonia, the cotton retains its gelatinous nature elasticity, so that it may be stretched to its original len without breaking, which is not possible with merceri cotton washed without tension. Thus washing with monia does not "demercerise." The analyses, of which results are given above, show, however, that, after wash with ammonia, far less alkali remains thar required by soda-cellulose. Since the formation of ammonia-cellulose compound is excluded under these ditions, it can only be assumed that a cellulose hydrat formed, which differs from the ordinary hydrate in be elastic. After washing with water, this hydrate becomes inelastic, and if the fibre be stretched du washing, it too acquires a silky lustre.—A. C. W.

Fast Brown Dyes on Wool; Production of ——. C. Rumpf. Färber-Zeit. 1901, **12**, [13], 197.

When solutions of phenols containing several hydr groups are boiled with hydrochloric or sulphuric acid a small quantity of formaldehyde, faintly coloured conde tion products are obtained, which are insoluble in acids alkalis. These products when oxidised by the actio certain metallic salts or other oxidising agents, yield stuffs similar in character to those of the oxy-ketone se Pyrogallol in this way yields a dark reddish brown dye resorcinol a somewhat yellower brown, whilst pyrocat and hydroquinone give greenish browns. These col it is stated, may be produced directly on the wool and in this case it has been found that the treatment acid is not essential, the reaction between the pheno formaldehyde being brought about by wool mordanted chromic acid or silk weighted with stannic hydroxi phosphate. The wool or silk is boiled with the above portions of phenol or formaldehyde and the colour devel in a boiling solution of bichromate. By this method, ful fast brown colours are obtained with very tendering of the fibre, and but little loss of dyestu precipitation.—R. B. B.

Acetylene Black. J. Dépierre. Bull. Soc. Ind. Mulh 1901, 189—190.

Acetylene Black is recommended for use in calico pri on account of its freedom from hard particles and re composition. It is manufactured, according to Hubo introducing acetylene gas into an hermetically sealed which has previously been deprived of air, until the g subjected to a pressure of two atmospheres, and then de posing it by means of an induction spark or hot wire, a of the gas yielding the same vol. of hydrogen and of the black. The latter consists of 99·8 per cent. of . It is very soft and light; can be made into a paste ater after being soaked in this for a short time, and ible in all proportions with oils, gums, gelatin, &c. t in admixture with albumin solution, it gives a dark lour, at the rate of 50 grms. per litre, and a percep- hade of grey at the rate of less than 1 grm. per E. B.

Blue [Calico Printing]; Discharging ——. H. heintz. Bull. Soc. Ind. Mulhouse, 1901, 180—181. ort upon two Notes presented by P. Wilhelm.)

URE of caustic soda and dextrin, under the influence n, discharges Indoïne Blue B A or B R (Geigy) dyed otton.

issue is padded in a solution of tannic acid (25 grms.), passed through tartar emetic, thoroughly washed, ith Indoïne, passed through a bath of bran, washed ed. Upon the dark blue ground thus obtained, there ed a mixture of 350 grms. of white dextrin, 30 grms. rin, 320 c.c. of water, and 300 grms. of caustic soda- 8° B. The tissue is then dried at a temperature not ng 40° C., steamed for $2\frac{1}{2}$ minutes in an atmosphere as possible from air, soaped for 10 minutes at 85° C., tly cleared.

elm states that Chicago Blue and other direct cotton s can be discharged in the same manner.

steaming process must be very exactly regulated: results were obtained by the author after 30 seconds' g.

xture containing "gelidine" instead of dextrin gave or result by the above method.

rinting mixture of dextrin and caustic soda keeps for 48 hours at the ordinary temperature.

—E. B.

m Phosphate Green [Calico Printing] upon a nium Chromate Brown Ground. A. Scheurer. Soc. Ind. Mulhouse, 1901, 188.

ENED solution of ammonium hydrogen phosphate is upon a cotton tissue mordanted with chromium ide. The tissue is steamed, washed, and passed lution of potassium bichromate. This converts the into chromium chromate, leaving unaffected the m phosphate which has been formed in the printed E. B.

m Persulphate; Destructive Action on Cotton of A. Scheurer. Bull. Soc. Ind. Mulhouse, 1901,

"colours" containing ammonium persulphate in ortions respectively of 20, 10, and 5 grms. per litre, eced by means of gum tragacanth, were printed tions of the same tissue, which were then dried and for $1\frac{3}{4}$ hours. The fents were afterwards washed in vater, dried upon a stentering machine, to render uniform width, and then tested in a cloth-testing machine along with an unprinted fent of the same tissue, which had been steamed, washed, and dried with them. Compared with the latter as standard (100), the strengths of the printed fents were in the ratio of 59 : 90 : 90.—E. B.

Chromium Oxide in Chrome Mordants; Volumetric Determination of ——. R. Hartmann.

See under XXIII., *page* 931.

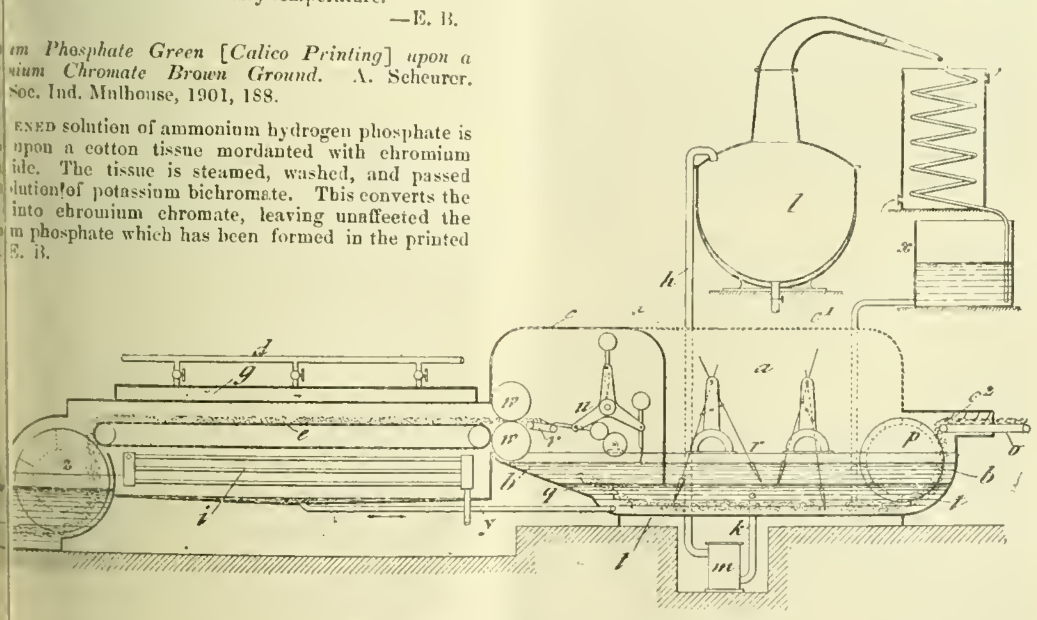
Chloride of Lime; Composition of ——. W. v. Tiesenholt.

See under VII., *page* 896.

PATENTS.

Wool; Removing Fat from ——, and Apparatus for that Purpose. C. D. Abel, London. From Délainage Verviétois, Peltzer and Co., Renoupré-Verviers, Belgium. Eng. Pat. 17,764, Oct. 6, 1900.

THE wool to be scoured is fed by means of a travelling apron *o* (see figure) into a tank *t*, in which it is treated with carbon tetrachloride and water, the latter forming an upper layer. To hinder the evaporation of the solvent, the tank is provided with an air-tight cover *c*, which surmounts the delivery end of the tank and at one end dips into it, forming a seal. The cover may be extended over the whole of the tank (as shown by the dotted lines c^1), in which case the escape of vapours is checked by the use of flexible flaps c^2 at the entrance.



Wool-scouring Machine.

After being propelled along the tank, the wool is lifted upon a travelling apron *v* and delivered to squeezing rollers *w*, which remove from it most of the carbon tetrachloride it contains. It then passes along an apron *e* into a chamber *g* full of steam, where a further quantity of the solvent is expelled from it, the vapours being condensed by the pipes *i*, and the water and recovered solvent returned to the tank through the pipe *y*. The wool is next treated in the tank *f* with an ordinary scouring solution.

As the solvent becomes charged with "fat," it is pumped into a still *l*, where it is vaporised and recovered for use again, the fatty residue left in the still being withdrawn from time to time.—E. B.

Fibre and Yarn; Machine for Treating Slivers of ——, with Liquids. H. F. A. à Brassard, Bradford. Eng. Pat. 12,550, July 12, 1900.

An endless apron is provided with grooves longitudinally, in which the slivers of fibre and yarn are placed. The apron travels entirely in a bath, rising up at each end. Grooved rollers are provided along its course to prevent the slivers rising up in the liquid. The slivers are delivered through squeeze-rollers, and then, if necessary, passed on to another bath. If the material is to be mercerised, then, to keep the yarn on the stretch, the feed and delivery rollers are run at different speeds.—C. M.

Yarn used in the Manufacture of Carpets, Plush or Pile Goods for Upholstery, and similar Fabrics; Apparatus for Printing and Treating ——. O. Hallensleben, Hilden, Rheinprovinz, Germany. Eng. Pat. 17,873, Oct. 8, 1900.

An elaborate machine, which performs mechanically the whole of the operations the yarn has to pass through, up to the weaving, that is to say, the yarn is printed, steamed, and washed in one passage through the machine. It is claimed that time, labour, and colour are reduced to a minimum by using this machine.—C. M.

Jute Fibres, Yarns, and Fabrics; Softening or otherwise Treating ——. E. König, Würzburg, Germany. Eng. Pat. 1081, Jan. 16, 1901.

Jute, in the raw or manufactured state, is thoroughly saturated, at a temperature of 50°—75° C., with a 30—45 per cent. solution of caustic soda or potash, in which it is steeped for about an hour. It is then placed in sacks or "closed receptacles" and heated at 40°—45° C. for about 24 hours, in order to dry it and render the encrusting "vegetable glue" soluble. The fibres thus treated are next washed and passed into an emulsion composed of 100 parts of "alkali soap," 100 parts of olive oil, and 200 parts of water. After being slightly squeezed, they are heated at a temperature of 75° C. for 24 hours. They are then boiled in water for a short time and afterwards dried. By this treatment, it is stated, the "vegetable glue and the like" in the raw jute are replaced by oily substances, which soften the fibre and give it a silk-like appearance.
—E. B.

Garments and other Articles Waterproof; Compositions for Rendering ——. G. F. Newman, Canterbury, New Zealand. Eng. Pat. 12,174, June 14, 1901.

This is an improvement upon the process described in Eng. Pat. 11,264, 1898 (this Journal, 1898, 775), which had the defect of leaving the goods sticky. The article is given one coat, hot, with boiled linseed oil, 3 galls.; castor oil, 1 gall.; "patent driers," 2 lb.; powdered sulphur, 4 oz.; burnt umber or sienna to shade. When perfectly dry, two coats of the following are applied: boiled linseed oil, 4 galls.; "patent driers," 2 lb.; powdered sulphur, 4 oz.; colouring matter to shade.—F. H. L.

Kiers for Boiling, Bleaching, and Dyeing. W. W. L. Lishman, Cornholme, T. W. Haughton, Culleybackey, J. J. Kirkpatrick, Ballyclare; and The Lishman Process Bleaching Co., Ltd., Cornholme. Eng. Pat. 15,486, Aug. 31, 1900.

The object of this invention is to provide a kier in which bleaching, dyeing, &c. liquors may be thoroughly circulated and also rapidly brought to the temperature of boiling point.

A second false bottom, placed above the ordinary false bottom of a bleaching kier, is movable up or down by suitable mechanism actuated on the outside of the kier. The latter is furnished at the top and bottom with liquor inlet pipes, connected on the outside with a circulating pipe which communicates with a liquor supply vessel. A steam injector is placed in each of the liquor pipes to cause the liquor to be forced in at the top or the bottom of the kier as required. One of the inlet pipes communicates with a steam pipe and serves for the introduction of steam in one direction, a pipe in communication with the circulating pipe supplying, when desired, a cu
of steam in the opposite direction. A "vomit" pipe i
attached to one of the inlet pipes.

When employed in dyeing or bleaching with li
which are not to be boiled, the circulation is effecte
means of a centrifugal pump.

A claim is made for the external covering of the
with a layer of wood or other material supported by
iron rings carried at the top and bottom of its side
the covering being further secured, when the kier is
high, by bolts passing through holes in the rings.—E.

Washing and Bleaching Vegetable Fibres and T Materials; Compounds for ——. F. L. Bartelt, E
Eng. Pat. 15,759, Sept. 5, 1900.

To a solution of an alkaline hydroxide is added m
zinc, zinc dust, or a zinc salt, *e.g.*, zinc sulphate.
whole is heated until the zinc is dissolved and then a
to settle. The clear liquor is drawn off and silicate o
added.

If the product is required in a solid form, an al
carbonate is also added in such quantity that the
becomes stiff or pasty and hardens on standing.

Under some circumstances the zinc is dispensed
and the solution contains only the alkaline hydroxi
silicate.—R. B. B.

Bleaching Slivers, Ends, Card Ends, and similar Products, also Loose Cotton and the like Ma
F. Gebauer, Charlottenburg, Germany. Eng. Pat.
Sept. 13, 1900.

The object of this invention is the bleaching of slive
under high pressure without disturbing the structure
material. The material is contained in perforated cy
or cans, in each of which is axially arranged a per
pipe connected at its lower end with a pump, by m
which the bleaching liquor is delivered into the t
of a hermetically closed vessel containing severa
The liquor thus penetrates the material from the
to the centre of each can, and is then drawn by the
of the pump through the central pipes and conduct
to the closed vessel.

The high pressure bleaching vessel is internall
with lead and provided with a hermetically closing
the bottom are a number of short tubes on wh
mounted the perforated cans. Connections are als
with the circulating pump and with an appara
heating the liquor while circulating, and by mea
bye-pass the liquor may be caused to circulate aro
heating apparatus in case the latter is not required.

The perforated cans are preferably constructed
iron coated with lead and the perforated pipes are
secured to the bottom of the cans and conically enl
the lower end so that they can be mounted over t
tubes at the bottom of the bleaching vessel.

With the object of facilitating the filling opera
central perforated pipes may be constructed sepa
detachable from the cylinders, and provided each
dish-shaped end piece. With this arrangement the
are secured to the bottom of the bleaching vessel,
perforated pipes are first inserted in the cans of th
in which the sliver, &c. is produced and, when f
pipes are removed from thence, carrying the slive
on the end piece, and transferred into the cans
bleaching vessel.—R. B. B.

Yarn; Boiling and Dyeing ——, and Apparatus
R. F. Schüle, Kirchheim, Germany. Eng. Pat
Nov. 8, 1900.

Partly an improvement in the cop dyeing a
described in Eng. Pat. 12,976 of 1900 (this Journ
577).

The cops to be dyed are placed upon easily r
wires so that the dye liquors can penetrate them fr
both the inside and outside.

Mechanism is also provided for keeping the
position in the dyeing apparatus when in use.—E.

rin Dyeing Processes; Impts. in ——. F. Kornfeld, 'rague, Austria. Eng. Pat. 15,639, Sept. 3, 1900.

AIM is made for the application in dyeing cotton with in, of "calcium saccharate" or the "calcium salts of ier kind of sugar," in place of the lime or lime comds hitherto used for the purpose. Thus, 35 kilos. of), mordanted as usual with alumina in admixture or ination with fatty compounds, are dyed from a bath 000—1,200 litres of water with 4·3 kilos. of alizarin oer cent. paste), 230 grms. of sodium carbonate (dis l prior to its addition to the bath), 860 grms. of ium saccharate" (in solution) and, if desired, 80 grms. mic acid. Dyeing takes place in the course of 10—15 es, either at, or above, the ordinary temperature. dyeing, the cotton is steamed for 1—2 hours at a tre of 1—1½ atmospheres.—E. B.

igs obtained with Substantive Colouring Matters on ictable Fibre; Fixing of ——. H. H. Lake, London. m The Farbwerke Mühlheim vormals A. Leonhardt Co., Mühlheim a/Main, Germany. Eng. Pat. 17,701, . 5, 1900.

ler to improve the fastness to water of substantive n vegetable fibres, the dyed material is treated with a on prepared in the following way:—About one part ight of aluminium sulphate and 1 part of sodium are separately dissolved, each in about five parts of and after cooling, the two solutions are mixed and ater is added until the total quantity is one hundred The material is then treated with this liquid for an t the ordinary temperature. Since the fixing bath itly acid, colours which are not fast to acids will be hat altered by it, and in such cases the original tint restored by a weak alkaline bath.

solution prepared as described, when standing at the ry temperature, gradually deposits hydrate of alumina asic salt of alumina in a very finely divided state, so e conditions are very favourable for the formation of le colour lakes on the fibre: by heating the solution, tation takes place too rapidly, and it is therefore le to operate in the cold.—R. B. B.

Wool [Blue Colours from Azo Dyestuffs]. C. D. l, London. From the Actiengesellschaft für Anilinkation, Berlin. Eng. Pat. 18,166, Oct. 12, 1900.

d-violet to blue-violet dyestuffs obtained by combinazotised 2:3-aminonaphthol-6-sulphonic acid with 1:8-aminonaphthol-sulphonic acids, when treated pper salts, undergo a characteristic transformation; des turn blue, and their fastness to light and soap derably increased.

property may be made use of in wool dyeing; for e, 10 kilos. of wool are dyed in a vat containing 400 water. 1 kilo. of sodium sulphate, and 0·2 kilo. of ic acid with 1·25 kilos. of the azo dyestuff obtained iazotised 2:3-aminonaphthol-6-sulphonic acid and inonaphthol-4-sulphonic acid. After dyeing in the nanner, 0·1 kilo. of copper sulphate is added to the hich is kept boiling for half an hour longer. By atment, fast deep greenish-blue shades are obtained. sulphonic acids of 1:8-aminonaphthol capable of ig the one mentioned in the preparation of dyestuffs purpose are the 5-mono sulphonic acid and the 5, 4:6, and 2:4 disulphonic acids.—R. B. B.

g Compositions; Manufacture of ——. L. Aloy, tend, Belgium. Eng. Pat. 11,359, June 3, 1901.

vention relates to the preparation of a composition for home dyeing and popular use.—R. B. B.

with the Colouring Matters known as Sulphide rs. A. Sansone and The Clayton Aniline Co., Ltd., hester. Eng. Pat. 17,193, Sept. 27, 1900.

ing paste is prepared containing caustic soda, or a alkaline compound such as sodium silicate, the of a reducing agent being unnecessary. The dyefreed from admixed sulphur and sulphides, and the insoluble free acid or as a strong solution in sodium sulphite, is mixed with an excess of caustic soda or silicate of soda (or a mixture of the two), and any suitable thickening agent. After printing, the goods are dried and then are steamed, washed, and, for greater fastness, passed through a hot fixing bath containing a bichromate, a salt of copper, or of iron, zinc, chromium, or other suitable metallic compound. Finally the goods are washed, soaped, rinsed, and dried. When the steaming operation is of short duration, *e.g.*, when the Mather-Platt ageing machine is employed, it is advantageous to pad the goods, previously to printing, in a solution of glucose (containing 5—20 per cent.) and then to dry.

The process is especially adapted to those sulphide colours obtained as described in Eng. Pat. 21,832 and 22,460 of 1898; and 5039 and 18,658 of 1899 (this Journal, 1899, 909; 1900, 141 and 816), since these products, being free from sulphur and sulphides, do not require special purification.

It is claimed that the colours produced by this process are extremely fast to soap and alkalis, and do not stain the whites, and that the black prints thus obtained are equal in fastness to Aniline Black.—R. B. B.

Chlorine; Manufacture of ——. G. J. Atkins. Eng. Pat. 13,815, 1900.

See under VII., *page* 897.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

Staining Oak; Process for ——, and giving Finished Oak Furniture an Old Oak Colour. W. Kolitsch. Mit. k.k. Tech. Gewerbe-Mus. in Wien, 1901, **11**, [4, 5, and 6], 79—80.

THE beautiful brown colour which is produced on oak by the action of ammonia, is both air-, light- and water-proof. The author describes methods of staining finished oak furniture by the action of ammoniacal gas. The articles are placed in an air-tight case, inside which an atmosphere of ammonia gas is produced, either by pouring strong liquor ammoniæ into a shallow dish contained in it, or by leading the gas into it by pipes; the progress of the staining action may be seen by means of windows provided in the case.
—J. W. H.

Sheepskins; Preparing ——, for Dyeing. Leather Manufacturer, 1901, **12**, [7], 125.

See under XIV., *page* 913.

VII.—ACIDS, ALKALIS, AND SALTS.

Thirty-Seventh Annual Report on Alkali, &c., Works, by the Chief Inspector, June 28, 1901.

THERE are no marked changes in the industries covered by the present report as compared with preceding years. Three alkali works have closed, and two new scheduled works have been opened. The figures relating to escape of acid and noxious gases vary but slightly from those of preceding years, with a tendency to diminution on the whole; only four prosecutions have been found necessary under the Acts. There are, and must be, occasional accidental escapes of acid fumes beyond the prescribed limits; but these are vigilantly noted, and are often the occasion of suggestions being made tending to their suppression.

The chief inspector deals in this report with a matter—the presence of hydrochloric acid, free and combined, in coal smoke—the interests involved in which touch closely the community at large. It is stated that in estimating the escape of hydrochloric acid in some alkali works it has been found necessary to take account, in this respect, of the products of combustion of the coal used. Water pumped from the collieries near Normanton contained chlorine, chiefly in combination with calcium, magnesium, and sodium, varying "from 578·7 grs. to 25,871 grs. per gallon"; and some mine waters in Yorkshire and Durham gave

"3,624 to 4,150 grs. per gallon." Generally, chlorine is largely found in coals mined on the line of outcrop of magnesian limestone. Ignorance of this fact caused, in one instance, heavy loss. At an iron works, where coal was used in place of coke in the blast furnace, ammonia recovery plant, of the type largely used in Scotland, was installed, but the ammonia came off largely as chloride, which is not easily arrested when diffused in a current of gases giving great dilution. A table is given of the results of analyses of several samples of liquors derived from the destructive distillation of coal in gasworks or coke ovens fitted with recovery plant, showing that the ammonia fixed as chloride, ranges from 29·6 to 85·5 per cent. of the total ammonia. In the chimney gases examined in Yorkshire, from one-half to two-thirds of the total hydrochloric acid was found to be free, the remainder being chiefly combined with sodium as sodium chloride. On the other hand, coal from the western coal fields gives chimney gases containing only from 0·02 to 0·03 gr. of HCl to the cubic foot of gases. The question as to how far combustion of coal results in liberation of HCl (and of chlorine if magnesium chloride be present), "and to what extent the compounds are volatilised, passing away without change of character," is admittedly difficult to answer, except within certain limits. The practice, common in the salt districts, of checking black smoke by throwing salt on the fire, is reprehended, since thereby "one evil is checked by giving rise to a greater." Mention is made of a much advertised blue compound, for use in domestic fireplaces to check black smoke, done up in high-priced small packages, which proved to be a mixture of coarse salt with a cheap pigment.

The recent increased demand for arsenic free acids has stimulated action among manufacturers, and new plant has in some cases been set up, and modifications in the conduct of the process of purification by SH_2 have been tried. It has been necessary to guard very carefully against escape of the gas. In the purification of sulphuric acid, besides arsenic, the reagent precipitates lead, antimony, and selenium, and destroys sulphurous, nitrous, and nitric acids.

In tin-plate pickling, it is essential to use sulphuric acid free from arsenic, as otherwise arsenic is deposited on the sheet iron, which will not then take the tin coating. It appears that non-arsenical ores are now very difficult to obtain, and the sulphuric acid obtained from other ores must be freed from arsenic. A copy of the rules to be observed by the workmen at both sulphuric acid and hydrochloric acid works, for their own protection and avoidance of nuisance, in the use of H_2S, is given. A case is mentioned in which the inspector had to direct attention to the danger of tipping the waste sulphide of arsenic mud with hot cinders on a tip of waste material already on fire in one part. A case of gaseous poisoning occurred early in the year, in cleaning out a chlorine still; and it was subsequently found, after the inquest, that the liquid residue from the still gave off, on immersion of iron in it, hydrogen and *arseniuretted hydrogen*, which latter most poisonous gas should not, as the inspector observes, by *a priori* reasoning, have been evolved at all; "experiment, however, demonstrated the possibility of such evolution."

In arsenic works, while there is a diminution in the escape of arsenious acid, there is, in some works, an increase in the average acid escape, due to sulphuric anhydride, in consequence of an increase of the sulphur contents of much of the ore calcined. The condensation of the sulphurous acid evolved is largely effected in limestone towers, but in these a liability occurs for the formation of calcium sulphate, the coating of which on the limestone greatly detracts from its efficiency. Means for overcoming this difficulty are described.

In the nitric acid chlorine industry there has been no revival of activity. Electrolytic processes are striving to gain a footing, and when a process is worked continuously, it is found that the chamber space required per ton of bleach is considerably less than with the Weldon process. There has been much demand for nitric acid of high strength for explosives, and the Valentiner system of distillation has been considerably increased.

The Chance-Claus sulphur recovery process has been carried out in nine English alkali-waste works. The residual gases from the sulphur "flowers" have not a been successfully utilised, though where practicable (w is rarely) they are conveyed to the pyrites burner o vitriol chamber. "It is estimated that the portion covered is fully 12 per cent. of the sulphur recover sulphuretted hydrogen by the Chance process from alkali waste, but leaving the Claus process as sulphur hydrogen and sulphurous acid in varying proporti Reference is made to a passage in the 17th Annual R by Dr. Angus Smith, in which the greater diffusivene sulphurous acid over sulphuric acid is pointed out the quotation given, specially directs attention to prevalence of injury to vegetation from the escap sulphurous acid from ordinary chimneys, a matter th not been brought under the Alkali Acts.

Sulphuric acid works have been busy, and the produ considerable; but the high temperature of the su months made the economic working difficult, and lia excessive escapes, even with high nitre consumption. from the distillation of gas liquor has been utilised source of sulphur for acid making in several works times of active demand, the acid in the vitriol chamb sometimes drawn down so low as only just to lute the and this affects very unfavourably the chamber rea for, says the chief inspector, "the bottom acid i chamber is by no means a spectator only (if I m personify it) of the reactions taking place above it, very active participant, the value of whose silent only felt when circumstances have withdrawn it, so is its necessary function fulfilled." Extensive pla been erected for the production of sulphuric acid catalytic process, and it is stated that, as is usual initial working of a new process, technical difficultie been experienced. No absolutely new developme taken place in the concentration of sulphuric aci condition of which is the exposure of sufficient s The Kessler process has now taken a firm footh England, after successful working in Scotland; acid per cent. monohydrate is produced. Glass retorts f centration are still in use, and are even being newly e in some large works. Webb's and Dyson's syste also in operation. Guttmann's system, in which a s comparatively small earthenware beakers are spirally s in a gas-fired cast iron tower, has been on trial mentally.

In sulphate and muriate of ammonia and gas works it is found that the utilisation of the H_2S vitriol chamber for conversion into sulphuric acid best method, provided the residual gases from the sa contain so much as 20 per cent. of that gas; but th of working must be large. The method is applie the case of municipal authorities working up resi their own gas works. In the Claus process, the per of H_2S in the foul gases must not be under 16, to k precipitated sulphur fluid, that it may flow into t section of the sulphur flowers chamber. When the of oxide of iron purifiers is used, it is considered e that the connection between the purifiers should be g not by screw-down valves, but by water lutes; a should be idle to each active purifier; a light ro the purifiers, to promote air circulation, is also mended. In some works the H_2S is burned in a furnace, and the sulphurous acid produced, is led limestone towers, which involves previous cooling hot gases, hitherto effected by the use of iron co pipes, which, however, are very liable to corros simple washer condenser has now been introduced, c of a circular stoneware tower, fitted with a wa distributing apparatus at the top, and having a perforated plates to bring into close contact the w gases; this plan relieves the limestone tower of its work, and has other advantages, making it great advance." The acidity of the cooling water the washer described, is readily neutralised by sper from the gas-liquor stills. Indeed, plans have b posed, and are under trial, to deal with the whole a passing the acid gases up a second tower fed wi liquors. Trials have been made, on a small scal application of a ferric salt, as the sulphate, to the of sulphur from H_2S, the produced ferrous salt being nerated to the ferric state by the electrolytic method has been used in the Siemens-Halske process of gold action in South Africa. Another process (Heming-'s) consists in bringing the foul gases into contact with r containing ferrous sulphite in suspension, when hur is separated; but experiment has shown that rial loss of sulphur ensues through formation of thio-bate. The process has been subjected to elaborate s by the chief inspector under varying conditions, and esults are tabulated.

e amount of sulphate of ammonia produced in the ed Kingdom is shown in the following table:—

----	1900.	1899.	1898.
orks	142,419	133,768	129.590
works	16,959	17,963	17,935
works	37,267	38,780	37,264
oven works	10,393	7,849	5.403
ucer gas and carbonising rks (bone and coal).	6,688	7,360	6,165
Total	213,726	205,720	196,357

Scotland there has been a sensible reduction in the onia recovered from blast-furnace gases, depending in on the quality of the coal used; extension, however, covery plant attached to coke-ovens may be expected. lischarging saturators of the "Colson" type are sing in number, and offer considerable advantages large make of sulphate of ammonia. In the district hug North and East Lancashire and part of Yorkshire rict No. 4) the proportion of liquor ammonia produced ly 1 per cent. of the total. The old intermittent d of distillation is giving way to the continuous process. e production of water-gas has increased, notwith-ing some hesitation on the part of manufacturers in lucing it, owing to the uncertainty still existing as e intentions of Parliament as to the proportion of n monoxide it will be allowed to contain.

e importance of the "producer" or "Mond" gas ction, with sulphate of ammonia recovery, especially se in gas engines as originating power for electric , comparable in economy to the power obtained in countries from water falls, is coming more and more notice, and its use so far as made must increase the t of the sulphate. The chief inspector states that at innington works of Messrs. Brunner, Mond and Co., two gas engines of 400 to 500 horse power nominal nore actually) have been working, tests show a thermal ncy of 30·38 per cent., "one indicated horse power being obtained from an expenditure of 0·88 lb. of on slack coal of so poor a quality that it only con-. 62 per cent. of carbon." In this connection, atten-s directed to Mr. H. A. Humphrey's paper read at the ute of Mechanical Engineers, "On Power Gas and Gas Engines for Central Stations" (this Journal, 107). The process, as conducted [with ammonia ery, is only feasible with large units of plant. Dr. has made important contributions to discussions as best means of using the mechanical energy produced s engines, at a distance from, as well as near to, the of origin, and a scheme seeking the sanction of ment has taken shape for providing a central pro-gas station, provided with ammonia recovery plant, Black Country, for distribution of gas to users of . In respect to the direct utilisation of blast-furnace of iron works for production of power by means of ngines, Scotland has not as yet "taken its due "; but the subject is described as acquiring increasing tance. Prof. Meyer, of Göttingen, has found that, as ured with condensing steam engines of the best class, tio is at least 3 to 1 in favour of using blast-furnace in gas engines for power production: thus, 1 indicated power is obtained from 3 cb. m. of blast-furnace gases a gas engine, as against 9 to 10 cb. m. when employed ising steam supply to the best condensing steam engine.

Analyses are given of deposits in mechanical washers at producer gas works. In 100 grms. of undried mud, resembling coal dust in appearance, were found, sulphur as thiosulphate, from 0·00 to 0·78 grm.; as sulphite, from 0·00 to 0·68 grm. The inspector has previously shown that thiosulphate may be formed by reaction between ammonium sulphite and sulphide. In the liquors from which the samples of mud analysed were taken, one specimen contained sulphite in considerable proportion. The usual table is given of analyses of ammoniacal liquors, in which the column for ammonium ferrocyanide (only traces of which were found in a single sample) is deleted; but as ammonium sulphite has been found in some liquors, it has received a column. The difficult problems involved in the analysis of ammoniacal liquors from various sources receive further elucidation. Notwithstanding that a polysulphide and a sulphite cannot co-exist, sulphite (as already stated) is found in certain liquors, and its presence is liable to cause errors unless certain precautions are taken. Careful experiments have shown that in extracting ammoniacal liquors with CS_2, there is in certain cases, and especially with shale liquors, liability to the formation of a sulphocarbonate and corresponding loss of sulphide. The use of CS_2 is therefore now abandoned, and separation of the sulphide from thiosulphate and sulphite is now effected by ammoniacal zinc chloride instead of neutral zinc sulphate. Also, "in the volumetric estimation of the carbonic acid the digestion at 98° C. with ammoniacal calcium chloride, necessary to decompose carbamates and complete the separation of the calcium carbonate, is now carried out in *stoppered* bottles kept immersed in the water-bath for $1\frac{1}{2}$ to 2 hours at boiling temperature, this method being found to yield the most reliable results."

Experiments were made on the action of ammonium sulphite on ammonium sulphide, and on polysulphide, in presence and absence of air, in which the reactions were all carried out in stoppered bottles of known capacity, kept at a constant temperature by means of a water-bath. The conclusions appended to the table of the results obtained are:—1. In absence of air—ammonium sulphite has but little oxidising action upon ammonium sulphide in the cold. With rise of temperature the action is more marked, but is still inconsiderable. 2. In presence of air—oxidation is marked, but the rate of "conversion" in a given time is very little greater than it would be if the same volume of air were allowed to act by itself. 3. Ammonium sulphite and ammonium sulphide can co-exist in the same solution. A further series of tabulated experiments on the oxidation of ammonium *polysulphide* by ammonium sulphite, similarly conducted, leads to the following conclusion:—That ammonium polysulphide is at once completely converted into a mixture of ammonium thiosulphate and ammonium sulphide by the action of excess of ammonium sulphite, one-half of the sulphur of the thiosulphate formed being derived from the polysulphide, the remaining half from the sulphite:

$$(NH_4)_2S_2 + (NH_4)_2SO_3 = (NH_4)_2S + (NH_4)_2S_2O_3.$$

Several salt works in Cheshire, originally belonging to individual owners, have now, as in the case of other works elsewhere, been merged into one ownership. The number of chimneys is very great, but the average escape of hydrochloric acid from them is well below the provisionally fixed legal limit. In some works, "multiple effect" evaporation has been introduced, a great, though avoidable drawback to which consists in the fouling of the tubes of the apparatus by sulphate of lime. One great advantage of the method would be the removal from the atmosphere of much aqueous vapour, which otherwise diffuses in it, and this would result in lessening the injurious effects of both hydrochloric acid and sulphur dioxide. In regard to cement works, not much progress in arrest of fumes is reported; but the Associated Portland Cement Manufacturers (Ltd.) have taken over the business of 30 firms, and it is expected that they will shortly introduce the use of continuous rotary kilns. An explosion attended with loss of life has occurred at a gas works in Lancashire, and the chief inspector directs attention to the necessity of guarding against the accumulation of explosive gases in tar wells.—E. S.

Sodium Nitrate; Decomposition of —— by Sulphuric Acid. C. W. Volney. J. Amer. Chem. Soc. 1901, **23**, [7], 489—492.

The author has made further experiments on the distillation of sodium nitrate and sulphuric acid, and from his results draws the following conclusions:—During the first period of action of sulphuric acid on sodium nitrate, a polysulphate of the composition $NaH_3(SO_4)_2$ is formed thus: $NaNO_3 + 2H_2SO_4 = NaH_3(SO_4)_2 + HNO_3$; the nitric acid set free is the true "first hydrate," and distils at 81°—88°. On raising the temperature, the second phase of the reaction begins, the polysulphate acting on the remaining nitrate according to the equation: $NaH_3(SO_4)_2 + NaNO_3 = 2NaHSO_4 + HNO_3$. The high temperature required by this latter reaction decomposes some of the nitric acid with the formation of water, so that the acid distilling over is diluted, and is sometimes called the second hydrate.—T. H. P.

Nitric Acid Manufacture by the Nebel Process. Rev. Prod. Chim. **4**, (11), 163.

The Nebel process is based on the observation that when bisulphate is heated to 300° C. with dilute sulphuric acid, water alone is eliminated, and there is formed a polysulphate that may be employed to replace concentrated sulphuric acid in decomposing sodium nitrate. In the course of this latter operation, it is found that when the strong nitric acid has been removed, the residual portion of this acid can be recovered in a dilute condition by exposure to a temperature of 300° C. in another vessel.

In view of this fact, the apparatus employed consists of three stills, two of them being placed above, and in communication with the third. One of the upper stills is charged with a mixture of polysulphate and sodium nitrate, and heated to 170°—200° C. The contents are afterwards discharged into the lower still, which contains a small quantity of bisulphate, and is kept at a temperature of 280°—300° C. The two upper stills are worked alternately, thus rendering the process continuous. The distillation takes 3½—4 hours. A portion of the bisulphate from the lower still is converted into polysulphate, by heating with dilute sulphuric acid, and is then used to charge the upper stills.

The cost of the apparatus and of the nitric acid produced, is claimed to be cheaper than in the ordinary processes.
—C. S.

Soda Manufacture by the Ammonia-Soda Process; Progress in ——. H. Schreib. Chem.-Zeit. 1901, **25**, [53], 566.

But little improvement has been made in this process during the last two years. Owing, however, chiefly to trade combinations, the price of calcined soda has increased by 15—20 per cent., and that of caustic soda by 10—15 per cent. Consumers have suffered more from a short supply than from the increase in price, as German manufacturers have not increased their output in proportion to the extended demand, preferring to allow the difference to be made up by imports. A table is given, showing the imports and exports of calcined, caustic, crude, and crystallised soda and bicarbonate from 1883 to 1900 inclusive. Caustic soda showed its maximum excess of exports over imports in Germany in 1894, when the excess amounted to 6,230 tons; in 1899 it had fallen to 2,618 tons, whilst in 1900 the imports exceeded the exports by 2,798 tons (1 German ton = 1,000 kilos.). The total production of all classes of soda showed its greatest excess of exports over imports, in Germany, in 1897, when it amounted to 49,490 tons. In 1900 the excess was 11, tons. The falling off is ascribed to the predominanc the German Syndicate of the Solvay Company, and preference shown by the latter for its foreign fact rather than for the German ones.—W. G. M.

Sodium Hydroxide; Solid Hydrates of ——. Forcr Comptes Rend. **133**, [4], 223—226.

The paper presents a thermal study of heats of solu The author's conclusions are:—1. The heat of solutio NaOH increases with rise of temperature, according to formula 9·78 *cal* + 0·048 (t − 10). This is the same efficient of temperature variation as for KOH. 2. Be the hydrates, $2NaOH.7H_2O$ and $NaOH.H_2O$, already kn there exists a hydrate $3NaOH.2H_2O$. 3. On adding w in successive small portions to NaOH, the heat-evoluti less for the first than for the later portions added, u $NaOH.H_2O$. A similar phenomenon exists in the cas KOH, but only up to $KOH.\frac{1}{3}H_2O$. The author can sug no explanation of the phenomenon. 4. The curves of of dissolution of KOH and NaOH cut one another at point $ROH.\frac{1}{3}H_2O$; so that greater heat is evolved by solution of the potassium or the sodium compound ac ing as the substance contains less or more water corresponds with that formula.—J. T. D.

Chloride of Lime; Composition of ——. W. v. Ti holt. Sitzb. Phys. Chem. Ges. St. Petersburg, 1901. Through Zeits. angew. Chem. 1901, **14**, 675—676.

According to the author, the formation of chloride of can be expressed by the equation—

$$2Ca(OH)_2 + 2Cl_2 \rightleftarrows Ca(OCl)_2 + CaCl_2.2H_2O.$$

It invariably contains a slight excess of water. facilitates the liberation of hypochlorous acid on war and the latter reacts with the calcium chloride as i equation $2HClO + CaCl_2 = 2Cl_2 + Ca(OH)_2$.

On the addition of calcium chloride there is a str evolution of chlorine. In all cases it stops, however, a certain proportion of water has been used, but is evolved on moistening the residue. "In this way author has liberated 29·72 per cent. of the 34·13 per of available chlorine by heating the chloride of lim carbon tetrachloride."

He demonstrates the presence of calcium hypochlo chloride of lime, by treating the latter in chlor solution with anhydrous alcohol, which combines nearly the whole of the hypochlorous acid to form hypochlorite. In this case, too, the presence of a of water is essential, for the reaction does not take if the materials be thoroughly dried. He has pre dry calcium hypochlorite by the use of carbon mon slaked lime and an equivalent quantity of calcium ch He thus obtained a mixture which, like ordinary ch of lime, loses nearly the whole of its chlorine on trea with carbon dioxide.—C. A. M.

Copper Sulphate and Sodium Sulphate; Solubil Mixtures of ——. Massol and Maldès. Comptes 1901, **133**, [5], 287—289.

The authors have determined the solubility of mixtu copper sulphate and sodium sulphate, both salts be excess, with varying proportions of each, and at v temperatures.

The results are summarised in the following table:—

Mixture.	Temperatures.							
	10° C.		15° C.		30° C.		50° C.	
	$CuSO_4$	Na_2SO_4	$CuSO_4$	Na_2SO_4	$CuSO_4$	Na_2SO_4	$CuSO_4$	N
	Grms. per 100 grms. of Water.							
$3CuSO_4 + 1Na_2SO_4$	19·75	12·40	20·60	15·88	22·03	16·36	32·37	[illegible]
$1CuSO_4 + 1Na_2SO_4$	19·70	12·50	20·75	15·90	21·00	20·14	31·45	[illegible]
$1CuSO_4 + 3Na_2SO_4$	19·69	12·55	20·70	15·92	15·28	22·70	28·76	[illegible]

s it was found that the composition of the solutions ed at 10° C. and 15° C. was the same whatever the rtions of the salts present (both being in excess), a hich had already been observed by Rüdorff. But at ratures of 30° and over—that is, at temperatures ently high for the existence of the anhydrous modifi- of sodium sulphate (23°—32° according to the te), the composition of the solutions varied with the e proportions of the salts used, the salt in excess g a diminution of the solubility of the other salt. It eresting to note that the total quantity of salts in on was constant whatever the mixture employed, and he two salts do not displace each other in proportion r molecular weights but simply in equal weights.

—J. F. B

ium Ferro- and Ferri-Cyanides; Action of Light queous Solutions of ——. J. Matuschek. Chem.- . 1901, **25**, [56], 601.

exposed to light, solutions of potassium ferrro- and yanides deposit ferric hydroxide, the former giving grained precipitate, while the latter yields a flocculent t. Under the same conditions a solution of the anide is decomposed more readily by light than a n of the ferro-salt containing the same proportion of -T. H. P.

sium Ferrocyanide; Action of Sulphurous Acid upon -. J. Matuschek. Chem.-Zeit. 1901, **25**, [57], 612.

a solution of potassium ferrocyanide is heated with rous acid, a white precipitate is formed at first, then turns green. Hydrocyanic acid is evolved. On more sulphurous acid and exposing the whole to t, both liquid and precipitate turn blue. On passing r dioxide and oxygen through a hot solution of ium ferrocyanide, a green (not blue) precipitate is l. The blue precipitate was found to be Prussian which is thus only formed in direct sunlight, when s access. Sulphurous acid acts on potassium ferri- e on heating or under the influence of direct sunlight .-Zeit. 1901, 587), but heat cannot effect the reaction ferrocyanide. Now solutions of potassium ferro- e separate ferric hydroxide on exposure to sunlight .-Zeit. 1901, 565), thus it may be assumed that the an blue is produced, under the action of the oxygen air, from the salts obtained from this ferric hydroxide ic acids (sulphurous, formic) present. The following on, which represents quantitatively the production of an blue, thus gives only the final condition of a series tions—

$$[4KCN.Fe(CN)_2] + 14SO_2 + 12H_2O + O_2 =$$
$$Fe_4[Fe(CN)_6]_3 + 14K_2SO_3 + 24HCN.$$

—A. C. W.

russiate of Potash; Action of Sulphur Dioxide on Aqueous Solution of ——. J. Matuschek. Chem.- . 1901, **25**, [55], 587—588.

uthor finds that, in the absence of light, sulphur e has no action on aqueous potassium ferricyanide, at when the mixture of these two substances is d to light or when sulphur dioxide is passed into a solution of the salt, a reaction takes place in Prussian blue is precipitated; the oxygen of the air no part in the change, which is represented by the ng equation:—

$$7K_6Fe_2(CN)_{12} + 21SO_2 + 24H_2O =$$
$$2Fe_7(CN)_{18} + 21K_2SO_3 + 48HCN + 3O.$$

ct that no smell of hydrocyanic acid can be detected to the hydrolysis of this acid in presence of dilute l acids with formation of ammonium formate.

—T. H. P.

tes; Electro-chemical Production of ——. W. Pick.

See under XI. A., *page* 905.

; Effect of Glassware Containers on ——. T. Tyrer and C. T. Tyrer.

See under VIII., *page* 899.

Hydrobromic Acid; Preparation of ——. E. M. Marshall.

See under XX., *page* 926.

Chili Saltpetre; Occurrence of Free Iodine in ——. F. W. Dafert and A. Halla.

See under XV., *page* 914.

PATENTS.

Brine; Process for the Purification of ——. G. N. Vis, Schweizerhalle, near Basle, Switzerland. Eng. Pat. 20,271, Nov. 10, 1900.

Sodium sulphate is added to brine, in excess of the proportion needed to react with the calcium salts present, and after salting out the greater part of the calcium sulphate, the brine is agitated for some time with quicklime, added in such proportion "that the brine treated acquires a degree of free alkalinity corresponding to, or exceeding the proportion of gypsum remaining in solution," and carbon dioxide is then passed in, in sufficient quantity to form carbonates, but not bicarbonates, with the calcium and free alkali present. The precipitated calcium carbonate is separated, and after salt has been obtained by concentration, the mother liquor, rich in sodium sulphate, is used in the next operation. Reference is made to Eng. Pat. 7107, 1899 (this Journal, 1900, 146). —E. S.

Chlorine; Manufacture of ——. G. J. Atkins, Tottenham, Middlesex. Eng. Pat. 13,815, Aug. 1, 1900.

Sodium or potassium chlorate and chloride, mixed, or in solution together, are treated with "an aqueous solution of sulphuric acid" to produce chlorine. The solution containing chlorine thus obtained, may be used in leaching ores, or for bleaching, disinfecting, or the like. The process may be varied by mixing sodium chlorate with potassium chloride, or potassium chlorate with sodium chloride, instead of having only one base present. The chlorine may, if desired, be separated from the solution for absorption by water or otherwise.—E. S.

Caustic Soda; Manufacture of ——. A. Brand, Dover. Eng. Pat. 19,322, Oct. 29, 1900.

Black ash is made in the usual way from a mixture of sodium sulphate, calcium carbonate, and carbon, and to the furnaced mass "a further quantity of carbonate of lime and, if necessary, some carbon" is added, and after increased heating, the pasty mass is drawn from the furnace, and is lixiviated, to obtain a "strong caustic liquor." The weak washings are used to lixiviate the next charge.—E. S.

Packing Material; for Gay Lussac, Glover, and the like Towers. J. M. Gibson, Buckley. Eng. Pat. 23,052, Dec. 17, 1900.

To increase the efficiency of absorption towers, the surfaces of the packing material are formed with horizontal grooves or recesses; drawings of packing rings with external grooves of varying form are given in the specification.—J. W. H.

Copper Sulphate and other Metallic Sulphates; Process for Making ——. H. J. U. Palas and F. A. J. Cotta. Eng. Pat. 17,485, Oct. 2, 1900.

See under XI. A., *page* 906.

VIII.—GLASS, POTTERY, ENAMELS.

Lead Compounds in Pottery; Report to His Majesty's Principal Secretary of State for the Home Department on the Work of the Government Laboratory on the Question of the Employment of ——. T. E. Thorpe.

The author has carried out inquiries and experiments with regard to the employment of lead compounds in the manufacture of pottery. The report is divided into three parts. The first, which forms the main subject of the report, deals with the proposed special Rules I. and II. The intention of Rule I. is to ensure that in the first place all lead used in the processes indicated shall be fritted, since even the more soluble kinds of fritted lead have some small advantages over "raw" lead. Rule II. is to ensure that the lead shall be fritted so as to produce a frit which is practically insoluble in dilute acids. This is done by properly apportioning the lead and the other materials.

The second part deals with the composition and solubility of lead frits. The third has regard to the influence of grinding on the solubility of lead in frits. In 1899 (this Journal, 1899, 494—495) the Home Office proposed that the use of raw lead should be discontinued, and all lead in future fritted, after a lapse of time sufficient to enable manufacturers to accommodate themselves to the change. The proposed rules provide that fritting should be made compulsory, and that the frits should conform to a maximum standard of solubility. The principle of Rule I. is accepted by the manufacturers, who propose, however, the addition of the words " with some siliceous substance " after fritted. Dr. Thorpe contends that this addition is not sufficiently precise, and would allow of raw lead being fused with a minimum or even a merely nominal quantity of silica. Manufacturers object *in toto* to Rule II. Dr. Thorpe gives a list of continental works with the kind of ware made, and the kind of lead used, showing that in works where fritted lead is employed, plumbism had largely or entirely disappeared.

For the solubility determinations, the solvents selected in the earlier stages of the experiments were solutions of hydrochloric, acetic, and lactic acids, of various strengths ranging up to 1 per cent. Afterwards only a 0·25 per cent. solution of hydrochloric acid was employed. The method eventually found most practicable for the purpose in view was to shake the finely powdered silicate for an hour with a thousand times its weight of the solvent at the ordinary temperature, using for this purpose an agitator worked by a small hot-air motor. The sediment was then allowed to settle for an hour, the liquid filtered, and the amount of lead in the filtrate determined. In most cases the lead was separated as sulphide and weighed as sulphate. The conditions which led to the particular method of estimating solubility are the following:—

Time.—One hour's shaking at the ordinary temperature followed by an hour's settling was found long enough to dissolve the whole of the lead from easily soluble frits. From sparingly soluble frits it dissolved nearly, though not quite, as much lead as two hours' shaking. It thus served to discriminate between the two classes of frits and the length of time met the requirements of a practical working method.

Temperature.—The ordinary temperature was chosen as being a more practical one for laboratory purposes than that of blood heat, and less liable to variation during experiments. Less lead is no doubt dissolved from slightly soluble frits than would be dissolved at the blood temperature.

Quantity of Acid.—The quantity "1,000 times its weight" was chosen (1) in order to ensure that under all circumstances an excess of acid should be present; and (2), in order that the excess should be so great as to prevent any considerable weakening of the acid through the neutralising action of soluble constituents of the glaze.

Strength of Acid.—The strength of acid adopted for the test is that which is generally taken to be the average strength of the hydrochloric acid in the gastric juice, this acid being without doubt the active agent in dissolving lead in the stomach.

Specimens of the frits in actual use in the factories of Boch Frères (Belgium) and La Société Céramique were obtained, and also a specimen of new frit at the time being tried at the Rörstrand Works. The solubility of the lead in these frits when finely ground and treated with dilute acid as laid down in Rule II. was determined with the following results:—

Frits.	Lead Oxide present.	Lead Oxide dissolved.	Solubility calculated for Glaze containing—		
			10 % PbO.	15 % PbO.	20 % PbO.
	%	%			
Boch Freres, Belgium..	22·4	0·7	0·3	0·5	0·6
La Societe Céramique..	19·0	1·2	0·6	0·9	..
Rorstrand............	14·1	2·1	0·5	0·7	1·0

Thus the solubility of any one of these frits woul less than 1 per cent. If either the first or third were in the same way for a glaze containing as much as 2 cent. of lead oxide, the solubility would still not ex 1 per cent. The second frit contains too little lead to fu 20 per cent. of lead oxide. Although the three frits s that even the 1 per cent. limit is practicable, and that standard is actually reached (though not enforced) on Continent, it was thought desirable to allow a margi possible accidental deviations. The limit of 1 per cent. therefore, doubled, and a standard of 2 per cent. sugg as a criterion of safety whereby glazes might be jud The possibility of conforming to Rule II., as show results obtained by English manufacturers since the of the Home Office proposals in Dec. 1899 are illust by tables, experiments, and extracts, giving: (1.) Exa tions of frits and glazes of low solubility. (2.) Pro shown by manufacturers in obtaining soluble glazes, Statements of manufacturers. (4.) The more ge introduction of "leadless" glazes. (5.) The possibili diminishing the quantity of lead actually used. A number of glazes from various firms have been exam from time to time, and a marked improvement in "solubi is observed. Evidence is given that it is possible to dim the amount of lead soluble in dilute acid. For exa when it is a question of a glaze containing 22 per ce lead oxide showing 4 per cent. of "soluble lead," th the glaze be made with only one-half the quantity o same frit, so as to contain 11 per cent. of lead oxide amount of "soluble lead" will also be reduced to one *i.e.*, to 2 per cent. The glaze, which did not origi conform to the 2 per cent. standard, is made to do decreasing the (unnecessarily large) amount of lead. average quantity of lead oxide in 15 specimens of and earthenware glazes was found to be about 18 per the highest amount being a little over 22 per cent.

Objections have been raised that the frits from Frères factory and from La Société Ceramique containe much silica and too little lead for English requirements. objection has been completely met by showing that may contain much less silica and much more lead these, whilst still remaining only slightly soluble. T as much lead, and less than four-fifths as much silic amounts frequently met with.

A number of tables are given showing the results o examination of various silicates. Crude monosilicate o was found to yield practically the whole of the lead t action of 0·25 per cent. hydrochloric acid. The examin of complex silicates illustrated an important prin namely, that the quantity of lead dissolved has no nece relation to the quantity of lead in the silicate. The parison of a large number of analyses and experi showed that the insolubility of the lead depends not any one oxide or group of oxides, but upon the mainte of a certain proportion between the whole of the basic o on the one hand, and the whole of the acidic oxides o other. Methods of calculating these ratios with table given. The conditions upon which the production of u insoluble lead silicates suitable as frits depends, are:— The preservation of the proper relation between the and the basic constituents.—Second. The fusion o materials for such a time and in so thorough a manner allow of the chemical reactions being completed. To may be added in certain cases, the treatment of the si with acid in order to extract small quantities of admix loosely combined lead compounds from the bulk o product. Provided that the foregoing condition satisfied, then, without prejudice to the insolubility standard solvent of the lead in the silicate—

(1.) The quantity of lead oxide in the silicate may any value up to 50 per cent. or even higher.

(2.) The other bases (lime, alumina, and alkalis vary considerably, replacing one another, and also th oxide, within very wide limits.

(3.) The influence of basic oxide, irrespective of t the silica with which it may be associated, still rema be ascertained, but it may be pointed out that basic up to 6 per cent., the highest amount met with i specimens examined, may be present without appr reising any special influence in promoting the solubility the lead.

The objections advanced by Messrs. Jackson and Rigby is Journal, 1901, 43), that the solubility of a glaze ends upon the fineness to which it is ground is exhaustly dealt with in detail. In general terms the answer is follows:—First. There is a certain modicum of truth in contention. But it is an academic and not a practical tter. The variation of solubility with fineness is tively slight, and considering the limits of grinding aining in practice, is of no real significance:—Second. ether or not the solubility of a glaze increases with ness is immaterial, provided that glazes are obtainable ch when ground to the fineness required in practice form to the proposed standard of insolubility. It is of consequence that such glazes have lower solubilities when e coarsely ground, and, as a fact, such glazes are ally in use by English manufacturers.—C. T. T.

Glass Making; Copper Oxide for ——. G. Raufer.

Zeits. angew. Chem. 1901, **14**, [30], 753—754.

ERRING to Drawe's assumption (this Journal, 1901,) that the frequent failure of copper oxide to produce desired green colour in glass to which it has been added, ue to the presence of cuprous oxide in the commercial le used, the author points out that few, if any, of commercial oxides are quite free from suboxide. failure is more probably due to the presence of cing compounds, through the insufficient addition of ites, or through reducing gases having had access to charge in the melting furnace, as for example, through use of coal firing where open melting pots are used. dden failure of copper oxide as a colouring medium is e often the result of a change in the construction of the ace, or in the method of firing, or to the disuse of nitre, to an alteration in the composition of the oxide. y care should therefore be taken to guard against cing influences in the furnace.—W. G. M.

s; Opal- and Alabaster- ——, with Durable White d Coloured Flashing Glass for Lamp Globes and ncy Articles. Sprechsaal, **34**, [1], 3—4.

l Glass.—Sand, 100 parts (kilos.); potash, 45; 98 per soda, 3; bone ash, 26; calc spar, 3; nitre, 1·5; um, 1·5; arsenic, 1·5; manganese oxide, 0·15 parts.

urable White Glass for Same.—Sand, 100 parts; sh, 40; soda, 5; calc spar, 15; nitre, 1·5; minium, arsenic, 0·5; manganese oxide, 0·10; antimony lus, 0·075 parts.

labaster Glass.—Sand, 100 parts; potash, 56; bone 6; natural alum, 8; nitre, 3; calcined borax, 1; ganese oxide, 0·075; antimony regulus, 0·05; tin e, 0·125 parts.

urable White Glass for Same.—Sand, 100 parts; sh, 40; calc spar, 15; minium, 2·5; nitre, 1·5; ned borax, 1; arsenic, 0·5; manganese oxide, 0·08; nony regulus, 0·06 part.

loured Adjuncts for the White Glasses.—Turquoise : Black copper oxide, 1 part; best smalt, 0·005 part. flower Blue: Black copper oxide, 0·8 part; best smalt, black nickel oxide, 0·025 part. Violet Blue: Black er oxide, 0·8 part; best smalt, 0·4; green nickel , 0·035 part. Pigeon Blue: Black copper oxide, part; black nickel oxide, 0·3 part. Florentine Blue: nickel oxide, 0·3 part; best smalt, 0·3; black copper , 0·4 part. Venetian Blue: Black nickel oxide, 0·4 ; best smalt, 0·4; green nickel oxide, 0·2 part.

taking 50 per cent. more, these blues may be used for colouring the opal and alabaster glass.

ss Green: Chromic acid, 1·5 parts. Leaf Green: n copper carbonate, 0·8 part; chromic acid, 0·5 part. Green: Barium chromate, 0·8 part; yellow iron oxide, part. May Green: Black copper oxide, 20 parts; m chromate, 0·6; red iron oxide, 0·4 part. Green: n copper carbonate, 2 parts; barium chromate, 1; iron oxide, 0·5 part. Florentine Green: Cupric nate, 2·4 parts; green copper carbonate, 1·2 parts. tian Green: Best copper acetate, 4 parts. Antique n: Manganese oxide, 3·3 parts; red iron oxide, 2·2; barium chromate, 0·5 part. Oriental Green: Ferric chromate, 3·3 parts; cupric borate, 2·2 parts. Japanese Green: Ferro-ferric oxide, 2 parts; cupro-cupric oxide, 1 part. Chinese Green: Cupro-cupric oxide, 3 parts; ferric oxide, 1 part.

Topaz Yellow: Sulphur, 1·5 parts; antimony sulphide, 2·5 parts. Quince Yellow: Cadmium sulphide, 3 parts; zinc sulphate, 1 part. Fruit Yellow: Titanic nitrate, 3 parts; lead nitrate, 1 part. Annatto Yellow: Uranium oxide, 1 part; antimony glass, 1 part. Antique Yellow: Manganese peroxide, 3·5 parts; ferric oxide, 2; antimony oxide, 0·5 part. Japanese Yellow: Potassium antimoniate, 2 parts; ferric oxide, 1·5 part. Chineso Yellow: Antimonic acid, 3 parts; ferric hydrate, 1·5 parts. Oriental Yellow: Sulphur, 1·5 parts; antimony sulphide, 2; antimony glass, 1 part. Florentine Yellow: Titanium oxide, 2 parts; antimonic acid, 1 part. Venetian Yellow: Cadmium oxide, 2·5 parts; uranium oxide, 0·5 part.—C. S.

Thermometer Glass at Higher Temperatures.

W. McClellan. J. Franklin Inst. 1901, **152**, [1], 63—72.

THE range of mercurial thermometers at the upper limit is sometimes increased by filling the tube, above the mercury, with nitrogen, and so, by increasing the pressure, raising the boiling point of the mercury. A thermometer used for some time in the metal pot of a linotype machine showed an alteration of 17° in the reading, and this led to the present investigation. The gradual alteration of the zero of glass thermometers is well known, and is due to the slow dissipation of tensions in the glass, imperfectly removed during the first annealing. Wiebe has found that Jena normal thermometer glass showed a rise of 0·04° in the zero-point during 285 days, and that Thüringen glass showed six times and English glass four times as much when at the normal temperature, whilst at 360° C. the Jena glass zero rose 2·21°, and that of the Thüringen glass 7·3° in 19 hours. He also found that of ordinary thermometer glass and "fine annealed" glass, the latter was by far the more constant. Baryta-Borosilicate 122 III. glass appeared, from his experiments, to be the best for thermometers. The author's observations on the gradual change of zero, when plotted on a curve, show that the alteration is at first rapid, and that, as the tensions are removed, the rate of alteration gradually decreases until the zero at last remains practically constant. The period at which this point is reached, varies inversely with the temperature. Experiments have shown that a good thermometer glass may be heated to about 600° C. before it begins to become plastic. Schott has stated that thermometer glass should be made with sodium salts, and should contain no potassium, as the samples containing the latter metal, show a greater alteration of zero.

The author makes the following recommendations: The glass for thermometers should be well selected; the empty bulb and tube should be carefully annealed by cooling very slowly: after being filled and sealed, the thermometer should be kept at a temperature as high as may be convenient for a time depending on this temperature. For ordinary thermometers (to be used up to 100° C. only) the ordinary method of seasoning (keeping them for six months at normal temperatures) may suffice, although the operation would be shorter at a higher temperature. High-temperature thermometers should be kept in an air-bath (or otherwise) at 450° C. for three or four days, after which they may be calibrated with the expectation that they will be subject to but slight alteration of the zero subsequently.

—W. G. M.

Acids; Effect of Glassware Containers on ——. T. Tyrer and C. T. Tyrer.

Brit. Pharm. Conference, Dublin. Chem. and Druggist, 1901, **59**, [1123], 234.

IN order to examine the action of acids upon glass, samples of pure sulphuric acid (sp. gr. 1·843), pure hydrochloric acid (sp. gr. 1·16), pure nitric acid (sp. gr. 1·42), and pure hydrobromic acid (sp. gr. 1·077) were placed in green, white, amber, and blue glass Winchester quart bottles, and exposed for seven months to diffused light. None of the acids showed appreciable or increased residue, or traces of iron, lead, or manganese, nor were any of them coloured. The hydrochloric acid showed a faint trace—approximately

1 in 2,000,000—of arsenic, but the others were quite free from this impurity. The authors observed incidentally that the presence of hydrochloric acid considerably enhances the delicacy of the Marsh-Berzelius test for arsenic.—A. S.

Porcelain Sand and the Composition of Porcelain Body. E. Linder. Sprechsaal, **34**, [2], 36.

The ordinary porcelain sands, according to geological and geographical position, contain from "6—11 per cent. of potash (any soda also reckoned as potash)," 2—6 per cent. of alumina, and 78—90 per cent. of silica, and also traces of iron. Since the low proportion of alkali necessitates the employment of high kiln temperatures, an addition of lime is sometimes given, to increase the fusibility of the mass, but such additions should be made with care, otherwise the ware is liable to deformation when exposed to strong fire.

Where the sand is interspersed with veins of iron or ferruginous or manganiferous clay, these impurities may generally be removed, those of the first-named class by sifting, and the others by washing. The author is of opinion that the calcination of sand for porcelain is not a rational procedure, and that sand requiring this treatment is better replaced by quartz and felspar.

As an instance of the effect of the firing temperature on the properties of the product, it is stated that the following porcelain body, consisting of porcelain sand, 56 per cent.; Halle kaolin, 42 per cent.; lime, 2 per cent., which is largely used in Thuringia, furnishes, when fired at a temperature below sintering heat, a ware noted for its capacity to stand fluctuations of temperature, which property it, however, loses if the ware be brought to sintering point in the kiln.

The following recipe gives a very fine ware that will stand the heat of the kiln: Zettlitz kaolin, 30 per cent.; English kaolin, 20 per cent.; levigated porcelain sand, 40 per cent.; Scandinavian felspar, 10 per cent. It is not expensive, especially when the sand can be obtained locally.—C. S.

Copper Oxide [for Glass Making], Commercial; Determination of Cuprous Oxide in ——. D. Miklosich.

See under XXIII., *page* 934.

PATENT.

Glass, Porcelain, or like Material; Process for Uniting Pieces of ——, for Mosaic Work and the like. L. Stein and W. Storr, both of Berlin. Eng. Pat. 12,017, June 12, 1901.

The process consists in heating the glass or other material, after applying to the joining edges a fusible and electrically conductive cement, and then depositing a strip of metal by electrolysis upon the conducting cement. The cement may be a mixture of flux, 10 parts; chalk, 10 parts; any suitable metal oxide, 30 parts; precious metal in powder, 40 parts; and soluble glass, 10 parts.—E. S.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Refractory Clay; Softening Point of ——. E. Cramer. Thonind. Zeit. 1901, **25**, 706. Chem.-Zeit. Rep. 1901, **25**, [58], 215.

For practical purposes it is almost as necessary to determine the temperature at which refractory clay softens as that at which it melts. This the author has done with some 25 samples of different materials by pressing them into cylinders, heating them several times in a porcelain oven at a temperature of Seger cone No. 16 while they were supported at the ends only, and measuring the distortion after each heat. The investigation is not yet finished, but in the meantime it is clear that clays become more refractory the oftener they are fired; Salzmund clay is the solitary exception to this rule, and it resists three heatings before beginning to soften. An addition of sand may increase the heat-resisting power. The effect of adding fireclay is not always advantageous; it depends on the kind of fireclay, that prepared from shales being useful.—F. H. L.

Quartz and Quartzite on Heating; Behaviour of —— E. Cramer. Thonind. Zeit. 1901, **25**, 864. Chem.-Zei Rep. 1901, **25**, 215.

The author has examined a large number of samples quartz, quartzite, sandstone, &c.—substances which are use in the manufacture of Dinas bricks—to study their behaviou on repeated heating; and he has found that identic materials show extraordinary differences in their chang of specific gravity, apparent density, bulk, porosity, an linear expansion. After eight heatings at a temperatu registered by Seger cones Nos. 16—17, the specific gravit of quartz varied between 2·45 and 2·66, whereas th weight per unit of volume varied more, the relationship the latter constant to the specific gravity depending on th greater or smaller degree of porosity. On a first heatin the increase in bulk was extremely irregular; one specime melting at cone No. 36, increased only 3·1 per cent another, melting at No. 35, increased 9·5 per cent. would seem that the purest materials have a tendency swell only a little at first, and afterwards to gain in volu continuously. For practical purposes this is clearly obje tionable. It was also observed that many quartzites ceas to lose specific gravity. The increase in volume does depend simply on an enlargement of the pores of the ston it depends also on an increase in the bulk of the substan itself, and in all probability is due to a change from the cryst line to the amorphous state. The author has ascertained t lowest point to which the specific gravity of quartz can f when it is converted into amorphous silica. Pure molt quartz gave values of 2·054 and 2·167, molten Hohenboc sand, 1·927 and 1·912. The difference can easily be explain by the presence of air bubbles in the molten sand, and the existence of portions of incompletely melted quartz the interior of the mass.—F. H. L.

PATENTS.

Wood; Apparatus for Impregnating —— and the l with Preservatives or other Fluids. G. F. Lebio Boulogne-sur-Seine, France. Eng. Pat. 10,448, May 1901.

The invention has special reference to Eng. Pat. 5193 of 19 (this Journal, 1900, 248), and relates to improvements in construction of the bell-shaped cutters there described, in the distribution of the impregnating liquid.—J. W. H.

Dyeing or Preserving Timber. J. Pfister, Vienna. E Pat. 11,045, May 29, 1901.

In the processes usually employed for dyeing or preserv timber, it is subjected to the action of the necessary liq in a pressure cylinder. The liquid enters at both ends, a portion in the centre of the log often remains unaffect an accumulation of sap and possibly air taking place in t portion. According to this invention, a cap of rubb canvas, or other waterproof material is applied to one en the timber before immersion in the liquid. If now liquid in the closed cylinder is submitted to pressure, it enter the unprotected end of the timber, and will penet a certain length with decreasing intensity. The cap is removed and put on the other end of the timber, and liquid again submitted to pressure. It is claimed tha this way the timber is finally thoroughly and unifor dyed or preserved throughout its entire length.—B. B. l

Bricks and Blocks; Preparation of —— for the Lu of Metallurgical Furnaces. B. Talbot, Egham. l Pat. 14,503, Aug. 14, 1900.

To render them more durable, the bricks, after being b t, are impregnated with a hot liquid hydrocarbon, w h becomes solid on cooling; coal tar, to which has been ad a little resin, is mentioned as a suitable impregna material.—J. W. H.

Bricks or Building Blocks; Manufacture of Fire d other ——, and Cement or Mortar therefor. W. Pilkington, Prescot, and W. R. Ormandy, St. He Eng. Pat. 17,120, Sept. 26, 1900.

A solution of an alkaline silicate is used as a bin agent in the case of those materials, such as refuse

1 glassworks, which would become too fusible by the tion of clay. The inventors find that the state of ion of the material has a marked influence on the lt.—J. W. H.

X.—METALLURGY.

Ores (Fine Grained) for the Blast-Furnace and emens-Martin Steel Process; Briquetting of ——. lein. Oesterr. Zeit. für Berg- u. Hüttenw. **48**, 652; rough Zeits. angew. Chem. 1901, **14**, [30], 754—755.

object of briquetting is either to render fine-grained suitable for the blast furnace (but briquettes are not suitable for the purpose), or to enable the ore to be tuted for scrap in the open-hearth process. To this the ore is mixed, before consolidation, with lime and carbon insufficient in quantity to reduce the whole of iron oxide present. In the open-hearth furnace, the ettes act favourably, owing to the reduction of the ge proportion of carbon in the charge by the addition e reduced spongy iron, and also by the oxidation of a on of the remaining carbon by means of the excess contained in them.—W. G. M.

l (Cast): Influence of Silicon on the Mechanical Proerties of ——. A. Wahlberg and E. Heyn. Stahl u. sen, **21**, 460; through Zeits. angew. Chem. 1901, **14**, 0], 755.

RE is still much uncertainty as to the exact influence licon upon the mechanical properties of iron and steel. riments are described with samples of steel in which ercentage of carbon is kept fixed, while that of silicon s. It appears that, in many cases, irregularities bed to the immediate influence of silicon are really due her causes, as, *e.g.*, to the conditions which have led e introduction of an unusually large proportion of n into the metal (such as an extra hot acid-Bessemer), to the way in which the steel has been treated in furnace, or to the presence of occluded gases in the l. The immediate influence of silicon appears to be in irection of raising the breaking strength, but decreasing toughness of the metal. This influence first makes felt in the steels richer in carbon at about 0·6 per Si; but beyond this an increase in the percentage of n is not accompanied by a proportionate increase in ffects of the addition.—W. G. M.

and Iron; Carbon Determination in ——. Schmitz.

See under XXIII., *page* 934.

for Cyaniding; Advantages of Roasting ——. E. itzky. Trans. Australasian Inst. Mining Eng. 1901, 101.

e ores be roasted previous to cyaniding, the consumpf cyanide is less, the solution percolates more readily, ess caustic soda is required for neutralisation.

order to ascertain whether the ore is properly roasted, -250 grms. are dissolved, the solution filtered, and de of potassium of the same strength as used in the nent on the large scale, added. If no cloudiness is iced, the ore is well roasted; if the solution is coloured a, the consumption of cyanide will be large; and if the on gives a blue or bluish-green precipitate, the ore is rfectly roasted.—A. S.

Dredging in New Zealand. W. Wylie. Trans. ustralasian Inst. Mining Eng. 1901, **7**, 102—112.

e present time, in the middle island of New Zealand, are about 240 dredges, costing from 5,000*l.* to 14,000*l.* in course of construction or ordered. Dredges are at or about to work on the following rivers :—Molyneux, a, Kawarau, Manuarhekai, Dart, Shotover, Lindis, u, Mataura, Waipori, Nevis, in Otago and Southland; e Westland and Nelson on West Coast, on the u, Hokitika, Grey, Ahura, Buller, Inanghua and Orwell . There are also a great number of gold-bearing flats are being dredged. The author states that with rn, up-to-date dredges, designed to suit the ground, the should pay well.—A. S.

Gold; Extraction of ——, by Sodium Hyposulphite [Thiosulphate]. E. Janitzky. Trans. Australasian Inst. Mining Eng. 1901, **7**, 99—101.

THE author recommends a solution of sodium thiosulphate to which has been added perchloride or bromide of iron and an acetate, as a suitable medium for the extraction of gold and silver. Such a solution is stated to have a greater solvent power than one of potassium cyanide, is not poisonous, and can be prepared in large quantities at a very low price. A solution of 1 or 2 per cent. of sodium hyposulphite, ¾ per cent. of iron perchloride, and 1 or 2 per cent. of acetate of soda or lime, diluted to 10 times its volume, will dissolve, in 6—12 hours, 15 or 20 times as much gold as a 1 or 2 per cent. solution of cyanide in the same time. The precipitation of the dissolved gold can be effected by zinc shavings or by electrolysis.—A. S.

Tellurium in the Ores of the Hauraki Goldfields, New Zealand. F. B. Allen. Trans. Australasian Inst. Mining Eng. 1901, **7**, 91—98.

THE author has examined a large number of ores as to the presence of tellurium, the rich sulphide ores being employed. In no case was the percentage of tellurium large enough to indicate in what combination it existed, but it is noteworthy that copper was present, in greater or less quantity, in every ore in which tellurium was detected.

The ores at the following places contained tellurium :—

1. Coromandel. Quartz containing 25 per cent. of mispickel. 200 oz. of gold and 90 oz. of silver per ton; small amount of tellurium.

2. Tapu. Quartz containing dense iron and copper pyrites. 2¼ oz. of gold, 250 oz. of silver, and 7½ oz. of tellurium per ton.

3. Waiomo. Small sample of white quartz, from the Gem mine, showing sulphides of silver, but no visible gold along a dark band. 15 oz. of gold, 600 oz. of silver, and 12 oz. of tellurium per ton.

4. Waiomo. Monowai ore containing quartz, sulphides of iron, copper, lead, and zinc, with a trace of antimony. 4 oz. of gold and 30 oz. of silver per ton; tellurium, less than 1 per cent. of the bullion.

5. Broken Hill, Waiomo. White quartz with blue-black specks containing iron and copper pyrites and sulphides of silver. 2 oz. of gold, 40 oz. of silver, and 4 oz. of tellurium per ton. Two other ores contained small quantities of tellurium.

Figures are also given relating to ores in which no tellurium could be detected. The results obtained indicate that tellurium is not present in the auriferous quartz in sufficient quantity to exercise a prejudicial effect on the extraction of gold.—A. S.

Silver Plating by Reduction. C. Göttig. Zeits. angew. Chem. 1901, **14**, [27], 672—673.

OWING to the difficulties in the way of plating large metallic objects with silver by electrolytic methods, various preparations have been put upon the market, which are reduced when rubbed upon the surface of copper alloys, and leave a deposit of metallic silver. The author calls attention to certain disadvantages in the preparations hitherto patented for this purpose. In the first place, the silver chloride used in them gradually loses its efficacy, owing to the reduction, by the action of light, of its solubility in solutions of alkali salts. Moreover, alkali chlorides act but slowly as solvents for silver chloride in certain cases (unless assisted by potassium cyanide, which is objectionable as being poisonous, or substances, such as ammonia, which attack the surface of the metal), and the reduction is therefore slow.

It has been found by the author that the reducing action of light upon the silver chloride can be prevented or lessened by the addition of iron chloride or copper chloride. Any subchloride formed is then reconverted into chloride, as in the equation $Ag_4Cl_2 + Fe_2Cl_6 = 4AgCl + 2FeCl_2$. Tin chloride, in concentrations up to 60 per cent., has no protective influence.

The reduction process can be accelerated by substituting certain chlorides of the metals of the alkaline earths, or of the magnesium or aluminium groups, for the alkali salts hitherto used. These effect a more speedy solution of the silver chloride, and, in consequence, a more rapid deposition of silver. These salts were mentioned in an old English patent (8064, Aug. 15, 1840), but the author has found no reference to their superiority over alkali salts. He has embodied the improvements mentioned above in a German patent (No. 118,922), which is also protected in other countries.—C. A. M.

Platinum Residues; Method of Working up ——. A. Berthold. Zeits. angew. Chem. 1901, **14**, [25], 621—622.

The residues are filtered, and the filtrate retained. The residue on the filter is treated with *aqua regia* and filtered, the filtrate is evaporated, and the cake-like residue obtained is treated with hot water, which is then added to the original filtrate. To this are added zinc dust and concentrated hydrochloric acid. No preliminary evaporation is made, as it would induce separation of potassium-platinum chloride, and the reduction would in that case have to take place in the hot instead of in the cold. The impurities remain in solution, and as soon as the reduction is shown, by the solution becoming colourless, to be complete, and the precipitate has settled out, the supernatant liquid is carefully poured off. The precipitate is boiled well in concentrated hydrochloric acid, and is then washed repeatedly by decantation with hot water until it barely shows the chlorine reaction; but, as potassium chloride cannot be completely got rid of by decantation, the precipitate is brought on to a Gooch crucible, previously dried at 100° and weighed, and washed. If filtration takes place very slowly, the crucible and contents are ignited. The platinum is thus rendered more compact, and may be readily washed. As soon as it is free from chlorine, it is ignited and weighed. The crucible is then brought into *aqua regia*, and a solution made of known strength.

The advantages of the foregoing method are avoidance of tedious evaporation, and reduction *in the cold*. The author is of opinion the reduction of platinum salts in acid solution by electricity might afford a satisfactory means of separating platinum from residues.—J. A. B.

Copper; Production of ——, *at Ashio, in Japan.* E. Bahlsen. Berg- u. Hüttenm. Zeit. 1901, **60**, 261—273; through Chem.-Zeit. Rep. **25**, [23], 203.

Of the Japanese metal industries the production of copper (27,560 tons in 1899) is the most important. The chief copper mine is in Ashio, in the west of the Shimotsuke province, whilst the smelting works are in Honzan. Iron, coke, and coal are brought to the mines from Tokio. The mines, which were discovered more than 290 years ago, have, since 1877, been in private hands.

The mountain range of Ashio is composed of palæzoic strata interspersed with granite. A network of seams of copper has been formed in these, of which about 30 are worked.

The ores are rich hard copper ores with silicious gangue, and contain 33 per cent. of copper ore and from 0·05 to 0·06 per cent. of silver. In 1884 modern machinery was erected, and the manufacture of copper sulphate was discontinued. Two classes of copper ore are obtained, one containing 11—12 per cent., and the other 1½ per cent. of copper. The former is enriched up to 20 per cent. and the latter to 12 per cent.

Before the introduction of European smelting methods, in 1887, a circular hole lined with clay and stones was charged with leather bags containing 3 parts of roasted ore and 1 part of roasted stone. After the smelting, the slag (containing 4 per cent. of copper) was removed, the stones heaped in layers, and the "black copper" collected. Now the roasting is done in reverberating furnaces. The ore (720 kilos.) is then fused with 186 kilos. of slag, 90 kilos. of limestone, and 126 kilos. of coke. The slag from this process still contains 0·4 per cent. of copper, whilst the copper matte contains from 50—58 per cent. The latter is broken up, fused in cupel furnaces, and air blown through it in a Bessemer's converter, the blast being continued for 55 minutes. The converter holds a charge of 1½ tons, and the copper produced contains 99 per cent. of copper and 0·1 per cent. of silver. The gases escaping from the conver
and from the roasting furnaces are washed with lime-wa
before escaping into the atmosphere.—C. A. M.

Bismuth; Method of Extracting ——, *from its O*
Eulert. Rev. Prod. Chim. **4**, [11], 164.

The finely ground bismuth ore is placed in a series
wooden vats, arranged in steps, and each holding abo
ton; and a current of extracting liquor, consisting
sulphuric acid, water, sodium chloride, and potass
nitrate, is allowed to traverse the series. The chlo
disengaged by the liquor liberates the bismuth, and
resulting solution, clarified by the filtering material c
tained in the vats, is finally delivered into a water ta
where the bismuth is precipitated as oxychloride, and
be recovered for sale in this condition, or converted into
metallic form by smelting with lime or carbon.—C. S.

Aluminium and Molybdenum; Alloys of ——. L. Gui
Comptes Rend. 1901, **133**, [5], 291—293.

Continuing his investigations on the alloys of alumin
and molybdenum obtained by the reduction of moly
acid by metallic aluminium (this Journal, 1901, 814),
author remarks that some of the products have a crysta
form and are not attacked by dilute hydrochloric a
this is the case with the button which was obtained f
the mixture intended to give the composition $AlMo_2$,
which was found on analysis to have the composi
$AlMo_4$. All the buttons, after treatment with di
hydrochloric acid, left a distinctly crystalline residue; t
AlMo was obtained from a mixture prepared to give Al
and occurred as a fine crystalline mass of threads.
product from the mixture made to give AlMo, le
residue of the composition Al_2Mo. The composition of
products varied enormously according to the size of
grains or powder of aluminium employed, and the auth
results are classified according to three grades of alumini
The mixture which was to yield $AlMo_5$, using alumin
powder, gave a button consisting entirely of small,
defined crystals. This product evolved no gas on treat
with dilute hydrochloric acid. On analysis it was fou
be extremely rich in molybdenum, and had a composi
corresponding to the formula $AlMo_{20}$. In several ex
ments, agglomerations of metallic crystals were observe
the surface of the mass; these were compounds of alumi
and molybdenum, always richer in aluminium than
main product of the reaction. At least six definite a
have now been isolated, *viz.*, Al_7Mo, Al_3Mo, Al_2Mo, A
$AlMo_4$, and $AlMo_{20}$.—J. F. B.

Residuals from the Use of White Metal; Utilisati
——. J. Richards. J. Franklin Inst. 1901, **151**,
445—455; and **152**, [1], 59—63.

Tin Clippings and Galvanised Iron Scrap.—A pr
worked profitably for a long period, and only sto
because of the nuisance caused to neighbours by acid fu
consisted in immersing the tinned iron clippings in hy
chloric acid until free from tin, then in water, next in w
with a little lime, then again in water, and finally, f
moment only, in copper sulphate solution. The se
vats were placed in circular fashion, and were all serve
a central crane, the clippings being packed loosely, to
extent of 200 lb., in a wooden cage which could be
from the crane. The object of dipping in the co
sulphate solution was to give a thin coating of co
which protected the iron from rust, until, after consolid
under a drop-press, it could be reheated and forged
blooms. The acid solution was used until much tin
dissolved in it, and the resulting chloride of tin so
was employed for the immersion of galvanised iron s
whereby the zinc replaced the tin, forming zinc chl
solution, which was sold for disinfectant and firepro
purposes. The precipitated tin was collected and rem
600 lb. of ingot tin being recovered from 10 tons of s
The cleansed iron was sold for 10 dols. per ton an
zinc chloride for 20 dols. per barrel.

Galvanisers' Wastes.—The sal ammoniac skimmings
the surface of the zinc, consisting mainly of oxide of
dissolved in ammonium chloride and double chlori

c and ammonium, were leached with hot water and steam, ereby the chlorides were dissolved, and could be used ain as flux after evaporating off the solvent. The arated solid matter, consisting of zinc oxide with dirt l shots of metal, was tumbled in a revolving barrel. The ots of metal were thus cleansed, and could be remelted on top of molten zinc, and the oxide of zinc, which became shed to powder, could be sold for 30 dols. per ton to the c-paint maker. The average yield from the skimmings s :—Zn = 20 ; NH_4Cl and $ZnCl_2$ = 30 ; ZnO = 35 ; and a scale and dirt, 15 per cent. Many old waste heaps re profitably treated in this way. Zinc oxide skimmings e simply tumbled in the barrel, and the separated ts remelted. Zinc dross, or zinc-iron alloy of higher cific gravity than zinc, which separates at the bottom the zinc bath, was formerly treated only by distillation. ter many experiments with steam, sulphur, and cyanides ing upon the molten metal, the method adopted consisted introducing a mixture of sulphur, potatoes, and leather ap below the surface of the liquid metal. In about 15 utes the action is finished, a little aluminium is introed (to break up dissolved oxides), and after standing for short time, the pure metal is ladled off into moulds, ing most of the impurities at the bottom. The minium is best introduced in the form of an alloy with c (98Zn : 2Al). The purified spelter averaged in one e (from 40 car-loads) Zn = 98·35, Pb = 1·5, and = 0·15 per cent.; spelter refined a second time by the e process contained from 99 to 99·75 per cent. Zn, the y impurity being lead. A third refining was not cessful in increasing the percentage of zinc in the product ve 99·85 per cent. Scrap zinc of commerce is treated the same way. Battery zincs are put in the pot at ht, with a cover attached to a condenser, for the recovery he mercury contained in them.

Zincous Lead.—The lead that sinks to the bottom of the cansing baths contains much zinc. It is remelted in a c pot at a temperature only just above the melting point cad. An iron ring, 2 ft. in diameter and 6 ins. in depth, placed on the surface of the metal, and the zinc is nmed off from within the ring as fast as it rises to the in a pasty condition. The residual lead necessarily ins about 2 per cent. of zinc, but readily finds a ket; or it may be refined in the usual way.

Britannia-Metal and Pewter.—Any coating of electroosited silver is "stripped," and the white metal is used make type-, stereotype-, or Babbitt-metal. Skimmings n solder-pots are crushed and washed free from shot al on a sieve. The oxides are then dried and reduced h carbon in a furnace. The resulting metal is usually ure; the impurities were at first removed—arsenic, by tment with zinc sulphate; antimony, by sulphur; and , by superheated steam or by chlorine. Now, a specially structed furnace is used to reduce the oxides, iron and per being removed in the slag, and a condenser is emyed to prevent the escape of condensible products. The lting metal is liquated to separate it from iron, copper, antimony, and may then be further refined by a process ilar to that above described for the purification of zinc.

—W. G. M.

PATENTS.

n; Introducing Carbon and Fluxes and Mixture of arbon and Fluxes into Blast Furnaces in the Manufacre of ——. W. J. Foster, Darlaston, Stafford. Eng. at. 9346, May 21, 1900.

10 carbon, which has been rendered as free as possible n hydrocarbons and moisture by previous heating to a h temperature or by any suitable process, is introduced, 1 or by the blast or by outside mechanical means, into blast furnace directly into the boshes or hearth beneath burden and adjacent to the zone of fusion. By this ns a saving in fuel is effected, although the introduction fuel with the charge at the top of the furnace is not gether superseded.

luxes or other slag-making materials, in a suitable and ctive condition, may be introduced in a similar manner er independently or mixed with the prepared carbon.

—A. W.

Cast Iron; Treatment of ——, *for the Purpose of obtaining an Alloy.* G. Grunauer, Berlin. Eng. Pat. 1375, Jan. 21, 1901.

To finished liquid cast iron is added solid or liquid nickel, to produce an alloy which may contain 40 to 50 per cent. of nickel, and up to 60, but not less than 50 per cent. of iron, the alloy thus obtained somewhat resembling wrought iron in its properties.—A. W.

Iron; Manufacture of Wrought ——. E. D. Wassell, Pittsburg, U.S.A. Eng. Pat. 10,983, May 28, 1901.

Liquid cast-iron is blown with air in a suitable furnace, which may be a combination of a Bessemer converter and an open-hearth, until it partly loses its fluidity and forms a pasty mass, when the slag is withdrawn and oxide of iron supplied to the surface of the remaining metal, the mass being then heated on the hearth in the usual way and with the aid of the regenerators, and agitated or stirred for the further and complete elimination of impurities and formation of wrought iron, which is finally balled.—A. W.

Iron; Process for Hardening ——. O. Schramm, Berlin. Eng. Pat. 11,687, June 7, 1901.

Rods of welded iron are placed in a crucible between layers of powdered horse chestnuts, and, after heating to a bright red heat until the required degree of cementation has been attained, are suddenly cooled by immersion in cold water, to obtain the desired degree of hardness.—A. W.

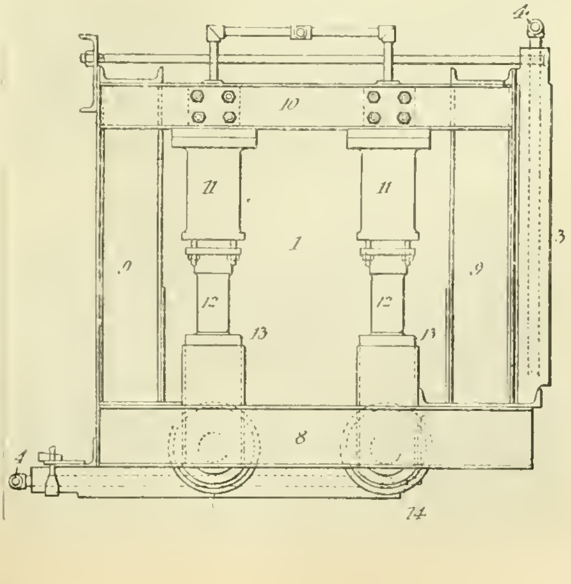
Steel Furnaces; Open-Hearth ——. F. L. Saniter, Seaton Carew, J. L. Smith, R. Bedford, both of Eaglescliffe, and The South Durham Steel and Iron Company, Ltd., Stockton-on-Tees. Eng. Pat. 12,823, July 17, 1900.

The hearth is divided into two or more sections or baths by the construction of banks or low walls of the same material as the hearth, each section being provided with its own tap-hole. The banks are submerged when the hearth is fully charged, so that the whole is then a continuous bath of metal, but on tapping from one of the sections, the metal falls only to the level of the banks in the other sections whilst being emptied from the one. The result is that a layer of metal covers the greater portion of the furnace bottom during tapping, and remains behind ready to be mixed with the fresh charge. Suitable channels or gutters are provided in the tops of the banks, to enable the metal to flow freely under the slag.—A. W.

Furnaces; Open-hearth, Melting, or other ——. B. Talbot, Pencoyd, U.S.A. Eng. Pat. 13,050, July 19, 1900.

The improvement is applicable to the author's rocking or tilting open-hearth furnace or to other furnaces, and consists

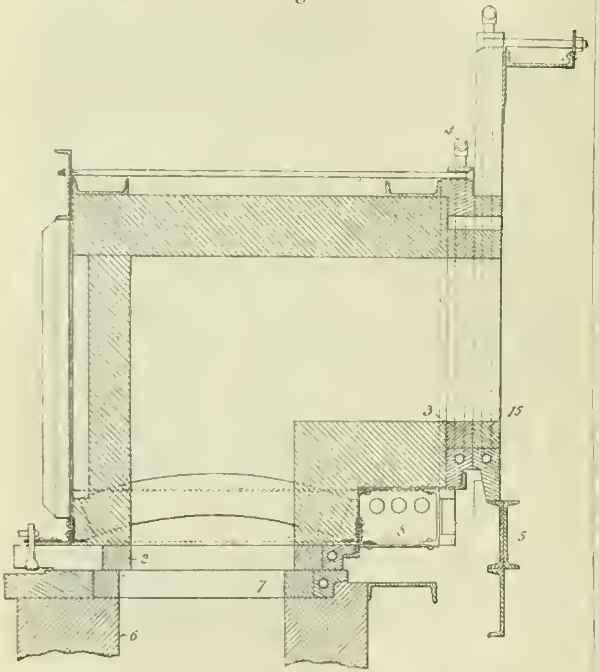
Fig. 1.



of a movable flue structure at each end of the furnace, which can be drawn back out of contact with the same whilst it is being tipped or tilted. Fig. 1 is a side elevation of one of the flue structures, and Fig. 2 is a side sectional elevation of the same. It consists of a chamber, made of refractory material in a suitable framework, and provided with chills or water-cooled frames 2 and 3, consisting of metal castings with water circulating from the pipes 4. The frame 2 is in contact with a similarly cooled frame or chill 7, at the opening of the fixed flue 6, and the frame 3 is placed against the chill 15, forming the entrance to the furnace 5.

The chamber is carried on a carriage consisting of a base frame 8, and uprights 9, which guide an upper framework 10, to which the chamber portion is attached, the frame 10 being carried on the heads of hydraulic cylinders 11 at each end, the rams, 12, of which abut against blocks, 13, carried by the base frame. The latter carries the wheels, so that the flue structure can be lifted vertically from the fixed flue by the pressure in the cylinders, and can be drawn away horizontally from the furnace opening.

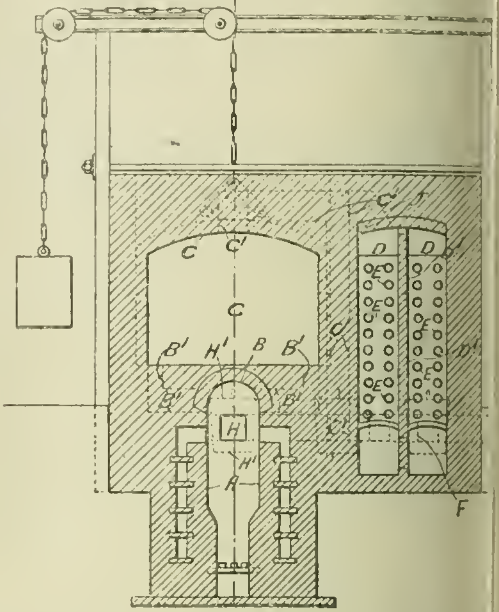
Fig. 2.



The movable flue structure is by preference constructed internally with three separate passages, the centre one for the gas and the other two for the air, so that the gases shall not mix or combine until they are in the furnace, corresponding passages being provided in the furnace until approaching the hearth, all the points of contact of the passages of the movable and fixed portions being made by chills or cooling frames as described.—A. W.

Iron and Steel Surfaces; Furnace for Oxidising ——. J. Meikle, Glasgow. Eng. Pat. 19,248, Oct. 27, 1900.

The furnace is for heating and oxidising surfaces of iron and steel goods, and is specially constructed with flues and dampers for controlling and directing the products of combustion alternately to the heating oven and through a chamber containing steam pipes, as shown in the accompanying drawing. The generator furnace A is constructed in the usual way, and above its crown, B, is a heating chamber or oven, C. The products of combustion pass by the flues B¹ into the oven C, over the articles to be heated, and through a flue C¹ into an adjoining chamber, D, divided into two compartments by a central wall, D¹, in both of which are fireclay pipes, E, through which steam passes on its way to the oven, C, through a flue, J, when necessary. At the back of the furnace are three flue dampers cylindrical or conical shape, preferably hollow, and nected at their upper ends to pivoted levers provided counter-balance weights or to screw spindles, by w means the direction of the products of combustion ca controlled and guided on their way to the exit flue, F.



After the articles to be oxidised have been raised red heat, the products of combustion are stopped entering the flue C¹, and are led off, by opening a dam H¹, in the flue H, direct into the chamber D. Steam is passed through the pipes E into the top of the hot ov whence it escapes through B¹ into A and further int with the combustion products, thus further assistin heating E.—A. W.

Gold, Silver, Lead, Zinc, and other Metals; Extracti ——, *from Sulphide Ores.* J. C. Clancey and L. Marsland, both of Sydney, N.S.W. Eng. Pat. May 7, 1901. (Under International Convention.)

The process is claimed for the recovery of the above n essentially in the following step-by-step operations:- Heating the ore, with the addition or admixture of sulphate, in a furnace, wherein hot air is blown throug mixture under pressure, so as to convert the lead and and other volatile metals contained in said mixture or less wholly into fume. (*b*) Collecting the fume the gaseous products of decomposition of the ore sulphuric acid chamber, thereby causing the sulphuric formed from the sulphurous acid gas evolved from th in the furnace to convert the formed metallic oxides their corresponding sulphates, or in the alternative, pa the fume and the gaseous products into a vat or containing sulphuric acid, and there arresting the n lic oxides as sulphates, and afterwards converting sulphurous acid gas into sulphuric acid. (*c*) Recov the metallic contents from the residue remaining in furnace, either (1) by pulverising and concentratin same, and then smelting the concentrate thus produce (2) by smelting the whole of the residual matter in furnace in which the ore has been treated, or in any furnace adapted for smelting purposes.

The lead sulphate may be added in a quantity portional to its molecular weight with the m sulphide in the ore or in any other quantity, an mixture may be heated in any kind of furnace or rece to any degree of temperature, to convert the who nearly the whole, of the volatile metals into fume, a ue processes of metal extraction of the residue employed conjunction therewith.—A. W.

Alloy ; Manufacture of an Improved [*Al-Mg*] ——. E. Murmann, Vienna. Eng. Pat. 15,171, Aug. 25, 1900.

E alloy is composed of aluminium, magnesium, and zinc in rious proportions, within the following limits :—aluminium 0 parts by weight, magnesium 1 to 10 parts, and zinc 1 20 parts. It is an aluminium-magnesium alloy in which e magnesium is partially replaced by zinc, whereby the ficulties of producing large castings, owing to porosity, are ercome and metals with equal tenacity, &c. obtained. —A. W.

nc Lead Sulphide Ores and Tailings ; Treatment of ——. . Twynam, Moortown. Eng. Pat. 14,983, Aug. 22, 1900.

IF raw finely ground ore is mixed with sufficient zinc loride and heated to just about or below a visible red heat th exclusion of air, whereby the lead sulphide reacts and rms lead chloride, which can be subsequently dissolved t and thus separated from the zinc sulphide.

The residue from the original and new zinc sulphide may used as a zinc ore after roasting to expel sulphur, but is eferably roasted to form sulphate and oxide. The sulate can then be dissolved out and used for converting the d chloride into sulphate, or the mixture of sulphate and ide can be used with the production of a mixture of sulate and oxide of lead fit for smelting. The zinc chloride ution so obtained is concentrated and used for the treatnt of fresh ore.

Tailings containing zinc sulphide may also be advantagesly used, after roasting to sulphate, for the decomposition the lead chloride.—A. W.

tals ; especially Mercury, Antimony, and Cadmium ; Obtaining Volatile ——. J. Armstrong, London. Eng. Pat. 15,879, Sept. 6, 1900.

E claims are for the application of the apparatus or of a dification of the same to, and for, the improved process obtaining mercury, cadmium, antimony, and other volatile tals other than zinc, as described and claimed in a previous ent, Eng. Pat. 3462, 1900, for the extraction of zinc only is Journal, 1901, 367). In the modified furnace a sump well with a tap hole is provided at the bottom the furnace for the separation of the non-volatile tals, the volatile metal being carried off through the eral exit pipe into the condenser, which consists of a mber with baffle walls and an outlet leading through a p containing some of the liquid metal at a little above freezing point. The upper part of the furnace above bosh is preferably divided into two compartments only, for the ore and carbon, and the other for the fuel, ich meet below in the bosh. There is one exit pipe at top of the bosh on the fuel side, so that the vapours of volatile metals pass through the incandescent fuel.

n the condensation of mercury, the drawing off the ours of the volatile metals through a volume of cool tallic mercury by means of a partial vacuum is claimed adaptation to any known method of reduction and atilisation.—A. W.

el or Iron covered on one or both Surfaces with a fixed roportion of Copper ; Manufacture of Sheets or Plates f ——. E. Martin, Paris. Eng. Pat. 11,603, June 26, 900.

the above manufacture a sheet of electrolytic copper, ch may be of predetermined thickness, is covered with alvanic coating of copper and heated, when it is applied he surface of a steel or iron ingot, the surface of which also been covered with a galvanic deposit of copper and ted separately to the same temperature, the whole being n suitably heated or pressed to bring the two galvanic faces together. The mass is subsequently rolled.

everal sheets can be simultaneously prepared in this by the further introduction, between each set of ingots h its copper sheets, of an auxiliary unprepared steel sheet ted to a less degree than the ingots, and pressing the le together, the copper-steel ingots being then taken and rolled separately.—A. W.

Metals ; Uniting or Welding ——. W. Griffiths, Pittsburg, U.S.A. Eng. Pat. 12,147, June 11, 1901.

THE metal, such for instance as steel, in the form of billets, bars, or sheets, is thoroughly cleaned, and one or more recesses cut into the same, the faces of which are then coated with a metal or alloy having a lower fusing point, such as copper, by placing in a bath of copper sulphate. A plate of copper, or a metal which will weld to the metallic coating, is then placed in the recess and secured by pressure, after which the whole is heated, and the metals finally united by pressure or rolling. It is not necessary to cut the recesses, as the outside surface can be similarly coated and treated, and the copper plate can be placed on in sections, with spaces between them where the metal will be ultimately cut into lengths and trimmed. Such sections, however, should be joined together by a strip or strips of copper in the centre or at the sides, to prevent their dislodgment during rolling, &c. The welding is thus more perfect, and the waste of copper when cutting and trimming the finished bar is minimised.—A. W.

Bricks and Blocks ; Preparation of ——, *for the Lining of Metallurgical Furnaces.* B. Talbot, Egham. Eng. Pat. 14,503, 1900.

See under IX., *page* 900.

Electric Furnace. [*Electrodes.*] La Soc. Electro-Metallurgique Française. Eng. Pat. 16,293, 1900.

See under XI. B., *page* 907.

Chlorine ; Manufacture of ——. G. J. Atkins. Eng. Pat. 13,815, 1900.

See under VII., *page* 897.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Acetylene ; Electro-Chemical Behaviour of ——. A. Coehn. Zeits. für Elektrochem. 1901, **7**, [49], 681—684.

A CERTAIN E.M.F. (about 1·7 volt) is required to drive an appreciable current through a solution of caustic potash. When acetylene gas is led over the anode, it acts as a depolariser with the result that a sensible current is obtained at about 1·22 volt. By maintaining the E.M.F. between these two values (*e.g.* 1·35 volt), it was found that the acetylene was converted quantitatively into formic acid according to the equation : $C_2H_2 + 6OH = 2HCOOH + 2H_2O$.

In normal sulphuric acid solution, it was found that with an E.M.F. of 1·60 volt, acetylene was converted quantitatively into acetic acid. The depolarising action and the formation of acetic acid is probably due to the formation of aldehyde in the first instance, thus, $C_2H_2 + H_2O = CH_3COH$. On oxidation the aldehyde then forms acetic acid, $CH_3COH + 2OH = CH_3COOH + H_2O$.

Details of experiments, conducted in the presence of the halogens, are promised in another communication, as are also measurements on an acetylene gas battery.—J. S.

Ferrates ; Electro-Chemical Production of ——. W. Pick. Zeits. für Elektrochem. 1901, **7**, [51], 713—724.

IN confirmation and in extension of Haber's experiments on the electro-chemical production of ferrates (this Journal, 1900, 1110), it was found that :—

1. All forms of iron, when employed as anode in a concentrated solution of caustic alkali, yield alkali ferrate, but this substance is most readily formed with a cast iron anode, less readily with steel, and with still greater difficulty with wrought iron.

2. Wrought iron and steel, which at first do not yield ferrate, can be made to do so by subjecting them alternately and at intervals of a few seconds to anodic and cathodic polarisation, or by maintaining a weak anodic polarisation for a long time in strong alkali.

3. Iron which has been used for the production of ferrate acquires a dark colour, becomes passive, and is, to a great extent, proof against rusting. The current yield of ferrate is greater when caustic soda is employed instead of caustic potash and is also greater the more concentrated the electrolyte.

4. With a current density of 0·1 amp. per square dcm., the current efficiencies are, for cast iron, about 47 per cent.; steel, about 26 per cent.; and wrought iron, about 14 per cent. when the electrolyte is caustic soda. Similarly, the efficiencies in caustic potash are, cast iron, about 37 per cent.; steel, about 13 per cent.; and wrought iron, about 2 per cent.

5. Increase in temperature increases the yield of ferrate. Electrolytically deposited iron, in a platinum dish, gave a minimum of ferrate at 0°, 16 per cent. at 30°, and 80—100 per cent. at 70° C.

6. The current yield of ferrate added to the current yield of oxygen, amounted to 100 per cent. Alkali ferrite is not formed as a primary product of electrolysis.

7. The potential ferrite ⟶ ferrate is − 0·78 volt. The potential of concentrated alkali solution against active iron is about 0·6 volt. Increase of temperature up to 70° C. produces scarcely any alteration in these values. The potential of passive iron, which has been employed for the production of ferrate, towards ferrate solutions, has, at lower temperatures, nearly the same value as ferrite ⟶ ferrate, whilst at higher temperatures (70°) it is displaced towards the cathode side by several tenths of a volt. This accounts for the higher current yield at increased temperatures.

—J. S.

Ferrite Solutions. F. Haber. Zeits. für Elektrochem. 1901, 7, [51], 724—726.

The author (this Journal, 1900, 1110) has already stated that solutions of alkali ferrates on boiling are converted into alkali ferrites. Quantitative experiments are now described which confirm this view.—J. S.

Nickel Ammonium Sulphate; Electro-Chemical Behaviour of ——. W. Pfanhauser. Zeits. für Elektrochem. 1901, 7, [50], 698—710.

The author has investigated the behaviour of nickel ammonium sulphate solution on electrolysis, and has arrived at the following conclusions:—

1. The addition of ammonium sulphate to a solution of nickel sulphate, causes the formation of a complex double salt, nickel ammonium sulphate $(NH_4)_2Ni(SO_4)_2 + 6H_2O$ and increases the specific conductivity of the electrolyte.

2. In concentrated solution the double salt dissociates according to the typical decomposition of complex salts into the ions, $\overset{+}{NH_4}$, $\overset{+}{NH_4}$ and $\overset{-\ -}{Ni(SO_4)_2}$. In dilute solution the salt decomposes and dissociates gradually, according to the degree of concentration, and hence the decomposition into the component salts is either partial or complete. It is therefore to be assumed that if the electrolyte is not subjected to mechanical circulation, the complex salt will be decomposed at the cathode, corresponding to a decrease in concentration, whilst it will be re-formed at the anode, since the solution there becomes more and more concentrated. In this way the frequent crystallisation of the double salt on the anode may be explained.

3. At the anode an oxidation of nickelous to nickelic sulphate takes place, *i.e.*, each atom of nickel takes an additional positive charge and causes a polarisation in consequence of the oxidation cell which is formed. The nickelic sulphate so formed is, however, unstable and undergoes hydrolytic dissociation, with the result that $Ni(OH)_3$ is deposited as a black film on the anode. If the solution is acid with sulphuric acid, the oxidation does not take place to the same extent, since the sulphuric acid, being the more easily dissociated component, carries the bulk of the current. In other words, the dissociation of the complex salt is diminished, so that only the ions $\overset{+}{NH_4}$, $\overset{+}{NH_4}$ and $\overset{-\ -}{Ni(SO_4)_2}$ are present, whilst the nickel ammonium sulphate carries only a very small fraction of the current. In this case the composition of the nickelic sulphate takes place with form tion of nickelous sulphate, sulphuric acid and oxygen.

4. As long as the operation is conducted with norm low current densities, the separation of nickel on t cathode is of a purely secondary character. In the event higher current densities being employed, the solution in t neighbourhood of the cathode is depleted of metal salt m rapidly than it can be replaced by diffusion. When t occurs, the complex salt is decomposed into the compon salts, *viz.*, $NiSO_4$ and $(NH_4)_2SO_4$, which then take part carrying the current, although the $NiSO_4$ does so only t minor extent as long as the solution is somewhat conc trated. Whenever $NiSO_4$ takes part in carrying the curre a primary deposition of nickel occurs, and this increa the more dilute the solution in the neighbourhood of cathode becomes. Since a primary separation of nic causes the deposit to be powdery and black, it follows t by employing a dilute solution and a high current dens a less valuable deposit of nickel will be obtained.

5. By circulating or stirring the electrolyte, the differen in concentration are equalised, and hence a higher cath current density may be employed. The same result may attained by heating the electrolyte, which also cause diminution of the electromotive force of polarisation.

6. Stirring or circulating the electrolyte causes a dimi tion of the polarisation, since the $NiSO_4$ produced on electrolysis of the complex salt is removed from the an and hence the formation of nickelic sulphate is diminishe

7. A formula for calculating the E.M.F. is gi which is applicable when both of the electrodes are co posed of nickel. In other cases corrections and modificati must be introduced which are represented in a more gen formula.

8. In all galvano-technical methods where the electro contains a metallic salt capable of different stages of ox tion, a counter electromotive force is produced whic derived from an oxidation cell, and which, when diffe metals are employed as cathodes, varies according to difference in the rise of potential between the latter and normal electrolyte.—J. S.

PATENTS.

Copper Sulphate and other Metallic Sulphates [Elec lytic]; Process for Making ——. H. J. U. Palas F. A. J. Cotta, both of Marseilles, France. Eng. 17,485, Oct. 2, 1900.

The electrolyser is divided into three compartments by vertical and parallel porous partitions. In the middle c partment dilute sulphuric acid, or an acidulated solutio an alkali sulphate, is caused to circulate; one side c partment contains copper scraps, forming the anode, acidulated solution of cupric sulphate; the other side c partment is charged with a solution of an alkali sulpl A small proportion of copper sulphate dialyses into middle compartment, and the copper is precipitated this solution, on its withdrawal, by H_2S, or electrolytic The circulation is so maintained that the cupric salt in compartment shall not exceed 1 decigramme to the "The speed of the circulation is about 40 litres per for an elementary electrolyser, which allows 25 t ampères to pass at four volts." Caustic alkali is obt in the compartment charged with an alkali sulp Reference is made to Eng. Pat. 9806, 1899 (this Jou 1900, 442).—E. S.

Electrolysis; Apparatus for ——. [Electrodes.] Schoop, Dozweil, Switzerland. Eng. Pat. 14 Aug. 13, 1900.

In this apparatus, which is an improvement on that desc in Eng. Pat. 13,074, 1899 (this Journal, 1900, 51 electrodes are arranged in long, narrow, parallel cha of insulating and resistant material, in such a way tha liquid continually flowing through each channel is ele lysed while it is in the form of filaments. The elect are wetted on both sides by the liquid to be electrol and are thus active on the whole surface.—G. H. R *ulating Materials or Non-Conductors of Heat; Ianufacture of* ——. O. Horstmann, Cologne. Eng. 'at. 14,722, Aug. 16, 1900.

s insulating material consists of a mixture of about arts of the "commercial tar-like product composed of altum and paraffin oil" with about 35 parts of ground r. It is cast into flat sheets in suitable moulds which e been oiled before filling, and rolled smooth with a r similarly prepared. If required for curved surfaces, sheets are heated in a special apparatus to their ening point and bent in the form desired.—F. H. L.

tes; Porous Metal ——, *for Electric Accumulators Felted Metal*]. F. W. Bühne, Freiburg, Germany. ng. Pat. 16,534, Sept. 17, 1900.

: plates are made of felted metal, an entirely new luct formed from the fibres obtained by the process ribed in Eng. Pat. 25,075, 1899, which can provide a e porous service, with little weight and sufficient ability.—G. H. R.

lectric Batteries. G. Heidel, St. Louis, U.S.A. Eng. Pat. 5017, March 9, 1901.

: cell, which is made of any suitable conductive erial, forms one element of the battery of which the r is formed by an electrode placed in the cell, and lated from it. The cell is insulated from surrounding cts by ribs located outside at intervals at the sides and om. Recessed bosses are formed on the ribs into which lator plugs are inserted.—G. H. R.

trolytic Cells [*Oscillating*]. P. M. Justice, London. rom The Castner Electrolytic Alkali Co., Niagara Falls, .S.A. Eng. Pat. 10,976, May 28, 1901.

cell, preferably rectangular, is mounted on an lating block, which can be vertically adjusted. A iwardly directed knife edge bearing beneath the oscil- g portion of the cell rests in a recess in the block, and ety link with a slot and pin attachment permits "lost on." The cell has three or more supports, on two of h it is free to oscillate, while the third comprises a rod iected to the cell by a ball and socket connection, and os are provided for vertically reciprocating the rod, h has an extensible connection for adjusting the nation of the cell on its three supports. There is a onary supporting frame on which the cell is mounted, a shaft for the cell is mounted in bearings adjustably red in the frame, and means are provided for adjusting supports of the cell on it. A gas eduction pipe, the tures of which make an articulate connection with the rests loosely in one or more lutes or seals provided for G. H. R.

ustation, Scale, or other Foreign Matter from Steam oilers, Tubes, and other Vessels or Objects; Removal ——. C. Elliott. Eng. Pat. 7951, 1900.

See under I., *page* 878.

(*B.*)—ELECTRO-METALLURGY.

and Nickel; Simultaneous Electro-Deposition of —, *from a Solution of the Sulphates.* F. W. Küster. its. für Elektrochem. 1901, **7**, [49], 688–692.

TINUING the experiments described by Toepffer (this nal, 1900, 156) and himself (this Journal, 1901, 50), author now finds that if a large cathode surface be oyed instead of the platinum wire point formerly used, decomposition potentials are lower, but the results in ral remain the same. Experiments with zinc are also ribed, and it would appear that the velocity of deposi- has an influence on the results.—J. S.

PATENTS.

tric Furnaces. [*Electrodes.*] J. Imray, London. om La Société Electro-Metallurgique Française, Froges, ance. Eng. Pat. 16,293, Sept. 13, 1900.

electric furnace consists of a crucible, having supported e it two electrodes connected in series, each capable of being separately raised or lowered, and each provided with a volt-meter "in shunt" between it and the metal in the crucible. It may be modified for use with alternating and polyphase currents by having the electrodes arranged to be raised or lowered together, with a single volt-meter "in shunt" between either of them and the metal.—G. H. R.

Sulphide Ores [*Pb, Zn*]; *Treatment of* ——. J. Swinburne and E. A. Ashcroft, both of London. Eng. Pat. 17,611, Oct. 4, 1900.

THE process is cyclic and is claimed as a whole and in parts. It consists of placing the crushed sulphide ore in a bath of fused chloride of zinc and adding sulphur chloride, which reacts with the sulphides forming their chlorides and sulphur. The latter vaporises and is condensed. The bath is purified from iron and manganese according to and claimed in specification 17,612 (see following abstract). The bath of purified chlorides is desilverised by lead, freed from lead by zinc and the fused zinc chloride mixed with alkaline chloride and electrolysed to produce zinc and chlorine. The latter is then used with some of the condensed sulphur for the regeneration of sulphur chloride. —A. W.

Sulphide Ores; Treatment of ——. J. Swinburne and E. A. Ashcroft, both of London. Eng. Pat. 17,612, Oct. 4, 1900.

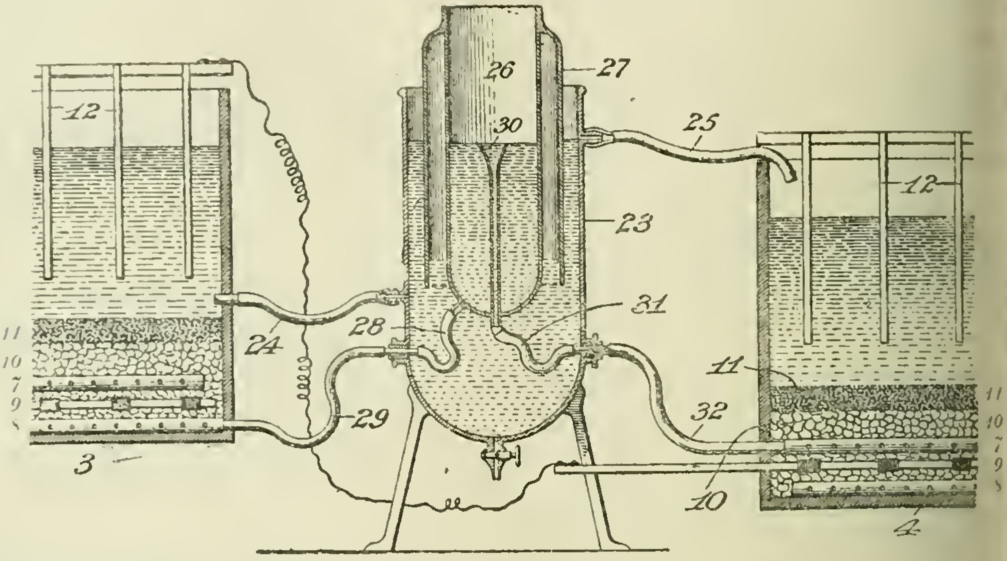
OXIDE of iron or manganese is produced by treating fused chlorides containing them with oxide of zinc, or by treating fused chlorides containing mixed sulphides with chlorine and oxygen. The oxides are thereby precipitated, leaving a purified chloride of zinc or lead, or both, for electrolytic decomposition after separation from the solid matter by distillation. (See preceding abstract.)—A. W.

Metals [*Cu, Ni, Ag, &c.*]; *Recovering and Separating* ——, *from their Ores and Concentrates thereof.* H. A. Frasch, Hamilton, Canada. Eng. Pat. 22,699, Dec. 12, 1900.

THE process, for which there are 21 claims, is more particularly applicable to the treatment of copper nickel ores or matte, and consists of depositing the various metals according to their electro-positive nature in a series of tanks specially constructed for the circulation of two electrolytes, so that whilst the deposition of metal is taking place in one compartment the extraction of them from the ore or matte as the anode is taking place in the other. The flow of the electrolytes through the series of tanks is regulated by the difference of their specific gravities, by means of an apparatus between each, as shown in the accompanying drawing. The tanks are arranged at decreasing levels, and contain a lower perforated inlet pipe 7, a discharge pipe 8, an electric conductor 9, surrounded by the anode 10, consisting of the ore or matte containing the metals to be extracted. Above this is a porous diaphragm 11 composed of sand to prevent the upper and lower liquors mixing, the cathode plates 12 being suspended in the upper portion of the bath, primarily composed of brine.

The automatic flow regulator consists of an outside casing 23, connected by a tube 24, with the lower portion of the cathode section of the higher tank 3, and connected with an overflow tube 25, with the next lower tank 4. In the interior is a float 26, buoyed by an air chamber 27 in the fluid contents of the outer casing. This float is connected by a flexible tube 28 and pipe 29, with the exit tube of the anode section of the higher tank 3, and by an overflow 30 and tubes 31 and 32, with the inlet tube of the anode section of the lower tank 4. By this means the overflow of the two liquors from the anode and cathode sections of the one tank to the corresponding sections of the tank next below is controlled and regulated by their specific gravities.

In the process of treatment the first or highest tank of the series contains a solution of brine, by which with the electric current, a solution of the metallic chlorides is obtained in the anode section, and caustic soda in the cathode section. The latter solution is run off separately out of the series, but the chloride solution is carried down the series through the anode sections of each tank, and gradually gets enriched until the final discharge. This enriched chloride solution is pumped back into the cathode section of the second tank, and flows down and forms the upper electrolyte of the remainder of the series, so that in the tanks from No. 2 downwards the metals are being dissolved from the matte in the anode sections, and are being deposited on the plates in the cathode sections. The latter can be so arranged that the metals can be deposited in the different tanks according to their electro-positive nature. After the deposition of the silver and copper, the solution is removed for the oxidation and precipitation of the iron, after which it is introduced into the lowest of the series of tanks for the deposition of the nickel. The process may be varied, and the origiual chloride solution obtained by chemical means, or the caustic solution from the first tank may be carried through the series for the production of strong alkali.—A. W.



Elements [Na, Zn, P, &c.]; Obtaining [Electrolytically] Volatile ——, from their Ores and Compounds. British Aluminium Company, Ltd., London. From A. H. Cowles, Cleveland, U.S.A. Eng. Pat. 9903, May 13, 1901.

The process of obtaining a volatile electro-positive element from its ores or compounds, consists in passing an electric current through the fused mass, sustained at a temperature higher than the volatilising point of the element, and employing a porous cathode, through which the vapours of the element pass, as they are formed, into a condensing chamber on the other side.

A separate claim is made for obtaining sodium from a mixture of the fluorides of sodium and aluminium by this process. An iron receptacle, connected with the negative pole of the battery, has a false bottom, upon which is laid a bed of porous carbon forming the cathode. The mixture is placed upon this bed and fused only in the central portion, the unfused material against the wall of the receptacle acting as a protective coating, both from contamination of the bath by the iron, and from the direct action of the current. The anodes are of carbon, and dip direct from above into the fused portion of the bath. The sodium vapour, as it is formed, passes downwards through the porous carbon cathode, and is condensed in a small air-tight chamber underneath.—A. W.

Ores or Compounds; Process for the Reduction of ——, by Means of the Electric Current. H. A. Irvine, Niagara Falls, U.S.A. Eng. Pat. 13,032, June 26, 1901.

A temporary conducting heap or mass of granular carbon is placed next to, or surrounded by, a charge of material having fusible mineral constituents, and containing a reducing agent. A current is passed through the i mediate mass, which produces a fused body of mineral through which the passage of the current is continued a body of the charge material is maintained next it reduced by the heat generated by the passage of current.—G. H. R.

Iron or Steel in a Molten State; Process for Purifyi Removing Impurities from ——, and Apparatus the A. G. Greenway, M.D., Lladdrindod Wells. Eng. 13,653, July 30, 1900.

Impurities are removed from iron and steel while molten state in a reverberatory or similar iron furnace with basic material, by passing a strong current o tricity through them. One pole enters the furnac forming either single or multiple points of electrical c with the lining of it, constitutes one of the electrodes. other electrode is made of a metal conductor coate basic material which is refractory in the metal, and a conductor of electricity, and it is suspended, fre unattached, in the midst of the furnace and molten through which a strong current is passed when th electrodes are coupled up with a dynamo or other po source of electricity.—G. H. R.

Matrices; Separating the —— from Galvanopla Precipitated Metals. C. E. Steinweg, Lüden Germany. Eng. Pat. 13,365, July 1, 1901.

The metal is precipitated around the flat side matrices which are formed of thin sheet metal, divi the back by grooves into several divisions, which ca be easily torn off the precipitated metal.—G. H. R.

XII.—FATS, OILS, AND SOAP.

Sunflower Oil. F. Jean. Ann. Chim. anal. appl. 166. Chem.-Zeit. Rep. 1901, **25**, 209.

The oil obtained by the first pressure of the seeds i yellow, clear, and neutral liquid, suitable for dietet poses. That won by subsequent expression is da colour, and is fit for burning and making varnishes. flower oil has a specific gravity of 0·925 at 15°, rotatory power of + 22′; its saponification value is and its iodine value 124. Its fatty acids melt at sample examined contained 3·1 per cent. of fr calculated as oleic; the unsaponifiable matter was 6 cent. Treated with one drop of sulphuric acid, su oil yields a golden yellow colour surrounded by a gr ring with violet spots. Mixed with sulphuric acid, gi

llow-red mass which does not become brown. Sun-
er oil reduces alcoholic silver nitrate.—F. H. L.

dlenut Oil. J. Lewkowitsch. Chem. Rev. Fett- u. Harz-Ind. 1901, **1**, [8], 156.

author obtained 58·6 per cent. of oil by extraction
the kernels of the nuts of the *Aleurites moluccana.*
constants differed from those recorded by De Negri,
ially the iodine value. The comparative figures are
in the subjoined table:—

——	De Negri.	Lewkowitsch.
fic gravity	0·920—0·926 at 15° C.	0·92565 at 15·5° C.
nification value	184—187·4	192·6
ner value	..	95·5
e value	136·3—139·3	163·7
ro-refractometer reading	76—75·5 at 15° C.	76 at 25° C., 78·5 at 20° C.
l value	..	9·8
sed fatty acids (insoluble petroleum spirit).	..	0·21 per cent.

e residual oil-cake had the following composition:—
8·80; moisture, 10·00; ash, 8·28; nitrogenous sub-
es, 46·16; fibre, 1·47; and starch, sugar, &c. (by
ence). 25·29 per cent. The ash contained 23·52 per
of K_2O and 53·04 per cent. of P_2O_5.—C. A. M.

n Wax; Variations in the Composition of ——.
Ahrens and P. Hett. Zeits. angew. Chem. 1901, **14**,
7], 684—685.

the object of determining the cause of the variations
recorded constants of Japan wax, the authors have
cted the fat themselves from the fruit of the Japan
ree (*Rhus sucsedanea*), partly by boiling it with water,
partly by extraction with ether. In this way they
ned about 25 per cent. of a soft greenish-yellow
ance which gave the following values:—Iodine value,
—12·8; acid value, 11·2—12·0; saponification value,
—212·0.

t of the substance was then bleached in the sun with
esult that the iodine value fell to 7·6, whilst the acid
rose to 13·8, and the saponification value showed
. Another portion decolorised by boiling with
l charcoal in an ethereal solution gave an iodine
of 11·1. It is stated that Japan wax with an iodine
of 4 is not met with in commerce at the present day.
planation of the difference between the results obtained
nd formerly, it is suggested that possibly the manu-
e of the wax is now carried out in a different manner
an; and that to meet the increasing demand, accele-
processes with methods of artificial bleaching may
been introduced.—C. A. M.

Linseed Oil and its Adulterants. P. C. McIlhiney, Report to Commissioner of Agriculture, New York State, U.S.A., 1901, 1—31.

ALTHOUGH oil from American seed is gradually replacing that from foreign seed in the United States, Calcutta seed-oil still commands a higher price owing to its lighter colour. Calcutta oil, as a rule, is sold in the raw condition, and is largely used by the varnish makers. The total yield in 1898 is estimated at 13,000,000 to 14,000,000 bushels of flax seed, whilst the output for 1899 probably amounted to 15,000,000 bushels. Each bushel of seed produces about 2·3 gallons of oil.

Extraction.—The oil is obtained by extraction with solvents or by expression.

Analysis.—In the author's opinion the most valuable data for judging as to the purity of linseed-oil are the following tests:—(1) specific gravity; (2) iodine and bromine values; (3) per cent. of unsaponifiable organic matter; (4) saponification value; (5) acid value; (6) per cent. of insoluble bromine derivatives; and (7) amount of volatile oil (turpentine and benzine). He has applied most of these tests to a large number of oils obtained from various manufacturers in New York States and gives the following conclusions:—

Specific Gravity.—This should vary between 0·931 and 0·937 for raw oil, and between 0·931 and 0·950 for boiled oil at 15·5° C.

Bromine Addition and Bromine Substitution Values (this Journal, 1900, 176).—The former should lie between 100 and 110, whilst the latter should not, as a rule, exceed 5.

Non-Volatile Unsaponifiable Matter.—This should be less than 2·5 per cent. in either raw or boiled oil.

Saponification Value.—Should not be less than 187 for raw or 186 for boiled oil, and in neither case should it exceed 196.

Insoluble Bromine Derivatives.—The author regards Hehner and Mitchell's method (this Journal, 1899, 77) as a valuable test for the detection of other seed-oils in linseed oil.

Acid Value.—This should be less than 5, as a rule, in either raw or boiled oil, though old oil may give figures as high as 7.

Action on Polarised Light.—The author considers that the test is chiefly of value for the detection of rosin oil, which is dextro rotatory.

Methods are given for the detection and determination of various adulterants.

Effect of Temperature on the Specific Gravity of Linseed Oil.—This is shown in the subjoined table in which water at 15·5° C. is taken as unity throughout:—

Oil.	Sp. Gr. at 15·5° C.	Sp. Gr. at 28° C.	Sp. Gr. at 100° C.	Difference for 1° C from 15·5°—28° C.	Difference for 1° C. from 28°—100° C.	Difference for 1° C. from 15·5°—100° C
au raw linseed	0·9336	0·9255	0·8736	0·000650	0·000721	0·000711
alcutta "	0·9328	0·9239	..	0·000698	..	..
merican "	0·9336	0·9255	..	0·000650	..	..
" "	0·9345	0·9263	..	0·000656	..	..
" "	0·9385	0·9297	..	0·000707	..	..
" "	0·9375	0·9293	..	0·000653	..	..
" "	0·9327	..	0·8732	..	..	0·000704
" "	0·9332	0·9245	0·8731	0·000693	0·000714	0·000711
" "	0·9336	0·9258	0·8735	0·000625	0·000726	0·000614
den	0·9316	0·9235	0·8712	0·000646	..	0·000716

rection for Temperature with a Hydrometer.—The
ing constants are to be added to, or subtracted from
adings of a glass hydrometer (correct at 15·5° C.)
immersed in linseed oil, for each degree from 40° to

correction for 1° F. was found to be 0·000361; and
C., 0·000650.—C. A. M.

Vaselines; Tests for and Properties of Natural ——. — Hœhnel. J. Pharm. Chim. **14**, [2], 74. Pharm. Post, 1901, 281.

Two kinds of vaseline are met with in commerce, that obtained directly from petroleum, and paraffin ointment, which is merely a solution of paraffin in vaseline oil. Of these the former is to be preferred for pharmaceutical use

on account of its homogeneous consistence. To determine the value of a sample, the following tests should be applied. *Colour*, when solid and when melted; *solidifying point*; *reaction* of an ethereal solution towards iodeosin; *odour*; action of permanganate by heating together equal parts of vaseline and 1:1000 solution of $KMnO_4$. White vaseline should not decompose the reagent in less than 15 minutes, the yellow variety in less than six minutes. *Viscosity* should be taken at two temperatures, *viz.*, 60° and 70° C., *Fractional distillation*; the quantity distilling below 180° and below 200° C. should be noted. A good vaseline should be free from sulphur compounds; it should, therefore, give no brown colour when heated on the water-bath with ammoniacal silver nitrate solution. The *iodine number* varies and is the highest (7 to 12) with American products. The *refractive index* at 55° should lie between 1·459 and 1·478. The *saponification number* should be 0. To distinguish between natural and fictitious vaselines, the index of viscosity is sufficient to decide the purity, any product showing a viscosity figure below 3 at 60° must be considered adulterated with paraffin ointment. Also when the index of viscosity falls below 1·4, adulteration must be assumed.
—J. O. B.

Oils, Fats, and Waxes: Elimination and Determination of Water in ——. C. B. Davis.

See under XXIII., *page* 941.

Oils; Maumené Test for ——. C. A. Mitchell.

See under XXIII., *page* 939.

Free Alkaline Hydrate and Carbonate in Soap; Effect of Sodium Chloride in the Determination of ——. F. E. Robertson.

See under XXIII., *page* 936.

Viscosimeter; The Engler-Ragosine ——. A. Ragosine.

See under XXIII., *page* 933.

PATENTS.

Wool; Removing Fat from ——, *and Apparatus for that Purpose.* C. D. Abel. Eng. Pat. 17,764, 1900.

See under V., *page* 891.

Oleaginous Matter; Bleaching of ——. The Cotton-Seed Co., Ltd., London. From J. C. W. Stanley, New York. Eng. Pat. 11,419, June 4, 1901.

Claim is made for a process of circulating the oil or wax in a thin film over a transparent surface, and subjecting it to the action of light during its passage, whilst in certain cases air or other gas is introduced under pressure to effect simultaneous oxidation.

In the special form of apparatus described, the oil is contained in a tank with a conical lower end which is closed. Above this tank are three bleaching chambers formed of a series of vertical posts supporting panes of glass, and closed with air-tight covers. A second tank is supported above the bleaching chambers, and is connected with a pump which draws the oil from the lower tank. Each of the bleaching chambers has an interior pipe or trough, connected with fan-tail distributors to spray the oil against the vertical panes of the chamber. The oil is returned to the lower tank through pipes which project a short distance into the bottom of the chambers and are controlled by valves. Electric arc lamps are supported within the chambers, and it has been found that three lamps of about 1,500 candle power will bleach the oil flowing over a superficial area of about 400 sq. ft. in 5 to 8 hours. The material in the lower tank is heated by means of a steam-coil when necessary, and means of cooling the bleaching surfaces are provided.—C. A. M.

Lubricant, and Process of Making the same. M. S. Hudnall and H. Calvert, Wichita, Texas, U.S.A. Eng. Pat. 22,867, Dec. 14, 1900.

The composition claimed is specially intended for moving machinery, and is stated to keep the parts and bearings cool. It is prepared by adding "signal oil" (1 quar slaked lime ($2\frac{1}{2}$ lb.), then moderately heating the emul with black oil (1 gall.), and finally pouring the mix into a hot solution of $2\frac{3}{4}$ lb. of soap in 5 pints of water.
—C. A.

Candles; Especially those for Burning in Spring La H. Palmer and W. Calderwood, Stratford, Essex. Pat. 23,789, Dec. 29, 1900.

The candle is provided with a base of cement to whic wick is attached.—C. A. M.

Soft Soap; New Manufacture of ——. F. A. H Stockport. Eng. Pat. 17,278, Sept. 29, 1900.

A soft soap is made by mixing a vegetable oil and re equal weights, heating and stirring till the resin is diss Caustic potash solution, free or practically free from c soda, is now added, and finally a strong lye to finish o
—A.

Soap for Use in Sea-Water; Composition for the M facture of ——. L. M. Baptistine-Blanc-Ray Praguignan, France. Eng. Pat. 2847, Feb. 9, 190

"A soap for use in sea-water" is prepared by b the following ingredients in approximately the propo named:—Cocoanut oil, 39·375 kilos.; water from rivers Narbuti and Foux in equal parts, 41·071 k caustic soda, 9·017; and salt-water containing 12 pa salt to 88 parts of water, 10·714 kilos.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

Oil Colours in Tubes; A Siccative [Elaococca Oi ——. M. Kitt. Chem. Rev. Fett- u. Harz-Ind. 8, [8], 157.

Many of the mineral colours, when worked into a with oil, show a tendency to separate again when st tubes. The most common means of preventing th add from 5 to 10 per cent. of wax to the mixture. T the saponification value of linseed oil as 195, and that wax as 95, the approximate proportions of the const can be calculated from the saponification value mixture. For this purpose the oil colour is expres to filter-paper and extracted in a Soxhlet apparat ether, the ethereal extract evaporated, and the saponified and titrated in the usual manner. In p the addition of wax is said to have the objections drying sufficiently hard and of not adhering to a coat of paint. This can be obviated by the substitu Japanese wood oil (tung oil) for the wax, adv being taken of the property possessed by that oil of s ing on exposure to light. The cold-pressed oil is e to direct sunlight in glass tubes about 1 cm. in di and yields in a few weeks a suitable product, which further advantage of increasing the drying properties oil colours. Linseed oil containing 10 per cent. solidified oil completely dried in 40 hours, whilst ultra oil paint, containing the same proportion, dried hours.—C. A. M.

Paris Green; Determination of Arsenious Oxide i S. Avery and H. T. Beans.

See under XXIII., *page* 936.

PATENTS.

Colour Substance [Iron Oxide Pigment] from Liquors. H. J. Haddan, London. From A S. B Cleveland, Ohio, U.S.A. Eng. Pat. 23,858, D 1900.

"Waste iron pickle liquor," either chloride or sul treated with a current of air and steam, and while the tion is proceeding, a solution of sodium or other ca is run in to exact neutrality. Simultaneously mo is introduced at the boiling point, double in volum he liquor under treatment. Provided that no excess of bonate is employed, a yellow precipitate, having the nite composition $Fe_2O_3Fe_2(OH)_6$, is deposited, which is ected, washed, and dried. This pigment is claimed to sess valuable and new properties; it does not require gating or grinding, is quite free from acid or undecomed sulphate, and can be ground into oil as it is, yielding aint of an opaque bright yellow colour. It may also be tly furnaced to give oxide reds of different shades. If original pickle is a sulphate liquor, and if barium or ium chloride be substituted for the sodium carbonate, a nent is obtained of about three times the usual bulk, taining the alkaline earth metal as sulphate. Similarly, 1 a chloride pickle, the barium or calcium remains in tion as chloride, and may be thrown down with a soluble bonate as "blanc fixe" (barium carbonate), or "pearl lening" (calcium carbonate).—F. H. L.

c and other Ores; Treatment of ——, chiefly for the Direct Production of Zinc White, and Furnaces therefor. F. B. Middleton and the Non-Injurious White Paint yndicate, Ltd., London. Eng. Pat. 12,274, June 15, 901.

FURNACE of the reverberatory type, but without a ge, and with a fire chamber about 3 ft. deep, is used. fire chamber is loaded with fuel, and a charge of ted blende, oxidised ores, or calamine is put on the th. When it becomes hot it is raked off the hearth on ne top of the incandescent fuel, and a fresh charge is into the furnace, with more fuel in the fire chamber. soon as the hot ore reaches the fuel, zinc fumes are ved and travel over the hearth into a suitable coning chamber. The fire bars of the furnace are carried ely on notched bearers, beyond which their ends ect; thus they can be rotated by means of levers so as reak up and remove gangue.—F. H. L.

nt; Preservative ——, for applying to India-Rubber yres. H. R. A. Philp, Pailton, near Rugby. Eng. Pat. ,844, Sept. 21, 1900.

parts of dry white lead are ground with 1 part of turine, thinned with 20 parts of mineral naphtha, and d with 160 parts of ordinary rubber solution, more entine or naphtha being added if the whole is too thick. composition is applied with a stiff brush to the sides ie covers of double-tube pneumatic tyres, to fill up the ks which appear there as the covers wear. Two coats given, being put on while the tyres are properly inflated. —F. H. L.

(*B.*)—RESINS, VARNISHES.

Linseed Oil and its Adulterants. P. C. McIlhiney.

See under XII., *page* 909.

(*C.*)—INDIA-RUBBER, &c.

outchouc from the Congo. Imp. Inst. J., Sept. 1901.

s the beginning of 1900, the production of caoutchouc he Congo State has been officially supervised, the rvice de Controle Forestier" having been organised for purpose, and that Institution having already brought it changes greatly to the benefit of the rubber-planting stry.

ouis Gentil, Forest Inspector in the Congo State, ribes the production of rubber as now carried on e.

actically the whole of the rubber exported is obtained the climbing plants of the genus *Landolphia*, of which e are four varieties. Other climbing plants, yielding rior caoutchouc exist, but in small quantities; probably e are 3,000,000 plants under cultivation at the present in the equatorial districts.

here are three distinct forms of rubber-yielding plants are most largely cultivated.

rst the white caoutchouc locally known as matofemongo, ined from the *Landolphia owariensis*. The fruit, which ains the seeds and a sugary-acid juice, is round and ish coloured, and is about the size of an orange. The milk of this liana, or climbing *Landolphia*, is whitish and is coagulated into rubber by pouring it into boiling water.

Another variety of *Landolphia owariensis*, which produces a milk yielding rosy caoutchouc, bears a small fruit, yellowish to reddish-green in colour, and containing an acid juice; this plant, known locally as mongew or bongow, yields the most valuable rubber, specimens of it having recently been quoted at 4*s*. 5*d*. per lb. It is precipitated or coagulated by boiling water.

The third variety, *Landolphia florida*, known as mondongo, boole, &c., yields a black caoutchouc, which, like the white and rosy varieties, is coagulated by boiling water; but it is not coagulated by the acid juice of costus canes, a fluid which is extensively used to obtain the rubber from the milk of the two varieties of *Landolphia owariensis*.

It is because of the properties of coagulation just mentioned that merchants strongly advise that the different varieties be collected separately, otherwise it happens that an inferior rubber is produced by a mixture of two or more kinds of caoutchouc.

The coagulation by means of the costus canes is readily carried out:—A banana leaf is fitted into a hole made in the ground, shaped like a small basin; into this the milk is poured. A portion of the costus cane is then squeezed over the liquid; the drops of juice immediately coagulate the rubber, which is afterwards pressed free from adhering liquid. All forms of caoutchouc coagulate on evaporation, producing the purest form of rubber.

The lianas are propagated upon a large scale from the seeds, of which from 10 to 20 exist in every fruit of the mature plant. It is essential that the seeds should be planted in the prepared area when they are ripe, and before they have had time to get dry. After the seeds are planted, germination occurs in about a fortnight, and when the little plants have eight leaves, they are in a suitable condition for planting out.

Large tracts of forest are marked out, and round each tree a space is cleared free from brushwood and undergrowth. From two to twenty little seedlings are planted round the tree (the number varies with the nature of the tree), and these, in growing, twine up even to the summit of the tallest trees, and in a few years create a dense stagnant undergrowth that is particularly favourable to their successful cultivation. At the end of nine or ten years they are fit to be tapped for the caoutchouc.

At present the caoutchouc is only obtained by incisions in the stem of the liana, and it is greatly to be hoped that during the next few years a method of treatment may be adopted whereby the milk may be drawn from the tissues of the leaves and bark. In the above-mentioned manner trial grounds, to the extent of 74 acres, have been planted with the *Landolphia*, at the rate of 5,000 plants per acre.

Rubber; Plants which furnish Congo ——. Gummi-Zeit. 1901, **15**, [42], 712—713.

CONGO rubber is chiefly derived from plants belonging to the order *Apocynaceæ*, but there are other sources, such as certain members of the genus *Ficus* and other undetermined plants. Hallier indicates 15 species and one variety, but all of these do not furnish rubber. In many cases the material necessary to classify them botanically has not yet been obtained. Of the six species mentioned by Schlechter (West African Rubber Expedition, 1899—1900) as commercial sources of rubber, *Landolphia tomentosa A. Dewèvre* is probably identical with *L. Hendelotii A.D.C.*, and *L. Comorensis K. Sch.* with *L. Florida var. leiantha Oliv.* The statements of travellers as to the commercial value of their products are also much at variance. *L. Klainii* is certainly found in various parts of the Free States, the rubber obtained from it being called "Kasaï red." The name "red rubber of Kasaï" belongs to the produce of *L. Gentil* (syn. *L. Owariensis*) or "Matofe-Mongo" (Schlechter, *loc. cit.*). The two plants are difficult to distinguish, but the former is characterised by its egg-shaped ovary and gigantic fruit.

L. Owariensis apparently furnishes most of the rubber obtained in West tropical Africa, several writers agreeing as to its high quality.

L. Heudelotii grows near the Stanley Falls, and yields nearly all the rubber exported from between the mouths of the rivers Senegal and Niger, *viz.*, about 2,000,000 kilos. yearly, worth 12 to 18 million francs (Chevallier).

L. lucida also furnishes Congo rubber, but little is known of the plant.

Authorities differ as to the commercial value of *Carpodinus lanceolatus*, said to yield a rubber of good medium value, and found between Lusambo and Luluaburg as far as the Manyema district, and in many other localities, in some places already growing scarce, owing to methods of collecting the juice.—R. L. J.

Rubber Industry of Rhodesia. Impt. Inst. J., Sept. 1901.

The following is a summary of a report, dealing with the species of rubber indigenous to North-West Rhodesia, by Mr. Harding, the Acting Administrator.

There are three distinct species of rubber plants indigenous to this country, *viz.*, *Landolphia florida*, *Capodinus lanceolatus*, and *Kickxia elastica*. The first-named is a kind of vine rubber usually found growing in marshy tropical localities. It grows in close proximity to a small tributary of the Zambesi, north-west of Nyakatoro, and also on an east bank tributary of the Kabompo River, called the Mumbasi. No doubt this species may be found in considerable quantities in the basins of the numerous tributaries of these two rivers, as quantities of the prepared rubber have been found in possession of the natives inhabiting these districts.

The *Landolphia florida* is collected and prepared by the natives. The cutting of the vine is accompanied by great waste, for it is promiscuously hacked, the best and largest branches being selected for subsequent preparation, while the smaller ones, which would attain maturity in another year, are left to rot on the ground.

The juice of the plant cannot be extracted by incision, and so the preparation of the rubber is conducted as follows:—The selected material, in lengths of 3 ft. to 4 ft., is soaked in water for 48 hours, and then hammered to remove the bark. The "blanket," as the rubber is termed at this stage, is then immersed in water and boiled for three or four days, until the bark is completely removed. While the rubber is still warm, it is rolled into sticks about six inches long, called *matallas*, which are hung up to dry and subsequently made into what are known as "chetotes," which are sold to the Mombari traders. The price of this class of rubber at Benguela would be from 2*s.* 9*d.* to 3*s.* 6*d.* per lb.

Kickxia elastica is a tree rubber found in close proximity to the *Landolphia florida*; it has been noticed in the possession of natives north-west of the Zambesi, near the Kasai River.

The rubber is procured by making an incision in the tree, and is of better quality than either of the products obtained from the two other species. It is free from dirt and bark, and the only objectionable ingredient present is grease, which is introduced into the material at the time of collecting, and also when moulding it into various shapes.

This kind of rubber is often used by the natives to mix with inferior samples, thereby improving their market value.

Capodinus lanceolatus is found in considerable quantities between the Kwando and Kwito Rivers, and is generally met with throughout the Barotse country west of East Lunga River. This plant is also a species of vine rubber, and although admittedly of inferior quality, still it will thrive in a very poor soil, and should eventually prove a valuable asset to Western Barotseland. To substantiate this statement it is pointed out that both east and west of the Kwito River the Portuguese have erected stations with the object of collecting this rubber.

Capodinus is a phanerogamous plant, and grows from 6 ins. to 8 ins. in height; the roots are found 4 ins. beneath the surface of the soil, and they extend evenly and uniformly over a considerable area.

The process of preparation of this root is the same as that described under *Landolphia florida*.

There is little doubt that North-West Rhodesia is a rubber-producing country, and only an early settlement of the internal conditions of the country is necessary secure a successful future for the development of industry.

Rubber Bands. Gummi-Zeit. 1901, **15**, [43], 722—7

Elastic rubber-bands require to be made of very g material, and at the best are greatly affected by atmosph conditions. The red variety has long been in favour, but quality of the rubber has of late deteriorated, either bec of faulty workmanship or the use of inferior material. grey bands, which are identical with the black except that latter are extracted with alkali, are most used now. They incorporated with sulphur by the aid of a kneading mac or immersed in molten sulphur. Extraction with al sometimes removes too much sulphur, so that after a t their state of vulcanisation deteriorates Experience sh that vulcanisation is best effected by means of sulp vapour.

Slight differences in the colour of the red bands are to changes which take place during vulcanisation, o variations in the colouring matter itself (antimony red).

—R. L.

PATENTS.

Vulcanising Rubber Materials or Compositions. A. Bourne, Bristol, Rhode Island, U.S.A. Eng. Pat. 7 April 4, 1901.

During the process of vulcanisation, the articles are pl in a strong cylinder, where they are subjected to the ac of air, or air and steam, at a pressure of from 5 to 100 lb. square inch, and a temperature of from 105 to 150 Sometimes the goods are "condensed" by treating with air at from 10 to 100 lb. pressure and at a tempera of from 40° to 100°, afterwards raising the temperatu the point at which vulcanisation commences. It is gene better to vulcanise at a relatively low temperature a high pressure than *vice versa*; and since, when both perature and pressure are high, vulcanisation proceeds rapidly, steam cannot be employed alone. Articles tr in the manner described are claimed to be much stro than those manufactured by ordinary processes.—F. H

Rubber Substitutes; Manufacture of ——. C. and Paulitschky and F. Wüste, Vienna. Eng. Pat. April 2, 1901.

This composition consists of disintegrated leather, 50 p waste rubber, 35 parts; cork, 0·5 part; asbestos, 5 p and "rubber-linseed oil," 10 parts. Waste (sole) leatl disintegrated by machine till the material consists of fibre partially connected, then softened by soaking and agit for a considerable time in tanners' dressing (bruised b leaven, and water), quickly dried, steeped for some tin "Lederöl" (train oil freed from acid by treatment with water), and pressed from excess of oily matter. The in pieces as large as hazel nuts, is boiled in the thick root sap of the Landolphia plant, to make it elastic durable, then dried slowly. The waste rubber, in mod sized lumps, is boiled for 15 minutes in a 1 or 2 per solution of caustic soda. The "rubber-linseed oil prepared by dissolving about 95 parts of rubber in linseed oil at a temperature of 40° to 60° C. These v materials are mixed together in the proportions indic the product is shaped in calenders having adju heated rollers, and finally treated with sulphur ch diluted with carbon bisulphide for the purpose of vulc tion. The finished material is stated to possess g elasticity and durability than the rubber subst hitherto manufactured.—F. H. L.

Gutta Percha or the like; Extracting ——, *from L and Twigs containing it.* G. Mitchell, London. Pat. 13,204, June 28, 1901.

The leaves or twigs are dried, reduced to powder extracted with carbon bisulphide. The solution is sep by subsidence or by centrifugal action, filtered th charcoal, and distilled. The inventor is aware that c bisulphide has been proposed as a solvent, and charc a filtering medium, before; he therefore only clain process outlined above as a whole.—F. H. L.

IV.—TANNING, LEATHER, GLUE, SIZE.

re Stock; Preparing "Schmaschen" Skins for ——. eather Manufacturer, 1901, **12**, [6], 107, [7], 127—28.

; "schmaschen" skins, which are principally skins of -born lambs, are sorted, in order to separate the long l from the short wool skins, and soaked in water for ut 48 hours, afterwards being laid in piles of 15—20 s, flesh side up, and a mixture, made by adding cient quicklime to a solution of gas-lime of 30 B. to e a paste, is applied.

he skins, after coating on the flesh side with the lime te, are laid flesh to flesh in pile, in which condition they left for 6—8 hours, when the wool can be removed. goods are limed for eight days, being moved daily, r which they are washed in water in a wash wheel, the er being changed three times.

fter washing, the goods are bated in an infusion of dung for about two hours, afterwards being scudded he beam, washed in warm water, and lightly drenched, n they are ready to be tawed.

fter the tawing process, they are taken out, and dried, erably in the open air, and, when dry, stored for about five ks in a dry room.—M. C. L.

eather; Black Glycerin ——. Leather Manufacturer. 1901, **12**, [7], 129.

ERY firm, tough leather can be produced by impreg-ng skins taken direct from the beam house, with erin, to which has been added either boric acid, c acid, or salicylic acid. This leather is known com-cially as transparent leather.—M. C. L.

Lactic Acid as a De-liming Agent. Leather Manufacturer, 1901, **12**, [7], 133.

TIC acid as a deliming agent is preferable to mineral s, which attack the skin, injuring the fibre and rendering resulting leather hard and brittle.—M. C. L.

heepskins; Preparing ——, for Dyeing. Leather Manufacturer, 1901, **12**, [7], 125.

EPSKINS intended for manufacture into coloured ters are best sorted immediately after bateing. The ing, which is best done with sumach, is the next ation, after which the skins should be well washed, and out on the flesh side on a stone or glass table, a zinc-red table being liable to cause dark spots on the ter. After setting, the goods are drummed in luke-n water for about two hours, and afterwards slicked a brass, stone, or wooden slicker, after which they ready for the colouring, which may be done either by ing or brushing, the former giving more uniform lts.

the brush method is to be employed, the skin is set out n oval zinc-covered table, and the colour is applied with ft hair brush. If the skins are to be dyed by dipping, ir of skins, paired together flesh to flesh, are dipped about 10 minutes in the dipping trough, which contains 8 litres of water at a temperature of about 40° C., to h is added a sufficient quantity of a 1 per cent. solution e aniline dyestuff, previously prepared.

fter dyeing, the skins are washed in cold water, set out he flesh side, given a coat of linseed oil, again set out afterwards dried.

hen dry, the skins are whitened on the flesh side, and oned with either of the following three seasonings:— itres of water and 1 litre of milk; or the whites of three , 8 litres of water, and 1—4 litres of milk; or 8 litres ater, 20 grms. of gelatin, and 5 grms. of brown sugar. r seasoning, the goods are allowed to dry, and are rolled, afterwards being cork-boarded, set out, and arded.

order to stiffen the goods somewhat, a mixture con-ng of 20 litres of water, 950 grms. of Iceland moss, and grms. of starch, after boiling and filtering, is applied to flesh side, and the goods hung up to dry immediately.

—M. C. L.

PATENTS.

Hides, Skins, Furs, and the like; Treating and Preserving ——. H. R. Riches and the Wool, Hide, and Skin Syndicate, Ltd., London. Eng. Pat. 13,361, July 21, 1900.

THE flesh side of the skins is thoroughly cleaned and then dusted over, by means of a blast-nozzle or other sprinkling device, with a fine powder of the following composition:— Charcoal (animal or vegetable), 10 per cent.; borax, 30 per cent.; alum or aluminium salts, 25 per cent.; cloves, 5 per cent.

The skins are allowed to lie for a time, and then packed for storage or transport.

It is claimed that skins treated in this manner keep perfectly, and can be handled by the tanner with a minimum of preparation.—R. L. J.

Treating and Colouring Hides and Skins: Apparatus for ——. C. A. Allison, London. From The Scott Leather Machine Co., New York, U.S.A. Eng. Pat. 10,152, May 16, 1901.

THIS invention relates to that class of apparatus for treating hides or skins, in which the hide or skin is drawn, by means of a belt or carrier, under mechanisms for seasoning, rubbing-in, and stretching the skin, and for spreading and finishing it, during its progress through the machine. The chief points are: The construction of the seasoning rolls of felt divided by narrow metallic strips secured in reverse spiral directions and sunk below the level of the rolls, the construction of the rubbing-in rolls, *i.e.*, spirals of rectangularly cut felt arranged with "break joints," mechanism for the equalisation of the upward pressure on the carrier under the rubbing-in rolls, a pump and continuous pressure in the feed pipe, a drip mechanism, and the means for diverting the drip from one of the seasoning rolls when it is lifted.

—R. L. J.

Artificial Leather, Floor Coverings, and the like: Method of Manufacturing ——. A. M. Posener, London, and F. W. Clerke, Tottenham. Eng. Pat. 16,525, Sept. 17, 1900.

THE following materials are used, in the proportions stated:—

As a Base.—A woven fabric, preferably jute, 2 lb.

Mixture A.—Body or covering material, 3 lb. (This consists of whiting, $1\frac{1}{2}$ lb.; ochre, 1 lb.; Venetian red, $\frac{1}{2}$ lb.)

Irish moss, $\frac{1}{4}$ lb., is dissolved in hot water (5 quarts), strained, and mixed with the above substances.

Mixture B.—Boiled oil or equivalent material, $1\frac{3}{4}$ lb.; resin, $\frac{1}{4}$ lb.; colouring body, as in A, $2\frac{1}{4}$ lb.; driers as necessary.

The base is impregnated with A at 90° F., dried, and pressed or passed through pressure rolls. One side is then coated with B (cold) and dried. The other side is now treated in exactly the same way. The two surfaces are smoothed with pumice stone, used wet, dried, and each separately coated with B as before, pumice-stoned once more, dried, and finished with a thin coat of B, but with oil substituted for the resin. The whole is then printed upon, if so desired, and left to dry and season thoroughly.

—R. L. J.

Floor Coverings, Artificial Leather, and the like; Methods of Manufacturing ——. A. M. Posener, London, and F. W. Clerke, Tottenham. Eng. Pat. 16,526, Sept. 17, 1900. (Compare preceding abstract.)

THE following materials are used, in the proportions stated:—

As Base.—A woven fabric of wool, cotton, or other vegetable or animal fibre, 5 lb.

Mixture A.—Glue, 1 lb.: body and colouring material (whiting, ochre and Venetian red), 5 lb.; silicate of soda, $\frac{1}{2}$ lb; hot water, 1 quart.

Mixture B.—Boiled oil or equivalent substance, $2\frac{1}{2}$ lb.; colouring body as in A, $3\frac{1}{2}$ lb.

The base is impregnated with A at 90° F. for 30 mins., dried and compressed. One side of the material is now rubbed with pumice stone, dipped in mixture B (cold), and dried. The other side is then treated in the same way. The two operations are repeated separately and in order. The material, after drying, is printed upon, if necessary, and left to season.—R. L. J.

XV.—MANURES, Etc.

Chili Saltpetre; Occurrence of Free Iodine in ——. F. W. Dafert and A. Halla. Zeits. landw. Vers.-Wes. Öst. 4, 732—734. Chem. Centr. 1901, 2, [5], 368.

The authors observed with a sample of Chili saltpetre, "which possessed a strong odour of iodoform," that iodine sublimed on the glass stopper of the containing bottle. The sample contained 0·4 per cent. of KIO_3; KI could not be detected. The liberation of free iodine from the iodate was caused by organic impurities, in this instance by some grains of barley. Saltpetre of this nature cannot be recommended as a manure, although the danger of injurious action is very small, and can be obviated by long exposure to the air.—A. S.

Wine Vinasses and Wines Spoilt by Sickness, as Manure; Utilisation of ——. F. Garrigou. Comptes Rend. 1901, 133, [4], 252—254.

The author draws attention to the fact that enormous quantities of vinasse from brandy distilleries and still larger quantities of wine rendered unsaleable by sickness, are thrown away into the rivers in the south of France, making an estimated total of 13½ million hectolitres annually. These liquors represent about 17,000 tons of organic matter, more or less nitrogenous, and 8,000 tons of saline constituents, largely potash. It is easy to save and utilise these wasted products almost without cost. All that is required is to allow them to evaporate spontaneously in shallow pools banked up with clay after the manner of salt marshes. At the end of the hot season, there would remain a concentrated natural manure, enriched as regards nitrogenous constituents by the dead bodies of numberless insects. The evaporation might perhaps be conducted in wide iron pans, heated from below by the combustion of dried vine leaves and stalks, which would themselves contribute a quantity of valuable ashes. For this auxiliary evaporation of the liquor, about 40 million kilos. of vine stalks would be available—the product of 12,654 hectares—yielding 5,800 tons of ash. The grand total of potash would then amount to 2,200 tons, and of phosphoric acid to 1,231 tons. The nitrogenous organic constituents accompanying these would have a value at least as much again. Lastly, the marcs could easily be burnt too, and the ashes added to the manure.—J. F. B.

Phosphoric Acid; Determination of ——, *in Superphosphates, Compound Manures, and Precipitated Phosphates, by Cold Precipitation as Ammonium Phosphomolybdate.* L. Ledoux.

See under XXIII., *page* 936.

Superphosphates; Determination of Water-soluble Phosphoric Acid in ——. L. v. Széll.

See under XXIII., *page* 936.

PATENT.

Manures; Impts. relating to Artificial ——. C. Roth. Berlin. Eng. Pat. 12,895, July 17, 1900.

The object of this process is to render less soluble the ordinary soluble artificial manures such as nitre, sulphate of ammonia, &c. This is done by mechanical means.

The manures are granulated and then treated either with organic or inorganic materials, or a mixture of both.

As examples, the granulated manure is moistened with a solution of sodium silicate and then dusted over with Portland cement, producing a thin covering of insoluble calcium silicate.

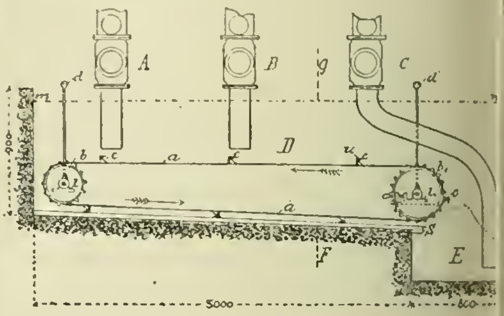
The manure treated in this way may then be subjec to the action of molten pitch to which has been added, ceresin, ozokerite, &c. to lower the melting point. P and resinous materials may be used by themselves, or manure may be treated with soap and then with powde alum.—C. M.

XVI.—SUGAR, STARCH, GUM, Etc.

Milk of Lime [Sugar Manufacture]; Apparatus removing Sand and Grit from ——. E. Bîža F. Věcek. Zeits. Zuckerind. Böhmen, 1901, 25, 485—488.

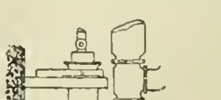
The apparatus described below was devised by the auth for removing sand and grit from milk of lime, and dur the present season it has proved itself well suited for purpose.

The prepared milk of lime is run into a cemented having a well E, and a shallower pit, D, with a ge sloping bottom. The deposit in D is carried forward scrapers, c, and falls into the well E, from which i removed from time to time.



The scrapers consist of a number of strips of sheet 6 mm. thick, and 55 mm. broad, riveted to Ewart's chain which run over toothed pulleys, *b* and *b*¹. The pulley are 390 mm. in diameter, and must be brought partly the well, so that the scrapers may carry the sand over edge.

If this is not done, or if the deposit be allowed to accu late in the well up to the dotted lines, the purificatio the milk of lime is incomplete.



The pulleys *b* are 290 in diameter, and on the axle, in an adjacent wel the driving pulley, 580 mm diameter. The arrangemen a motion of 4 m. per mi The bearings of the axle of leys at *l* are fixed, those of leys at l_1 adjustable, in ord keep the chain tense.

The suction pipes A a dip only 500 mm. below surface of the milk of lim order to avoid carrying sand; but pipe C reach 250 mm. from the bottom emptying.

The advantages derived the arrangement are tha milk of lime is obtained pure and uniformly mixe pumps work smoothly and regularly, the valves and nections are only slightly worn, and the pipes do become choked.

There is little disturbance of the steam pipes, valves connections during saturation, and the slime-press more quietly and regularly. The alkalinity of the satu juice shows no sudden undesirable fluctuations, as formerly the case, from subsequent solution of lime par in the juice. The air passages of the presses do not c so that the pressure is more uniform and there is less lamage to the plates and frames. From the greater ılarity of the filtration, fewer cloths are required. ,400 hectolitres of milk of lime are prepared daily, ug 15 quintals of waste, of which 8 quintals are sand and .—L. J. de W.

charification by Seminase under the Influence of Sodium 'luoride, on the Carbohydrates of the Horny Albumin of eguminous Seeds. H. Hérissey.

See under XXIV., *page* 944.

ar Canes; Valuation of ——. F. N. G. Gill. J. Soc. Arts, 1901, **49**, 662.

; most obscure point in the valuation of sugar canes is assessment of their yield in white dry sugar, and as yield is the basis of valuation of any raw sugar, as ggery" or "muscavado," which may, in the first place, ıanufactured from cane, the point is a most important

ıe difficulty hitherto felt in making any assessment is oubt owing to the generally accepted assumption that amount of treacle separated during manufacture was ıdent mainly on the "ash" and "glucose" in the , or the amount and constitution of the "ash" and known."

is owing to the want of a practical method of arriving e refining value of cane juices and their products, that vses have hitherto been stated in the usual ultimate tituents, instead of the proximate ones of "sugar" perly so called), "treacle," and "water." By "sugar" ant white, dry, sugar, and by "treacle." the mother r exhausted of all practically crystallisable sugar. sugar which may be won will be the sugar existing in uice, less that spoiled and lost in manufacture.

om a number of analyses of cane treacle quoted, it be seen that the most marked and constant relation een sugar withheld from crystallisation to the other ituents of the treacle is that of sugar to water present, very nearly twice the weight of the water. For ary working there should not be more than 20 per of water and 40 per cent. of sugar, so that a le from such working would show :—apparent solids, sugar 40, glucose and non-saccharin 40); water ırent), 20.

a complete analysis of a cane juice be made, treacle ng in the juice can be deduced from the glucose and accharine bodies present on the basis of the above al analysis. A partial analysis is, however, sufficient. determination of density to arrive at the apparent ved solids, and polarisation (direct polarisation is cally sufficient) to arrive at the total saccharose, give for determining the purity and the difference between igure and 100 is a sufficient measure of the glucose on-saccharine bodies present, and therefore a direct ıre of the sugar belonging to the treacle, whence llisable sugar existing in the soluble solids of the juice = purity coeff. – (100 – purity coeff.), and re be ascribed 5 per cent. to the raw sugar, the result plied by 0·95 will give the crystallisable sugar existing and the refining value of this raw sugar will be this , less losses, &c.

ese losses in a modern factory working with char for and nearly white (after-boilings) sugars, thoroughly -washed in the centrifugals, and for exhausted treacle, bout:—Loss of saccharose as crystallisable, by ion, 3·7 per cent.; loss of saccharose, as crystallisable, lution in the water associated with the resulting se, and with lime taken up, 2·5 per cent.; loss of ırose absolutely, 1·3 per cent.; so that the approxi- refining value will be about 7·5 per cent. lower. A with a purity of 87·7, would therefore show:— llisable sugar existing (1) in its dry solids 87·7 – – 87·7) = 75·4, (2) in its contained jaggery, 75·4 95 = 71·6, and the refining value of its contained y would be 71·6 × 0·925 = 66·2.

if desired, to express the results in lb. per gallon of —Specific gravity, 1·0837 = 20·1 per cent., dis- solids = 2·178 lb. dissolved solids per gallon, ning, as seen above, 75·4 per cent. × ·925 = 69·7 per cent. practically crystallisable sugar, whence juice would yield: White, dry sugar, per gallon 1·52 lb., treacle solids (allowing 3 per cent. loss) 0·593 lb. and the 3 per cent. loss, 0·65 making up the total to 2·178 lb., and then, if desirable, the statement may be modified to show contents of the juice in sugar of any quality.

Any increase in refining value through possible elimination of impurities in course of manufacture of the sugar, as in the defecation of the cane juice, and in its treatment with animal charcoal, is ignored, because such elimination is small, and the effect of it is allowed for, as far as can be judged, in the restriction of total losses of refining value to 7½ per cent. The refining, as at present practised, of cane juice and of raw cane sugars is mainly a redistribution of impurities, and not their elimination in any material degree.

In the above method of assessment of refining value, no regard is paid to the constitution of the non-saccharine bodies, and all melassigenic values are dispensed with, and this view is warranted by the analyses of cane treacle. This view receives further corroboration from a comparison of the amount of crystallisable sugar found in various mixed "cane raws" by the author's calculation and direct determination by Scheibler's washing out process.

In the author's opinion, what has militated against the progress of the cane-sugar industry more than anything else has been a want of proper recognition of what is sugar. With those interested in the industry, scientifically as well as industrially, "sugar" has been just that mixture of sugar (saccharose) crystals, and treacle, which is the "sugar" production of their district, though such "sugar" might consist of 45 per cent. only of white, dry sugar, and 55 per cent. of treacle, or of 90 per cent. of white, dry sugar, and 10 per cent. treacle. The consequence is that there is extreme confusion as to the sugar production of an unit area of cultivation in different places, and, worst of all, there is confusion as to relative merits of descriptions of cane and methods of cultivation, which has led to a most mischievous obscuring of the important point of where mere weight of yield of the unit area of cultivation should give way to quality.—L. J. de W.

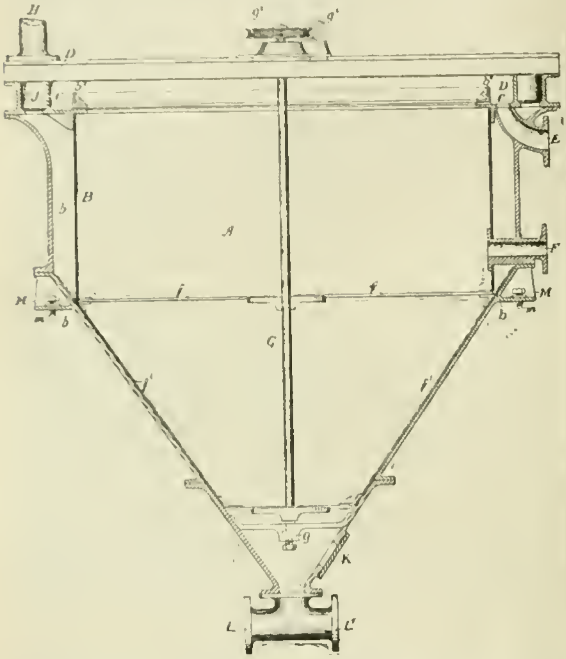
Sugar in Beets; Rapid Determination of ——. Hiltner and Thatcher's Paper (this Journal, 1901, 754); Notes on ——. E. E. Ewell. J. Amer. Chem. Soc. 1901, **23**, [6], 432—436.

The author points out that Hiltner and Thatcher (*loc. cit.*) are in error in regard to the allowance to be made for the liquid matter in the beet pulp, the means of determining the amount of such allowance being also inaccurate. The corrections are based on the percentage of water in the beet instead of on the percentage of liquid (juice) in the beet; the substances (sugar, &c.) dissolved in the water present in the beet must necessarily increase the volume of that water as calculated from its weight at a given temperature. Further, the determinations of water in the beets, as given by these authors, are not in accord with their numbers for the amount of fibre; the totals of average water, average sugar and average non-sugar are too high, the differences (marc) from 100 being in some cases less than 2 per cent. The author goes on to show that in extreme cases the error attending the use of the Sachs-Le Docte method of allowing for the liquid in the pulp will not be greater than that incurred by working according to Hiltner and Thatcher. The author has made use of a balance without weights in the way described by Hiltner and Thatcher, and has found it to be wholly inaccurate.—T. H. P.

PATENTS.

Sugar Juice or other Liquids; Continuous Subsiders for Cleansing ——. J. Pickering, Glasgow, and P. Macgregor, Dalmuir, by Glasgow. Eng. Pat. 4834, March 7, 1901.

The patentees describe a subsider, shown in sectional elevation in the figure, consisting of a circular vessel, A, of cast-iron or other material, fitted with the baffle plate B, arranged to form an annular space, *b*, into which the dirty sugar or other solution is introduced, and from which it passes quietly and slowly through the narrow aperture *b* into the main portion of the vessel. As the main vessel fills, the clear juice flows over the top lip b^2 of the baffle plate into the discharge gutter C, from which it is discharged into the supply tank by means of the pipe E. $f^1 f^1$ represent continuously or intermittently actuated scrapers or stirrers, which are carried by the vertical shaft G, driven by the worm g^1 and worm wheel g^2, and are placed close to the sides of the vessel to prevent either these latter or the aperture *b* from becoming clogged by deposit. H is the inlet pipe to the channel J through the perforated bottom of which the juice passes into the annular space *b*. F is a discharge pipe for use when the vessel is being emptied. The door K admits of the V-shaped vessel being cleaned and the shaft G adjusted. The outlet L leads to the gutter for washing out and L^1 to the filter presses. M M are two of the four supporting castings, which are fitted with screws *m* to allow the lip b^2 to be accurately levelled.—T. H. P.



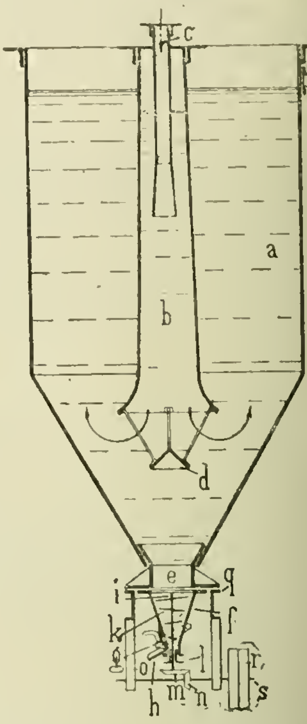
Lime Scum and Lime Sediment of Sugar Factories; Complete Extraction of Sugar from ——. C. Steffen, Vienna. Eng. Pat. 10,883, May 25, 1901.

Claim is made for an improved process of extracting sugar from the lime scum and lime sediment of sugar factories, consisting in completely extracting the sugar from this scum in the known manner in filter presses or the like by means of sufficiently large quantities of water, whereupon the sweet water containing the sugar and cooled to temperatures below 30° C, is treated with such quantities of lime powder that the sugar is precipitated as sucrate of lime, which after being separated from the liquid in filter presses, yields a very pure sucrate of lime capable of serving to defecate or separate the raw juice.—T. H. P.

Starch Manufacture; Impts. in ——. W. H. Uhland, Leipzig-Gohlis, Germany. Eng. Pat. 11,428, Aug. 11, 1900.

Claims are made for: (1) A process for the continuous separation of starch from raw starch or impure solutions of starch from potatoes, wheat, maize, and similar materials, the mixture of starch and water being passed down a conical pipe of increasing section, and afterwards deflected radially by means of a conical body. The liquid then ascends in a vessel of increasing sectional area in which it suffers such a reduction in velocity that the downward motion of the starch particles caused by gravity overcomes the motion of the fluid, which continually flows u through a pipe in the upper part of the vessel, whilst starch in a highly concentrated condition is continu drawn off from the lowest part of the vessel, and can further treated; (2) Treatment of the residuum wl flows off with fresh water, followed by renewed separat until pure starch solution and residues remain; (3) carrying out the process described in (1) and (vessel *a* of any desired section with a bottom conve to a point, and with a conical pipe, C, suspended in conical deflector; *e*, an outlet, *i*, and an overflow pi for the purpose of reducing the velocity of the fluid flo through, and thereby effecting the separation of suspended starch or residues; (4) Also a combined arrangement consisting of a circular body, *f*, a acutely conical body, *h*, and regulating gear at *i*, whicl be controlled and set by means of the hand wheel, *k* worm and worm wheel for enabling a continual and un outflow of concentrated starch milk from the appar (5) The combination of several of the apparatus desc in (3) and (4) either side by side or one above the for mixing the separated starch solution with fresh er, and further separating the starch from the liquid.

—T. H.



XVII.—BREWING, WINES, SPIRITS,

Arsenical Poisoning from the Consumption of Bee other Articles of Food or Drink. First Report Royal Commission. Part I. Report. (See als Journal, 1901, 644.)

In February of this year a Royal Commission, con of Lord Kelvin, Sir W. Hart Dyke, Dr. T. E. T Mr. H. C. O. Bonsor, Drs. Church and Whitelegg appointed to ascertain, with respect to England and W (1) The amount of recent exceptional sickness and attributable to poisoning by arsenic; (2) whether exceptional sickness and death have been due to ars beer, or in other articles of food or drink, and, if so, what extent; (*b*) by what ingredients, or in what the arsenic was conveyed; and (*c*) in what wa such ingredients became arsenicated; and (3) if it be that exceptional sickness and death have been nic in beer, or in other articles of food or drink, by t safeguards the introduction of arsenic therein can be rented.

'he Commission has now examined 51 witnesses, and marises in this first report, dated 6th July 1901, the clusions arrived at from the evidence already received er the following heads.

. *The Extent of the Recent exceptional Sickness and th in England and Wales attributable to Poisoning by enic.*—In the county boroughs of Manchester and ord, which were the most seriously affected by the emic of the latter part of 1900, the medical officers of th estimate that at least 3,000 persons suffered by it; s are being taken to obtain further information.

. *The Causation of the Recent Epidemic of Arsenic soning.*—The evidence has been uniformly to the effect the epidemic was attributable to beer contaminated arsenic at numerous breweries, and when the nicated beer was withdrawn from sale, the epidemic dily died out. In all cases where sickness has been ed to beer from particular breweries, the latter have been s of brewing sugars supplied by Bostock and Co., Ltd., Garston, near Liverpool. The quantity of arsenic cted in specimens of the above-mentioned sugars has relatively large, the percentages of arsenious oxide ing from 0·008 (0·56 grain per lb.) to 0·131 (9·17 s per lb.). The implicated Bostock sugars owe their amination to the use, in their manufacture, of sulphuric supplied by Nicholson and Sons, Ltd., of Leeds, such as taken from Bostock's works, containing, in one as much as 2·6 per cent. of arsenious oxide. The actions between these two firms being about to come e a court of law, the Commissioners have not sought portion between the firms, or between individuals, the nsibility for the acts of omission or commission which entailed sickness or loss of life. Conclusion as to the t amount of arsenic present in the inculpated beer rendered difficult by the fact that different analysts employed different methods of analysis, the Commis- proposes "to make further inquiry into the relative of different quantitative tests for arsenic in beer, as e most trustworthy methods to recover all the arsenic nt in a given sample of beer, and as to the possible ence of arsenic in beer in some combination with ic matter in which it might escape determination by in of the tests commonly employed." Dr. Tunnicliffe stated that he has detected a relatively considerable tity of selenium in a sample of Nicholson's acid, in a le of Bostock's glucose, and in a sample of beer factured with Bostock's sugars; no evidence confirma- of this has been received; on the contrary, the absence lenium from samples of Bostock's brewing sugars and stock-brewed beer has apparently been proved in a derable number of instances.

Medical and Toxicological Aspects of the Epidemic.— of the sufferers by the epidemic were heavy beer ers, whilst others were probably quite moderate mers. Reports of researches received, indicate that rtain conditions the elimination of arsenic from the may take place much more slowly than has been rto generally supposed, and the evidence "suggests on as necessary in comparing the effect of arsenic in quantities taken at irregular intervals along with beer n uncertain relation to food, with the effect of its inal administration under medical supervision." many of the beer drinkers attacked, the symptoms hardly, if at all, to be distinguished from those of the e known as "alcoholic peripheral neuritis," which, gh customarily associated hitherto with the con- tion of large quantities of alcohol by spirit drinkers, y certain physicians in Manchester and Salford, from local experience of the disease before the 1900 mic, come to be regarded as essentially one which ed beer drinkers. Further facts are hoped for with l to the suggestion by the evidence that in Manchester alford, for some years before 1900, alcoholic peripheral is has been more common than in large towns in parts, where excessive drinking is apparently no less on than in Manchester.

D. *Arsenic in Beer previous to the Epidemic.*—Beer other than that brewed with the contaminated Bostock sugars of 1900 has in the past undoubtedly contained, and does now contain, small quantities of arsenic.

E. *Ways in which Arsenic is liable to gain access to Beer.*—Arsenic may be introduced into beer by way of (1) brewing sugars, (2) malt, and (3) other ingredients, such as chemical substances used for various purposes. As regards brewing sugars, where the source of risk is mineral acid, the evidence shows that such acid can be commercially obtained free from arsenic. Further, the Commissioners state "we are of opinion that the use in the malting kiln of fuel selected on account of its freedom from arsenic, supplemented by a careful process of screening, brushing, and cleansing of the malt, will insure the protection of the public from danger due to the presence of arsenic in malt," and by the exercise of care in the other ingredients liable to contain arsenic, no risk of contamination need arise. In rare instances very minute amounts of arsenic have been detected in hops, and it is hence desirable that the hop drier also should exercise care in the selection of the fuel he uses.

F. *Arsenic-free Beer.*—Since the epidemic, brewers and others have adopted precautions to obviate the access of even minute amounts of arsenic to beer. Although some tests for arsenic are very delicate, so that any beer, however carefully prepared, would, if examined in sufficient quantity, be liable to show minute traces of arsenic, "in the absence of fuller knowledge than is at present available as to the possible effect of consumption of mere traces of arsenic, we are not prepared to allow that it would be right to declare any quantity of arsenic, however small, as admissible in beer or in any food, and we think it should be the aim of the manufacturer to exclude arsenic altogether." As regards beer, the Commission recognises the desirability of ultimately defining, in terms of a standard quantity of beer and of a standard test, a proportion of arsenic to be regarded as altogether inadmissible, but considers the institution of further inquiry as essential before recommending the standard test to be imposed.

G. *Arsenic in Articles of Food and Drink other than Beer.*—In instances where arsenic has been detected in articles of food or drink other than beer, the amounts reported have been minute, and have not seemed to indicate material danger to public health. By inviting the co-operation of public analysts throughout the country and in other ways, steps are being taken to obtain further information as to "whether or not in the case of a given article of food there is risk of access of arsenic, owing to lack of knowledge or of care on the part of the manufacturer, and to determine the extent of risk in the absence of suitable precaution."

H. *Administrative Considerations.*—The report goes on to consider how far the recurrence of such an epidemic as that of 1900 may be avoided in future by the action of existing authorities: (*a*) under the Sale of Food and Drugs Acts, by the County or Borough Councils, or by their public analysts; (*b*) under the Public Health Acts, by town councils or urban and rural district councils, or by their medical officers of health; (*c*) under the Revenue Acts, which can afford security only as regards articles subject to duty, by officers of the Revenue. The Commissioners think that some improvement in administrative measures is called for, and consider it essential to await further evidence before making final recommendations. As a provisional measure they suggest that the Board of Inland Revenue should possess and exercise powers to specify in detail those ingredients of beer liable to contain arsenic, and "to prescribe for every such ingredient, and for the different materials used in their preparation, an adequate test which should ensure their freedom from arsenic, and to prohibit, under penalty, the use in a brewery of any material which infringes the prescribed test."

In an added memorandum, dated 10th July, 1901, by Dr. Whitelegge, the latter expresses the opinion "that at the present stage of the inquiry, and in a provisional recommendation, the reference of administration and standards to the Board of Inland Revenue should be limited to materials found upon the premises visited for revenue purposes," namely, breweries and brewing sugar factories. He further states that it remains to be determined whether careful selection of fuel used in malting, or subjection of it to some safeguarding process, would not be a surer basis of precaution than reliance upon certificates of compliance with a standard chemical test, the value of which in practice must depend upon the proper choice of samples taken from a large bulk of fuel.—T. H. P.

Malt-Kilns; Arsenic in ——. T. Fairley. Analyst, 1901, **26**, [304], 177—180.

It is pointed out by the author that when fuel containing arsenic has been used for a long period in a malt kiln the walls and tiles may become so coated with arsenic that a change to a purer fuel will not lead to security from contamination of the malt.

In older unglazed tiles, weighing about 13 lb. and measuring about 1 sq. ft., he has found from 109 to 36 grains of arsenic trioxide, whilst in glazed tiles the amount, after removal of exterior dust, ranged from 25 grains to none, according to the perfection of the glaze. In his opinion, all tiles into which arsenic has penetrated should be removed from the kiln. Although the arsenic on the malt is generally external, he considers that reliance should not be placed on any mechanical brushing or screening to effect its removal.

In the analysis of the tiles from 2 to 5 grms. were treated with 20 to 50 c.c. of 25 per cent. sulphuric acid, the volume of the liquid made up to 50 or 100 c.c., and a measured portion with the powder in suspension, tested by Marsh's method, about 2 inches of the exit-tube of the flask being heated for 30 minutes. The mirrors obtained were then compared with standard arsenic mirrors.

For gravimetric determinations from 10 to 20 grms. of the finely powdered tile were distilled with pure hydrochloric acid containing ferrous chloride, and the arsenic in the distillate precipitated and weighed as sulphide.

In examining the dusts, 5 grms. were treated with 10 to 50 c.c. of strong sulphuric acid and about 20 c.c. of nitric acid (sp. gr. 1·42). After oxidation of the organic matter the nitric acid was boiled off, and the liquid cooled, diluted, boiled to expel oxides of nitrogen, and made up to 50 or 100 c.c. In the gravimetric tests 5 grms. of dust were distilled with hydrochloric acid as in the case of the tiles.

Purification of Sulphuric Acid from Arsenic.—In order to obtain sulphuric acid free from arsenic, the author took advantage of the fact that this acid can be distilled quietly in the presence of alkali bisulphates, whilst arsenic in the form of arsenic acid does not volatilise under these conditions.

A retort was about half filled with the commercially "pure" acid, and 25 to 30 per cent. of sodium or potassium bisulphate, or proportionately less sulphate, introduced. After the addition of a small quantity of potassium permanganate or bichromate, to ensure the complete oxidation of the arsenic, about two-thirds of the sulphuric acid were distilled over.

In the purification of *ordinary* commercial acid it was found that ammonium sulphate could take the place of other alkali sulphates, and that it also destroyed any oxides of nitrogen that might be present.

Amount of Arsenic Trioxide in Tiles and Dusts.—The percentage results obtained by the author by the Marsh method described above, are shown in the subjoined summary:—

A. Floor tiles, unglazed: 0·12; 0·064; 0·04.

B. Floor tiles, glazed and cleaned: 0·03; 0·02; 0·02; 0·01; 0·008; none.

C. Floor tiles, dust from under surface: 1·0; 0·8; 0·75; 0·7; 0·3; 0·2.

D. Malting room, dust from walls above floor; 0·06; 0·04; 0·035; 0·03; 0·02.

E. Chamber or space below malting room, dust from walls, &c. (often chiefly culms): 0·05; 0·035; 0·03; 0·025; 0·012; 0·008; 0·007; 0·04; 0·0025. The dust giving 0·04 per cent. was sifted to separate the culms, and then showed 0·07 per cent.

F. Malt-screening machines, dust containing much organic matter: 0·01; 0·004; 0·0016.

Several of these determinations were repeated gravia
cally, and gave results in close agreement with the ab
—C. A. M.

Yeast; A Conjugating ——. B. T. P. Barker. Pro Royal Soc. 1901, **68**, [447], 345—348.

Commercial ginger was placed in sterile saccharose-M
solution, and kept at 25° C., until the organisms on
surface attained vigorous growth; the organism, whic
the subject of the paper, was separated by means
fractional plate-cultures of beer-wort gelatin; a pure cul
was obtained from a single cell in a hanging drop of b
wort gelatin. Reproduction by budding in the usual ye
like manner took place best at 25°—30° C., the limi
temperature being 37°—38° C. and 10°—13° C. In han
drops of distilled water details of the conjugation
observed at 25° C.; the cells originally homogeneous, be
to grow vacuolated and develop bright-looking granu
in 12 or more hours a beak-like tubular process bega
form, which grew until it came in contact with the bea
a neighbouring cell, when fusion of the protoplasmic cont
of the beaks took place, and the protoplasm of the
began to contract and form small rounded masses w
eventually developed into spores. The spores germi
normally; occasionally fusion of spores takes place be
germination. It is proposed to place the organism
new genus, *Zygo-saccharomyces.*—J. W. H.

Yeast; Nitrogenous Nutrition of ——. P. Thomas Comptes Rend. 1901, **133**, [5], 312—314.

The author has studied the assimilation of pure nitroge
materials by yeast, fermentation being restricted, as fa
possible, by suitable exposure of the cultures to ai
shallow layers. When urea was employed as the
genous nutrient it was found, with concentrations of s
(glucose) of about 10 per cent., that fermentation was
slow and the assimilation of nitrogen very weak, the
produced being poor in nitrogen. Under the same
ditions, however, but with 20 per cent of sugar, the re
were very much more favourable.

Keeping the other conditions constant and increasin
quantity of urea added, it was found that the quanti
yeast formed, tended towards a maximum, as did also
quantity of nitrogen assimilated and the percenta
nitrogen in the yeast. When this maximum was rea
increasing quantities of urea produced no effect; the
of this maximum appears to depend on the quanti
yeast sown and the nature of the nitrogenous nutrient.

When the urea was replaced by the correspo
ammonium salt—ammonium bicarbonate—the conce
tion of 20 per cent. of sugar was still the most favou
for good assimilation. On increasing the quanti
ammonium salt, the weight of the yeast produced and,
all, the assimilation of nitrogen were also increased.
increase is not indefinite, but also tends towards a maxi
much higher, however, than in the case of urea. The a
concludes that the percentage of nitrogen in the ye
very variable, changing with the nature of the nitrog
nutrition. It does not appear, as Hayduck thoug
have any direct relation to the fermentative power
yeast. In the case of mixtures of nitrogenous nut
the problem is more complicated; it has been show
grape must that the yeast makes use preferably
ammoniacal nitrogen, the organic nitrogen of the
being scarcely attacked. The author cites experi
which appear to show that ammoniacal nitrogen is
sary for the yeast, even when the latter has an abu
supply of another form of nitrogen. A series of cu
containing equal quantities of acetamide, received in ad
increasing quantities of ammonium acetate. Wh
ammonium salt was either absent or in small prop
the acetamide was barely attacked, but with larger qua
of ammonium salt an assimilation of nitrogen simultan
took place from both forms of nutrient.—J. F. B.

Bottom Brewery Yeasts; Preparation of ——, *Ferment at High Temperatures.* G. Jacquemin. Soc. Chim. 1901, **25**, [14], 731—736.

The author has succeeded in modifying the conditi
existence of bottom fermentation yeasts so as to mak

able of fermenting at temperatures above 20° C. without
any way interfering with the quality of the beer pro-
ed. His method of treatment consists, first, in preparing
ure culture in the usual way and then, in successive
ures, replacing a gradually increasing proportion of the
ient wort by an equal quantity of wort containing
aric, citric, or lactic acid, so that, after about 20 opera-
s, the yeast is cultivated in a medium having an acidity
valent to 7 grms. of tartaric acid per litre. The tem-
ature is also gradually raised along with the acidity, the
st finally obtained, growing readily at 25° C., or even
her temperatures. The property of fermenting at high
peratures possessed by such yeast is retained even
ugh a number of generations grown in neutral wort, and
other properties are not modified; it remains at the
om when used to ferment brewery wort prepared in the
nary way but not cooled below 20—25°. As long as
beer is kept, during storage and transit, at a temperature
or 2 degrees lower than that of fermentation it will
ain clear. It is hence possible for the brewer to modify
temperature of working so as to dispense entirely with
necessity of refrigerators, even in southern climates.

—T. H. P.

*st; Oxydase Reactions of ——. The Functions of the
rydase.* J. Grüss. Woch. für Brau. 1901, **18**, [26],
5—338.

author draws attention to the close parallel between
physiological processes in the fermenting yeast cell and
germinating barley corn. In both cases very similar
lases, accompanied by masking reducing bodies, are
ed, sugar is assimilated and transitory reserve material
d up. Further investigations have shown that top-
entation yeast containing active oxydase brings about
oxidation of aldehyde to acid. The action of the
me on amines was studied with asparagine. The
ts showed that the asparagine was absorbed or decom-
d with production of an acid, which, however, could
e identified. If this acid were aspartic acid it would
ly indicate hydrolysis, but if, as is more probable, it
malic acid it would show oxidation. The oxydase
ion of yeast is better preserved after immersion in
agine solution than in water, which is evidence in
r of its specific activity towards the former. The
uction of malic acid and its subsequent reduction by
"reducing body" would account for the presence
uccinic acid in fermented liquids. Yeast oxydase
n action upon several other bases besides the "tetra
" (Tetramethyl-*p*-phenylenediamine) employed, but
author has found no convenient substitute for this
test reagent. Trials were made with several other
es and races of yeast in addition to the bottom-fermen-
beer yeast and the top-fermentation distillery yeasts
es II. and V.] with which the main experiments were
ed out. Some of these other yeasts gave no reaction
l. Certain wild yeasts reacted very strongly with the
ra soda paper," and a red Torula was most remarkably
e. The characteristics of various oxydases may be
conveniently studied in the different parts of the tissue
tatoes, testing their reactions after heating for various
ds at various temperatures under alcohol. The oxydases
divided into two classes: those which react with
cum and also apparently with "tetra-base," to which
g laccase and the oxydase of the parenchyma of
oes; and the so-called "amino" oxydases like sper-
and yeast oxydase, which do not react with guaiacum
o with "tetra base" and certain other amines.

—J. F. B.

*Yeast in Pressed [German] Yeast; Detection of ——,
Bau's Method.* S. Küttner and C. Ulrich. Zeits.
entl. Chem. **7**, 185—186. Chem. Centr. 1901, **2**, [5],
3.

authors examined Bau's method by subjecting a 1 per
solution of raffinose to the action of a pure culture
rmentation yeast and of pressed yeast admixed with
n quantities of beer yeast. The results obtained prove
omplete reliability of the method.—A. S.

Beer Yeast in Pressed [German] Yeast; Detection of ——. H. Herzfeld. Zeits. öffentl. Chem. **7**, 220—221. Chem. Centr. 1901, **2**, [5], 363.

The author agrees with Küttner and Ulrich (see preceding abstract) that pressed yeast of authentic purity would not be indicated as questionable by Bau's method. He also uses the following method, which gives results agreeing well with those obtained by Bau's method. 10 c.c. of a 1 per cent. solution of melitriose are well agitated with 1 grm. of the yeast, and the mixture introduced into an Einhorn's fermentation saccharimeter, in the same manner as in urine analysis. If the saccharimeter be placed in a thermostat at 30° C., then a pressed yeast containing at least 5 per cent. of beer yeast would develop in 24 hours, at least 4—5 c.c. of carbon dioxide; pure pressed yeast, prepared by the old (Vienna) process, never more than 3 c.c.; and yeast prepared by the aëration process, ("Lufthefe") not more than 4 c.c.

The author cannot entirely agree with Langfurth's condemnation of Bau's method as regards its value for commercial yeasts (this Journal, 1901, 843). For yeasts prepared by the old process, the results obtained by Bau's method are irresistible. If, with a "Lufthefe," complete fermentation has taken place after 24 hours, the yeast may be regarded as suspicious, and should be further investigated. The factory whence the yeast came should be ascertained, and the yeast of this factory examined by Bau's method. If complete fermentation has taken place after 24 hours, it is still not proved that there has not been an admixture of beer yeast, and recourse must be had to other means for absolute proof. If the yeast of the factory has not caused complete fermentation after 24 hours, and it remains unchanged in a sufficient series of generations, then the suspected yeast must be regarded as adulterated.—A. S.

Beer; Nathan's Process for Brewing ——, in a Closed Vessel. P. Lindner. Woch. für Brau. 1901, **18**, [28], 354—356.

The author describes his experience of Nathan's process and apparatus (Hansen's Apparatus), gained during a visit to a Zürich brewery, where the plant had been, commercially, in operation for some months, and had given entire satisfaction. The principle of the process is to carry on fermentation under aseptic conditions, such as obtain in Hansen's and other pure yeast cultivation apparatus. The fermenting vessel is a cylindrical tun of iron, cast in one piece, of about 100 hectolitres capacity, provided with an airtight cover and a four-bladed propeller or "rouser," of which the shaft passes through the cover. The whole of the internal surfaces are heavily enamelled with 5 superimposed layers of glaze, the inner one white, the other four of glass, fired at a very high temperature so as to fuse the whole into one mass. Experience has shown that this glaze resists great extremes of temperature without cracking or peeling, for long periods. The vessel, externally, is fitted with a wrought-iron jacket into which steam (up to 3 atmospheres pressure) or cold water can be admitted, for boiling or cooling purposes. In operation the hot wort from the copper is charged into the apparatus, if necessary, again boiled to ensure sterilisation, and cooled down to the pitching temperature. During cooling, filtered (germ-free) air is drawn in near the bottom of the tun; and the rouser kept going in order to facilitate cooling, for which 3—4 hours are requisite. The wort is then pitched with 10—15 litres of yeast drawn into the apparatus by suction, and thoroughly roused. Fermentation is under absolute control as regards temperature, degree of aeration and rousing, &c., and when complete, the beer is carbonated and filtered; or it may be filtered into another similar apparatus and there carbonated, pasteurised, or otherwise treated.—H. T. P.

Beer; Practical Control of the Keeping Qualities of ——. C. Bergsten. Woch. für Brau. 1901, **18**, [30], 384—385.

In order that the brewer may have a check on the keeping properties of his beer, and deal with fraudulent claims for deterioration, the author advises that samples be taken from each batch systematically, and kept under observation for a month at the temperature of the room. Two methods are recommended:—According to the first, the sample is taken from the vat as it is racked off and placed in sterilised bottles of 10 c.c capacity and tightly corked. The bottles are placed on a shelf pierced with holes, each labelled with the day of the month, one sample being taken every day. In this way the beer is preserved in presence of its own gas, which is its natural protecting agent. The length of time during which the beer remains good without formation of cloudiness or sediment, is taken as a measure of its permanence; the deposit formed is then examined with the microscope. The second method is designed more especially for bottled beers; a sample is taken in the bottling cellar each day and kept in white glass bottles of about one-third of a litre capacity, which have merely been washed in the ordinary manner. The bottles are corked and stored on racks in a dark room and kept under observation in the same way. Except in the hot weather, beer ought to keep good for about three weeks under these conditions. The author speaks highly of the great utility of Tornoe's beer-refractometer, which gives very accurate results for the rapid determination of the alcohol and the true extract of beer; he advises that all beer returned as bad by the retailer should be checked, in order to see whether there has been any admixture of water or residues of other beers which might have caused infection.—J. F. B.

Beer or similar Beverage; Process for Manufacture of ——, *with simultaneous Production of Pressed Yeast.* F. Sauer. Ger. Pat. 121,524, 1900; through Woch. für Brau. 1901, **18**, [27], 346—347.

In Germany the ordinary bottom-fermentation beer yeast is of little value for the manufacture of pressed yeast, and top-fermentation yeast of the distillery type is invariably employed. This invention has for its object the production of Lager beer by fermentation in two stages, first with a distillery yeast for the manufacture of pressed yeast, and finally with a bottom-fermentation beer yeast. The wort for the distillery yeast is prepared with kilned malt only, without green malt, but with the addition of raw grain; its treatment is otherwise the same as in the manufacture of pressed yeast, and it is of course an unboiled and unhopped wort. After fermentation with the distillery yeast, the wort is separated from the yeast and heated in a closed vessel to sterilise and coagulate albuminoids. There is then added a very concentrated hopped beer wort of a density of about 30° Balling. This wort is mashed at 70° C., so as to be especially rich in isomaltose and dextrinous constituents. After mixing with the highly attenuated distillery wort, the proportion of unfermentable carbohydrates should be about the same as in beer wort. The mixture is finally fermented in the Lager vats with ordinary beer yeast at a temperature of 4°—5° C., and is ripened by secondary fermentation in the ordinary way.—J. F. B.

Breweries; Risk of Microbial Infection in Top-Fermentation ——. R. Schönfeld. La Bière, **9**, [6], 85—87. (See also this Journal, 1901, 490.)

Infection of Wort through delay in Pitching.—Unless immediately pitched with yeast, the wort entering the fermenting tun in a cooled state is exposed to infection by wild yeasts and bacteria; hence any delay in pitching is dangerous. Even in the case of beers intended for immediate sale, and when the amount of yeast has to be reduced in order to prevent undue fermentation in the trade casks, about $\frac{1}{5}$th to $\frac{1}{6}$th the total quantity requisite for the whole brew should be added as soon as the first portion of the wort is run into the tun. In any event it is better to commence brewing at a later hour than to leave the cooled wort in an unprotected condition.

Infection in the Fermenting Vessels.—If the head of yeast be left too long before removal, it is liable to infection especially where there is a possibility of access of dust from outside the fermenting room. This yeast will then infect the latter batches which it is employed to pitch, and the necessity for changing it will soon become apparent. To guard against this danger, the yeast should be skimmed off as soon as the head begins to subside.

Bacterial Infection in Cask Fermentation.—Where fermentation is conducted in casks, thorough sterilisatio essential. The washing and steaming by which this effected are, however, frequently performed in a perfunctory manner, the water being insufficiently hot the steaming applied for only a few seconds. The is accentuated by the difficulty of inspecting the inter and should an infected wort be introduced into the e even prolonged washing and steaming may prove ineffe especially in the case of old or defective barrels.

Another danger arising during the cleansing metho cask fermentation is the facility afforded for the deve ment of bacteria on, and in, the wood of the cask during time the beer is throwing up the head and underg aeration, which bacteria readily infect the beer subseque placed in the cask.

Infection of Yeast during Storage.—Where y intended for pitching has to be kept some time before it should be stored at as low a temperature, and in as water as possible; otherwise the water will extract suffi soluble matter from the yeast to form a highly sui nutrient medium for the bacteria with which it is prob already infected, and the yeast will be spoiled.—C. S.

Lactic Acid Bacteria of Distillery Mashes, Milk, Beer. W. Henneberg. Woch. für Brau. 1901, **18**, [381—384.

The author gives a descriptive summary of the mor logical and physiological properties of the principal sp of lactic acid bacteria.

Bacillus Delbrücki (Leichmann), named by Lafa *acidificans longissimus*, is the bacillus employed for acidification of distillery yeast mashes. It grows best a limited quantity of air, and the most favourable tem ture is about 45° C. It forms lactic acid from most o sugars, but not from milk sugar; cane sugar is not inve No volatile acid is produced and the acid is not consu the maximum acidity produced in mashes was 1·4—1 cent. The quantity of acid and the rate of formation v with the temperature. The author describes a new va of this species which grows better in presence of air, produces less acid than the original.

Bacillus lactis acidi (Leichmann), the bacillus of turned sour at 50° C., has longer cells than the prec species. The development proceeds best at 43°—48 first, and later at 36°—39° C. It produces acid from sugar; no volatile acid is formed and the acid is not consu The maximum acidity is rather less than that pro by the last species. In this case, also, aëration res the acidification; this species is more resistant to temperatures.

Pediococus lactis acidi (Lindner), the "spher bacterium of distillery mashes, occurs as round cells gr in chains of 2 or 4. It produces lactic acid from sugar but not from cane sugar or maltose. The best perature for its development is between 34°—40° C., or no volatile acid is produced. There is really danger from this organism in the distillery, unle obtain a large start from the first; it is very frequ predominant on barley, rye, and malt.

Bacterium lactis acidi (Leichmann), the bacteriu milk turned sour at ordinary temperatures, does not in beer or hopped wort. It grows best at 35°—38 C. acidity produced is always very low, never over 0· cent. The acid formed appears to be consumed to extent; the acid is inactive lactic acid, no volatile being formed.

Saccharobacillus pastorianus (van Laer), the bacillus of "turned" Belgian beer, grows best at 29°—3 it forms lactic acid from most of the sugars, but o little from starch and milk sugar. The producti acidity is almost as high as with *B. Delbrücki*. In centrated, unfiltered mashes much carbonic acid is ev formic and acetic acids and alcohol are also fo Another variety of this species occurs as shorter, u nected cells.

Saccharobacillus pastorianus, variety *berolinensi* lactic bacillus of Berlin "Weiss-bier," grows b 21°—24 C.; the acid produced appears to be the in dification, volatile acids and alcohol are also formed. maximum acidity developed in mash was 0·8—1 per t. This species occurs on grain and malt but is easily pressed by other organisms.

Bacillus Lindneri, the lactic bacillus of "turned," hopped ger beer, grows best at 21°—23° C. Pale Lager beer is n rendered quite cloudy by this bacillus and the flavour hanged in a characteristic manner, dark beers are more stant. Carbonic acid is evolved; the maximum acidity luced is less than 1 per cent.—J. F. B.

r; Atmospheric Infection of ——, and its Dangers. . Fernbach. Ann. de la Brasserie, **4**, [8], 169—172.

view of the greater danger from air-borne microanisms in the case of breweries situated in towns, the ior recommends the abolition of the open cooler, or at the removal of the wort therefrom before it has cooled n to a temperature at which bacterial development mes possible. Air filters should also be subjected to uent inspection, the yeast changed at short intervals, a careful examination made of the surrounding air in r to ascertain the most likely quarter for microbial tion to arise. This investigation can either be coned by the Pasteur method of taking samples of air, or, conveniently, by exposing plates, coated with sterilised -gelatin, for a definite time, *e.g.*, five minutes, in posi affording the greatest probability of infection, and nining the cultures so obtained.—C. S.

Beer; Starchy and Dextrinous Cloudiness in ——. K. Kurz. La Bière, **9**, [5], 66—69.

pears certain that dextrinous cloudiness in beer cannot ue to the erythrodextrin II., which is readily soluble in e alcohol, nor to the achroodextrins (these being comly soluble in water), but to erythrodextrin I., this being nt in a state of diffusion (not solution) from which dually separates in the form of solid particles, which in in suspension for a considerable time, thus producing iness.

e formation of this intermediate product of saccharificaor rather its non-conversion into more advanced pro-, is due to imperfect action of the malt diastase, may be crippled at various stages of the malting and ing processes. Thus, imperfect or excessive steeping, icient ventilation or handling on the malting floor, may to this result. Again, insufficient preliminary drying ering) of the malt before kilning, leaves the diastase susceptible to the influence of heat than when drier, y facilitating the gelatinisation of the starch, produces malt, which is less permeable by the diastase and ore more likely to lead to starchy haze in the beer. herefore necessary to reduce the percentage of moisture malt to 5—8 per cent. in the case of pale malt, and 8 per cent. in dark malt, before exposing it to a kiln rature of 50° C. Another essential feature in kilning ficient ventilation to remove the moisture as soon as rated, and the arrangement of the heating apparatus to prevent local overheating whilst the malt is still Occasionally, when the constituents of the grain perfectly modified, the condition may be improved by e, which allows the diastase to recuperate.

protect the diastase, the mashing temperature should not wed to exceed 75° C., the water being added slowly and rrers kept in rapid motion; if the malt be defective, the temperature should not exceed $\frac{3}{4}$° C. per minute. decoction method, the volume of the mash should tricted and the heat applied slowly, a stoppage of minutes being allowed between 70° and 75° C. to conversion, a longer time being granted if there reason to fear starchy haze. The proper degree of sion is indicated by a brown colour reaction with Imperfect action on the part of the stirring appanay cause starchy haze, by leaving the grains insuffidisintegrated and thereby retarding the action of the e, the result being that either the deposited starch is off with the goods into the copper, where it is gelatiwithout conversion, or else it is extracted by the ng liquor and, if the latter be too hot, will also be ised and remain unsaccharified.

A point of interest, especially to small brewers using only a single thermometer, is recorded in the case of a brewery where, despite all precautions with regard to temperature, the beer from good malt was invariably subject to starchy haze, until it was ascertained that the thermometer in use registered about 8° too low.—C. S.

Beer; Filtering ——. M. Lamont. La Bière, **9**, [2], 21—23.

The advantages of filtering—which is mainly confined to low-fermentation beers—are that clarification is insured without alteration in flavour; in fact the flavour is improved owing to the removal of all organisms and matters in suspension.

On the other hand, the operation is attended with the following inconveniences: The beer suffers a certain loss of flavour. Again, filtered beer loses its keeping properties, the larger yeast cells being removed whilst some of the smaller bacteria traverse the pores of the filtering medium and infect the beer, and as the secondary fermentation cannot take place, the bacteria have the field to themselves. Consequently, filtration with a sole view to improving the stability of the beer is a dangerous operation, and its utility is restricted to clarification.—C. S.

Fermenting Vats; Varnished ——. Brand. La Bière, **9**, [2], 18—21.

The author's own experience of the effect of varnished fermenting vats on the fermentation process, is that the attenuation is practically unchanged, but that the consistence of the (low-fermentation) yeast leaves much to be desired, the yeast being too liquid at first, though an improvement is observed as time goes on. The head and "break" of the beer are normal. These results agree with those obtained in a Nüremberg brewery, and it is therefore considered that, in view of the greater facility for cleaning afforded by the use of varnish, the practice is an advisable one.—C. S.

The "Tourne" Ferment; Influence of the Composition of Wine on the ——. J. Laborde. Ann. de la Brasserie, **4**, [7], 149—156.

The influence of alterations in the proportion of alcohol, acidity, tannin, and sugar, on the development of the "tourne" ferment was examined by the author, working with a wine of the following initial composition: alcohol, 11·00°; total acid, 3·55 grms.; volatile acid, 0·95 grm.; tannin, 3·60; sugar, 2·50; potassium bitartrate, 4·89 grms. The wine, which was already infected with the ferment in question, was placed in 200 c.c. flasks, and sterilised by exposure to a temperature of 65° C. for two minutes. After inoculation, the samples were kept at 25°—28° C. for different periods, not exceeding eight months, the amount of volatile acid being determined in each case as affording the best criterion of the activity of the ferment.

Influence of Alcohol.—The results show that the presence of up to 16 per cent. (by vol.) of alcohol—*i.e.*, about the highest limit usually found in red wine—does not prevent the development of the ferment, the presence of the organism being revealed by the microscope; whilst the amount of potassium bitartrate had decreased from 1·89 grms. per litre to 0·86 grm. The determination of the nature of the volatile acids by the Duclaux method, indicated a proportion of 3·01 grms. of acetic acid to 0·30 grm. of propionic acid, a mixture known to be present in all wines infected with the ferment.

Influence of the Acidity.—The increase of volatile acid falls away up to 5·65 grms. of total acidity, at which point it disappears entirely; hence the activity of the ferment appears to be paralysed by about 5 grms. of acid per litre, though this is not altogether the case.

Influence of Acidity during Fermentation.—Experiments made with grape must containing up to 8 grms. of acidity per litre, however, showed that the microbes are capable of still acting in presence of 6 grms., though in this case they cannot do much injury to the wine. The fermentation was unusually slow, and it is considered that in practice an acidity of 5 grms. per litre will suffice to weaken the power of the organisms, both during the fermentation and the storage of the wine. Below this limit the development of the ferment was inversely proportional to the acidity, and where the acidity had been completely neutralised, mannite sickness supervened.

Influence of Tannin.—The presence of even as much as 7·20—7·75 grms. of tannin per litre does not seem to affect the activity of the ferment; indeed, in one instance where the wine was inoculated with yeasts and bacteria, the total acidity was greater in presence of 7·20 grms. of tannin than of any smaller quantity. This result, however, is due more to the retarding influence of the tannin on the yeast, whereby alcoholic fermentation was arrested, the sugar present then falling a prey to the microbes. It may therefore be concluded that the tannin of wine does not prevent the development of the ferment.

Influence of added Oak Tannin.—An addition of about 1 grm. of gallotannin per litre will paralyse the microbe; but unfortunately the addition of a larger quantity than about ½ a grm. is rendered impossible by the resulting bitterness and astringency imparted to the wine. A white wine already attacked by the microbe may be rendered resistant thereto by an addition of 3—4 grms. of gallotannin per litre, but in this case also the same objection applies.

Influence of Sugar.—To investigate the action of the ferment on the two sugars constituting the invert sugar of wine must, a sample of wine containing 3 grms. of total acidity, and 0·70 grm. of volatile acidity per litre, was treated with increasing quantities of glucose or levulose, up to 10 grms. per litre, and then inoculated with the ferment. The results show the predilection of the microbe for sugar, the amount of total acidity produced in the case of the sugared samples being quite fivefold that formed in the check sample without added sugar. The proportion of volatile to fixed acid decreases as the amount of sugar increases up to about 5 grms. per litre, beyond which limit greater constancy is attained. This is because, when the amount of sugar is small, the microbe also attacks the potassium bitartrate present. Weight for weight, levulose yields a slightly larger quantity of volatile acid than glucose, the converse holding good with regard to fixed acids, whilst in total acidity, the results are nearly equal in both cases. The volatile acidity is mainly due to the presence of acetic acid, with mere traces of a higher acid, probably propionic acid.

The method of taking the volatile acidity as a measure of the activity of the ferment in question is not always exact, since a portion of this acidity may be masked in prolonged experiments by esterification, and it is therefore preferable to determine the total volatile acid by first rendering, say, 10 grms. of the sample decidedly alkaline by double the amount of soda required for neutralising the free acid, then adding 10 c.c. of water, concentrating to half the volume by boiling, adding 0·5 grm. of tartaric acid, and determining the volatile acidity by the Duclaux method. The application of check tests to ascertain whether the extra acidity has resulted from oxidation, showed that the whole of the acidity is due to the action of the ferment, and that the latter continues to be active in certain cases where, according to the determination of the free volatile acids, it would appear to have already ceased. The weakening effect of acidity and gallotannin is analogous to the action of heat during pasteurisation to arrest the development of microbes.

The author concludes that attempts at protecting the wine from the effects of the ferment in question should be made in the fermentation stage; in subsequent stages a little benefit may be derived from the addition of acid and tannin, but the practicable limit is soon reached in both cases on account of the resulting action on the flavour, so that efforts must be mainly directed to multiplying the treatments usually practised for the preservation of the wine, pasteurisation being resorted to in difficult cases.

—C. S.

Wine Must; Concentration of——. J. Dugast. Ann. de la Brasserie, **4**, [6], 124—127.

The author concentrated several varieties of wine must at a temperature of 40°—45° C., under a pressure of 30 mm. mercury, until the volume had decreased to one-fifth, product being a thick syrup in the case of poor musts, a jelly in the case of rich musts. The concentrated m have kept well in partly filled, closed vessels, and, w diluted and fermented, yielded wines comparable with t furnished by the same grapes in the ordinary way. method has the advantage that the strength of the wine be varied according to the degree of dilution, and also the wines clarify more quickly than in the ordinary pro the effect of concentration being apparently to increase rapidity of deposition of the substances usually remai in suspension, and to precipitate at once the bodies us becoming insoluble during fermentation. For this reason, the concentrated must from red grapes gives lighter in colour than the corresponding wine prepar the ordinary manner. In the case of red wines, necessary to retain the grape skins, the most sui method being to heat the mass to 65°—70° C. three tim succession and then incorporate it with the correspon concentrated must; the mixture will keep well for months at least, and will furnish a satisfactory wine.

As to whether the process would be profitable manufacturing scale, the author inclines to the affirm provided the work be undertaken by large growers association of smaller growers, to lay down the necessary especially if other uses could be found for the plant d the off season. In hot countries the adoption of this m would enable the fermentation to be carried on in places with a more favourable climate for vinificatio during the cooler season of the year.

Concentration by congelation was attempted but f less economical.—C. S.

Wines; The Acidity of——. E. Kayser and G. B Rev. de Viticulture, **15**. Ann. de la Brasserie, **4**, 271—278, [13], 293—298.

The chief point investigated by the authors was the of adding tartaric acid to must and wine deficient in ac In the case of Petit Bouschet of 1898 vintage, cont 145·71 grms. of sugar per litre, the result of adding to the must showed practically no loss from the theor standard; but in the wines, a reduction of 18·8 per ce acidity was found in the sample receiving 0·1 per c tartaric acid (per 100 of grapes), whilst in the s receiving 0·5 per cent. of acid, the acidity increased per cent. as compared with the check sample, thou compared with the corresponding musts, there decrease of 18·8, 43·3, and 19·7 per cent., thus sh the absence of any definite ratio between the acid and that ultimately found. In the 1899 vintage, the content was 129·79 grms. per litre, and the additi 0·1, 1·2, and 0·5 per cent. of acid led to a perc decrease of 19·8, 22·1, and 22·9 per cent. respectiv the must (after four months storage as before). I wines, the percentage decrease, compared with the sponding musts, was 35·8, 18·1, 32·4, and 18·0 per but as compared with the check sample, an incre 21·6, 17·4, and 100 per cent. respectively. In th vintage the sugar content was 121·7, and the addit tartaric acid 0·124, 0·248, and 0·620 per cent.; the showed a decrease of 13·22, 5·99, and 6·42 per cen the theoretical yield. Compared with the musts, the showed the following diminution in total acidity: 24·1, and 28·5 per cent. The amount of *free tartar* found in the wines was

$$\frac{1}{1\cdot4}, \quad \frac{1}{2}, \quad \frac{1}{1\cdot8}$$

respectively of the quantity added.

Part of the check sample of the last-named win received additions of tartaric acid (1, 2, and 5 gr litre). The resulting percentage increase of total was 13·6, 29·9, and 69·1 per cent, or more portion than in the first series. The increase in t tartaric acid present amounted to 0·631, 0·927, and grms., or 63·4, 46·3, and 86·0 per cent. of the add remained uncombined, the rest having gone to form and potassium bitartrate. In this series a diminutio amount of potassium bitartrate was found in propor the percentage of free tartaric acid increased. An of citric acid was found to reduce the solubility of

is wine, though not in another kind of wine examined
his purpose; it is therefore considered probable that
eculiarity in question is due to the composition of the
Bouschet wine.—C. S.

*ylic Acid in Wines; Sensitiveness of the Different
lethods of Detecting* ——. A. J. Ferreira da Silva.

See under XXIII., *page* 938.

pyl Glycol; Oxidation of ——, *by Mycoderma aceti.*
A. Kling.

See under XXIV., *page* 941.

*Vinasses and Wines spoiled by Sickness; Utilisation
of* ——, *as Manure.* F. Garrigou.

See under XV., *page* 914.

*ol and Water; Boiling Point Curve for Mixtures
of* ——. W. A. Noyes and R. R. Warfel.

See under XX., *page* 928.

PATENTS.

s and Spirits; Rapidly Ageing ——, *and Apparatus
efor.* F. Ivison, Jerez de la Frontera, Spain. Eng.
. 17,472, Oct. 2, 1900.

ts are made for a process for ageing wines and spirits
xposing them to a confined atmosphere which by
of its access to deliquescent compounds, such as the
tes of soda or potash or deliquescent chlorides, exer-
selective action on the evaporation from the liquid;
r apparatus consisting of closed vessels for holding
ne or spirit which is separated from the deliquescent
unds, by means of a porous partition.—T. H. P.

/III.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A*.)—FOODS.

he Standard for Milk. (See also this Journal,
May 1901, 493.)

oard of Agriculture was empowered by the Sale of
and Drugs Act, 1899, to fix a standard for milk, so
hen a sample contains less milk-fat and milk-solids
he limit fixed by the standard, the milk is presumed
not genuine unless the contrary is proved. The
tions which apply to Great Britain were published
Gazette of August 6th, and come into operation
ptember 1st. The following is the wording of the
tions:—

Where a sample of milk (not being milk sold as
ed, or separated, or condensed milk) contains less
per cent. of milk-fat, it shall be presumed, for the
es of the Sale of Food and Drugs Acts, 1875 to 1899,
he contrary is proved, that the milk is not genuine,
son of the abstraction therefrom of milk-fat, or the
n thereto of water.

Where a sample of milk (not being milk sold as
ed, or separated, or condensed milk) contains less
·5 per cent. of milk-solids other than milk-fat, it
e presumed, for the purposes of the Sale of Food and
Acts, 1875 to 1899, until the contrary is proved, that
lk is not genuine, by reason of the abstraction there-
of milk-solids other than milk-fat, or the addition
of water.

Where a sample of skimmed or separated milk (not
condensed milk) contains less than 9 per cent. of
olids, it shall be presumed, for the purposes of the
f Food and Drugs Acts, 1875 to 1899, until the contrary is proved, that the milk is not genuine, by reason of the abstraction therefrom of milk-solids other than milk-fat, or the addition thereto of water.

Albuminoids; Precipitation of Some ——, *by Chloroform.* F. Krüger. Zeits. Biolog. **41**, [N.F. **23**], 341—359. Chem. Centr. 1901, **2**, [5], 359.

Salkowski has pointed out (this Journal, 1901, 379) that chloroform possesses the property of precipitating albuminoids. The author draws attention to the fact that he, in conjunction with his pupils, Graubner and Meinshauser, made some experiments on this subject 10 or 11 years ago, some of the results being published at the time. He now gives fuller details of the investigation. A description is given of the preparation of a new albuminoid, *mucosalbumin*, which is precipitated by chloroform. Egg albumin is also precipitated by chloroform; blood serum gives only a slight turbidity. Hæmoglobin is quantitatively precipitated by chloroform, not only at 50°—55° C., as stated by Formánek, but also at the ordinary temperature. The albuminoids precipitated by chloroform resemble, as regards solubility, those coagulated by heat.—A. S.

Gelatin; Conversion of ——, *into a readily-soluble, only slightly adhesive, and non-gelatinising Food Products.* Brat. Rummelsburg, Berlin. Ger. Pat. 121,997, June 6, 1900. Zeits. angew. Chem. 1901, **14**, [31], 788.

An aqueous solution of the gelatin is heated for several hours in the presence of small quantities of acid or alkali at temperatures below 100° C. The liquid is then neutralised, freed from the resulting salts, and evaporated to dryness.
—C. A. M.

Bread; Yield of ——, *from Flour.* Balland. Comptes Rend. 1901, **133**, [4], 251—252.

The author has determined the weight of the loaves made from various weights of dough, prepared with the same flour and the same yeast under identical conditions. The dough contained 45 per cent. of water and the loaves received a normal baking of 30 to 60 mins. according to their size. They were weighed 12 hours after baking and the yield varied with the size and shape of the loaf.

Weight of Dough.	Round Loaves.		Long Loaves.	
	Diameter of Loaf.	Yield per Cent. on the Dough.	Length of Loaf.	Yield per Cent. on the Dough.
Kilos.	Cm.		Cm.	
2·0	28	85	62	81
1·5	24	84	60	79
1·0	22	80	50	75
0·5	17	78	32	73
0·25	12	76	22	70

In most cases the crumb contained the same proportion of water as the original dough, but in the smallest sizes it was less, since the large proportion of very dry crust had absorbed some of the moisture from the crumb. The yield of bread, therefore, is closely dependent on the relative development of the crust as compared with the whole loaf, and this varies with the size and shape. The wheat flour employed was bolted at 70 per cent. and contained 26 per cent. of gluten. With flours bolted at 80 per cent. and those richer in gluten, the dough and the crumb contain normally rather more water (46—47 per cent.). In the case of unbolted flours termed "whole-meal," the proportion of water often rises to 50 per cent. and more, and the yield of bread increases to the same extent.—J. F. B.

Flesh Preservation; Notes on the Value of Boric Acid, Borax, and Sodium Sulphite for ——. L. Lange. Arch. Hyg. 1901, **40**, 143. Chem. Zeit. Rep. 1901, **25**, [58], 214.

Ox blood cannot be completely sterilised even by additions of 4 per cent. of boric acid; but that quantity diminishes, sometimes largely, the number of colonies that develop. Many kinds of micro-organisms appear to be encouraged in growth by 0·25 or 0·5 per cent. of boric acid. Between 0·5 and 1 per cent., the colour of the blood is somewhat preserved; above 1 per cent., appearance of a fœtid odour is postponed. Less than 1 per cent. of borax is as useless as similar amounts of boric acid; between 2 and 4 per cent. it is superior, but is never fatal to all bacteria. More than 0·5 per cent. of borax preserves the colour; more than 1 per cent. prevents all putrid odour for a month. Even 4 per cent. of sodium sulphite is neither fatal, nor does it preserve the colour or prevent foul smell in the slightest.

Boric acid is not suitable for the treatment of minced meat, for the surface becomes grey-brown in 24 hours; and certain growths appear even when 4 per cent. is employed. It is undecided whether boric acid might be adapted for flesh in larger masses, and whether it might at least preserve the interior of the pieces. Borax is equally useless for chopped meat; even 3 per cent. may permit infection, and 4 per cent. a putrid odour in three days. Sodium sulphite preserves the colour and fresh odour for two days at the most; then putrefaction proceeds more rapidly than in the presence of the other substances.

Boric acid hinders the spontaneous coagulation of milk, and at 2 per cent. entirely prevents it. Coagulation by means of rennet, however, is assisted by less than 2 per cent. of boric acid, and only inhibited by the addition of 4 per cent. Increasing doses of borax show a slightly increasing retardation of rennet coagulation. Sulphite has no effect upon spontaneous coagulation, but hinders that induced by rennet; and in quantities of more than 1 per cent. causes the casein to appear as a fine powdery precipitate instead of the usual curd.—F. H. L.

PATENTS.

Food Extract from Yeast, Dregs, Settlings, or like Waste Materials from Breweries, Distilleries, and Wines; Manufacture of a ——. L. Aubry, Munich, Germany. Eng. Pat. 13,475, July 26, 1900.

Beer, spirit or wine-yeast, is first freed from bitter principles by sifting or by treating with a 1 per cent. solution of ammonium carbonate and pressing dry. The crumbly material so obtained is mixed with from 5 to 10 per cent. of common salt and allowed to stand some time. The mixture is then diluted with an equal part of hot water, boiled for two hours, and filtered. The extract is evaporated, allowed to settle, and again filtered.

The residue of coagulated albumin and remains of cells are treated with enzymes to obtain a further extract.

—W. P. S.

Meat Extract; Preparation of ——. A. Heyen, Lausanne, Switzerland. Eng. Pat. 9091, May 2, 1901.

The process claimed, consists in adding 20 to 25 per cent. of dextrin, glycogen and inulin to meat extract. These soluble carbohydrates, either together or separately, may be added at any stage of the manufacture of the extract, but preferably during the final evaporation.—W. P. S.

Albumin; Method of Producing an Easily Digestible Peptonised Preparation of ——. H. Wilhelm, Prague, Austria. Eng. Pat. 13,906, Aug. 2, 1900.

"Kefir" is an alcoholic beverage manufactured by the Caucasian hill-tribes by fermenting cow's milk by means of the "Kefir" mushroom or berry. The patentee increases the food value of the same by adding albuminous substances. After the milk has been fermenting for several days, the milk serum separates as a clear liquid and is removed. This serum then receives the addition of fresh milk curd, egg-albumin, etc. On standing, fermentation again takes place, and is aided by the addition of milk-sugar. When complete solution of the curd and albumin has taken place, the lactic acid produced, is neutralised with a dilute solution of soda or preparations of iron, and the liquid is then concentrated below 50° C. to complete dryness.—W. P. S.

Cocoa: Manufacture of ——. M. L. H. Lich and de Weik, trading as F. Korff and Co., Amsterdam, H Eng. Pat. 14,519, Aug. 14, 1900.

Cocoa powder and sugar are boiled with water, the butter is removed by filtration under pressure, and concentrating by evaporation, the mixture receive addition of a small quantity of pancreatin, sodiu carbonate and vanilla. The product is then bottled.

—W. I

Non-alcoholic Aromatic Juices and Drinks from F Manufacture of ——. C. Enoch, Hamburg, Ger Eng. Pat. 14,783, Aug. 17, 1900.

According to this process fruit juices or extrac diluted with water, about 1 per cent. of tartaric added, and the whole heated under pressure at a tempe of 100° to 120° C. for several hours, until a sample out and cooled is perfectly clear when filtered. Wh digestion is thus found to be complete, the whole is and filtered.—W. P. S.

Margarine or other Artificial Butter; Manufact ——. M. Poppe, Bielefeld, Germany. Eng. Pat. Sept. 3, 1900.

For the purpose of flavouring margarine or other a butter, the patentee adds to the same, volatile fatt obtained from real butter by saponifying the latter, posing the soap with acid and distilling. The di from 100 grms. of butter will flavour 100,000 gr margarine, so as to confer a flavour (taste and smell said, like that of natural butter.—W. P. S.

Eggs and other Articles of Food; Preservation o W. L. Wise, London. From B. Bache-Wiig Norway. Eng. Pat. 8937, April 30, 1901.

The eggs to be preserved are first heated in "a (water is referred to), at a temperature of from 60° to and then immersed in a solution of waste sulphite l the manufacture of wood pulp. Previous to use, th heated to get rid of injurious volatile matters.—W. I

Milk, Cream, and like Substances; Process and Ap for Preserving ——. H. Marquardt, Cologne, Ge Eng. Pat. 9215, May 3, 1901.

The milk or other substance to be preserved, pasteurised, then cooled to 4° C. and filled into a cask-shaped wooden vessel, having an opening at which can be closed by means of a cover fitted tightening-up screw spindle and handle. This cask pletely filled with the milk, and the cover is screwe The pressure thus produced prevents the forma colonies of bacteria.—W. P. S.

Sterilising and Cooling Liquids [Milk, &c.]: Pro Apparatus for ——. J. C. Miller, Canton, Ohio, Eng. Pat. 11,944, June 11, 1901.

The process claimed consists of the followi "Suddenly raising the temperature of the liquid u to the required degree, subjecting it to the atmosp to liberate therefrom all gases and fumes, and sud continuously, without pause, reducing its temperatu

—

Wheaten Flour; Densimeter for the Valuation for Bread Baking. E. Fleurent.

See under XXIII., *page* 941.

(B.)—SANITATION; WATER PURIFICAT

Natural Waters; Determination of Ammonia, Nit Nitrous Acids in ——. L. W. Winkler.

See under XXIII., *page* 937.

Water; Determination of the Carbonic Acid in — J. W. Ellms and J. C. Beneker.

See under XXIII., *page* 937.

PATENTS.

*Blocks or Briquettes; Utilising for the Preparation
——, the Sludge or Scum produced during the
eatment of Sewage by Biological or Bacterial
rifying Processes.* C. J. Whittaker. Eng. Pat. 16,104,
00.

See under II., *page* 882.

er: Apparatus for Softening or Purifying ——.
. Harris, London. Eng. Pat. 14,417, Aug. 11, 1900.

der that the relation between the volume of lime water
he volume of water to be softened may remain
nt, independently of variations in the rate of flow of
ater, the inventor constructs the revolving distributor
bed in his specification, Eng. Pat. 8354, of 1900, in
way that the compartment in which is received the
n of the total water destined to form the lime water,
e varied in size, so that it may be adjusted to suit
ater. The revolving part of the distributor is also
ucted so that the upper chamber into which the water
is of less diameter than the lower chamber, and the
ry nozzles are arranged in pairs at different levels
d of all at the same level. To maintain the lime
of constant strength, the lime and water are kept
usly stirred in the following automatic manner. All
ter, except the fraction which goes to the lime mixer,
ivered into a vertical funnel-tube which terminates
he bottom of a closed box, and the air in the box is
orced out through another tube and through the
nd water, stirring them up. When the air has all
xpelled from the box, the water rises in a siphon
which discharges the box into the softening tank
raws another charge of air down the funnel-tube.
angement is also described for automatically flushing
er which comprises part of the apparatus.—L. A.

; *Apparatus for Softening and Purifying ——.*
H. Koyl, New York, U.S.A. Eng. Pat. 11,353,
e 3, 1901.

g. Pat. 11,112 of 1900 (this Journal, 1900, 843),
entor has described a water-softening apparatus in
the bottoms of the reaction tank and the settling
re conical, and are connected by a large pipe. The
in flowing from the former to the latter has to pass
h the mud at the bottoms of these tanks, which
in arresting the fine precipitate. In order to
e this coagulating effect, an independent "agglo-
ng tank" is now interposed between the reaction
nd the settling tank, through which the water
and in which the mass of precipitate is allowed to
ulate indefinitely.—L. A.

(C.)—DISINFECTANTS.

uling Coating for Metal Structures. C. A. Day,
lon. From the Coleman International Ship and
Coppering Co., Boston, U.S.A. Eng. Pat. 10,962,
28, 1901.

bmarine metallic structure which has to be protected
he attack of sea water and aquatic growths is first
ghly cleaned by scraping, and then given a coating
t. When the paint has dried to a tacky condition,
of ground mineral matter such as sand, vegetable
ce such as sawdust, or manufactured insulating
l such as compressed fibre, is applied to the surface
wing or otherwise, the object being to provide
on between the iron structure and the copper of
l coat so as to prevent electrolytic action. After
t coating of paint with its adhering insulation, has
thoroughly dry, a second layer of paint is laid on;
en a layer of powdered copper is applied as before.
y cases it is desirable to use somewhat coarse
dust at first, following it by an application of finer
s so that all the surface shall be covered with
Finally the copper is driven into the second coating
t by rolling, hammering, or pressure, which serves
the fragments together, and to present a smooth surface to the sea. The composition of the paint is not specially claimed, but an oil varnish of linseed oil, 40 galls; kauri or Zanzibar copal, 100 lb., reduced with turpentine, &c., is applicable.

Eng. Pat. 14,069, 1899, is referred to.—F. H. L.

Antifouling Coating for Metal Structures. C. A. Day, London. From the Coleman International Ship and Pile Coppering Co., Boston, U.S.A. Eng. Pat. 10,963, May 28, 1901.

This specification is identical with Eng. Pat. 10,962, 1901 (cf. preceding abstract) except that a more specific claim is made for the employment of a vegetable substance such as lignum vitæ or oak sawdust, shoddy, flax tow, papier maché, &c., as the insulating material between the iron structure and the copper of the composition.—F. H. L.

XIX.—PAPER, PASTEBOARD, Etc.

Cellulose. R. Wolffenstein and G. Bumcke. Ber. 1901, **30**, [11], 2415—2417.

In Tollens' classification of the cellulose group of carbohydrates (see this Journal, 1901, 740) the hydrocelluloses are regarded as hydrated or hydrolysed derivatives, whilst the oxycelluloses are merely oxidised products. It is hardly probable that the natural hydrolysing tendencies of the acid reagents employed should be inhibited by the presence of the oxidising agents. Again, Tollens suggests that the cellulose in these products may be present combined with the oxidised portion in the form of an ester, but this view implies condensation rather than hydrolysis and the molecule of the product must be at least twice as large as that of the original cellulose. If this were so, the oxycelluloses ought to be more resistant to hydrolysing conditions than the celluloses, whereas the reverse is certainly the case. The authors' view is that the cellulose molecule is so condensed that oxidation cannot take place without previous rupture of the molecule by hydrolysis at the position of the "ester-like" oxygen atom. There can be no simple oxidation of the cellulose without hydrolysis, and the term "oxycellulose" is regarded as misleading.

The authors would classify this group of carbohydrates as follows:—

A. Celluloses.
B. Hydrated Celluloses (Hydrocelluloses);
  (*a*) reducing ("hydralcellulose");
  (*b*) reducing and with carboxylic groups;
  (*c*) with carboxylic groups but non-reducing (acid-cellulose);
  (*d*) neither reducing nor with carboxylic groups (lactone configuration).

"Hydralcellulose" being produced by so mild a reagent as a 3 per cent. solution of hydrogen peroxide, is regarded as a purely hydrolytic product without the formation of any more highly oxidised groupings.—J. F. B.

Wood Pulp; Specks of Monosulphite in ——. Papier-Zeit. 1901, **26**, [62], 233.

When viewed by transmitted light, there may occasionally be seen in paper innumerable small dark specks, which appear white, and are not very noticeable by reflected light. These specks are due to the presence of small particles of calcium monosulphite or sulphate in the wood-pulp used for making the paper. If the liquors be not sufficiently rich in sulphurous acid, or if too much of this gas be allowed to escape during the boiling, gypsum or calcium monosulphite may be deposited amongst the fibres, and not be completely removed by the subsequent washing. Small clots of this deposit appear in the form of specks in the finished pulp, and cannot be kept out of the paper.

Such specks may be identified by picking out with the point of a knife, dissolving in hydrochloric acid, and testing with iodine-starch paper for monosulphite, and with barium chloride for gypsum. The prevention lies with the pulp manufacturer, and more attention must be paid to the quantity of sulphurous acid in the boiling liquors. The presence of these lumps in the pulp is best observed by peeling off thin layers from the sheet, moistening and examining by transmitted light.—J. F. B.

Transfer Paper. Papier-Zeit. 1901, **26**, [57], 2156—2157.

Transfer-paper, used for applying decorative designs to metallic objects (*e.g.*, sewing-machines, coal-boxes, &c., which are finally lacquered) is made from unsized cellulose, with a small proportion of rag, treated with one or more coats of such materials as gum arabic, wheat-starch, glycerin, albumin, hollyhock root, and barytes (blanc fixe). These may be detected by simply tasting, or, in the case of starch and barytes, by easy chemical methods. The cheaper qualities have a single dressing of gum arabic, of wheat-starch, or a mixture of the two. Better qualities are coated twice with starch, and then gum arabic, or barytes followed by starch, starch and then gum, or again, barytes and a mixture of starch and gum. The most expensive paper has three coats, such as starch, albumin, gum; or barytes, starch, gum, of which the last formula probably gives the best results. The barytes, carefully ground to a smooth paste, is first applied. The paper is then sized, hardened with chrome-alum, and treated with spirit, glycerin, or wax in solution. Glycerin makes the paper hygroscopic and liable to stretch, which must be guarded against. The sheet is now calendered to give it a smooth surface, the coats of starch and gum applied in order, and then dried thoroughly. Excess of heat causes it to curl up, whilst the humidity of the workroom requires careful regulation.

The starch used must be of the best quality, but medium varieties of the more expensive gum may serve, if thoroughly filtered.

The finished product is tested in various ways. If a moistened finger pressed on the prepared surface removes much substance the sizing is at fault. (Lifting test.) Gentle rubbing between thumb and finger should also not disturb the surface to any great extent. (Rubbing test.) The best indication is obtained by glueing a piece of moistened paper with best fish-bone glue to the prepared surface, and stripping it when dry. (Glue test.) The final test is that it transfers readily and completely.

—R. L. J.

Paper; Specific Gravity of ——. Papier-Zeit. 1901, **26**, [57], 2154.

Fibres of different origin are known to differ in specific gravity, and yield different bulks of paper, but the difference is small, and the question has scarcely any practical importance, so that little is known accurately on the subject.

The specific gravity of the resulting paper, or, in other words, the area of paper derived from a given weight of material, depends far more on details of manufacture, such as whether the fibres have been ground or cut, whether closely or loosely felted, and on the amount of mineral constituents added. From the point of view of paper-testing, other qualities, namely, purity of colour, strength, and homogeneity, &c., are more important than specific gravity.—R. L. J.

Substances resembling Celluloid; Preparation of ——. Zühl and Eisemann, Berlin. Ger. Pat. 122,166, Oct. 28, 1900. Through Zeits. angew. Chem. 1901, **14**, [31], 788.

Claim is made for the use of certain solid ketones to replace camphor either partially or altogether in the manufacture of substances resembling celluloid. The following derivatives of naphthalene have been found specially suitable:—Methylnaphthyl ketone, dinaphthyl ketone, methyloxynaphthyl ketone, and dioxynaphthyl ketone.

—C. A. M.

PATENTS

Paper-making Materials; Washing of ——, and Recovery of Soap and Alkali from the Water used. A. B. Knopf, *née* Fuchshuber, Hamburg-Eimsbüttel. Eng. Pat. 13,255, July 23, 1900.

Waste stuff for the manufacture of paper, such as old printed paper, rags, cordage, &c., is washed in a solution of soap, and the impurities are loosened and removed with the liquors. The wash liquors, containing the soa
treated with common salt to throw down the soap; t
separated and treated with a base (caustic lime or b
capable of forming an insoluble soap with the fat-
carrying down with it the colouring matters and in
ties. The caustic lye is then available for soap ma
the insoluble soap is separated, decomposed by acid
the fat-acids are obtained in a pure state by distil
in vacuo or with superheated steam.—J. F. B.

Paper; Manufacture of ——. F. Billing, Birmin
Eng. Pat. 249, Jan. 4, 1901.

This invention relates to the manufacture of an imp
paper, which contains a woven or plaited material
interior of its substance, with the object of increasi
strength. For this purpose the textile or plaited m
is fed off from rolls or other medium on to the tra
pulp as it is carried forward to the ordinary rolls, in
manner that the pulp and textile material are abs
incorporated together as the paper is formed.—J. F.

Hydrocellulose; Production of ——. H. H.
London, from R. Stahmer, Hamburg, Germany.
Pat. 19,039, Oct. 24, 1900.

According to this process, hydrocellulose is prep
treating cellulose with glacial acetic acid containi
chlorine, and heating the mixture with agitation
temperature of 60°—70° C. The quantity of acid em
is four or five times the weight of the cellulose, it d
require to be fully saturated with chlorine; if the te
ture be allowed to exceed the above limits, oxidati
occur with formation of brown products. The nat
the hydrocellulose produced may be varied by varyi
duration of the reaction.—J. F. B.

Celluloid; Manufacture of ——. E. Zühl, Berlin.
Pat. 17,948, Oct. 9, 1900.

As substitutes for camphor in the manufacture of ce
the author claims the use of the esters of the phe
their substituted derivatives with monovalent or pol
aliphatic acids. Phenolic esters of formic, pr
carbonic, tartaric, citric, and other acids are specifi
acetates having been claimed in a previous specificati

—J.

XX.—FINE CHEMICALS, ALKALOI
ESSENCES, AND EXTRACTS.

Hydrobromic Acid; Preparation of ——. E. M
shall. Brit. Pharm. Conference, Dublin. Che
Druggist 1901, **59**, [1123], 246.

In the preparation of hydrobromic acid by Fl
process—passing sulphuretted hydrogen gas into
containing bromine until the liquid is no longer red, a
distilling off the hydrobromic acid from the sulphur
the other product of the reaction—as much as 20 p
of the bromine may be converted into sulphur b
The author collected some of the sulphur bromi
purified it by distillation, the fraction distilling
195° and 200° C. being taken as pure sulphur brom
forms a red liquid, sp. gr. 2·4, which is decomp
the passage of a current of air. With water i
hydrobromic acid, sulphuric acid, and sulphur. T
dissolves in the sulphur bromide, rendering the con
of the last of the bromine into hydrobromic acid
slow, the water having some difficulty in penetra
plastic mass; but on standing for a short time, the
becomes solid enough to be broken up, and the rea
then soon completed. Sulphur bromide may
conveniently prepared by adding 2 parts of sul
5 parts of bromine, a small amount of heat being
during the combination.

The author recommends the following proces
preparation of hydrobromic acid. A small qua
hydrobromic acid is first made by means of sulphur
and water; the acid liquid is poured off from the
and bromine is added to it, preferably from a se

l delivering below the surface of the liquid. The l is agitated, and a very small amount of sublimed ur added, when combination takes place according equation—

$$3Br_2 + S + 4H_2O = 6HBr + H_2SO_4.$$

bromine is then added, followed again by sulphur, on until the liquid has a sp. gr. of about 1·61. This the point of equilibrium between the sulphuric and bromic acids, after which there is a tendency for the ing reverse reaction to take place:—

$$2HBr + H_2SO_4 = Br_2 + SO_2 + 2H_2O.$$

hydrobromic acid is distilled off and purified by llation, yielding a pure, colourless acid of 40 per cent. th. Care should be taken that no sulphur bromide the distilling flask, otherwise free sulphur will distil ontaminate the hydrobromic acid with sulphurous and iric acids. It is stated that 1 oz. of sulphur is capable iverting over 17 oz. of bromine into hydrobromic -A. S.

; *Preparation of Pure Oxide of* ——. J. Sterba. Comptes Rend. **133**, [4], 221—223.

oxide, prepared from monazite and purified by 's method, showed a strong absorption spectrum. atments by Mosander's method failed to remove this, a modification of Wirouboff and Verneuil's method tes Rend. **124**, 1230), consisting in the oxidation of nitrate to ceric nitrate by electrolysis, a perfectly rium compound was obtained. The ceric oxide so d showed at first a pale yellow or rose colour; but hors traced this to the formation of a small amount de, and found that when this impurity was removed, ide was snow white. The oxide was partially re- by heating with zinc, or in hydrogen, from CeO_2 to —J. T. D.

h Salicylate; New ——. P. Thibault. J. Pharm. im. **14**, [1], 22—25. (This Journal, 1901, 603.)

ploying the method for the production of pure h oxide, first described by him (this Journal, 1901, he author has succeeded in preparing bismuth sali- $Bi_2O_3\,3(C_7H_6O_3)$ in the form of a rose-grey crystal- wder, composed of small transparent prisms, which ffected by cold alcohol and by ether; they are slowly osed by cold water, more rapidly on warming; stable lried at 100° C. 15 grms. of crystalline bismuth are precipitated from nitric acid solution by means tic alkali, after boiling; the impure oxide is trans- into the pure crystalline oxide by the method isly described. This is then heated on the water ith 10 grms. of salicylic acid suspended in about of water for some time, until no opaque yellow of uncombined bismuth oxide are observable on opic examination. The hot liquid is then decanted, cipitate is washed, first with cold alcohol, and with ether, collected, and dried at ordinary tempera- in the drying oven.—J. O. B.

y Salicylate; Solubility of ——. J. A. Larin. Chem.-Zeit. Rep. 1901, **25**, 193.

y prepared mercuric salicylate is almost insoluble tic soda or the carbonates of sodium, by which, how- is very readily decomposed. An addition of common solves the mercuric oxide formed in solutions of nates alone. An old preparation was, however, not d by bicarbonate and common salt, and was not osed by normal carbonate. Freshly prepared ic salicylate dissolves very readily in sodium chloride at the ordinary temperature, but is not completely in 3—4 parts of boiling water. A 20 per cent. in common salt remains undecomposed for some ut a turbidity appears in about two months. The ty of a fresh preparation was found to decrease bout 2—3 months. Mercuric salicylate is almost le in water and chloroform; it dissolves in 45 parts per cent. alcohol and in 100 parts of ether. The fresh preparation gives a more intense reaction with ferric chloride than the old, and the reaction is not affected by common salt. Preparations of greater age than several months should not be used in therapeutics. Common salt appears to be the best solvent.—A. C. W.

Manganese Citrate; A Soluble ——; *also some Compounds of Manganese with Iron.* F. B. Power. Brit. Pharm. Conference, Dublin. Chem. and Druggist 1901, **59**, [1123], 242—244.

Soluble Manganese Citrate.—To a solution of 100 grms. of crystallised manganous sulphate, one of 140 grms. of crystallised sodium carbonate is added gradually, with constant stirring, the precipitate washed by decantation and the moist mass added to a solution of 62·8 grms. of citric acid, the mixture filtered and the precipitate washed with a little water and dried at a gentle heat. The manganese citrate forms a white crystalline powder, containing 23·17 per cent. of Mn, as compared with 23·3 per cent. of Mn, calculated for $Mn_3\,(C_6H_5O_7)_2\cdot 9H_2O$. The soluble citrate is prepared by adding to the moist manganese citrate, prepared as above, 105 grms. of crystallised sodium citrate, and heating the mixture on the water bath until complete solution is effected. The liquid is then diluted sufficiently to filter readily, and at once spread on glass plates, in order that it may dry in the form of scales. The salt when in solution oxidises readily and becomes brown, but in the dry state it is quite permanent when protected from light. It has a composition corresponding very nearly to the following molecular proportions:—

$$\frac{Mn_3(C_6H_5O_7)_2.9H_2O}{703} + \frac{2Na_3C_6H_5O_7.5\frac{1}{2}H_2O.}{714}$$

It forms pearly scales, readily soluble in water, and contains from 12—13 per cent. of manganese, according to the care exercised in its preparation, the thickness of the scales, and the temperature at which they are dried. The salt is not precipitated by ammonia, nor at once by potash, although gradually forming with the latter a brown precipitate; it is either not precipitated by the alkali carbonates, or gives but a slight turbidity. It is, however, at once and abundantly precipitated by ammonium sulphydrate and by potassium ferrocyanide. The author states that the precipitation of manganese by ammonium sulphydrate in presence of alkali citrates depends upon the greater or less amount of the latter that may be contained in the solution, and this explains the discrepancies which have been previously observed in this respect.

Soluble Iron and Manganese Citrate.—To the moist manganese citrate prepared in the manner described above, a solution of ferric citrate containing an equivalent of 49·3 grms. of iron is added, and the mixture is heated on a water-bath until solution is effected. The liquid is filtered, evaporated to a syrup, spread on glass plates and dried. The salt forms yellowish-brown scales, readily soluble in water. The solution becomes deep red on addition of ammonia; with potassium ferrocyanide it gives a light blue precipitate, changing to deep blue on addition of acid.

Soluble Iron and Manganese Phosphate.—This salt, which, like the U.S.P. preparation, is really a citro-phosphate, is prepared in an analogous manner to the iron and manganese citrate, manganese phosphate produced from manganese sulphate and sodium phosphate being treated with ferric citrate. It forms greenish-yellow scales, slowly soluble in cold, readily in hot water, and like the iron and manganese citrate, usually containing about 14 per cent. of iron and 7 per cent. of manganese.

The advantages claimed for the above preparations are their ready solubility in water, freedom from objectionable taste, and relative uniformity in the amount of their constituent elements.—A. S.

Phellandrene Nitrite. O. Schreiner. Pharm. Arch. **4**, 90.

Phellandrene nitrite purified by repeated crystallisation from hot alcohol, melts, according to the author, at 120°—121° C., and not at 105° C., as stated by Wallach. The crystalline nitroso compound yielded by oil of ginger is really a zingiberene nitrite melting at 97°—98° C., and not phellandrene nitrite. The lower boiling fraction of ginger oil gives a crystalline nitroso compound which melts at 105° C.—A. S.

Alcohol and Water; Boiling Point Curve for Mixtures of ——. W. A. Noyes and R. R. Warfel. J. Amer. Chem. Soc. 1901, **23**, [7], 463—468.

The authors have determined the boiling point curve for aqueous alcohol, and find that 96 per cent. alcohol (97·45 per cent. by volume) has a minimum boiling point, namely, 78·174° C., whilst that of absolute alcohol and also of 90·7 per cent. alcohol is 78·30° C.—T. H. P.

Cinchona and Quinine in Java. Chem. and Druggist, 1901, **59**, [1122], 161—169.

This is an account of the cultivation of cinchona and manufacture of quinine in Java, being based upon information supplied by F. L. Seely. The daily output is stated to be about 4,000 oz. of quinine of good quality. The parcels of bark arriving at the factory are each assayed and the various lots are then so mixed that an average amount of alkaloid is represented in each day's work. The bark is ground, sifted, moistened with alkali, and introduced into large digesters containing hot crude petroleum, and provided with agitators. When the alkaloid is extracted, the contents of the digesters are allowed to settle and the petroleum extract decanted off and washed with weak sulphuric acid. The petroleum is returned to the digesters to be used over again. The crude quinine sulphate is crystallised out from the acid solution and purified by recrystallisation in large porcelain-lined pans, the mother liquors being also worked up. The crystals are separated from the mother liquor in centrifugal machines. The quinine sulphate as taken from the centrifugal machines is nearly dry, and the drying is completed according to a method invented by A. R. van Linge, by means of which the current of air and other conditions in the drying chamber can be so regulated that the finished product contains 14—16 per cent. of water of crystallisation. The pure quinine sulphate is finally weighed and packed. The principal characteristic of the building in which the operations of crystallising are carried out is its extreme cleanliness. Cloths are stretched over each row of pans to keep out the dust and light, and the pans are washed with soap and water every time the solutions are changed.
—A. S.

Morphine; Extraction of ——, *from Solutions.* W. A. Puckner. J. Amer. Chem. Soc. 1901, **23**, [7], 470—473.

The author has made a number of experiments to ascertain whether, in the extraction of morphine from its solution by means of a mixture of alcohol (20 vols.) and chloroform (80 vols.), the alkaloid may be liberated by means of ammonia instead of fixed alkali. The results show that while ammonia combines with morphine to form a salt which is not readily taken up by the solvent mixture, it does so to a much smaller extent than caustic soda does. In presence of but a slight excess of ammonia, approximately 98 per cent. of the alkaloid is removed by the first three extractions, while even if 10 times as much ammonia as is necessary be employed, three extractions remove over 90 per cent. of the morphine, and five extractions practically the whole. The effect of the presence of excess of ammonia may be overcome by the addition of sodium bicarbonate.
—T. H. P.

Pseudaconitine and Japaconitine; Pharmacology of —— *considered in relation to that of Aconitine.* J. T. Cash and W. R. Dunstan. Proc. Roy. Soc. 1901, 378—384. (See also this Journal, 1898, 387.)

Pseudaconitine is the alkaloid, $C_{36}H_{49}NO_{12}$, contained in *Aconitum ferox.* When heated in the dry state at its melting point (202° C.), it evolves 1 mol. of acetic acid and leaves the alkaloid pyropseudaconitine. When a salt of pseudaconitine is heated in a closed tube with water, as in the case of aconitine, partial hydrolysis occurs, with the loss of 1 mol. of acetic acid and formation of the base veratryl-pseudaconine. Complete hydrolysis, effected by heating veratryl-pseudaconine with alkalis, produces veratric or dimethylprotocatechuic acid and the
base pseudaconine. Thus pseudaconitine contains
veratric radical in place of the benzoic radical of aconi

Japaconitine is obtained from Japanese aconite
japonicum or *A. Fischeri.* Although this alkaloi
regarded by Lübbe and by Freund and Beck as ide
with aconitine, the authors consider it a distinct alk
of the formula $C_{34}H_{49}NO_{11}$. It contains, similarl
aconitine, the acetyl and benzoyl groups, but the ce
nucleus appears to be different.

The physiological actions of these three alkaloid
almost identical.—A. C. W.

Pyraconitine and Methylbenzaconine; Pharmacolo
—— *considered in relation to their Chemical*
stitution. J. T. Cash and W. R. Dunstan. Proc.
Soc. 1901, 384—389.

Pyraconitine is obtained by heating aconitine a
melting point, when the acetyl group is expelled as
acid. Pyraconitine thus differs from benzaconine by 1
of water.

Methylbenzaconine is produced on heating ac
with methyl alcohol in a sealed tube; by a remar
reaction, the acetyl group is replaced by the m
group.

These alkaloids were specially purified, and their h
bromides employed in aqueous solution. The remov
the acetyl group from aconitine in the formatic
pyraconitine almost entirely abolishes the great toxic
aconitine; the characteristic features of aconitine pois
are not produced by pyraconitine. Benzaconine and
conitine produce very similar physiological effect
latter being the more active (about six times more tox

Aconitine is roughly 80—100 times more toxic
methylbenzaconine; the latter induces an effect resem
that produced by curare; it is about three times as
than benzaconine.—A. C. W.

Atropine Sulphate; Tests for ——. T. Gadame
Archiv der Pharm. **239**, [5], 336.

The German Pharmacopœia IV. requires atropine su
for medicinal use to be prepared from the base melt
115·5° C., and that it must itself melt at 180° C.
melting points exclude, as far as possible, the prese
hyoscyamine. That these requirements do not accor
the experience of E. Merck in the extraction of the al
is evident from the facts communicated by h
E. Schmidt, that absolutely inactive atropine prepar
research work had the m.p. 112—113° C.. His comm
atropine, on his own showing, is never quite i
optically, and, therefore, not quite free from hyoscya

According to Merck the double gold salt prepare
the pure base melts at 134°—136° C. The corresp
sulphate obtained by crystallisation from suitable so
and not by precipitation, melts when heated gradu
185° to 187°, but if the heat be very slowly increas
m.p. is lowered to 182°—183°, and with quickly
temperature is increased to 188°—189° C. The
has prepared optically inactive atropine, and find
the white needles melt at 115°—116° C., but
powdered and dried, the m.p. falls to 112°—113° C.
sulphate of this base was obtained by crystallisatio
a mixture of absolute alcohol and acetone. This pu
when dry, melted in the Roth apparatus at 183°—184
but in a capillary tube suspended in H_2SO_4, as pre
for taking melting points in the official work, it mel
156°—160° C. Dried afresh over H_2SO_4 and hea
prescribed in the pharmacopœia, it melted at 187°
whereas the salt tested immediately afterwards in a
apparatus melted at 160°—161° C. It is evident t
melting point is lowered by the presence of the
trace of moisture; for this reason the determination
such condition, cannot be recommended as a stand
for true alkaloid.

The use of the gold double salt for the melting po
is not open to objection since hyoscyamine must be
in fairly large quantity to raise the melting point
marked degree; but fractional precipitation wit
chloride is not a test to be recommended for pharma
employment. The author advocates, if it be essenti

ine should be free from hyoscyamine, that the optical should be relied on, and the melting point methods doned. He considers it to be an open question if this ically pure atropine is requisite for medicinal use.
—J. O. B.

kaloid; New ——, from Elder Bark. F. Malméjac. J. Pharm. Chim. 14, [1], 17—19.

bark was extracted by means of alcohol acidulated tartaric acid, by digestion at 75° C. After evaporating solvent, the acid residual extract was washed with , made alkaline with sodium bicarbonate and again cted with the same solvent. The second ethereal ct, on evaporation, gave a crop of small, long, very oscopic crystals, which rapidly deliquesced on exposure e air to a colourless oily liquid, which, however, stallised on being placed in a desiccator over H_2SO_4. queous solutions of this body gave marked precipitates all the general reagents for alkaloids. It is, therefore, dered to be one of them, and has been named *ucine.*—J. O. B.

acylphenacetin. C. Goldschmidt. Chem.-Zeit. 1901, 25, [59], 628.

formula is $(C_2H_5O)C_6H_4N(COCH_3)(CH_2COC_6H_5)$ a non-poisonous, hypnotic antipyretic. It is prepared similar manner to methylphenacetin. A solution of cetin in xylene is heated to boiling, sodium added, and parated phenacetin-sodium treated with an equivalent ity of bromacetophenone. After filtering from sodium ide, the liquid is evaporated, and the residue, crude cylphenacetin, crystallised from alcohol. The com- l is soluble in alcohol and glycerin, insoluble in water, elts at 87° C.

e author has also prepared the guaiacol sulphonic acid f triphenylguanidine. Pure barium guaiacol sulphonate ted hot with the necessary quantity of pure triphenyl- dine sulphate. The compound forms thin plates g at 50° C., soluble in ether and alcohol, and some- poisonous. It acts as a local anæsthetic.—A. S.

astin (Resinoid). L. Ough. Chem. and Druggist, 1901, 59, [1122], 152.

rhizome of *Hydrastis canadensis* Linn. contains ber- and hydrastine in combination with an unknown etable acid," a fluorescent substance (probably cal with æsculin), a green fixed oil of disagreeable and taste, a small quantity of volatile oil to which the of the root is due, sugar, albumin, starch, and about r cent. of mineral matter. For the preparation of sinoid hydrastin, the coarsely powdered rhizome is ghly damped with alcohol (sp. gr. 0·828), the mix- llowed to macerate in a percolator for about 48 hours, hen the root slowly extracted with more alcohol till etely exhausted; about 2 galls. of alcohol are re- l for each pound of root. The greater part of the l is removed from the extract by distillation, and the e is evaporated to dryness at a low temperature. The id thus obtained (yield, 11 per cent.) is of a darkish colour, and can be readily reduced to a fine powder ry, warm atmosphere.—A. S.

melins of Commerce. T. S. Barrie. Pharm. J. 1901, 67, 231—233.

MELIN is the name given to preparations obtained *Hamamelis virginiana*, the witch-hazel. The com- l hamamelins are dry extracts of (1) the leaves and he bark. The extracts of group (1) are green in , they appear (judging from the analytical data) to be with strong alcohol, the alcoholic solution being mixed owdered leaves and the whole evaporated to dryness. xtracts of group (2) are brown in colour, they seem made from the bark by means of dilute alcohol. g to the presence of hygroscopic substances, they do ep well; in all the samples examined, mineral matter een added to overcome the hygroscopicity. They n more tannin than the green extracts. The organic of one brown sample was completely soluble in te alcohol and almost completely soluble in boiling water; on exposure to air it remained pulverulent. These properties, taken in conjunction with the high percentage (26·0) of tannic acid, indicate a specially treated extract of witch-hazel, or that the extract was not prepared from that bark at all. Barks normally contain more tannic acid than leaves, thus the two groups of extracts should not be compared on the basis of their acid-contents alone.—A. C. W.

Lotus arabicus; Nature and Origin of the Poison of ——. W. R. Dunstan and T. A. Henry. Proc. Roy. Soc. 1901, 374—378.

A CONTINUATION of the work described in this Journal, 1900, 1140.

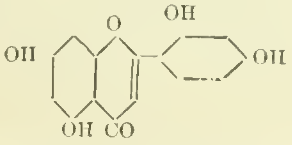
Lotusin can be separated from an alcoholic extract of the plant by a tedious process, which gives the small yield of 0·025 per cent. It is a yellow crystalline glucoside, more soluble in alcohol than in water. On heating it gradually decomposes without exhibiting a definite melting point. On hydrolysis it is decomposed into dextrose, hydrocyanic acid, and *lotoflavin*—

$$C_{28}H_{31}NO_{16} + 2H_2O = 2C_6H_{12}O_6 + HCN + C_{15}H_{10}O_6.$$

The hydrolysis is readily effected by hydrochloric acid, slowly by sulphuric acid. When heated with aqueous alkalis, ammonia and *lotusinic acid*, $C_{28}H_{32}O_{18}$ are formed. Lotusinic acid is a monobasic acid which yields yellow crystalline salts; it is readily hydrolysed into lotoflavin, dextrose, and heptogluconic acid—

$$C_{28}H_{32}O_{18} + 2H_2O = C_{15}H_{10}O_6 + C_6H_{12}O_6 + C_7H_{11}O_8.$$

Lotoflavin, $C_{15}H_{10}O_6$, is a yellow crystalline colouring matter, isomeric with luteolin and fisetin, readily soluble in alcohol, hot glacial acetic acid, and aqueous alkalis. Morin appears to be hydroxylotoflavin. Lotoflavin forms a tetra-acetyl derivative and two mutually convertible trimethyl ethers, which yield the same acetyltrimethyl-lotoflavin. Fused caustic potash converts lotoflavin into phloroglucinol and β resorcylic acid; its formula is thus probably—



The *o*-position of one of the hydroxyl groups with reference to a carbonyl group explains the production of only a trimethyl ether. Lotusin is assigned the formula of a lotoflavin ether of maltose cyanhydrin. Mandelic nitrile, levulose cyanhydrin, and penta-acetyl gluconitrile, in which the cyanogen group occupies a similar position to that assumed in lotusin, are readily hydrolysed by dilute hydrochloric acid into hydrocyanic acid and the corresponding aldehyde or ketone.

Mature plants bearing seed-pods gave 0·345 per cent. of hydrocyanic acid, calculated on the air-dried material. Younger plants gave less, and old plants, from which the seeds had fallen, hardly any. Lotusin disappears during the ripening of the seeds.

Lotase is much more readily injured than emulsin; its hydrolytic power is rapidly destroyed by heat, and gradually by contact with alcohol and glycerin. Lotase acts very feebly on amygdalin, and emulsin attacks lotusin very slowly. The plant also contains an amylolytic and a proteolytic enzyme.—A. C. W.

Carvone; Auto-oxidation of ——. C. Harries. Ber. 1901, 34, [10], 2105—2106. (See also this Journal, 1900, 682, 697.)

WHEN carvone is shaken with barium hydrate, water, and a little methyl alcohol, barium peroxide separates and the ketone goes into solution. The latter is completely oxidised if the operation be performed in an atmosphere of oxygen. After filtering, extracting the filtrate with ether, evaporating *in vacuo* and acidifying, a diketone separates, which melts at 185°—187° C. when slowly heated. The reaction proceeds according to the equation—

$$C_{10}H_{14}O + H_2O + O_2 = H_2O_2 + C_{10}H_{14}O_2.$$

The diketone is identical with the final product of the oxidation of oxaminocarvoxime (Ber. **31**, 1812), which must possess the constitution of 1-methyl-4-propenyl dihydroresorcinol. Small quantities of a substance with a pleasant odour of strawberries are also formed in the auto-oxidation of carvone.—A. C. W.

Thujylamine into Thujene; Transformation of ——.

L. Tschugaeff. Ber. 1901, **34**, [11], 2276—2281.

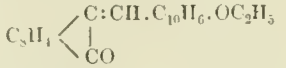
Thujene was originally obtained from thujone (this Journal, 1901, 65). The author has now endeavoured to convert thujylamine into thujene; dry distillation of the hydrochloride of the base gives, however, isothujene.

Thujone was carefully fractionated, and then converted into the oxime, which on reduction with sodium in absolute alcohol gives the amine. Pure thujylamine, regenerated from the hydrochloride and dried over barium oxide and sodium, is a colourless liquid, boiling at 195° C., with an odour similar to coniine, and readily absorbing carbon dioxide from the air; sp. gr. at 20° C., compared with water at 4° C. = 0·8712, $[\alpha]_D = + 101 \cdot 00$. The base was completely methylated in one operation by means of aqueous potash and methyl iodide. The resulting crystalline mass of trimethylthujylammonium iodide, after standing overnight, was filtered and crystallised from hot water. The free trimethylthujylammonium hydroxide was obtained by digestion with silver oxide and water, as an alkaline liquid, which was evaporated to a syrup on the water-bath, and then *in vacuo* over phosphorus pentoxide. The resulting crystalline mass, chiefly composed of carbonate of the ammonium base, was subjected to dry distillation. The distillate was washed with dilute hydrochloric acid, then with water, dried over calcium chloride, and distilled over sodium. The product is identical with thujene and quite distinct from Wallach and Semmler's isothujene; thujene from thujylamine has, however, a greater laevo-rotation than thujene obtained by the xanthogenic acid method. If the dry distillation of thujylxanthogenic methyl ester be interrupted when the temperature in the flask has reached 190° C., and the fraction distilling at 190°—215° C. collected separately, this fraction is found to possess all the properties of ordinary thujene, except that it is dextro rotatory; for 100 mm. $[\alpha]_D = +21 \cdot 83$. The dry distillation of the xanthogenic ester thus appears to produce two thujenes.—A. C. W.

Camphor; Compound of —— with β-oxy-α-Naphthoic Aldehyde.

A Helbronner. Comptes Rend. **133**, [1], 43—45.

By reacting with the sodium-derivative of camphor on the ethyl ether of the oxynaphthoic aldehyde, brilliant white crystals were obtained, which melt at 100° C. and dissolve readily in most organic solvents. The formula of the substance is—



$$C_8H_{14}\left\langle\begin{array}{l}C{:}CH.C_{10}H_6.OC_2H_5\\ |\\ CO\end{array}\right.$$

and the author calls it "ethoxynaphthal camphor." It yields by reduction the corresponding hydrogenated compound, which melts at 112° C., and has a specific rotation lower than that of the naphthal camphor from which it was prepared. The analogous methoxy-compounds were also prepared.—J. T. D.

Jasmine Flowers; Essential Oil of ——.

E. Erdmann. Ber. 1901, **34**, [11], 2281—2283. (See also this Journal, 1899, 296, 396, 513, 1153; 1900, 770; 1901, 275.)

The author made the first announcement of the discovery of methyl anthranilate in jasmine oil. (See Verhandl. Ges. d. Naturforscher-vers. in München, 1899, **1**, 139; Ger. Pat. 122,290 of May 28, 1898). This patent also contains the first announcement of the presence of benzyl alcohol, benzyl acetate, and linalool in jasmine oil. These results were obtained by working with a preparation made in Grasse by extraction of the flowers with a volatile solvent, and of guaranteed purity. Hesse's statement that methyl anthranilate is formed during *enfleurage* is, accordingly, not co firmed. Also Hesse's conclusion, that jasmine blosso develope nine times as much essential oil during the 24 hou *enfleurage* as they contained when plucked, does not appe to be warranted. Animal and vegetable fats are good solven for perfumes, but the petroleum spirit used to extract t blossoms in Southern France has little solvent power, *e.* it does not mix in all proportions with benzyl alcoh The blossoms contain sap and the perfumes are enclosed cells, thus the extraction by petroleum spirit cannot well exhaustive. Loss of perfume also occurs in driving off t solvent. Comparative experiments with similar mater by *enfleurage* and by maceration with the same fat wou be required to decide the question. Although Charat has shown that simple changes occur in the essential o of flowers during blooming—loss of water with formati of esters and terpenes, oxidations of alcohols to aldehy and ketones, formation of indole pyrrol from a derivative there is nothing yet to justify the statement that a la formation of perfume from indifferent materials takes pl within such a brief period. (Compare also Walbaum, t Journal, 1900, 1036, and von Soden and Rojahn, 1901, 6 —A. C. W

Oil of Rue; Algerian ——.

H. v. Soden and K. Her Pharm. Zeit. **46**, 277. Pharm. J. 1901, **67**, [1619],

The oil distilled from Algerian rue differs considerably character and constituents from the ordinary oil of described by Thoms (this Journal, 1901, 606). T Algerian oil consists principally of normal methylhept ketone, together with small quantities of methylnonyl-keto it also contains the ester of an unknown alcohol. It has sp. gr. 0·842 at 15° C.; optical rotation, −5°; and it d not solidify at −15° C.—A. S.

Monarda Oil.

J. W. Brandel and E. Kremers. Phar Review, **19**, 241.

The authors have identified a new constituent, hydrot moquinone, in the phenolic portion of the oil of *Mona fistulosa*. The hydrothymoquinone was recognised means of its melting point, and by giving with thymoquin the violet-blue thymoquinhydrone. It is suggested t other coloured oils which contain phenols may owe t tints to the interaction of two similar bodies produc coloured quinhydrones—A. S.

Citronella Oil.

E. J. Parry. Chem. and Druggist, 1 **59**, [1122], 142.

When subjected to the so-called "Schimmel's test," citronella oils of commerce give somewhat different res some being completely soluble in 80 per cent. alc whilst others, although quite soluble in 3 or 4 volu of the alcohol, become slightly turbid when 10 volume the solvent have been added. The author finds tha general, the oils of low sp. gr. give a perfectly clear solu whilst those of high sp. gr. often give the slight turbi referred to. In cases where doubt can arise as to the l this turbidity may assume, the author recommends the of alcohol of slightly higher strength. With pure citro oils, the turbidity almost, if not quite, disappears alcohol of 81—83 per cent. strength is used, whilst if very small quantities of petroleum are present, ther practically no change if the strength of the alcohol increased to 85 per cent. The lower solubility in alc of the oils of high sp. gr. is probably due to the gre proportion of sesqui-terpene in such oils.—A. S.

Mercury and Bismuth Salts; Determination of —

T. Tyrer and C. T. Tyrer.

See under XXIII., *page* 937.

Tartar; Commercial Determination of ——.

H. Qua

See under XXIII., *page* 941.

Nicotine in Tobacco and in Aqueous Extracts of Tob Leaves; Determination of ——.

J. Tóth.

See under XXIII., *page* 942.

Alkaloids; Action of the Vegetable ——, on certain Indicators. A. Astruc.

See under XXIII., *page* 941.

Santonin; The B.P. Test for ——. E. M. Marshall.

See under XXIII., *page* 938.

Hydrastine and its Determination, &c. T. Maben.

See under XXIII., *page* 942.

rphine; The Lloyd Reaction for ——. J. L. Mayer.

See under XXIII., *page* 938.

panish for Common Broom; Dangerous Substitution of ——. E. Perrot.

See under XXIV., *page* 944.

henol when mixed with Resinous Substances: Determination of ——. J. C. Thresh.

See under XXIII., *page* 939.

thol; Action of Benzaldehyde on the Sodium Compound of ——; and New Methods of preparing Benzylidenementhone. C. Martine.

See under XXIV., *page* 944.

permint Oil; Colour Reaction of ——. P. Welmans.

See under XXIII., *page* 938.

PATENTS.

: Improved Process for Treating ——, for obtaining a as or a Liquid rich in Oxygen therefrom. W. P. ompson, London. From E. A. Le Sueur, Ottawa, nada. Eng. Pat. 10,722, June 12, 1900.

rding to the third claim, this process of treating air der to produce from it a fluid rich in oxygen, "consists illing it at a suitable pressure until a partial liqueon of said air occurs, whereby a liquid richer in oxy than is air, is precipitated; in transferring said liquid chamber, in which it exists under a lower pressure that under which it was precipitated, and in contact one side of a pipe to the other side of which is ed the temperature of the incoming air in process of al liquefaction, whereby the oxygen strength of the l is further raised, and in utilising the chilling effects ing in the said liquid, the gaseous mixture off from it, the unliquefied gaseous residue from the original fying operation to chill fresh incoming air on its way ing split up."—E. S.

en Gas; Preparation of ——. G. F. Jaubert, Paris. Eng. Pat. 11,466, June 4, 1901.

xture of 200 parts of chloride of lime with 78 parts dium dioxide is strongly compressed into pastilles or idges in the manner described in Eng. Pat. 17,161, (this Journal, 1901, 43). When the compressed rial is placed in water, oxygen is evolved, and may be ed generally, and in particular, to oxidise the impurities etylene. The claims include the use of alkali or ine earth peroxides mixed with alkali or alkaline hypochlorites.—E. S.

ctyldiamidouracil; Manufacture of ——. G. W. hnson, London. From C. F. Boehringer und Söhne, aldhof, Mannheim, Germany. Eng. Pat. 12,985, ly 25, 1901.

process for the manufacture of 4·5-diacetyl diaminol is claimed, which consists in heating uric acid with anhydride (with or without a condensing agent—pyridine, quinoline, or dimethylaniline) until an ammoniacal silver solution is not reduced on heating for a short time with the product of the reaction. The diacetyl compound is then separated, by boiling with water, from the slightly soluble 8-methylxanthine (compare Eng. Pat. 526, 1901, this Journal, 1901, 833). A triacetyl compound formed at the same time is decomposed by boiling with water.
—A. C. W.

Lactic Acid; Manufacture of Purified ——, from crude Solutions. C. N. Waite, Cranford, New Jersey, U.S.A. Eng. Pat. 13,403, July 1, 1901.

The process claimed for the production of purified lactic acid consists in repeatedly washing the crude acid with amyl alcohol and distilling off the solvent from the alcoholic solution of lactic acid, or washing this solution with water and concentrating the aqueous solution.—A. C. W.

XXI.—PHOTOGRAPHY.

Photographic Image; Variation of Gradation of a Developed —— when impressed by Monochromatic Light of different Wave-lengths. Sir W. de W. Abney. Proc. Roy. Soc. 1901, **68**, [447], 300—321.

Some two years ago the author indicated that in a given photographic plate there was a variation in gradation according to the colour of the light with which the exposure was made; he has now carried out a series of experiments, under different conditions, which show (at least with pure silver salts in gelatin) that the least steep gradation is produced by that monochromatic light to which the plate is most sensitive, and that the gradation becomes steeper the further in either direction along the spectrum the light for exposure is taken.

If then, a photograph of a graduated scale of greys be taken through red, green, and blue glasses, the gradation or contrasts of greys in the negative would be most pronounced in the case of the red image, and would produce a difficulty in three colour photographic printing, which is certainly the case.—J. W. H.

Hydrocyanic Acid; Action of ——, upon finely divided Silver. A. Haddon. Photography, 1901, **13**, 396; Chem.-Zeit. Rep. 1901, **25**, [58], 216.

Henderson has shown that "green-fog" can be removed, or an overdense negative "reduced" by placing it in the wet state, film downwards, over a bath of potassium cyanide solution for several hours. The action is due to the gradual decomposition of the cyanide by the carbon dioxide of the atmosphere, which liberates hydrocyanic acid gas; the latter being very soluble in water, dissolves on the damp film, and attacks the superfluous metal in the gelatin. Henderson stated that the plate must not fit the dish closely, as free admission of air was necessary. The author finds that presence of air is not required to effect solution of the silver; that the silver remains in the film; that the substance produced by the reaction between the hydrocyanic acid and the silver can be removed from the gelatin even if it has been allowed to dry; that if it dries on glass, the substance is decomposed; and that it is probably the same substance as is formed when hydrocyanic acid acts directly upon metallic silver.—F. H. L.

Chromium Family: Compounds of the ——; Sensitive to Light. T. T. Baker. Brit. Jour. Phot. 1900, **48**, [2148], 428.

Potassium di-tungstate, di-molybdate, and di-uranate may be used in place of potassium bichromate for sensitising gelatin. A molybdenum printing-paper may be obtained by soaking gelatin in a diluted solution of molybdenum in *aqua regia* and applying the mixture to paper; weak acetic acid may be used as a fixing agent. Tellurium chloride is very sensitive to light and gives an invisible image capable of being developed by potassium ferricyanide; it is also a useful toning agent.—J. W. H.

Toning Baths for Gelatin-Chloride Prints. M. Wilson. Brit. Jour. Phot. 1901, **48**, [2149], 442.

THE author gives an account of further tests of toning baths. Potassium molybdate in the usual chloride of gold bath was not a success on account of the objectionable colour of the resulting prints. Sodium malate gave very good results, the toning action was rapid and there was no tendency to produce double tones. A combined sodium malate and sulphocyanide bath was found to be very liable to stain: sodium benzoate (60 grains), sodium phosphate (75 grains), ammonium sulphocyanide (38 grains), chloride of gold (1 grain), and water (15 fluid ounces), formed the best bath tested; each constituent seemed to bring about its own change independently; the gradation was perfect and the colour effects pleasing. Sodium benzoate and phosphate together also gave excellent results. Red-brown tones were given by a combined bath of sodium benzoate and tungstate, but patches of different colour were produced. Sodium tungstate and phosphate gave good results, without any tendency to double tones or stain. Sodium oxalate was a failure as a toning agent when used alone, but with the addition of sodium phosphate very satisfactory prints were obtained.—J. W. H.

PATENTS.

Photographic Chemicals or other Materials; Receptacles for holding Small Quantities of ——. A. J. Griffin and Sons, Ltd., and F. H. Ibbetson, London. Eng. Pat. 14,047, Aug. 4, 1900.

CLAIMS are made for modifications in the construction of the glass tubes described in Eng. Pat. 12,337 of 1899. The tube and transverse dividing partition may be made of transparent or opaque xylonite, celluloid, viscose, porcelain, stoneware, or other non-vitreous chemically inert material impervious to air; material not naturally impervious may be coated or impregnated with a suitable air-excluding substance. The tube may be composed of a narrow and a wide tube joined co-axially end to end, or of two parallel tubes of equal diameter joined together to form a double tube. A longitudinal partition may be used, forming two semi-cylindrical compartments, or three or more compartments may be obtained by joining together three or more tubes parallel to each other, or by providing a cylindrical tube with two or more longitudinal partitions. The different compartments may be distinguished by giving different colours to the material. The ends of the tube may be closed with caps secured by means of a suitable adhesive or binding substance; if the tube and caps are of celluloid or xylonite, it is preferred to secure the cap by means of acetone or other suitable solvent.—T. H. P.

Photographic Plates, Films, and Papers; Process of Drying ——. A. Edwards and E. M. Nelson, Warwick. Eng. Pat. 14,625, Aug. 15, 1900.

CLAIM is made for a process of drying photographic plates, films, and paper, consisting in heating the air in the drying chamber by means of hot water pipes or other heaters and in removing the moisture from the heated air as a deposit of frost or snow on pipes into which ammonia is allowed to expand, or on pipes filled with cold brine and glycerin, or on any other suitable containers holding a refrigerating medium.—T. H. P.

XXII.—EXPLOSIVES, MATCHES, Etc.

Explosives; New Method of preparing ——. Bonnet. Rev. Prod. Chim. **4**, [6], 83—84.

THE "nitro derivatives and nitro-picrate derivatives" being soluble in free fatty acids, the author has succeeded in preparing in this way explosives of higher fusing point than those from oils and fats containing the fatty acids in combination with glycerin. The fatty acids, or fatty acid esters of bases other than glycerin, are melted, alone or with fatty substances, and employed to dissolve the nitro derivatives, &c., after which the mass is incorporated with potassium (or ammonium) chlorate or perchlorate, and left to cool.

The following typical examples of these explosives a given:—

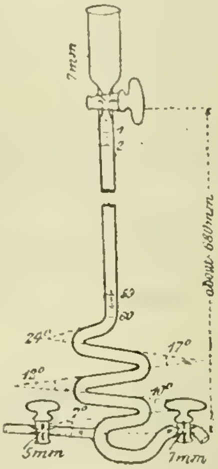
Prepared from Fatty Acids alone.—Free (stearic) ac 12 parts; dinitrobenzene, 8 parts; potassium chlorate, parts.

Mixed Fatty Acid and Fat.—Palmitic acid, 6 parts; or fat, 2 parts; nitronaphthalene, 10 parts; picric ac two parts; ammonium perchlorate, 80 parts.

Mixed Fatty Acid and Fatty Acid Ester.—Margaric ac 7 parts; methyl stearate, 3 parts; dinitrotoluene, 15 part potassium perchlorate, 75 parts.

Fatty Acid and Dissolved Nitro Derivatives.—Stea acid, 6 parts; mononitro-naphthalene, 12 parts; dini toluene, 2 parts; potassium chlorate, 80 parts.—C. S.

Nitrocellulose; Researches on the Stability of —. W. Will. Zeits. angew. Chem. 1901, **14**, [31], 783.



SINCE the conclusion of research on this subject (t Journal, 1901, 609—61 the author has made a se of experiments which h led him to adopt the foll ing modifications in methods.

(1) The guncotton is traduced into the apparatu the moist condition in wh it leaves the centrifugal chine; (2) A copper U-t is used as the reduction v sel; and (3) A special paratus is used for measur the gas (see figure). T consists of an ordinary g burette with its lower fused to a tube bent in zag fashion. A fairly ra current of carbon dio can be passed through apparatus without tear any of it escaping abs tion.—C. A. M.

PATENTS.

Picric Acid; Process for the Manufacture of —. L. Wenghöffer, Berlin. Eng. Pat. 16,371, Sept. 1900.

ONE hundred kilos. of crude sulphanilic acid are stirre a thin paste with water, and mixed with a dilute solutio 40 kilos. of sodium nitrite, so that the whole passes solution with the exception of impurities, which must filtered off. The filtrate is mixed with 28 kilos. of sulph acid, forming diazobenzene sulphonic acid, which crystal out. After filtering, the yellowish porous mass of crys containing about 20 per cent. of water, is introduced nitric acid of such strength that, after the admixture, acid has a density of 40° B. The mixture is slowly he until the generation of nitrogen gas commences, and supply of heat is stopped when this gas is no longer evol Then, after standing for about 36 hours, the whole of picric acid will have formed a deposit. Or, 100 kilos of sulphanilic acid are slowly added to 40 of the nitrite i of water, with constant stirring, the resulting yellow is then introduced into sufficient nitric acid of such de as to produce 320 kilos. of acid of 40° B. By this pro 50 kilos. of aniline have yielded 110 kilos. of picric aci 90 per cent. of the theoretical yield. The object of invention is to substitute for phenol a raw material liable to fluctuations in market value, as the basis for manufacture of the picric acid.—W. G. M.

Gunpowders; Smokeless ——. E. Edwards, London. W. Kent, Chicago, Ill., U.S.A. Eng. Pat. 11 June 4, 1901.

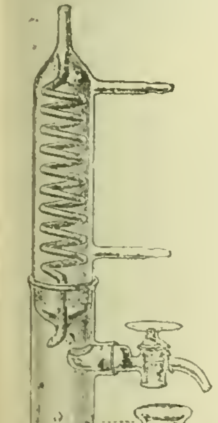
FIFTY parts of picrate of ammonia and 50 of ba nitrate are well ground and mixed in a wheel mill wit aid of a little water; the resulting paste is granulate by ducing the pressure of the wheels, and the grains are parated by means of a sieve, and dried. To give duraility to the powder, which without the addition is efficient r some purposes, about 15 parts of picric acid are added 100 parts of the composition specified, either before ranulation or by melting and mixing it with the granulated wder. This powder aims at being smokeless, and without ndency to deteriorate with age, whilst it gives a high uzzle-velocity to the projectile without undue pressure in e gun-barrel on firing.—W. G. M.

riming [Explosive] Compositions. H. Ziegler, Thun, Switzerland. Eng. Pat. 14,583, Aug. 14, 1900.

ARBONATES of the alkaline earths may be added to fulinate of mercury priming compositions to prevent the composition of the fulminate by other constituents. arium nitrate (with barium carbonate) is substituted for tassium chlorate, as the products of explosion of the wder containing it are less liable than those of chlorate arges, to lead to the rusting of the gun-barrel. The bility of the baryta composition is also greater than that other mixtures commonly used, both in the presence of mp and at 40°—50° C.; also any explosions occurring ring manufacture are less violent than those of chlorate ixtures. The following is a typical example of a compoion recommended, fulminate of mercury, 30 per cent.; rium nitrate, 35; antimony trisulphide, 25; barium rbonate, 6; powdered glass, 4 per cent.—W. G. M.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.



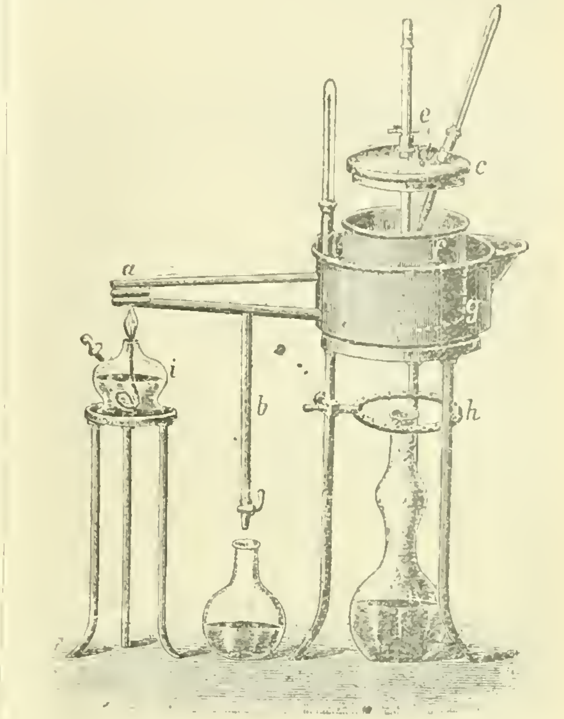
Extraction Apparatus with Arrangement for Distilling off the Solvent. A. Chatelan. Chem.-Zeit. 1901, **25**, [57], 612.

As the figure shows, the lower end of the condenser tube is bent to the side, so that it delivers the condensed solvent over the material during the extraction, or into the collecting spoon connected with the tap during the distillation. The material to be extracted is contained in a removable portion with siphon tube and ground-in stopper, which may thus also be used as a weighing bottle. In case the whole capacity of this cylinder is required, a small Soxhlet filter may be placed in the part of the extractor which lies in the neck of the flask. If the collecting spoon should be broken, it may be replaced by a cork during extraction, and by a bent tube with the end widened out during distillation.

—A. C. W.

iscosimeter; The Engler-Ragosine ——. A. Ragosine. Chem.-Zeit. 1901, **25**, [59], 628.

using Engler's viscosimeter, if the temperature of the ter be maintained exactly at 50° C., that of the oil sinks, ards the end of the operation, to 49° or 48° C., or even ther in the case of very thick oils. The oil may be kept 50° C. throughout, by raising the water at first to 51·5° 52° C., and not allowing it to sink below 50° C. Both se methods are in use; the former will naturally give a her viscosity than the latter. The modification of the aratus here described enables both oil and water to be maintained at 50° C. throughout. Loss of heat from the oil is prevented by covering the lid with a non-conducting layer, c, 5—8 mm. thick. The water-bath is kept at a



constant temperature by means of the copper tube *a*, 7—8 mm. in diameter, which is bent at the end into a spiral, heated by a small spirit lamp, *i*. The tube *a* is provided with a draw-off cock, *b*, to be used in case cold water has to be added. The cover is provided with an air-opening, *d*. The rod is perforated, and may be supported during the experiment by a pin, *e*. It is found that the temperature of the water is readily kept at 50° C., and that the temperature of the oil does not sink more than 0·1—0·3° C. This improved apparatus naturally gives somewhat lower viscosities, which are, however, more exact.—A. C. W.

Thermometer Glass at Higher Temperatures. W. McClellan. *See under* VIII., *page* 899.

INORGANIC CHEMISTRY.—QUALITATIVE.

Potassium; Detection of ——, in presence of the other Alkali Metals, Thallium and Ammonia, by means of Sodium Picrate. C. Reichard. Zeits. anal. Chem. 1901, **40**, [6], 377—384.

THE author has determined, for solutions of various salts of the alkali metals, of thallium and of ammonium, the minimum concentrations with which a cold saturated solution of sodium picrate produces a precipitate. The results show that in the case of potassium salts containing less than 50 per cent. of the metal, a 2 per cent. solution is precipitated by the saturated sodium picrate, whilst this occurs with a 1 per cent. potassium chloride solution. Ammonium salts must be removed by ignition before testing for potassium in this way, since 2 per cent. solutions of ammonium salts are also precipitated. Lithium and sodium salts do not interfere with the reaction, excepting sodium carbonate, which must be previously converted into the chloride, care being taken to add but a slight excess of acid. As cæsium and rubidium picrates are less soluble than the potassium salt, the formation of a precipitate with sodium picrate solution cannot be used as an indication of the presence of potassium when these metals are present. Before testing for the alkali metals, it is of course necessary to remove any other metals present by the ordinary methods.

Thallium, which resembles the alkali metals in some respects, also forms a sparingly soluble picrate, the minimum percentage of thallium nitrate in a solution giving a precipitate with saturated sodium picrate, being about 0·5.—T. H. P.

Indium; Detection of [micro-chemically] ——. P. Kley. Chem.-Zeit. 1901, **25**, [53], 563.

Indium is best detected (micro-chemically) by means of the double chloride of indium and rubidium. A small fragment of rubidium chloride is added to the solution of indium hydroxide in strong hydrochloric acid; the crystals which separate are colourless octahedra, which polarise light strongly and show themselves to be complex rhombic crystals, measuring from 10 to 70 μ. The limit of the reaction lies at 0·00024 mgrm. In. The delicacy of the reaction can be increased by using cæsium instead of rubidium, the limit being then 0·00002 mgrm., but the crystals are then so small that they are only recognised with difficulty. The separation of indium from other metals is readily effected by converting it into hydroxide; when precipitated by means of ammonia, the hydroxide clings to the object glass, and can here be washed, first with ammonia and then with water. In this way most of the zinc and cadmium are removed. Aluminium and zinc are not, however, prejudicial to the reaction; even when 50 per cent. of zinc is present, the separation with ammonia need not be made. But when traces of indium are accompanied by large quantities of trivalent metals, the separation by means of ammonia is followed by treatment with ammonium carbonate, in which indium is soluble, and from which it is afterwards precipitated by oxalic acid. But with very small quantities of indium, the reaction is not satisfactory, and the rubidium process is preferable. Ammonia and ammonium chloride should be expelled as far as possible, as they tend to reduce the size of the crystals. Ammonium chloride gives double salts with indium chloride, soluble in hydrochloric acid. The remainder of the article is taken up with a criticism of Huysse's work (see this Journal, 1900, **19**, 930).
—W. G. M.

INORGANIC CHEMISTRY.— QUANTITATIVE.

Chromium Oxide in Chrome Mordants; Volumetric Determination of ——. R. Hartmann. Chem.-Zeit. 1901, **25**, [53], 564.

About 1 grm. of chromium acetate (of 21° B.; for more concentrated mordants, less would be used) is diluted with 10—15 c.c. of water, and mixed with a few drops of strong caustic soda solution, until the precipitate formed has redissolved. The solution is heated on the water-bath, and sodium peroxide added until it has a pure yellow colour. The solution is then completely evaporated, in order to decompose any Na_2O_2 or H_2O_2, redissolved in 500 c.c. of water, and acidified with dilute sulphuric acid. 50 c.c. of a decinormal solution of Mohr's salt are then added, and, after dilution to 1 litre, the excess of the latter is titrated back with decinormal permanganate solution until the liquid has a dirty violet colour. Chromium acetates produced by reduction from bichromate are freed from the reducing substances by nitric acid or by hydrochloric acid and chlorate, as for gravimetric determinations, and after conversion into sulphate are titrated as above. Certain pyroligneous substances in the acetate cause a somewhat excessive use of permanganate, and therefore lead to correspondingly low results; but as the difference rarely exceeds 0·02—0·09 per cent., it is negligible.—W. G. M.

Sulphur; Influence of Aluminium Salts in the Determination of ——. E. Noaillon. Bull. Assoc. Belge des Chim. **15**, [2], 90—93.

The author finds that the influence of aluminium chloride on the results obtained in determining sulphur as barium sulphate, is the opposite to that exerted by iron salts, the results coming out higher than the truth. For example, a potassium sulphate solution that furnished 0·10035 grm. of sulphur in the absence of alumina, gave 0·10164—0·10180 grm. in presence of 2 grms. of that substance, whereas in the case of iron salts, the results come out below the truth.

The high results are probably due to the presence o alumina, in the state of chloride, in the precipitate, since, i present as sulphate, the results would come out too low It is found advantageous to make the sulphur determination in a solution containing 5 per cent. of hydrochloric acid the slight error resulting therefrom being negligible, whils the operation is facilitated by the improved condition of th precipitate.—C. S.

Copper Oxide, Commercial; Determination of Cuprou Oxide in ——. D. Miklosich. Zeits. angew. Chem 1901, **14**, [30], 753.

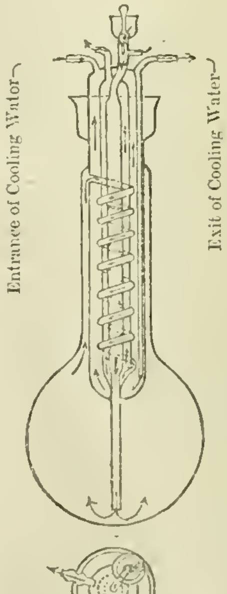
P. Drawe's method for estimating Cu_2O in commerci CuO (this Journal, 1901, 809) is liable to error, owin to the solubility of metallic copper in copper sulphat solutions. A method, however, based on the second of th following two equations, gives good results:—

$$Cu + Fe_2O_3 = CuO + 2FeO.$$
$$Cu_2O + Fe_2O_3 = 2CuO + 2FeO.$$

One gram of ferrous ammonium sulphate is weighe carefully, and, after adding 10 c.c. of dilute sulphuric aci is titrated with permanganate. When just peroxidised, further addition of 10 c.c. of the dilute acid is made, an 0·5 grm. of the copper oxide to be tested is added. Th mixture is warmed in an Erlenmeyer flask, provided wit a Bunsen valve (to prevent access of air), until the coppe oxide is dissolved; after cooling, the contents of the flas are quickly poured into 1 litre of air-free water in porcelain dish, and titrated back with permanganate. I this way a known quantity of standardised ferric salt mixed with the copper oxide, and any reduction to th ferrous condition that may occur should be due to cuprou oxide, the amount of which is therefore found by simp calculation.—W. G. M.

Steel and Iron; Carbon Determination in ——. Schmit Chem.-Zeit. 1901, **25**, [65], 684.

A slight modification of the method for determining carb in iron and steel gives good results, and can be carried o in 1—2 hours. 5 grms. of iron or 3 grms. of steel are di solved in the flask shown in t figure (which may also pro useful for other purposes), ir mixture of chromic acid, cup sulphate, and sulphuric acid, a the hydrocarbons formed bei passed, together with air ov a platinum spiral maintained a bright-red heat, and are th burned to carbon dioxide. T quantities employed are, 25 c of chromic acid (500 grms. 250 c.c. of water), 150 c.c. copper sulphate (200 grms. p litre), and 200 c.c. of sulphu acid (2,100 grms. of conce trated sulphuric acid to 1 li of water). The apparatus arranged as follows:—Fla platinum spiral, small wa bottle with sulphuric ac U-tube with phosphoric anh dride, two U-tubes with so lime and phosphoric anhydri U-tube with phosphoric an dride and finally a wash bo with sulphuric acid. In ordinary method, in spite of copper sulphate, the loss hydrocarbons, according to hardness of the steel, is quently considerably more t $\frac{1}{50}$th of the total carbon. T error is avoided by the use of the platinum spiral. W two sets of apparatus as described, eight determinations be readily carried out in one day.—T. A. L.



ine in Spathic Iron Ores ; Estimation of Small Quantities of ——. J. Flath. Chem.-Zeit. 1901, **25**, [53], 564—565.

ue usual method of estimating zinc in these ores is dious and liable to errors, which the author describes. ie process recommended is as follows: 3—5 grms. of e ore are dissolved in hydrochloric acid, with gentle ating, requiring about a quarter of an hour. The liquid diluted with about 150—200 c.c. of water, a slight excess ammonia is added, the resulting precipitate at once lissolved, without filtering, in acetic acid (15 c.c. of the per cent. acid being used), and the metals Zn, Pb, Cu, d about 2—4 per cent. Fe precipitated by passing H_2S. the beaker be kept covered with a clock glass, to exclude as far as possible, the precipitate may be filtered in m 5 to 10 minutes. It deposits quickly and completely, l the supernatant liquid has never been found to contain re than a trace of Zn. The precipitate is washed twice h hydrogen sulphide water, any milkiness of the filtrate ng disregarded as due to sulphur. The precipitate is u dissolved in *aqua regia*, evaporated with 10 c.c. of ute (1:1) sulphuric acid, diluted with 100 c.c. of water, l boiled. The copper is precipitated with sodium thiophate and filtered off. The excess of thiosulphate and iron that may be present are oxidised by adding 5 c.c. nitric acid, and boiling. Bromine water is added, and iron is precipitated by ammonia. The zinc is estimated umetrically in the filtrate. By this process the zinc is idly freed from the bulk of the iron. Figures quoted to show that results are accurate, but somewhat higher n those obtained by the older method.—W. G. M.

nc ; Volumetric Determination of ——. P. H. Walker. J. Amer. Chem. Soc. 1901, **23**, [7], 468—470.

e process given by the author is a modification of that ised by Stolba for the determination of magnesium, is carried out as follows :—To the zinc solution, which uld contain ammonium chloride, a large excess of uonia is added, then a large excess of sodium phosphate ution. Hydrochloric acid is now gradually added until, r stirring, the solution remains milky, when the liquid eated to about 75° C., and the gradual addition of acid tinued, with constant stirring, until nearly complete tralisation is attained. By this means the precipitate omes crystalline, and after five minutes' standing it ld be filtered off and washed with cold water until the hings show only a faint trace of chlorine. The filter er and precipitate are now returned to the beaker in ch the precipitation was carried out, an excess of dard acid added, and the exact point of neutrality rmined by means of standard alkali, using methyl ge as indicator. From the equation—

$$ZnNH_4PO_4 + H_2SO_4 = ZnSO_4 + NH_4H_2PO_4$$

seen that 1 c.c. of normal acid corresponds with 32·7 ms. of zinc. The method gives good results. Since zinc ammonium phosphate is not precipitated in ence of a large excess of ammonia, any magnesium ent, which will be precipitated, may be removed by ation, and the filtrate neutralised to throw down the . Fairly good results are obtained by this method also e presence of iron, calcium, and magnesium, but any ganese must be previously separated, best by means of c acid and potassium chlorate.—T. H. P.

Z : *Determination of* ——, *by means of Iodine Solution.* P. Knaps. Chem.-Zeit. 1901, **25**, [51], 539—540.

Z sulphide, in the acetic acid solution in which it is narily precipitated, is converted by iodine into zinc le and sulphur. If, however, more than 0·05 grm. of sulphide to 200 c.c. of water be present, the separated hur protects particles of it from the action of the e. This can be prevented by forming a precipitate, as barium sulphate, in the liquid prior to the introduc- of the hydrogen sulphide. Thus, from 10 to 20 c.c. of ution of 150 grms. of barium chloride in a litre, and ame quantity of sodium sulphate solution (200 grms. litre), are introduced, the zinc precipitated, and the ss of hydrogen sulphide removed by boiling. An excess of standard iodine solution is then added, the liquid shaken for 1—2 minutes, and the excess of iodine titrated with standard thiosulphate. Ammonium salts do not interfere, and the author shows by test experiments that the results are accurate even in the presence of considerable quantities of manganese salts.—C. A. M.

Arsenic Acid ; Acidimetry of ——. A. Astruc and J. Tarbouriech. Comptes Rend. **133**, [1], 36—38.

With Methyl Orange, arsenic acid is neutral when soda, potash, ammonia, baryta, strontia, or lime has been added in quantity sufficient to form the salt RH_2AsO_4, where R represents a monad radicle; this is true in cold or hot solutions.

With phenolphthalein, neutralisation occurs in the case of the alkalis with the formation of R_2HAsO_4, whether in cold or hot solutions. The phenomenon is the same with the alkaline earths in the cold; but, when boiled, neutrality is shown only on the formation of R_3AsO_4.

If to arsenic acid in the presence of a chloride of an alkaline earth metal, there be added excess of alkali, a gelatinous precipitate of tribasic arseniate falls. If now phenolphthaleïn be added, and acid just to the permanent disappearance of the red colour, it is found that the precipitate dissolves, and that at the neutral point there is exact formation of R_2HAsO_4; but if, before titration with acid, the liquid be boiled, the gelatinous precipitate becomes crystalline, and this crystalline tribasic arseniate remains undissolved on titrating.—J. T. D.

Cyanides ; Isopurpuric Acid Test for ——. C. Reichard. Chem.-Zeit. 1901, **25**, [51], 537—538, and [52], 555—556.

If 10 c.c. of a 1 per cent. solution of potassium cyanide be mixed with a few c.c. of a cold saturated solution of sodium picrate, there results in a few moments a dark coloration, which gradually deepens, until after 15 minutes, the liquid has become purple-red and opaque. A solution containing 0·25 per cent. of potassium cyanide, when similarly treated, at first remains clear for some time, but after 30 to 45 minutes it, too, becomes dark, and finally, after about two hours, completely opaque. If the cyanide solution contain only 1 part in 1,600, it remains unchanged for about an hour, but after 10—12 hours there is a perceptible coloration, which, however, does not deepen in intensity on standing, as in the case of the stronger solutions. Even in dilutions of 1:2,000 or 3,000, a perceptible darkening occurs, but in the author's opinion the limits of the test cannot be fixed at more than 1:2,000.

If the solutions be boiled, the reaction is considerably accelerated, but in order to obtain an approximate idea of their strength by the velocity of the changes, it is necessary to make the test in the cold.

As the simplicity of the test is frequently complicated by the presence of other salts, the author has studied the behaviour of insoluble cyanides towards picric acid.

The presence of cyanogen in silver cyanide cannot be detected by the isopurpuric reaction.

Copper Cyanide, when freshly precipitated and exposed in a moist condition to the atmosphere, soon absorbs oxygen and becomes light blue. If freshly precipitated copper cyanide be suspended in water and treated with barium peroxide, oxygen is soon liberated, and the colour of the cyanide changes to light blue. The substance formed dissolves in solutions of ammonium hydroxide or sodium hydroxide, yielding dark blue liquids, which are so stable that they can be boiled without change. Like this blue compound, copper cyanide which has been treated with sodium picrate yields a blue solution on treatment with ammonium hydroxide, but this solution is decomposed on warming with sodium hydroxide, yielding a colourless liquid and a black powder, probably copper oxide. By treating copper cyanide with sodium hydroxide solution, a similar blue solution is obtained, but no purple coloration results on the addition of sodium picrate. On the other hand, by warming the copper cyanide with barium peroxide and water until all evolution of oxygen has ceased, and then filtering from the blue compound, a colourless filtrate is obtained, which, when treated with sodium hydroxide and sodium picrate, gives the purple coloration.

Lead Cyanide suspended in water and heated with sodium picrate remains unaltered. No purple coloration is obtained on adding sodium picrate after treatment with barium peroxide, as in the case of copper cyanide.

Zinc Cyanide is readily soluble in sodium hydroxide solution, yielding a colourless liquid, which becomes dark reddish-yellow on the addition of sodium picrate. Ammonium hydroxide also dissolves zinc cyanide, and on heating the solution with sodium picrate, a purple coloration is obtained, whilst ammonium picrate is precipitated. The filtrate from the barium peroxide treatment gives the coloration, even without the addition of alkali.

Cadmium Cyanide gives a coloration with sodium picrate and sodium hydroxide, but not with ammonium hydroxide. Barium peroxide gives a filtrate which does not show the reaction without the addition of ammonium or sodium hydroxide.

Nickel Cyanide is a light green powder which does not alter when heated with sodium picrate solution alone, but on heating the mixture with concentrated sodium hydroxide solution, a purple shade is produced.

From his experiments the author concludes that the isopurpuric acid reaction can only be used advantageously with the simple cyanides of the alkali metals.—C. A. M.

Soap: Effect of Sodium Chloride in the Estimation of Free Alkali Hydrate and Carbonate in ——. F. E. Robertson. J. Soc. Dyers and Colourists, 1901, **17**, [7], 171—172.

In estimating the free alkali in soap, an error is caused by the presence of the sodium chloride used in "salting out" the soap. The process employed was to salt out, filter, and in the filtrate estimate free NaOH and Na_2CO_3 by titrating with N/10 acid until neutral to phenolphthaleïn, then adding Methyl Orange and continuing the titration until again neutral. The first titration should give the caustic soda plus half the carbonate; the second neutralises the remainder of the carbonate. When salt is present it affects both indicators, but in an opposite manner, reacting "acid towards phenolphthaleïn, but alkaline towards Methyl Orange." The two errors thus both tend to reduce the apparent amount of caustic and increase the apparent amount of carbonate.

This effect is not due to the use of impure commercial salt, since the most carefully purified samples gave practically identical figures. It is, however, worthy of note that some samples of salt sold as "chemically pure" are distinctly alkaline, even to phenolphthaleïn.

Corrections: Estimation of Total Free Alkali.—In estimating the total free alkali with Methyl Orange indicator, a deduction must be made of 0·0114 c.c. of N/10 H_2SO_4 for each grm. of salt used, or, without sensible error, 0·004 c.c. of N/10 H_2SO_4 for each 1 c.c. of a saturated solution of salt.

Separate Titration of NaOH and Na_2CO_3.—Sufficiently concordant results were obtained on working with samples of known alkalinity by adding to the acid figure obtained in the phenolphthaleïn titration, 0·024 c.c. of N/10 H_2SO_4 for each 1 c.c. of saturated salt solution, and deducting 0·0285 c.c. of N/10 H_2SO_4 for each 1 c.c. of saturated salt solution when titrating with Methyl Orange; but no absolute figure has been arrived at in this case, because the necessary correction varies with each proportion of NaOH and Na_2CO_3. The correction given, applies when the two are present in approximately equal amounts. "If the NaOH is in excess the correction is less; if the Na_2CO_3 is in excess, the correction must be greater; and this fact renders an explanation of the action of the salt more obscure." (See also Wright and Thompson, this Journal, 1885, 625.)—R. B. B.

Paris Green; Determination of Arsenious Oxide in ——. S. Avery and H. T. Beans. J. Amer. Chem. Soc. 1901, **23**, [7], 485—486.

The following procedure affords a rapid and accurate means of determining the arsenious oxide content of Paris green. 0·2—0·3 grm. of the pulverised sample is weighed out into a beaker of about 300 c.c. capacity, water being added and then concentrated hydrochloric acid, drop by drop, until solution is just effected; from 6 to 10 dro are usually sufficient. Sodium carbonate solution is th added until a slight permanent precipitate is formed, which point a solution of 2 to 3 grms. of sodium potassiu tartrate is run in; by this means the precipitated copper dissolved and further precipitation during the subseque titration prevented. After diluting the liquid to abo 200 c.c., solid sodium bicarbonate and starch solution a added, and titration with iodine carried out in the usu way. The end reaction is sharp, and the determinati can be completed in about 10 minutes, while the meth gives concordant results. The presence of copper sulpha has no influence on the titration, which, however, does n give accurate results if cuprous salts are present; su salts have not been observed in the samples of Paris gre examined.—T. H. P.

Phosphoric Acid; Determination of —— in Superpho phates, Compound Manures, and precipitated Phospha by Cold Precipitation as Ammonium Phosphomolybda L. Ledoux. Bull. Assoc. Belge des Chim. **15**, 125—129.

The reagent employed consists of 100 c.c. of a soluti prepared by dissolving 150 grms. of molybdic acid 600 c.c. of ammonia (sp. gr. 0·96), and pouring t solution into 1,070 c.c. of nitric acid (sp. gr. 1·22), obtain by mixing 500 c.c. of concentrated acid with 570 c.c. water.

Three essential conditions affect the reliability of t method: the presence of a considerable quantity of a monium nitrate; the conversion of the phosphoric a into the ortho form; and the presence of sufficient of t molybdic reagent to saturate the total citric and phospho acid.

In carrying out the method, 2 grms. of superphosph or 4 grms. of compound manure are extracted by wa and by citrate solution in the usual manner, each of extracts being made up to 250 c.c. and mixed in eq proportions (59 c.c.). In the case of precipitated ph phates, a quantity of the citric extract corresponding 0·2 grm. of substance is taken.

The solution is boiled for five minutes with 15 c.c. nitric acid (sp. gr. 1·40), cooled, and treated with 15 of ammonia (sp. gr. 0·92); 100 c.c. of molybdic reag are then added to the solution, which should be sligh acid, and the mixture agitated briskly for half an h at a temperature not exceeding 16° C. The result precipitate is perfectly pure, and may be estimated by Pemberton titration method or by weighing as magne pyrophosphate.—C. S.

Superphosphates; Determination of Water-soluble Ph phoric Acid in ——. L. v. Széll. Landw. Vers.-S 55, 325—346. Chem. Centr. 1901, **2**, [5], 374.

The author finds that with pure solutions of sodi phosphate, the molybdate method gives good results, with solutions containing other salts, the precipitates are c taminated by SiO_2, Fe_2O_3, Al_2O_3, and traces of MoO_3, consequently give higher results than the ordinary citr method. The latter method gives too low results, owing the slight solubility of magnesium-ammonium phosphate ammonium nitrate solution. The author modified molybdate method (repeated evaporation of the solut with hydrochloric acid, and then with nitric acid and do precipitation of the phosphomolybdate) and also the citr method (use of only a little more citrate solution tha required for dissolving the precipitate which forms at fir and then obtained results that agreed very satisfacto The modified molybdate method gave, with pure sodi phosphate solutions, results absolutely identical with th obtained by the usual methods.

The water-soluble phosphoric acid is determined in e following manner:—

The superphosphate is ground, passed through a 3 sieve, and 20 grms. triturated with water to a thick p This is diluted, decanted, rinsed into a litre flask, nearly up to the mark, and agitated or rotated as us 50 c.c. of the clear solution are treated with sufficient cit solution (300 grms. of citric acid and one litre of 24

it. ammonia, made up to 3 litres) to dissolve the pre-
itate formed, then $\frac{1}{10}$th of the previous quantity of citrate
ution is further added, and the mixture treated, with
itation, with magnesia mixture (25 c.c. are sufficient in
st cases). The subsequent operations are the same as
ual.—A. S.

tural Waters ; Determination of Nitric and Nitrous Acid in ——. L. W. Winkler. Chem.-Zeit. 1901, 25, [55], 586—587.

e author gives the following improved methods for the
pid determination of ammonia, nitric and nitrous acids in
tural waters.

Nitric Acid.—10 c.c. of the water to be examined and
distilled water are mixed separately in 50 c.c. flasks with
c.c. of a 2 per cent. solution of brucine sulphate and 20 c.c.
concentrated sulphuric acid. The distilled water
ution is then made hot, and potassium nitrate solution
c.c. = 0·1 mgrm. of N_2O_5) added to it drop by drop
til it assumes a yellow tint identical with that of the other
ution. Instead of the ordinary flasks, it is more con-
ient to use long-necked cylindrical flasks with a bulb
out 3 cm. in width, as with these the tints can be more
dily compared ; it is best also to look downwards through
flasks at a milk-glass plate, using a black screen with
es to stop the white light. If the red colour produced
the nitrate is slow in changing to yellow, the solution is
cold and must be reheated. Since brucine sulphate
ation does not remain clear for more than a few days, it
l sometimes be found convenient to add to the water
·3 centigrms. of pure brucine and then 1—2 drops of
centrated sulphuric acid, the remainder of the latter being
ed after the brucine has dissolved. The best results
obtained with waters containing from 1 to 10 mgrms. of
ic acid (N_2O_5), per litre ; waters containing more
n this quantity should be suitably diluted. The results
lded by this method are not vitiated by the presence
organic matter in the water.

itrous Acid.—100 c.c. of the water are mixed in a
c.c. flask with 20 c.c. of 10 per cent. hydrochloric acid
2—3 c.c. starch solution, and to the mixture is
ed 5 grms. of potassium bicarbonate and, after about a
ute's gas evolution, 0·1—0·2 grm. of potassium iodide ;
r standing for five minutes longer, the iodine separated
itrated with a sodium thiosulphate solution, 1 c.c. of
ch corresponds with 0·1 mgrm. of N_2O_3. If the
assium bicarbonate is in small crystals, it must be
ken into the liquid a gram or so at a time, the po-
sium iodide being added with the last of the carbonate.
preserving the starch solution the author considers it best
to add anything to it, but to sterilise it and keep it sterile.
rm. of starch is boiled with 500 c.c. of water, the clear
id filtered after 24 hours' standing, and the filtrate
oduced into small (50 c.c.) medicine bottles, which are
n fitted with cotton-wool plugs and heated for half an
r at 100° C.

he methods described are found to give good results.
—T. H. P.

bonic Acid in Water ; Determination of ——. J. W.
ms and J. C. Beneker. J. Amer. Chem. Soc. 1901,
3, [6], 405—431.

authors have investigated the following three volu-
ric methods of determining the free and half-bound
bonic acid of water :—(1) Pettenkofer's method, in which
cipitation of the magnesia during titration with barium
roxide is prevented by the addition of ammonium
ride. (2) Trillich's modification, in which precipitation
the magnesia is not prevented during titration, the
ount of barium hydroxide used up by the magnesium
bonate being allowed for by means of a separate
vimetric determination of the magnesium present
The Lunge-Trillich or Seyler method. The last method
recommended on account of ease and rapidity of
ipulation, avoidance of difficulties arising from the
sence of magnesium salts, and for its greater accuracy,
results obtained being mostly less than 1 per cent. too
, and the possible error being less than ± 3 per cent.
tenkofer's method and Trillich's modification of it give numbers which are on an average 5 to 10 per cent. too low. The Lunge-Trillich or Seyler method depends on the action of phenolphthalein as an indicator in the presence of free carbonic acid, and of carbonates and bicarbonates of the alkaline earth bases, the assumption—shown by the authors to be justified—being made that in the bicarbonates of these bases, there is one molecule of half-bound carbon dioxide for each molecule of fixed carbon dioxide. The free carbonic acid in the water is determined by placing 100 c.c. of the sample in a glass cylinder, with 25 to 30 drops of a neutral phenolphthaleïn solution, and running in N/50 or N/20 sodium carbonate solution until a faint permanent pink colour is obtained. In this operation the following precautions should be observed :—(1) The titration may be carried out in a short Nessler cylinder, with a similar vessel containing the same quantity of water to help in the determination of the end point, the stirring rod used being bent at the end into a ring, perpendicular to the length of the rod. (2) The sodium carbonate solution should be prepared from freshly ignited carbonate, and well-boiled water cooled out of contact with air ; it should be exposed as little as possible, and the greater portion of it should be run in quickly. (3) With waters rich in free and half-bound carbonic acid, less than 100 c.c. should be employed, especially when N/50 carbonate is used, and shaking or vigorous stirring of the water should be avoided. The fixed carbonic acid, which gives the half-bound, is then determined according to Hehner's method, using methyl orange or lacmoid as indicator. In the absence of free carbonic acid in a water, the half-bound may equal the fixed, in which case phenolphthalein would show a neutral reaction ; if, however, the water is alkaline to phenolphthaleïn, the half-bound acid is less in quantity than the fixed, so that part of the alkaline-earthy carbonates exist in solution without the assistance of half-bound acid. In such a case, the half-bound carbonic acid is arrived at by first determining the fixed acid by titration, with lacmoid as indicator, and deducting from the result twice the amount of carbonic acid indicated by the sulphuric acid required to discharge the pink colour produced on adding phenolphthaleïn to the water. The existence of free carbonic acid in a solution containing free mineral acid is possible, but is seldom met with in natural waters.—T. H. P.

Mercury and Bismuth Salts ; Determination of ——. T. Tyrer and C. T. Tyrer. Brit. Pharm. Conference, Dublin. Chem. and Druggist, 1901, 59, [1123], 234.

Determination of Mercury.—The authors have used the hypophosphorous acid method for the determination of mercury for several years with satisfactory results. They have also tried stanoous chloride, formaldehyde, and sodium arsenite as reducing agents, and give the following average results obtained :—

—— .	Hypophos-phorous Acid.	Stannous Chloride.	Form-aldehyde.	Sodium Arsenite.
Hyd. ammon. chlor.	76·9	75·81	76·32	76·53
Hyd. perchlor......	73·6t	72·86	73·42	72·92
Hyd. ox. rub.	91·7	91·17	91·37	91·15

Phenylhydrazine hydrochloride, tartar emetic, and phosphorous acid did not give satisfactory results. A modification of the method proposed by Vanino and Treubert (this Journal, 1898, 379) is stated to give fair results.

Determination of Bismuth.—In the determination of bismuth by reduction, hypophosphorous acid and formaldehyde were found to work well, but neither method has any advantage over the B.P. sulphide process.—A. S.

ORGANIC CHEMISTRY.—QUALITATIVE.

Nitrogen ; Oxidation of ——, *as a Source of Error in the Determination of Hydrogen and Methane.* A. H. White. J. Amer. Chem. Soc. 1901, 23, [7], 476—482.

Oxides of nitrogen are always formed in explosion analyses in amount increasing with the violence of the explosion. The value of the explosive ratio, *i.e.*, the ratio of the volume of the non-explosive gases to that of the explosive gases, recommended by Bunsen, namely, 3·81—1·55, is not sufficient when working with the Hempel explosion pipette. If the explosive ratio be kept between 4 and 3, however, the error is negligible in the technical analysis of gases consisting almost entirely of hydrogen. The presence of small amounts of methane increases the error, and when large quantities of this gas are mixed with the hydrogen, the error may easily amount to 1 per cent. or even more; in this case also the explosive ratio should be kept between 4 and 3. The method of Dennis and Hopkins, according to which the gas, in contact with a glowing platinum spiral, burns quietly in a current of oxygen and air, tends to give high results, and the errors may become of importance if care is not taken to avoid prolonged and excessive heating of the spiral.—T. H. P.

Beer Yeast in Pressed Yeast; Detection of ——, *by Bau's Method.* S. Küttner and C. Ulrich.

See under XVII., *page* 919.

Beer Yeast in Pressed Yeast; Detection of ——. H. Herzfeld.

See under XVII., *page* 919.

Salicylic Acid in Wines; Sensitiveness of the different Methods of detecting ——. A. J. Ferreira da Silva. Bull. Soc. Chim. 1901, **25**, [14], 726—731.

The author has determined the smallest proportions of salicylic acid in wine which it is possible to detect by means of ferric chloride after extracting the acid by one of the various methods proposed. The German official method in which 50 c.c. of the wine are treated with a mixture of ether and light petroleum spirit, is sensitive to 1 part of salicylic acid per 200,000 of wine, whilst if the extract obtained as above be subjected to further treatment with benzene, only 1 part in 100,000 can be detected. The latter degree of sensitiveness is also possessed by the two methods proposed by Weigert and Rösler, in which 50 c.c. of the wine are extracted in the one case with carbon bisulphide, and in the other with chloroform. Extraction of 20 c.c. of the wine with ether and treatment of the ethereal liquid with benzene, which is the method of procedure adopted in the Municipal Laboratory of Paris will not detect less than 1 part of the acid in 33,000 of wine.—T. H. P.

Morphine; The Lloyd Reaction for ——. J. L. Mayer. Brit. and Colonial Druggist, 1901, **40**, [4], 90.

The author recommends a new test, to be known as the Lloyd reaction for morphine, based upon the fact that a mixture of morphine and hydrastine when treated with a few drops of concentrated sulphuric acid gives a violet-blue coloration. The author has determined the effect of the reaction on various alkaloids by mixing 1 part of hydrastine with 8 parts of the other alkaloid, adding a few drops of concentrated sulphuric acid, and stirring for at least five minutes. It is important that the mixture be stirred for at least five minutes, as many alkaloids give colorations for the first few minutes, which are totally different from the end reactions. Of 20 alkaloids examined, only two, heroine and veratrine, besides morphine, gave a violet-blue colour when mixed with hydrastine and treated with concentrated sulphuric acid in the way described above. These three alkaloids, heroine, morphine, and veratrine, can readily be distinguished, as veratrine gives a characteristic cherry-red coloration with concentrated sulphuric acid; whilst when treated with nitric acid, heroine gives a yellow and morphine an orange-red colour.—A. S.

Santonin; The B.P. Test for ——. P. Pain. Brit. Pharm. Conference, Dublin. E. M. Marshall. Chem. and Druggist, 1901, **59**, [1123], 246.

The author points out that many other substances will answer the B.P. test for santonin. He suggests the following test, which he claims to be more certain and sensitive. If a few crystals of santonin be warmed in a test tube, with 2 or 3 c.c. of ethyl nitrite solution, a fine rose-red colour is produced on the subsequent addition of a few drops potassium hydroxide solution. No colour is produced the potash is added, a distinction from aloin and resorcin both of which give a red colour with ethyl nitrite solutio intensified by the addition of potash; thymol gives a da yellow solution when submitted to this test.—A. S.

Peppermint Oil; Colour Reaction of ——. P. Welm Pharm. Zeit. **46**, 591. Chem. Zeit. Rep. **25**, [26], 253.

An excellent colour reaction can be obtained by treati 5 c.c. of peppermint oil with about 1 c.c. of mercu iodochloride (25 grms. of I., 39 grms. of $HgCl_2$, made up t litre with acetic acid and acetic ether), the liquid turni deep blue within a minute and exhibiting a beauti fluorescence. The colour increases in intensity on standi and persists for a considerable time.—C. S.

Titration of Organic Acids and Alkalis of Comp Function by Coloured Indicators. Neutralisatio Studies in ——. Berthelot. Comptes Rend. 13 [23], 1377—1382.

The author has examined, using as indicators litm Methyl-Orange, phenolphthaleïn, and Poirrier's Blue, so typical compounds of complex function:—glycoc (aminacetic acid), leucine (aminocaproic acid), the th aminobenzoic acids, hippuric acid, taurine, aspartic ac and uric acid. *Glycocoll:* is acid to phenolphthaleïn, neutrality is reached on adding a quantity of soda in t proportion $NaOH : 16·7\,C_2H_5NO_2$; it is alkaline to Meth Orange, and needs for neutralisation $\frac{1}{2}H_2SO_4 : 16·7\,C_2H_5N$ it is acid to Poirrier's Blue, but there is no clear indicati of the neutral point on adding soda. *Leucine:* acid phenolphthaleïn, needs about $NaOH : 14C_6H_{13}NO_2$; sligh alkaline to Methyl-Orange, about $\frac{1}{2}H_2SO_4 : 70C_6H_{13}N$ neutral to litmus; acid to Poirrier's Blue, indicat not clear, but about $NaOH : C_6H_{13}NO_2$, indicating a c pound similar to the alkali alcoholates. *Aminoben Acids:* no neutral point with Methyl Orange; with other three indicators, acid, needing $NaOH : C_7H_7NO_2$; three acids behave alike. *Aspartic Acid:* no satisfact indication. *Hippuric Acid:* a well defined monobasic with all the indicators, though the change-point is well marked with Methyl-Orange or Poirrier's B *Taurine:* neutral to litmus, phenolphthaleïn, and Met Orange. *Uric Acid:* solution very dilute, indicati not sharp; but acid to litmus, phenolphthaleïn, Poirrier's Blue, alkaline to Methyl-Orange.

Mixtures in known proportions of hippuric acid sodium phosphates were also examined with the s indicators, to discover how far there was reaction betw the acid and the salt. *Hippuric acid* and NaH_2P with Methyl-Orange, the hippuric acid is indicated though alone; with phenolphthaleïn, the acidity of acid adds itself to that of the phosphate. *Hippuric* and Na_2HPO_4: faintly alkaline to Methyl-Orange, acid ($1·01NaOH : C_9H_9NO_3 + Na_2HPO_4$) to phenolphtha The mixture behaves like sodium hippurate and NaH_2 *Hippuric acid* and Na_3PO_4: alkaline to Methyl-Or neutral to phenolphthaleïn; behaves like sodium hipp and Na_2HPO_4.

Glycocoll has no similar influence on the phospha the bodies behave in all cases as though each were alo —J. T.

ORGANIC CHEMISTRY.—QUANTITATI

Acetylene and other Combustible Gases; Determinatio Phosphorus and Sulphur in ——. P. Eitner G. Keppeler. J. für Gasbeleucht. 1901, **44**, [30], 5 552.

The authors consider Wilgerodt's method of estim the phosphorus and sulphur compounds in acetylen oxidation with bromine water (this Journal, 1896, inconvenient, because of the enormous consumptio bromine entailed by the conversion of the acetylen tetrabromide. The method of Lunge and Cederk (this Journal, 1897, 1046), in which the acetylene is p through a solution of sodium hypochlorite, is conve but Ahrens found that the acetylene, after treatment solution, still contained some phosphorus, which he ted by means of potassium permanganate (this nal, 1899, 819). The authors consider the method idising the whole of the phosphorus and sulphur ounds by permanganate impracticable, because the lene also must be oxidised, and an enormous volume olution of permanganate is therefore required. The mination of small quantities of phosphorus and sulphur becomes difficult.

e authors have modified Drehschmidt's method for the mination of sulphur in coal gas by combustion, in to make it applicable to the determination of phos- s and sulphur in acetylene. The gas is burnt in a blast burner fed with oxygen, so as to give a non- ous flame, at the rate of about 10 litres per hour, he products of the combustion, diluted with a little dary air, which is admitted to the flame, are collected a glass hood, from which they are aspirated through ption bulbs. The first set of 10 bulbs contains only , a second set contains solution of sodium hypobromite, ten follows an empty Peligot's or Volhard's absorption by which any liquid sprayed forward is retained. The e of acetylene consumed is exactly measured by of an experimental meter, in which concentrated previously saturated with acetylene of similar origin l as the confining liquid. After a suitable volume of etylene has been burnt—usually 20 to 25 litres serves the glass hood, on which phosphoric acid will have l, is inverted and filled with hot water containing hloric acid, which is left in it overnight. Its contents en concentrated in a porcelain dish, and ammonia and nium carbonate added. The liquid is then filtered to e silica, &c., and the filtrate is added to the liquid ed from the contents and washings of the absorption atus after they have been boiled with hydrochloric destroy the hypobromite, made ammoniacal, and l. After cooling, the phosphoric acid is determined cipitation with magnesia mixture, and the sulphuric n the acidified filtrate from this determination by tation with barium chloride.

authors found by investigation that the whole of the oric acid produced by the combustion was retained glass hood and first set of bulbs, while the sodium omite in the second set of bulbs ensured the retention the sulphuric acid formed. They made parallel inations of the phosphorus in four different samples tylene by this method and by the Lunge and Ceder- method, and found that the former consistently gher results. They then passed acetylene through hypochlorite, as directed by Lunge and Ceder- . collected the gas thus treated, and determined the orus remaining in it by the combustion method. ets of analyses thus made on different samples of ne gave the following results :—

——	1.	2.	3.	4.
	Grammes of Phosphorus per Cubic Metre of Acetylene.			
d by hypochlorite	0·21	0·60	0·15	0·40
by combustion, in the assed through the hypo- te......................	0·20	0·21	0·31	0·07
Total	0·41	0·81	0·46	0·47

authors therefore consider that the method of com- with oxygen is more exact and convenient than the methods for the estimation of phosphorus compounds ylene. It is also applicable to other gases, such bane (from aluminium carbide), or to combustible with which air or, preferably, hydrogen may be tted.—J. A. B.

when Mixed with Resinous Substances; Determin of ——. J. C. Thresh. British Pharm. Conce, Dublin. Chem. and Druggist, 1901, **59**, [1123],

examination of carbolised gauze on which the is fixed by aid of resin, the author found that the ordinary methods for the determination of phenol give absolutely unreliable results. He states that the following method, however, will give very concordant and accurate results in such cases. About 20 grms. of the gauze are mixed in a 700 c.c. flask with 500 c.c. of water acidulated with hydrochloric acid, and a few fragments of granulated zinc. The mixture is slowly distilled until about 300 c.c. have passed over; the distillate contains practically the whole of the phenol, which can be readily determined by the bromine process. The zinc enables the boiling to be carried on steadily, and the gas-bubbles, with a little manipulation, keep the gauze from matting together. The author has obtained the following results with the method :—

Percentage of Phenol.

Calculated.	Found.
6·0	5·88
6·0	5·64
4·0	3·75

—A. S.

Indigo containing notable Amounts of Indirubin; Analysis of Samples of ——. W. M. Gardner and J. Denton. J. Soc. Dyers and Colourists, 1901, **17**, [7], 170—171.

Indirubin is formed in notable amount whenever an excess of alkali is used in the extraction tanks or beating vats employed in the manufacture of indigo. When present in larger amount than 1—2 per cent., indirubin interferes greatly in the permanganate method of assaying samples of indigo. Indirubin is less readily attacked than indigotin by permanganate, and the solution shows a bluish red tint when the oxidation of indigotin is complete, finally acquiring a yellow colour when the indirubin has also been oxidised. It is possible with much practice to obtain a fairly satisfactory result by taking the moment of fullest development of the red colour to represent the complete oxidation of indigotin and the moment of its final destruction as a measure of the indirubin, but the end reactions are very indefinite, and the method is not suitable for general use.

Indirubin is more easily soluble than indigotin in alcohol, and it is also soluble in ether and glacial acetic acid. Methods of analysis depending on a separation by the two latter solvents have been devised respectively by Rawson (this Journal, 1899, 251) and Koppeschaar (this Journal, 1899, 302), but in both these methods the present authors have found a difficulty in completely extracting the indirubin. They have found the most satisfactory solvent to be acetone, and have devised the following process which has proved to be accurate, rapid, and easily carried out:

Process for Assaying Indigo rich in Indirubin.—0·2 grm. of the finely powdered and dried sample is boiled in a flask with reflux condenser for half an hour with 100 c.c. of acetone. After cooling, the solution is made up to 100 c.c. with acetone and then to 200 c.c. with a 10 per cent. salt solution which precipitates the small amount of indigotin in solution and also the impurities. After shaking, the solution is allowed to stand for five minutes, filtered through an asbestos filter, and the indirubin estimated colorimetrically by comparison with a standard solution of indirubin. This standard solution must be made up with acetone and salt solution in similar proportion to that employed above, as the colour is redder in pure acetone.

Estimation of Indigotin.—Wash the precipitate on the asbestos filter with hot water until free from salt. Dry, and transfer the asbestos and precipitate to a cylindrical crucible by means of a camel's hair brush. Treat with concentrated sulphuric acid, purify the sulphindigotic acid and titrate with permanganate in the usual way. The end reaction is then quite sharp, there being an entire absence of indirubin. The quality of the acetone used is of importance.—R. B. B.

Maumené Test for Oils. C. A. Mitchell. Analyst, 1901, **26**, [304], 169—177.

In the ordinary methods of applying this test it is practically impossible for different chemists to obtain concordant results, and this is especially the case with highly unsaturated oils, like linseed oil, in which the rise of temperature is so great as to lead to charring. Maumené attempted to remedy this by mixing the linseed oil with a definite proportion of olive oil of known thermal value, whilst Ellis (this Journal, 1886, 361) employed a mineral oil for the same purpose. Both of these methods, however, only partially prevented the effects of overheating, and it was impossible for different workers to be sure of obtaining a diluent of the same thermal value.

In the method proposed by the author, carbon tetrachloride is used for the dilution, and all oils diluted alike. The test is made in the same way as Hebner and Mitchell's bromine thermal test (Analyst, **20**, 146):—2 grms. of the oil are dissolved in 10 c.c. of carbon tetrachloride in a vacuum-jacketed tube, the temperature of the solution taken with a standard thermometer graduated in tenths of a degree, 2 c.c. of sulphuric acid of known strength introduced, the mixture stirred with the thermometer, and the rise of temperature noted. Shortly before the end of the reaction, which occupies about a minute, the sulphonated product rises to the surface of the carbon tetrachloride.

Fatty Acids.—Experiments were first made with the dry fatty acids of the oils in order to eliminate the heat due to hydrolysis, and in each case a parallel determination of the bromine thermal value was made with the same tube and thermometer. The iodine values were calculated from each series of figures and showed a close agreement in the majority of the oils, as is seen in the following table:—

Fatty Acid.	Rise with H_2SO_4. 93·8 per Cent.	Calculated Iodine Value. Rise × 7.	Bromine Thermal Rise.	Calculated Iodine Value Rise × 6.
	° C.		° C.	
Oleic acid I. (old)	11·8 ; 11·7	82·6	14·0	84·0
„ „ II. „	11·3 ; 11·4	79·8	14·3 ; 14·2	85·8
Almond	13·6 ; 13·8	96·6	16·1	96·6
Earthnut	12·5	87·5	14·2	85·2
Olive	11·6	81·2	14·1	84·6
Cotton	16·8	117·6	18·1	108·6
Maize I. (old rancid).	18·4	128·8	18·4	110·4
Maize II.	16·9	118·3	19·8	118·8
„ III. (1898)	17·2	120·4	20·0	120·0
Sesamé	16·0	112·0	18·1	108·6
Rape	13·7	95·9	16·5	99·4
Poppy, 1895	17·8	124·6	20·4	122·4
Linseed I. (4 yrs. old).	24·8	173·6	28·2	169·2
Linseed II. (Calcutta).	24·7	173·9	29·4	176·4
Linseed III. (after 3 weeks exposure).	27·6	193·2	27·9	167·4
Linseed III. (oxidised).	21·5	150·5	21·7	130·2
Linseed IV. (boiled 10 hrs.)	23·9	167·3	28·3	169·8
Tung	23·2	162·4	21·2	127·2
Castor	16·8	117·6	14·5	87·0
Codliver (old)	20·5	143·5	23·4	140·4
Whale (old)	14·0	98·0	15·3	91·8
Butter I.	8·1	56·7	5·8	34·8
„ II.	9·4 ; 9·1	65·8	6·0	36·0
Mutton fat	9·6	67·2	8·6	51·6
Lard	11·5	80·5	10·9 ; 10·8	65·4

The Maumené figures of the maize oil acid (I.) and exposed linseed acids (II.) show that the rise of temperature with sulphuric acid is increased by oxidation, as was also found by Ballantyne (this Journal, 1891, 29). Castor oil, tung oil, butter fat, and lard fatty acids gave Maumené figures much higher proportionately than the bromine thermal figures.

Glycerides.—The oils themselves tested by this method also showed a certain agreement between the Maumené figures and the iodine value, though as a rule this was not so close, as in the case of the fatty acids. It was fairly satisfactory, however, in the case of almond, earthnut, olive, maize, sesamé, mustard husk, rape, and Japanese rape oils. The figures given by linseed oil were invariably too low, though the results obtained with 98 per cent. sulphuric acid approximated more closely to the truth than those with acid of 94 per cent. In the case of tung oil a clot for round the thermometer immediately, and vigorous stir was required to break this up (*cf.* Jenkins, this Jou 1898, 671). The sample of tung oil examined by Row Williams (this Journal 1900, 301) showed by the autl method:—Maumené figure, 26·2° C., and bromine the value 23·7, the respective calculated iodine values b 112·6 and 142·2.

Halogen Standard Figures.—In order to obtain formity in the results, the author suggests that all re should be calculated on the basis of a tube and the meter with a bromine thermal factor of 5, and that exact strength of sulphuric acid be given. The influ of using different apparatus is shown in the follo examples:—

Oil.	Vacuum Tube I., Thermometer I., Bromine Thermal Factor = 6.		Tube II., Thermomter I' Bromine Therm Factor = 5·5	
	Rise with H_2SO_4 93·8 °/o.	Halogen Standard Figure.	Rise with H_2SO_4 93·8 °/o.	Hal Stan Fig
	° C.		° C.	
Almond	12·7	15·24	13·6	1
Cotton	15·3	18·36	16·3	1
Oleic acid	11·7	14·04	12·5	13

Influence of the Duration of the Reaction.—The r temperature with sulphuric acid occupies from 45 se to one or even two minutes with the weaker streng acid. A rough correction can be obtained by noti fall of temperature from the highest point atta intervals of 5 minutes, and dividing the total loss of perature by the number of minutes before the m ceases to fall. It becomes apparently constant at 2° above the temperature of the room, which points t establishment of an equilibrium between any substi which occurs and the loss of heat. The loss thus mined was found to amount to approximately 0·2° C different tubes, strength of acids, and oils. If the ris not last more than a minute, this correction m neglected, but it is advisable to use acid of more 96 per cent. strength to reduce the time error as possible.

Influence of Different Strengths of Acids.—Ar (this Journal 1886, 304) showed that the concentrat the sulphuric acid had a considerable influence o ordinary Maumené figure, and this is also the case the author's method, as is shown in the following resu

Oil.	Acid. 93·8 °/o	Acid. 95·1 °/o	Acid. 96·3 °/o	97
	° C.	° C.	° C.	
Oleic acid	11·8	13·25	14·6	1
Almond	12·7	14·4	16·2	1
Cotton	15·0	18·7	20·0	
Linseed	19·6	27·5	25·1	

It will be observed that the rise with 93·8 per cen was disproportionately low in the case of the linseed

—C. A

Hübl's Solution; Improvement of the Stability
M. Kitt. Chem.-Zeit. 1901, **25**, [51], 540.

The instability of Hübl's solution depends upon a r which gradually leads to a condition of chemical brium. This condition can be accelerated by boil Hübl solution on the water-bath under a reflux cond

Thus, a solution prepared in accordance with directions contained 0·61405 grm. of iodine in 20 c. after being boiled for five hours, the amount had fa 0·22194 grm., at which it remained constant even a additional 196 hours. The author then prepared a which, after boiling, gave a reading of about 0·5 iodine in 25 c.c. in the following manner:—30 g iodine and 25 grms. of mercuric chloride were c solved in 500 c.c. of 98 per cent. alcohol, and the as boiled for an hour on the water-bath. Before 25 c.c. of the solution gave a reading of 0·76756 grm. ie and, after boiling, 0·49321 grm.

omparing the keeping qualities of this solution with ordinary freshly-prepared Hübl solution, the follow- ilts were obtained :—

Hu l Solution.		Iodine Solution.	
ne.	Decrease in Iodine Reading.	Time.	Decrease in Iodine Reading.
s.	Per Cent.	Days.	Per Cent.
= 1	2·12	23 hours = 1	Nil
= 2	3·31	74 „ = 3	Nil
= 15	9·33	96 „ = 4	0·75
= 27	12·75	193 „ = 8	1·50
		289 „ = 12	2·88
		599 „ = 25	5·62
		940 „ = 39	8·12

—C. A. M.

its, and Waxes; Elimination and Determination ter in ——. C. B. Davis. J. Amer. Chem. Soc. 23, [7], 487—488.

due to foaming and spitting met with in the deter- of water in oils, fats, or waxes, may be obviated following way:—Coiled-up thick filter paper is d into a wide mouthed, glass-stoppered, weighing quantity sufficient to half fill it, and the bottle er are then dried at 110° C. until of constant A portion of the oil or of the solid wax or fat to just saturate the filter paper is then added, the ing then closed and re-weighed, and afterwards 110 until no further loss in weight occurs. Sam- ae to oxidation are dried in an atmosphere of or carbon dioxide.—T. H. P.

Oil and its Adulterants [Analytical Constants, tection and Determination of Adulterants]. P. C. ney.

See under XII., *page* 909.

ir Canes; Valuation of ——. F. N. G. Gill.

See under XVI., *page* 915.

Beets; Rapid Determination of ——. Hiltner and er. (This Journal, 1901, 754.) Notes on the E. E. Ewell.

See under XVI., *page* 915.

dity of Wines; New Indicator for Determining E. G. Runyan. J. Amer. Chem. Soc. 1901, 23, 2—405.

rmining the total acidity of wines, the author ds as indicator the Aurin-Malachite Green which Lachaux proposed for the rapid measure- he excess of alkali in beet-sugar juices. This is prepared by dissolving 3·1 grms. of aurin or l rosolic acid in 150 c.c. of 90 per cent. alcohol, a, after neutralisation, being mixed with 0·5 grm. te Green dissolved in 50 c.c. of alcohol. The end sharper for the change from acidity to alkalinity ution than for the reverse. A number of com- eterminations of the acidity of claret, Rhine wine, using aurin-malachite green, phenolphthaleïn, as indicators, shows that the first-named ives results which are lower than those obtained hers. As the differences are greatest in the case red wine where, with phenolphthalein or litmus xcess of alkali must be run in before the change can be detected, the author considers that the btained with Aurin-Malachite Green are the most T. H. P.

Wheaten Flour; Densimeter for the Valuation of —— for Bread Baking. E. Fleurent. Comptes Rend. 132, [23], 1421—1423.

THE value of a flour for baking depends on the proportion of gliadine contained in its gluten. For its rapid approximate valuation, the author has devised a densimeter, graduated in two series of divisions from a common zero. The upper set serves for the preparation of the alcohol (74 per cent.) to be used as a solvent, the lower to read the density of the solution of gliadine. The solution is made by agitating a quantity of the flour containing 5 grms. of dry gluten with 150 c.c. of the 74 per cent. alcohol. The gliadine content is deduced empirically from the density, the densities of a number of such solutions being compared with the amount of gliadine gravimetrically determined in each case. The author states that variations in the gliadine from different flours, in the amount of other substances dissolved, and in the humidity of the flours, do not affect the results to an extent appreciable for the purposes of the baker.—J. T. D.

Tartar; Commercial Determination of ——. H. Quantin. Ann. Chim. anal. appl. 6, 244—248. Chem. Centr. 1901, 2, [7], 503.

THE French casserole test ("procédé à la casserole") consists in extraction with boiling water and subsequent separation of crystals from the liquor by cooling. This approximate determination is of good service in the factory and can be carried out by a workman. The obtainment of sufficiently large crystals to allow of their separation without appreciable loss depends entirely upon the method of carrying out the test, *i.e.*, upon gradual cooling. The author, whilst adhering to the principle of the casserole test, proposes to avoid the drying and weighing of the crystals by titrating the solution of the sample and the mother liquor from the crystals, taking due regard to the temperature at which the crystals separated.—A. S.

Alkaloids; Action of the Vegetable —— on certain Indicators. A. Astruc. Comptes Rend. 1901, 133, [2], 98—100. (See also this Journal, 1900, 781.)

Alkaloids derived from Pyridine.—Pyridine is less basic than piperidine, thus the former does not act on phenolphthaleïn, whilst the latter may be estimated by means of that indicator in aqueous solution. In an indifferent solvent (benzene) pyridine does not act on rosolic acid; whilst, in presence of this substance, piperidine is neutralised by 1 mol. of hydrochloric acid. In a similar manner the alkaloids derived from piperidine (conicine, conhydrine, sparteïne, &c.) are strong bases acting on Helianthin A, phenolphthaleïn, and rosolic acid, whilst the alkaloids derived from pyridine (nicotine, pilocarpine) do not act, under the same conditions, on phenolphthaleïn; in an indifferent solvent the former influence Helianthin A and rosolic acid, the latter Methyl Orange alone.

Sparteïne, in aqueous solution, is made neutral to rosolic acid and phenophthaleïn by 1 mol. of hydrochloric acid, and neutral to Helianthin A by 2 mols. of the same acid. In an indifferent medium, sparteïne is a monovalent base towards rosolic acid.

Alkaloids derived from Tropine.—Tropine itself is a strong base and behaves towards indicators in a similar manner to piperidine. Atropine and hyoscyamine are also similar. In benzene solution, however, tropine is basic towards rosolic acid, whilst atropine and hyoscyamine are neutral. Ecgonine and benzoylecgonine, which possess both acid and basic functions, are neutral to indicators in aqueous solution; dissolved in benzene, they are neutral to rosolic acid, monovalent bases towards Helianthin A, and monobasic acids towards phenolphthaleïn.

Alkaloids derived from Quinoline.—In aqueous solution, quinine is neutral to phenolphthaleïn, requires 1 mol. of hydrochloric acid to become neutral to rosolic acid and 2 mols. to become neutral towards Helianthin A. In benzene solution, quinine acts only on Methyl Orange, and then as a divalent base.

Alkaloids derived from Oxazine and Isoquinoline.—Dissolved in water or dilute alcohol, codeïne, morphine and thebaine may be approximately estimated by means of rosolic acid, to which papaverine, narcotine and narceïne are neutral. All these alkaloids behave as monovalent bases towards Helianthine A. The benzene solutions of these alkaloids act similarly towards Methyl Orange; 1 mol. of narceïne or morphine requires 0·9—1·0 mol. of potash to become neutral towards phenolphthaleïn.

Alkaloids which probably contain the Pyridine Nucleus in an unknown State of Condensation.—Aconitine, veratrine, strychnine and brucine are very weak bases which hardly act upon Helianthine A.

Alkaloids derived from Purine.—Crystallised caffeïne is neutral to all the indicators. When dehydrated and dissolved in benzene, it turns Methyl Orange yellow, but cannot be estimated, even approximately, by this means.

— A. C. W.

Nicotine in Tobacco and in Aqueous Extracts of Tobacco Leaves; New Method for the Determination of ——. J. Tóth. Chem.-Zeit. 1901, **25**, [57], 610.

In titrating nicotine solutions, Iodeosin alone was found to give a sharp reaction. A strong solution of caustic soda should be used to liberate the alkaloid from the salts in which it is present in tobacco: the subsequent extraction with ether is the more incomplete the more water is present. The following method was adopted: The tobacco, dried in the air or over quicklime, was ground or pounded, 6 grms. were weighed and well triturated with 10 c.c. of 20 per cent. caustic soda. Burnt gypsum was then added in small quantities, with continuous stirring, until the whole mass fell to powder when lightly pressed. The powder was brought into a thick-walled cylinder, 25 cm. high and 5 cm. wide, and shaken with 100 c.c. of a mixture of ether and petroleum spirit 50 times at intervals during at least 1 hour. Then 25 c.c. of the clear solution were withdrawn by means of a pipette, brought into a 300—400 c.c. flask, 40—50 c.c. of water and 1 drop of Iodeosin solution added, then excess of $\frac{1}{10}$ N. acid, which was titrated back with caustic soda. A control experiment on pure nicotine gave 96·3 per cent.

The presence of ammonia in small quantities in the tobacco leaves does not affect the accuracy of the method. Keller recommends that a current of air be blown through the ether solution for one minute in order to drive off ammonia (D. pharm. Ges. Ber. 1898, **8**, 145). The author did not find that the ether vapour lost its alkaline reaction after blowing air for one minute or more, and in working on pure nicotine lower results were obtained, which were doubtless due to loss of alkaloid in the ether vapour.

— A. C. W.

Hydrastine and its Determination, &c. T. Maben. Brit. Pharm. Conference, Dublin. Chem. and Druggist, 1901, **59**, [1123], 234—236.

Hydrastin is essentially a mixture of the alkaloids occurring in the rhizome of *Hydrastis Canadensis.* The name hydrastine is now usually applied to the white, and berberine to the yellow alkaloid obtained from the plant. Both alkaloids are bitter, but they differ considerably in therapeutic properties, hydrastine being much the more powerful of the two. The rhizome contains, on the average, about 2·18 per cent. of hydrastine and about 3·3 per cent. of berberine, but the percentage of both alkaloids varies very greatly. The following method has proved most satisfactory for the assay of hydrastis:—10 grms. of the finely ground drug are exhausted with hot alcohol, and the percolate cooled and made up to 100 c.c. with alcohol.

Determination of Berberine (Yellow Alkaloid).—25 c.c. of the percolate are treated with 1½ c.c. of hydrochloric acid (32 per cent.), ¼ c.c. of concentrated sulphuric acid, and 125 c.c. of sulphuric ether; the mixture is cooled, well agitated, and allowed to stand for 24 hours in a refrigerator. The separated berberine hydrochloride is filtered through a tared filter, washed free from acid with a mixture of equal volumes of alcohol and ether, dried at 105° C., and weighed. The weight multiplied by 0·9017 gives the weight of berberine.

Determination of Hydrastine (White Alkaloid). combined filtrate and washings from the berberine l chloride are rendered almost neutral, evaporated ne dryness on the steam bath, and the residue treated wi water in small quantities. The hot aqueous solu filtered into a separating funnel, and the treatment i tinued until the washings from the residue cease to g alkaloidal reaction with the ordinary test reagents extraction of the alkaloid from the resinous mass somewhat expedited by the addition of a few dr alcohol at each extraction with water, evaporating alcohol each time before pouring off the aqueous w The aqueous extract is made alkaline with ammoni and the hydrastine removed by continued extracti ether. The ethereal extract is evaporated, the hyd dissolved out from the residue by treatment with suc quantities of 5 per cent. sulphuric acid, the solutio alkaline with ammonia, and the alkaloid again ex with ether. The ethereal extract is evaporated to d the residue dissolved in excess of $N/_{20}$ acid, and the s titrated back with $N/_{100}$ alkali, using cochineal as in The result multiplied by 0·00383 gives the wei hydrastine.

In assaying the "concentration" or extract, the process may be used, or the following shorter me ½ grm. of the "concentration" or extract is trea beaker with sufficient 60 per cent. alcohol to diss greater portion of it. The alcoholic solution is dis upon about 2 ozs. of well-washed sawdust or oth material contained in a dish, the beaker being ri with successive small portions of 60 per cent. alco the washings also transferred to the sawdust. The allowed to stand in a warm place until the alc practically all evaporated, the residual powder is tr an 8-oz. flask with 150 c.c. of sulphuric ether and s water to moisten the mass, the whole made alkal ammonia, and the flask corked tightly, and sh intervals during five hours. After settling, 75 c. clear ethereal solution are withdrawn, the hydras tracted by successive quantities of 2 per cent. hyd acid, the acid solution made alkaline with ammo the hydrastine again extracted with ether. The solution is evaporated to dryness, the hydrastine d in $N/_{10}$ acid, and the solution titrated back wi alkali.

The author then criticises the B.P.C. formulary for the preparation of the extract by aid of 60 alcohol. He states that not only will the dry contain less than 10 per cent, of "white alkalo owing to the weak alcoholic menstruum, it hygroscopic, and, unless care be taken to guard atmospheric influences, it will, in time, form a sti solid, gum-resinous mass. He recommends that in issue of the Formulary the name of the extract be to "*extractum hydrastis siccum*"; that a stron holic menstruum be employed; and that the e standardised to contain 10 per cent. of hydrasti alkaloid). The following were the results obt examining six samples of commercial hydrastine, four were American, one was B.P.C., and one was unknown source:—

——	Hydrastine.	Berbe
I.	15·2	23·
II.	8·7	9·
III.	trace	26·1
IV.	„	16·
V.	„	trac
VI. (B.P.C.)	„	„

One sample was said to contain 20 per cent. o tine; another "the combined alkaloids from gold the same proportion as they exist in the drug, times the concentration"; and no claim was ma of the others. In appearance three of the sampl a bright yellow colour, in fine powder, and perf hygroscopic. Two, including the B.P.C. sampl coarser powder, hygroscopic, and darker. One w in colour, and non-hygroscopic.—A. S.

V.—SCIENTIFIC & TECHNICAL NOTES.

rsenical Poisoning. Eng. and Mining J. 1901, **72**, [4], 102.

ıg regard to the comparative immunity from illness n who work in mines containing arsenical ores and in ion works where such ores are treated, it is certain senic is not a cumulative poison like lead, but quickly ears from the vital organs of the body, and it is also ılo that men working continually with arsenical als undergo a kind of inoculation. Brouardel has that arsenic could be administered as a slow poison ath might occur six weeks after it had ceased to be While the person subject to arsenical poisoning is arsenic is readily detected in the urine or linen and lly in the hair. At Havre, France, the hair of a ho was poisoned was analysed: 100 grms. yielded n. of arsenic. Pouchet has shown that long after all of arsenic had disappeared in the viscera, it could be detected in the spongy tissue of the bones. ally the arsenic given in small doses appears to located in the bones.—A. S.

or Green) Wöhler's Sulphur; New Case of the nation of ——. N. A. Orlow., J. russ. phys-chem. **33**, 397—399. Chem. Centr. 1901, **2**, [8], 522.

bismuth sulphide, Bi_2S_3, be agitated with a solution ıhur monochloride in benzene, and the solution, lecanting from some greenish-black lumps, be to 70° C., a green powder is formed, which does not benzene, but which becomes yellow to white on or moistening with alcohol. It consists of almost ılphur (about 5 per cent. of ash). Zinc sulphide lmium sulphide act in a similar manner. The prepared by means of cadmium sulphide also ed blue grains, and this led the author to identify en variety of sulphur with Wöhler's modification. ggested that the blue sulphur stands in the same to ordinary sulphur as ozone does to oxygen. It ble that the ash found in all the products ($BiCl_3$ in m Bi_2S_3) acts the part of a condensing agent.

—A. S.

Modification of Sulphur; Reaction of the Formation e ——. N. A. Orlow. J. russ. phys.-chem. **33**, 400—403. Chem. Centr. 1901, **2**, [8], 522. preceding abstract.)

rmation of the green sulphur will take place in e of carbon bisulphide or toluene instead of benzene. ction proceeds according to the equation:—

$$CdS + S_2Cl_2 = CdCl_2 + S_3.$$

mpound $CdCl_2S_3$ must be excluded, since analyses precisely analogous bismuth product, showed that ipitate formed in that case is of extremely variable tion (0·90 per cent. $BiCl_3$).—A. S.

Sulphate under the Influence of Water and Temure; Dissociation of ——. C. Hensgen. J. prakt. . 1901, **63**, [10 & 11], 554—562.

LIMINARY communication on the dissociation of sulphate in water in different concentrations and at t temperatures, the author finding that the propormetal to acid determined as Cu_2S and $BaSO_4$, differs e relative amounts present in the solid salt according varying conditions, details of which are given in a of tables.—T. A. L.

m Oxide; Natural ——. B. Neumann and Vittich. Chem.-Zeit. 1901, **25**, [53], 561—562.

usually been accepted that cadmium is always in zinc minerals, even in zinc carbonate, in the form ide. The authors have now, however, found that n-black deposit, partly amorphous, partly crystalsome fragments of calamine from Monte Pone in , consisted of "chemically pure cadmium oxide." the covering of crystals and the ground mass was an extremely thin citron yellow layer which contained much cadmium; the ground mass itself contained no trace of cadmium. Similar crystals can be produced artificially by the distillation of cadmium. The natural crystals belonged to the regular system, and had a hardness of about 3, and a sp. gr. of 6·15. No measurements could be made as the largest crystal measured only ½ m.m. along one side. W. G. M.

Stannous Chloride and Oxygen; Reaction between ——. S. W. Young. J. Amer. Chem. Soc. 1901, **23**, [7]. 450—456.

In order to get a clue to the course taken by the reaction between stannous chloride and oxygen, the author has prepared solutions of the chloride in hydrochloric acid, these being then oxidised as quickly as possible, transferred to a thermostat and measurements of the electrical conductivity made from time to time. The oxidation was effected by means of free oxygen (aided by small quantities of hydrogen sulphide), potassium permanganate, ferric chloride, hydrogen peroxide or sodium hypochlorite. In all cases, the freshly oxidised stannous chloride solutions show electrical conductivities which increase with time, the increase being in general greater for solutions more concentrated in hydrochloric acid than for those containing less acid. These results show that the first stage in the oxidation of stannous chloride is the formation of stannic chloride, and that hydrochloric acid is necessary for this change, which takes place according to the equation: $SnCl_2 + O + 2HCl = SnCl_4 + H_2O$. The stannic chloride thus formed is then acted upon by water, the resulting products being stannic hydroxide and hydrochloric acid. $SnCl_4 + 4H_2O = Sn(OH)_4 + 4HCl$; it is this second reaction to which the increasing conductivity of the oxidised solutions is due. The oxidation of stannous chloride hence follows the Ostwald rule, which states that wherever an intermediate product can be formed during a reaction, such product is formed.—T. H. P.

Chlorine and Ammonia; Reaction between ——. W. A. Noyes and A. C. Lyon. J. Amer. Chem. Soc. 1901, **23**, [7], 460—463.

By the action of an excess of concentrated ammonia solution on chlorine, the volume of the nitrogen evolved approaches but never reaches one-third that of the chlorine used, whilst if a 0·5 per cent. ammonia solution be taken in such quantity as to leave the liquid faintly acid, the volume of the nitrogen is very nearly one-sixth of that of the chlorine. If a 2 per cent. ammonium chloride solution be used in place of ammonia, the chlorine is almost completely absorbed, while the volume of the nitrogen may be as low as only 1—2 per cent. of that of the chlorine. The normal reaction between chlorine and ammonia is expressed by the equation: $12\ NH_3 + 6\ Cl_2 = N_2 + NCl_3 + 9\ NH_4Cl$; this, however, only takes place when nearly the proper proportions of the two compounds are taken. In presence of excess of ammonia, the nitrogen chloride reacts thus: $NCl_3 + 4NH_3 = N_2 + 3NH_4Cl$, and $NCl_3 + 2NH_4OH + H_2O = 3NH_4ClO$.—T. H. P.

Cupric Hydroxide; Action of ——, on Solutions of Metallic Salts. A. Mailhe. Comptes Rend. **133**, [4], 226—228.

TETRACUPRIC hydroxide, $Cu_4O_3(OH)_2$, with solutions of metallic chlorides or bromides, gives a series of mixed basic salts, of the general formula $MR_2\,x\,CuO\,y\,H_2O$, where x is usually 2 or 3. The action is slow in the cold but much more rapid in hot solutions. The hydroxide $Cu(OH)_2$, and in some cases the oxide CuO, furnish the same compounds.—J. T. D.

Light; Chemical Action of ——. II. G. Ciamician and P. Silber. Ber. 1901, **34**, [10], 2040—2036. (See this Journal, 1901, 844.)

CONTINUING their researches on the chemical action of light, the authors find that o-nitrobenzaldehyde when exposed to light in a thin layer or dissolved in benzene, ether, acetone, or isopropyl alcohol is converted almost completely into *o*-nitrosobenzoic acid. Thus a solution of *o*-nitrobenzaldehyde in benzene contained in a sealed tube and exposed for half an hour to light, deposits a white crystalline precipitate of *o*-nitrosobenzoic acid. This product already obtained by E. Fischer, by the oxidation of phenyloxindole (Ber. **29**, 2064) blackens at 180° C., and melts at 205—210° C. A solution of *o*-nitrobenzaldehyde (1 grm.) in absolute ethyl alcohol (20 c.c.) is converted after a few hours exposure to light into *o*-nitrosobenzoic ethyl ester (0·7 grm.) This substance forms colorless crystals which fuse at 121° C. to an emerald green melt. The methyl ester obtained similarly from methyl alcohol crystalises in rhombic plates (occasionally 2 c.m. long) and melts at 153° C. No similar reactions to the above were observed in the case of the *m*- and *p* isomerides.

—T. A. L.

Saccharification, by Seminase under the Influence of Sodium Fluoride, of the Carbohydrates of the Horny Albumin of Leguminous Seeds. H. Hérissey. Comptes Rend. **133**, [1], 49—52.

The author has previously shown that seminase is present not only during the germination of these seeds, but in the seeds when at rest, by keeping the moist seeds at 25° C., in presence of chloroform, when formation of mannose and galactose occurs through the action of the ferment. He now employs sodium fluoride as an antiseptic instead of chloroform, and finds that the action is carried farther and is much more rapid (eight or nine days in place of two or three months), so that it can even be utilised as a practical mode of preparation of mannose. The fluorides of potassium and of ammonium, as well as the double fluoride of potassium and sodium, were tried in place of sodium fluoride, but none gave satisfactory results.—J. T. D.

Propyl Glycol; Oxidation of ——, by Mycoderma Aceti. A. Kling. Comptes Rend. **133**, [4], 231—233.

A 5 per cent. solution of propyl glycol was sown with pure cultures of *mycoderma aceti*, and fermented at 30° C. for some days. Examination of the hydrazone, osazone, and oxime of the product showed them to be identical with the corresponding derivatives of acetol. This ferment, then, like the sorbose bacterium, converts propyl glycol into acetol:—$CH_3.CHOH.CH_2OH + O = CH_3CO.CH_2OH + H_2O$. *Mycoderma* seems to be rather more active than the sorbose bacterium. The acidity diminishes slightly as the fermentation proceeds, and an acidity of 2 per cent. of acetic acid greatly retards it.—J. T. D.

Acetone; Action of Hypophosphorous Acid on ——. C. Marie. Comptes Rend. **133**, [4], 219—221.

When hypophosphorous acid (250 grms.) is treated with acetone (400 grms.), simple solution occurs in the first place. But on boiling for 60—70 hours, the boiling-point rises, and on cooling, crystals separate, which, after purification, melt at 180°—181° C., and have the composition expressed by $2H_3PO_2 + 2C_3H_6O$. The substance is a monobasic acid, which decomposes carbonates, forming crystallisable salts. The mother liquor, after distilling off the acetone, and treating with lead carbonate, yields a soluble and an insoluble portion. The former, after separating the lead, yields a crystallisable substance, extremely soluble in water or alcohol, melting at 40°—41° C., and functioning as a monobasic acid; its formula, from the analyses of the substance itself and its lead salt, appears to be $H_3PO_3 + C_3H_6O$. The insoluble lead compound is the salt of a bibasic acid of formula $H_3PO_4 + C_3H_6O$; on decomposing the lead salt by hydrogen sulphide, the acid is obtained in crystals melting at 169°—170° C.

—J. T. D.

Menthol; Action of Benzaldehyde on the Sodium Compound of ——; and new Methods of preparing Benzylidenementhone. C. Martine. Comptes Rend. **133**, [1], 41—43.

When the sodium-compound of menthol is treated with benzaldehyde, reaction according to Claisen's equation occurs in part, but in part the menthol compound reacts in the same manner as the corresponding borneol pound, and yields benzylidene-menthone. The benzylidene-menthone is obtained by the actio benzaldehyde on the sodium compound of menthone.

—J. T

Spanish for Common Broom; Dangerous Substitut ——. E. Perrot. J. Pharm. Chim. **14**, [1], 19—

It is stated that, on the Continent, the flowers Spanish broom, *Spartium junceum*, are frequently tuted for those of the common broom, *Saroth scoparius*, in commercial specimens of the drug. this substitution is dangerous has recently been by several serious cases of poisoning which follow taking of a herb tea, compounded with dried he which broom flowers were an ingredient, and whic those of *Spartium* and not the official *Saroth* Although 1 litre of the herb tea prepared fr ingredients would only represent 4 to 6 grms. of flowers, yet a dose was sufficient to produce alarmin symptoms such as purging and vomiting. It ha stated that the Spanish broom is 6 or 7 times as p in its medicinal action as the common broom, definite chemical investigation of the active princip been made. The following characters distinguish flowers: — *Sarothamnus scoparius:* Calyx sm shaped with two unequal lobes, the upper bidenta lower with three small teeth. Style, always rolle circle. *Spartium junceum:* Calyx deeply cleft side to the base. Style, merely curved, not rolled.

—J.

Prizes.

Société Industrielle de Mulhouse.

The programme of subjects, for which prizes awarded by the Société Industrielle de Mulhouse ne has been issued, and copies can be obtained application to the secretary of that society. In chemistry, medals will be awarded for the best mem works on the theory and manufacture of alizari the synthesis of the colouring matters of coc theoretical and practical study of the carmine of co criticising the methods indicated in books and com methods, as well as giving a process rivalling t present in use, as to brilliancy of shade, price, &c., ex the theory of the process; study of the colouring m cotton; its isolation and identity or otherwise w substance which acts as a mordant in the fibres bleached or insufficiently bleached cotton; the com of aniline blacks; work on the physical and c modifications which occur when cotton fibre is co into oxycellulose, and explaining the deterioration when an alkaline bath in boiling water acts on the fibre; the influence of chlorine and its oxygen com upon wool; the constitution of colouring matters e on linen fibrics, and hitherto incompletely studied; s of one of the natural colouring matters emplo industries; theory of the natural formation of so stance of organic origin and its synthetic reproducti

In connection with dyeing, medals will be awar memoirs and studies on the following subjects:— mordant capable of practical application; metallic s which yield their base to the immersed fibres, conditions under which they are most effective; mordants, and the part they play in dyeing, de on their state of oxidation and hydration; a solid Black which will not deteriorate, or cause other to deteriorate, with especial reference to albumin; black, which shall be equal, as regards the action and soap, to Aniline Black; a blue which shall be ch which will dye wools and resist the action of hai light; a blue analogous to ultramarine in shade an capable of being chemically fixed on cotton; a pur capable of being fixed like alizarin, and havin properties; a lake red equal, in colour and resis light, at least to that of vatted Indigo blue; a purp with cotton a shade equal to that of Magenta o a dyestuff capable of replacing logwood in its

ations ; an assistant applicable to wool, and prepared
salts other than tin salts, thiosulphates, sulphites, and
hites ; a new method of fixing aniline colours, equal
at of the tartar emetic process, and as resistant to
it as these are after the sulphate of copper bath ;
of making dyestuffs resist the action of boiling
solutions and the prolonged action of water ; method
oducing the sheen of gold and silver metallic powders,
le of resisting the operations of cleaning, and the
of colours printed at the same time ; a manual
ning a series of tables showing the specific gravity,
olubility at various temperatures of as many inorganic
rganic compounds as possible, especially as regards
nces used in bleaching, dyeing, and printing ; syn-
of a cheap substance having the essential properties
egal gum ; a substitute for egg albumin in linen dyeing
e of causing the fixed colours to withstand the
s operations, and as resistant to friction as those
with albumin ; a method for rendering blood albumin
o egg albumin for industrial applications ; a manual
g with the analysis of compounds used in printing
lyeing ; an indelible ink for cotton and similar
; a method for cheaply removing grease spots from
; the use of resins in bleaching cotton fibre, indicating
t that resin takes in the lye-washing of fibres, as well
quantities of resin most suitable ; on the part that
at varieties of cotton play in bleaching and dyeing of
indicating the relative solidity of various cottons, and
ing action on them ; the bleaching of wool ; the
ing of silk ; the preparations and applications of
gen peroxide in bleaching textile fibres ; in the bleach-
cotton, wool, silk, hemp, and other fibres.

als are also offered for various methods of fabric
g ; an alloy or other substance having the elasticity
rability of steel, and the property of not causing
al action in the presence of acid dyestuffs and colours
ning metallic salts ; a new cylinder machine capable
ting eight colours at once ; and an application of
ity to bleaching, dyeing, or textile printing ; the
tion of some new method of electrolytic bleaching,
, or textile printing ; the discovery or introduction
seful process for the manufacture of printed calicoes.
are also offered for memoirs and improvements in
tion with steam generation, power production,
g machines, weaving appliances, electric lighting,
i-on of costs of electricity, gas, acetylene, and water-
lighting factories. Money prizes are awarded in some
subjects ; all competitions are open to everyone, irres-
of nationality. Memoirs, designs, and models must
t to the President of the Société Industrielle de
use before Feb. 15, 1902.—C. T. T.

NERAL PHOSPHATES IN WESTERN AUSTRALIA.

Bd. of Trade J., Aug. 22, 1901.

Government Gazette of Western Australia of the 12th
blishes an official notification that the following
are offered for the discovery of mineral phosphates
he State of Western Australia, *viz.*, 500*l.* if discovered
rown lands, 250*l.* if discovered upon private lands.

conditions under which the rewards will be paid may
at the Commercial Intelligence Branch of the Board
e, 50, Parliament Street, S.W.

New Books.

INERAL INDUSTRY : ITS STATISTICS, TECHNOLOGY,
TRADE IN THE UNITED STATES AND OTHER
TRIES TO THE END OF 1900. Founded and edited
ICHARD P. ROTHWELL, late Editor of the Engineer-
nd Mining Journal ; Ex-President American Insti-
of Mining Engineers, &c. ; and completed by JOSEPH
THERS, Ph.D., Columbia University, New York City.
me IX. Supplementary Volumes I. to VIII. The
tific Publishing Company, New York and London.
Price 1*l.* 10*s.*

8vo volume containing table of contents, introduc-
4 pages of subject-matter, and a copious alphabetical index. The subjects in this work are treated exhaustively, geographical and geological occurrence, commercial values, modes of treatment, chemical composition, and statistics being given. In the Introduction are given :—I. The Total Value of the Mineral and Metal Production of the United States. Statistical Tables of the Production of Ores and Minerals, Production of Metals, &c. Summary of the Mineral Industry of the United States in 1900, &c. II. Aluminium and Alum. III. Ammonia and Ammonium Sulphate. IV. Antimony. V. Arsenic. VI. Asbestos. VII. Asphaltum. VIII. Barytes. IX. Bismuth. X. Borax. XI. Bromine. XII. Calcium Carbide and Acetylene. XIII. Cement. XIV. Chromium and Chrome Ore. XV. Clay. XVI. Coal and Coke. XVII. Copper. XVIII. Copperas. XIX. Felspar. XX. Fluorspar. XXI. Fullers' Earth. XXII. Garnet. XXIII. Gems and Precious Stones. XXIV. Glass. XXV. Gold and Silver. XXVI. Graphite. XXVII. Gypsum. XXVIII. Iron and Steel. XXIX. Lead. XXX. Magnesium and Magnesite. XXXI. Manganese. XXXII. Mica. XXXIII. Molybdenum. XXXIV. Nickel and Cobalt. XXXV. Ochre and Iron Oxide Pigments. XXXVI. Petroleum. XXXVII. Phosphate Rock. XXXVIII. Platinum and Iridium. XXXIX. Potash and Potassium. XL. Mercury. XLI. Rare Elements. XLII. Salt. XLIII. Silica. XLIV. Slate. XLV. Soda and Sodium. XLVI. Stone. XLVII. Sulphur and Pyrites. XLVIII. Talc and Soapstone. XLIX. Tin. L. Tungsten. LI. Zinc and Cadmium. LII. Pyritic Smelting. LIII. Progress of Metallography in 1900. LIV. Manufacture of Titanium and its Alloys. LV. Review of the Literature on Ore Dressing in 1900. LVI. Concentration of the Broken Hill (N.S.W.) Sulphide Ores. LVII. Recent Contributions to the Science of Ore Deposits. LVIII. Notes on Electro-Chemistry, 1900 ; On the Concentration of Finely Crushed Ores, &c. LIX. The Mining Stock Exchanges in 1900. LX. General Summary of Import Duties and Mineral Statistics of Foreign Countries, &c.

SUBJECT LIST OF WORKS ON CHEMISTRY AND CHEMICAL TECHNOLOGY IN THE LIBRARY OF THE PATENT OFFICE. [Patent Office Library Series : No. 6. Bibliographical Series : No. 3.] Darling and Son, Ltd., 34—40, Bacon Street, London, E. Printed for His Majesty's Stationery Office. Published at the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C. 1901. Price 6*d.*

KEY TO THE CLASSIFICATION OF THE PATENT SPECIFICATIONS OF GERMANY, AUSTRIA, DENMARK, AND NORWAY, IN THE LIBRARY OF THE PATENT OFFICE. [Patent Office Library Series, No. 5.] Darling and Son, Ltd., 34—40, Bacon Street, London, E. Printed for His Majesty's Stationery Office. Published at the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C. 1901. Price 6*d.*

ZUR GESCHICHTE DER ENTSTEHUNG UND ENTWICKLUNG DER CHEMISCHEN INDUSTRIEN IN DER SCHWEIZ. Zusammengestellt im Auftrage der schweizerischen Gesellschaft für chemische Industrie, auf Grund von Mitteilungen seitens Mitgliedern der Gesellschaft. Von Dr. GEORG LUNGE, Professor am eidgen. Polytechnikum in Zürich. Druck und Verlag : Art. Inst. Orell Füssli, Zürich. 1901. Price M. 1.

SMALL 8vo volume, bound as pamphlet, containing preface, 70 pages of subject-matter, and a table of contents. In the preface Prof. Lunge acknowledges the assistance and co-operation of various Swiss manufacturers and chemists, representing the several industries on which reports are given. These branches are as follows :—1. Acids, Alkalis, and Salts. 2. Manure Manufacture. 3 Wood Distillation. 4. Explosives and Match Industries. 5 Electro-chemical Industry. 6. Pharmaceutical and Photographic Preparations. 7. Soap Manufacture and Allied Industries. 8. Starch and Dextrin. 9. Glue. 10. Lakes and Varnishes ; Book- and Stone-Printing Colours, Pigments, &c. 11. Artificial Organic Dyestuffs. 12. Vegetable Dyestuffs. 13. Bleaching. 14. Dyeing. 15. Textile Printing. Under the head of "Artificial Organic Dyestuffs" a remarkable achievement is recorded for Switzerland, in that whereas the production of these dyestuffs reckoned as to value, in millions of francs, for the countries England, France, and Switzerland is respectively, 9, 7, and 7, during the year 1875, on the arrival of the year 1896 these figures have changed as follows: 8—9 (England); 8—10 (France); and 16 (Switzerland). The figures for Germany are: 1875, 30½ millions; and 1896, 90 millions.

Twentieth Century Inventions: A Forecast. By George Sutherland, M.A. Longmans, Green, and Co., 39, Paternoster Row, London; New York and Bombay. 1901. Price 4*s.* 6*d.*

8vo volume, containing preface, table of contents, and 286 pages of subject-matter. The general drift of the work may be gathered from the following chapter headings:—I. Inventive Progress. II. Natural Power. III. Storage of Power. IV. Artificial Power. V. Road and Rail. VI. Ships. VII. Agriculture. VIII. Mining. IX. Domestic. X. Electric Messages. XI. Warfare. XII. Music. XIII. Art and News. XIV. Invention and Collectivism.

Chemisch-technisches Repertorium. Uebersichtlicher Bericht über die neuesten Erfindungen, Fortschritte und Verbesserungen auf dem Gebiete der technischen und industriellen Chemie, mit Hinweis auf Maschinen, Apparate und Literatur. Herausgegeben von Dr. Emil Jacobsen. 39. Jahrgang. 1900. Zweites Halbjahr. Zweite Hälfte. R. Gaertner's Verlagsbuchhandlung, Hermann Heyfelder, Schönebergerstr. 26, Berlin, S.W. 1901.

This is the number of the "Repertorium" for the second half of the second half-year of 1900, and it treats of the following subjects of chemical technology:—I. Foodstuffs. II. Paper. III. Photography. IV. Residues, Manures, Disinfection, and Sanitation. V. Soaps. VI. Explosives and Matches. VII. Preparation and Purification of Chemicals. VIII. Fine Chemicals, &c. IX. Chemical Analysis. X. Apparatus, Machinery, Electro-technology and Thermo-technology. XI. Appendix, &c. XII. New Books. Alphabetical index of subject-matter.

A Manual of Laboratory Physics. By H. M. Tory, M.A., and F. H. Pitcher, M.Sc. John Wiley and Sons, New York. 1901. Price 8*s.* 6*d.* Messrs. Chapman and Hall, Ltd., London.

8vo volume containing preface, table of contents, 284 pages of subject-matter, and the alphabetical index. The text is illustrated with 63 engravings, and the subjects practically treated of are Sound, Light, Heat, Magnetism, and Electricity.

The Chemical Essays of Charles William Scheele. Translated from the Transactions of the Academy of Sciences at Stockholm, with Additions. First published in English by J. Murray, 32, Fleet Street, London, in 1786. With a sketch of the Life of Karl Wilhelm Scheele. By John Geddes M'Intosh. Scott, Greenwood, and Co., 19, Ludgate Hill, London, E.C. 1901. Price 5*s.*

8vo volume containing dedication, preface, table of contents, 290 pages of subject-matter, and an alphabetical index. The subjects of the essays are: Fluor Mineral and its Acid. Manganese, Manganesium, or Magnesia Vitrariorum. Arsenic and its Acid. Salt of Benzoin, Silex, Clay, and Alum. Preparation of Mercurius Dulcis via humida. Cheaper and more convenient method of preparing the Pulvis Algarothi. Experiments on Molybdena; Plumbago; Ether; Colouring Matter in Berlin or Prussian Blue. Preparing a New Green Colour. Decomposing Neutral Salts by unslaked Lime and Iron. Quantity of pure Air daily present in our Atmosphere. Milk and its Acid. Acid of Saccharum lactis. Constituent parts of Tungsten. Method of preserving Vinegar. Inflammable principle of Crude Calcareous Earth. Incidental remarks on the Affinity of Bodies. Crystallisation of the Acid of Lemons. Dissertation on Prussian Blue.

Trade Report.

TARIFF CHANGES AND CUSTOMS REGULATIONS.

Government Laboratory; Report for the Ye ended March 1901.

I.—Customs.

The chemical work of the Customs Branch of Government Laboratory, during the past year, ma conveniently divided into four principal classes:—

(1) Tea examined under the Sale of Food and D Act, and denatured tea.

(2) Tobacco, snuff, and nicotine.

(3) Articles containing spirit, ether, or other du substances.

(4) Spirits, wine, and beer.

(i) Under the first class, 2,600 samples were exam against 2,353 during the previous year. Of these, were samples sent by the tea inspectors for chemica microscopical examination.

Of the samples submitted, 252, representing packages, were refused admission for home consum on the ground that they contained exhausted leaves, unsound, or were mixed with sand or other subst within the meaning of the Act.

Tea which is refused admission for home consum can be used for the manufacture of caffeine, after i been denatured in bond, by the admixture of a c quantity of asafetida and lime; 676 samples of denatured tea were examined at this Laboratory, f purpose of testing the completeness of the denat process, before the tea could be delivered from bond.

(ii) The second class comprises the examination of sa of leaf and manufactured tobacco, for proportion of mo and of tobacco suspected to contain prohibited ingredi

Samples of snuff are tested for genuineness, before accepted on deposit for drawback, the assessme drawback value being determined at the Laboratory.

A considerable proportion of the waste snuff, dep on drawback, is used for the production of nicotin samples of nicotine in various stages of manufactu well as imported nicotine, are examined at the C Laboratory, to see if they conform to the standard of sanctioned by the Treasury, *viz.*, 90 per cent. of ni and 10 per cent. of solids. Several samples of so nicotine were refused admission, as they were fo consist of tobacco extract, and were not sufficientl to meet the requirements of the standard.

(iii) The third class includes a miscellaneous list of a Drugs, soaps, confectionery, patent medicines, toi quisites, varnishes, paints, yeast, perfumery, es jellies, &c., are examined for proportion of spirit p soaps, fats, and some drugs for cocoa-butter; confec for proportion of chocolate and for presence of spirit to see that it is fermented apple juice only.

Ethers, as sulphuric, acetic, butyric; chloral h chloroform, and substances suspected to contain articles, are examined on importation.

Methyl alcohol is examined for potability. If suffi purified to be potable, it is liable to the same duty a alcohol of similar strength, whilst the crude article of duty.

Roasted cereals, intended as coffee substitut examined on importation, as the presence of eithe or chicory renders such articles liable to duty.

Coffee, roasted and ground, when exported or for stores, is allowed a drawback; samples of s examined, to see that it is pure coffee before draw paid.

(iv) The fourth class consists of wines, spirits, an wines and spirits being tested for quantity of spirit and beers for original gravity.

II.—Excise.

Medicinal Tinctures, &c.—The exportation of m tinctures, flavouring essences, and perfumes on dr under the special regulations sanctioned by the T ntinues to extend. In the past year 10,640 samples, presenting 95,542 galls. of proof spirit, have been amined, as compared with 9,540 samples and 80,726 galls., spectively, in the previous year.

During the last two years, it has been observed that an proper advantage was occasionally being taken of these ecial regulations, to send out preparations almost devoid of edicinal or flavouring properties.

In certain British colonies, and possibly in other countries so, the rate of duty on the spirit present in medicinal ictures, &c. is very small, as compared with that on spirit ended or capable of being used for potable or other purses, and to avoid payment of this higher rate of duty, lers are occasionally sent from abroad, to include in the nsignment of ordinary medicinal tinctures, &c., considerle quantities of alcohol, under names appertaining to such dicinal tinctures, &c., but so slightly coloured or flavoured, to be available for other purposes. The explanation en by the exporters is, that the preparations in question re so ordered by their customers abroad, and they aded that, if their exportation were interfered with, they uld be obtained from the Continent, and so the trade uld be lost to this country. It may be pointed out, hower, that such preparations can be legitimately exported, ler the regulations applicable to British compound rits.

The Board of Inland Revenue, after first cautioning the orters, refused to allow drawback on such preparations ler the medicinal tinctures regulations, and this action materially, if not yet quite completely, checked this ctice.

Wood Naphtha.—986 samples of wood naphtha, intended methylating purposes, and representing 373,804 galls., e been examined. Of these, 52 samples, representing 865 galls., could not be approved as suitable for the pose. Owing probably to the exceptionally large rease in the total quantity of wood naphtha required methylating purposes in the year ending 31st March 9, the number of samples of this abnormal character, ch had to be rejected in that year, and especially in latter portion of the year, was greater than at any ner period. In the last quarter of 1899, about oned of the samples submitted contained less than the imum quantity of 72 per cent. of methyl alcohol. The ciency, in a very large proportion of these samples, excessive, amounting in many cases to 10, 15, or 20 cent., and in one or two instances to 30 per cent. and vards. The percentage of "acetone" and "esters" in h samples was, of course, correspondingly high. In the esponding quarter of 1900, six months after the e of the new instructions, the number of samples i less than the minimum percentage of methyl alcohol fallen to one-sixth of the total number submitted, of these, considerably more than half contained veen 70 and 72 per cent., and only in a single sample the deficiency amount to more than 10 per cent. In the quarter of the year just ended, only 10 samples out of 242 submitted were deficient in methyl alcohol, and all hem contained over 70 per cent. The number of ples containing an excess of "acetone" and "esters" six and one, respectively, in the same period.

no less satisfactory improvement has taken place in "purity" character of wood naphtha. In 1888–9 many ples, as measured by the "bromine" and "methyl orange linity" tests laid down (see this Journal, **21**, 11, 1034), also by their taste and smell, were much too pure to be able for methylating, whilst others were unnecessarily ure. Samples of this exceptional character are now ly submitted. During the final quarter of last year, only samples were rejected solely on the ground of being o pure," and none of those examined were exceptionally ure.

liscellaneous.—The samples not included in the foreg branches of work comprise 3,197 of compounds, eurs, and wines for the estimation of their spirit value; of spirits for the determination of amount of obscuration; of yeast pressings and wash, for the determination of ginal gravity; and 1,839 of a general nature, including s, cider, cordials, chocolate liqueur beans, essences, fusel oil, finish, grogged spirits, lees, liniments, methylated spirit, patent medicines, pigments, wines (British, foreign, and medicated), vinegar, yeast, &c.

Tobacco.—Another important matter connected with the manufacture of tobacco has been dealt with in the year under review. Past experience has shown that there is always a tendency, on the part of a certain number of manufacturers, to add to their tobacco or snuff as much as possible of any ingredients which may be legally added, thus really adulterating tobacco with impunity, and the abuse has on each occasion required legislation for its rectification.

As a specific instance, may be mentioned the restriction of the use of lime-water and alkaline salts to certain definite proportions, in the manufacture of snuff.

In manufacturing roll tobacco, in addition to water, a small quantity of some kind of oil is necessary, but prior to 1879, there was no restriction either as to the quantity or the kind of oil which might be used. In 1879, at the instance of some of the larger manufacturers, an Act was passed in which olive oil was specially named as the only oil to be used in the spinning of roll tobacco. Therefore, from and after 1879, the only foreign substances which could be added to tobacco in the process of manufacture were water and olive oil for spinning, and essential oils for flavouring, roll tobacco, no restriction, however, being placed on the quantity of water or oil. In 1887, it was found desirable, in the interests of the revenue and of the consumer, to restrict the amount of moisture, and by the Act of 50 & 51 Vict. c. 15, s. 4, the extreme amount of moisture which might exist in any portion of manufactured tobacco was fixed at 35 per cent. By the Finance Act, 1898, this limit was further reduced to 30 per cent., and soon afterwards, an important movement on the part of certain manufacturers began. It was observed that occasionally some specimens of roll and cake tobacco, which from a physical examination seemed to contain moisture in excess of the legal limit, actually contained moisture considerably below that limit. An investigation of this apparent anomaly led to the conclusion that the physical appearance of such tobacco was due, not to excess of moisture, but of oil.

A process for the estimation of the amount of oil in tobacco was therefore devised, and specimens of roll tobacco from every factory in the three kingdoms were examined.

The results obtained pointed to the following conclusions:—

(1) That the actual necessities of manufacture did not require the use of a very large quantity of oil.

(2) That the roll and cake tobaccos from certain factories contained an excessive quantity of oil.

(3) That manufacturers in the habit of using oil liberally were gradually increasing the amount.

(4) That some manufacturers who had formerly been using the oil in normal quantity were also beginning to use it more freely, being, no doubt, compelled to do so by trade competition.

As this state of things was a source of grave danger to the revenue, the Oil in Tobacco Act, 1900, limiting the amount of oil to 4 per cent., was passed, and received the Royal Assent on the 6th August, 1900. Manufacturers were allowed till the 20th September to dispose of any tobacco which, having been manufactured prior to the 6th August, might contain oil in excess of the now legal limit.

III.—Board of Trade.

The lime and lemon juice submitted for approval during the year has been again generally good in quality. Out of 441 samples representing 57,200 galls., it has only been necessary to reject 14 samples, referring to 1,859 galls. The causes of rejection were lowness of quality, excess of pulpy matter, or contamination with iron or salt. Thirty samples of spirits for fortifying the juice were all of suitable character, and 13 samples of fortified juice, which had been fortified for at least two years, were all found fit to be re-issued.

IV.—*Home Office.*

Fifty - one samples were examined for the Factory Department of the Home Office and the Dangerous Trades Committee. The examination of these samples was mainly directed to the determination of the amount of lead, arsenic, or mercury present in various substances, and the samples included pigments used by boot finishers and wall-paper manufacturers, polishing powders from electro-plate works, enamels and colours employed in the enamelling of copper letters and iron-work, dust from the drying-room of calico printing works and yarn-drying establishments using lead and copper compounds, paper flock, slag powder, and rabbit pelt.

V.—*India Office.*

The samples examined for the India Office were of the usual wide range. Gold-leaf is required to contain not less than 97 per cent. of pure gold, but in one instance, a sample contained 5 per cent. of silver and only 91 per cent. of gold. Type-metal should consist of 65 parts of lead, 30 parts of antimony, and 5 parts of tin, and yet in eight samples received together, the lead varied between 65 and 82 per cent., the antimony between 15 and 29, and the tin between 0·6 and 5·5, per cent. Antimony is required to contain less than 3 per cent. of impurities, but of five samples, two contained 4·76 and 4·15 per cent. of impurity, respectively.
—C. T. T.

UNITED KINGDOM.

Sugar Import Duties.

In view of the provisions of the "Finance Act, 1901," the Commissioners of Customs have issued a series of regulations for the guidance of Customs officers, with reference to the duties imposed on sugar and articles of cognate description imported into the United Kingdom.

The following extracts contain the principal provisions of these regulations, and give detailed information as to the rates of duty imposed on the various articles mentioned:—

Import duties on sugar, &c., are to be charged on and after 19th April, 1901, *viz.*:—

		s.	d.
Sugar of a polarisation exceeding 98°	the cwt.	4	2
„ „ not exceeding 76°	„	2	0
And intermediate duties varying between 4*s.* 2*d.* and 2*s.* on sugar of a polarisation not exceeding 98° but exceeding 76°, in accordance with table annexed. (See this Journal, 1901, 515.)			
Molasses (except when cleared for use by a licensed distiller in the manufacture of spirits), and invert sugar and all other sugar and extracts from sugar which cannot be completely tested by the polariscope and on which duty is not specially charged—			
If containing 70 per cent. or more of sweetening matter.	the cwt.	2	9
If containing less than 70 per cent., and more than 50 per cent. of sweetening matter.	„	2	0
If containing not more than 50 per cent. of sweetening matter.	„	1	0
Glucose—			
Solid	„	2	9
Liquid	„	2	0
Saccharin (including substances of a like nature or use).	the oz.	1	3
Sugar candy will be dealt with as sugar polarising over 98°.			

Plums (including greengages) preserved in sugar or otherwise are to be charged at 7*s.* per cwt.*

Samples of sugar and molasses and of all goods in which sugar is an ingredient, except those specified in the schedule below, are to be taken for analysis, and duty will be charged on such goods according to the rating shown on the testing form. Delivery may be allowed to proceed at once, on the importer's depositing a sufficient sum to cover t duty. With the permission of the Customs Commissioner merchants may clear sugar on payment of duty on a estimated polarisation, as well as syrups and molasses, at a estimated percentage, on entering into a bond in a sufficie amount to cover any short payment, arising either from th weight or rating having been understated. If importe elect to pay the maximum duty leviable, sampling may b dispensed with.

Sugar will be tested at the following ports, *viz.*:— London, Liverpool, Glasgow, Bristel, Hull, Leith, Sout ampton, Greenock, and Grangemouth: but where loc arrangements have not yet been completed, samples sugar are to be forwarded to the Laboratory, Custo House, London.

Until further orders, samples of goods containing sug (including molasses and glucose), or goods in the manufa ture or preservation of which sugar is used—except su goods as are mentioned in the schedule below—are to forwarded to the Laboratory, Custom House, London.

The duty on sugar, &c., is chargeable according to t account taken on the landing thereof, subject to the usu regulations as regards accidental damage while in warehou or during removal under bond.

Sugar may be coloured in a bonded warehouse f exportation. Sugar may also be delivered from warehou for the purpose of breaking or crushing for exportation, up bond being entered into, in the penalty of double the du payable upon the goods, for the return of the sugar to t warehouse.

Sugar may be removed under bond to a bonded warehou for the purpose of sweetening spirits under the standi regulations, and also to a bonded Cavendish factory sweetening tobacco.

Molasses may be removed under bond direct from t ship's side or from warehouse to distillers' premises, free duty, for use in the manufacture of spirits.

Honey (pure) and milk sugar or lactose are not liable the sugar duty.

For table showing percentage of duty chargeable on su of a polarisation not exceeding 98° and exceeding 76°, Journal, 1901, 515.

Schedule of fixed rates on the under mentioned goods:

		s.
Blacking, solid, containing sugar or any other sweetening matter.	the cwt.	1
Candied and drained peel	„	3
Caramel, solid	„	4
„ liquid	„	3
Cattle foods containing molasses or other sweetening matter.	„	1
Cherries, drained, imported in bulk	„	2
Chutney	„	2
Cocoa-nut, sugared..................................	„	2
Confectionery containing chocolate, *viz.*:—		
When the chocolate exceeds 50 per cent. of the total net weight.	the lb.	0
When the chocolate does not exceed 50 per cent. of the total net weight.	„	0
Confectionery made from sugar and containing no other ingredients except flavouring.	the cwt.	4
Confectionery, hard, such as—		
Sugared almonds..........................	„	1
Caraway seeds, &c.		
Confectionery, soft, such as—		
A. B. gums imported in bulk in barrels or cases, on the entry for which the importer has declared that duty on the combined quantity of sugar and glucose used in the manufacture of the goods did not exceed the rate of 2*s.* the cwt.	„	2
Other A. B. gums	„	5
Caramels		
Chewing gums		
Jelly beans		
Turkish delight, &c.		
Flowers, as violets and rose petals, &c., in crystallised sugar, as crystallised fruit.	„	4
Fruit, canned and bottled, other than fruit liable to duty as such, preserved in thin syrup.	„	1
Fruit, canned and bottled, other than fruit liable to duty as such, preserved in thick syrup.	„	3
Fruit, crystallised, glacé, and metz, except fruit liable to duty as such.	„	4
Fruits, imitation, crystallised (orange and lemon slices, &c.).	„	4

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* Tinned and bottled apricots, in syrup or water, and apricot pulp, are not liable to duty as preserved plums. Duty, however, must be charged on any added sugar. Dried apricots are to be charged 7*s.* per cwt.

The duty of 7*s.* per cwt. on figs is equally applicable to tinned figs and fig pulp, and is to be levied accordingly.

		s	d.
Fruit, except currants, liable to duty as such, preserved in sugar, or otherwise, whether mixed with other fruits or not.	the cwt.	7	0
Fruit pulp, excepting fruit pulp liable to duty as such, preserved in thin syrup.	„	1	0
Fruit pulp, excepting fruit pulp liable to duty as such, preserved in thick syrup, as jam.	„	3	0
Ginger, preserved in syrup or sugar	„	3	0
Marmalades and jams, and fruit jellies, if not made from fruit liable to duty as such.	„	3	0
Sweetened spirits tested for strength, additional to the spirit duty, in respect of the sugar used therein.	pf. gall.	0	2
Marzipan	the cwt.	2	6
Milk, condensed, sweetened, whole	„	1	8
Milk, condensed, sweetened, separated, or skimmed.		2	0
Nestle's milk food		1	3
Soy, when containing molasses or other sweetening matter.	„	2	0
Tamarinds preserved in syrup	„	1	0
NOTE.—An additional ½*d.* a lb. is chargeable in respect of any of the before-mentioned articles in which spirit has been used in the manufacture.			
Blacking, liquid, containing sugar or any other sweetening matter. (Together with the duty on any spirit contained therein.)	„	1	0

Saccharin.—Saccharin must not be imported into Great Britain or Ireland except into ports approved by the Commissioners of Customs. These ports are, at present, London, Harwich, Dover, Folkestone, Newhaven, and Southampton. nported saccharin must be warehoused. Saccharin manuictured in Great Britain must be charged with duty in the istody or possession of the maker. It must not be ported otherwise than in packages containing not less ian 11 lb.

The Board of Customs have further issued amended gulations, with regard to the drawback to be allowed on igar and cognate goods exported, deposited, or shipped r use as ships' stores, or removed to the Isle of Man. ntil the new arrangements are in full working order, the isting form of shipping bill, whether presented at the istom house or at the export station, may be used in all ses where the special form required by the amended gulations will hereafter be applicable (see this Journal, '01, 629).

British India.

igar imported from Italy ; Countervailing Duties on——.

The Board of Trade have received a notification, dated t August, 1901, to the effect that additional duties are posed, from 15th August, 1901, on bounty-fed sugars ported from Italy into British India, as follows :—

Country.	Kind of Sugar.	Bounty Bestowed.	Additional Duty to be Levied.
		Per 100 Kilos.	Per Cwt. R. A. P.
ly........	Sugar below No. 20 Dutch standard.	5·60 francs	1 11 0
	Sugar, No. 20 Dutch standard and above.	6·13 „	1 13 7

The above additional duty is levied upon all sugar ported into British India from Italy, whether directly or irectly, and whether in the same condition as when ported from the country of production, or changed in ndition by manufacture or otherwise.

Sugar from the Argentine Republic.

The Board of Trade have received a copy of a Customs cular which, by order of the Governor-General in uncil, revises the rate of "additional duty" on all kinds sugar imported into British India, whether directly or erwise, from the Argentine Republic. These "additional ies" are therefore revised as follows, with effect from July, 1901 :—

Kinds of Sugar.	Additional Duty to be levied.
New Rate.	Per Cwt. Rs. a. p.
All kinds (except sugar exported from the Argentine Republic without payment of internal revenue tax).	15 3 10
Old Rate.	
All kinds	9 2 0

Egypt.

Valuation Tariff.

The Board of Trade are in receipt of a copy of a valuation tariff, used by the Egyptian Customs Authorities, to come into force on the 22nd July, and to remain in operation for three months, or until denunciation. It affects the undermentioned articles :—

Articles.	Valuation per Kilo.
	Mill.
Zinc white (1st quality), including *Vielle Montagne.*	22
Zinc white (2nd quality), including *Nouvelle Montagne* and other kinds.	13
Red lead	16
Linseed oil, crude	32
„ boiled	33
Cotton-seed oil	21
„ „ refined (double)	23
Cochineal	90

Western Australia.

Customs Decisions.

The Board of Trade have received a copy of the following Customs decisions relative to the tariff of Western Australia :—

Articles, and how Classified.	Rate of Duty.
Aluminium powder—	
As articles not otherwise enumerated	15 % *ad valorem.*
Boiler fluid (solid)	Free.

New Zealand.

Customs Decisions.

The Department of Trade and Customs of New Zealand has issued the following decisions, dated 3rd July, 1901, relating to the classification of the following articles under the Customs Tariff of the Colony :—

Articles, and how Classified.	Rate of Duty.
Carbolic acid or phenol, liquid or in crystals, in bottles of ½ lb. or over—	
As carbolic acid in bulk	Free.
Carbolic acid or phenol, liquid or in crystals, in bottles of less than ½ lb.—	
As drugs and druggists' sundries, not otherwise enumerated.	15 % *ad valorem.*
"Vinette" used with aniline dyes in colouring leather—	
As articles suited and intended only for use in manufactures within the Colony.	Free.

Mauritius.

Sugar Export Duty.

The Board of Trade have received a copy of an Ordinance which came into force on the 28th June last, and which repeals Ordinance No. 14 of 1889. It enacts that an additional duty of 2 cents of a rupee per 100 kilos. (3¼*d.* per ton) shall be levied on the exportation of all sugar produced in the Colony. The present duty is in addition to the export duty of 30 cents per 100 kilos (4*s.* 1*d.* per ton), leviable under the "Customs Consolidated Tariff Ordinance, 1895," a notice with regard to which was published in the *Board of Trade Journal* for 15th March, 1900.

UNITED STATES.

Customs Decisions.

The following decisions have recently been issued by the Treasury Department at Washington :—

Vienna Lime.—Vienna lime or "Putz kalk" is dutiable at the rate of 5 cents per 100 lb., under paragraph 90 of the Tariff, and not under paragraph 97, as an earthy or mineral substance, not decorated.

Asphaltum. — Asphaltum, "sun-dried in the bed," is dutiable at the rate of 3 dols. per ton, as dried, crude asphaltum, under paragraph 93 of the Tariff.

Carriage of Explosives on Steamers.—According to a recent decision of the Treasury Department, the only explosive powder which it has authority to permit to be carried on passenger steamers is the powder designated, in section 1422 of the Revised Statutes, as "gunpowder."

Magnesium Sulphate.

The Treasury Department has promulgated the decision of the United States Circuit Court of Appeals, settling the issue concerning the dutiability of sulphate of magnesia, or Epsom salts, which has been pending since the passage of the Wilson Tariff Act, in 1894, and very considerable refunds will now result, as this article has been declared to be free of duty.

FRANCE.

Sugar Bounties.

The following French Presidential Decree, published in the *Journal Officiel* of the 24th ult., fixes the rates of the direct bounties to be allowed, from the 1st inst., on sugar, the produce of France and the French Colonies, declared for exportation :—

The bounties which will be granted to French native or colonial sugars declared for exportation to foreign countries and to the French Colonies not subject to the Metropolitan Customs Tariff, are, from the 1st Sept., 1901, fixed as follows :—

	Frs.	Cts.
Raw sugar in grains or small crystals testing at least 98 per cent. for beetroot sugars, or 97 per cent., at least, for colonial sugars, the testing being made before allowance for waste in refining :—Per 100 kilos. of refined sugar.	1	78
(Sugars of this class, liable to duty and exported abroad directly by the manufacturer, when they polarise 99·75 per cent., at least, shall be considered as refined sugar, without any deduction on account of drawback in favour of the manufacturer.)		
Raw sugar testing from 65 to 98 per cent for beetroot sugar, or from 65 to 97 per cent. for French colonial sugar :—Per 100 kilos. of refined sugar.	1	56
Sugar candies, calculated at their legal co-efficient : refined sugar in lumps or pieces, perfectly pure, hard and dry :—Per 100 kilos.	2	00
"Vergeoises" :—Per 100 kilos. of refined sugar.........	2	00
Refined sugar in grains or crystals testing at least 98 per cent. :—Per 100 kilos. of refined sugar.	1	78
(If the sugars of this last-named class polarise at least 99·75 per cent., they shall be considered as pure refined sugars, and the export certificates thereto e shall be accepted as discharge of temporary admission bonds for their total weight, without any deduction.)		

RUSSIA.

Tanning Materials.

A decision of the Russian Imperial Council has been recently published, in virtue of which, mimosa bark (except in the form of ground powder) may, for the future, be imported into Russia duty free, under the provisions of the note to par. 1 of section 124 of the Customs Tariff ; also, that mimosa extract in any form is to be admitted on the same footing as chestnut, hemlock, and other tanning extracts, under par. 3 of section 124 of the Tariff, at the rate of 15 copecks per pood (=36 lb.).

NETHERLANDS.

Salt as Cattle Food or Manure.

A Dutch Royal Decree, dated the 26th June last, provides, with reference to the exemption from duty of salt required for cattle food or for manuring land, that "exemption is only allowed on raw salt in which there are no pieces of a larger size than one centimetre in the case of sea salt, and one-half centimetre in the case of rock or mine salt."

ITALY.

Photographic Plates and Vegetable Tallow.

The Italian *Bollettino di Notizie Commerciali* for August contains a Decree, dated the 16th July last, effecting alterations in the tariff classification of the undermentioned articles, as stated :—

——	Tariff No.	Duty.	
Prepared plates for photography—		Lire	Ct.
(*a.*) Of crystal or glass	273 per 100 kilos. ...	40	00
(*b.*) Of any other material.	352(*a*) „ „ ...	80	00
Former classification—			
Prepared plates for photography, of metal, glass, celluloid, or any other material.	352(*a*) „ „ ...	80	00
Vegetable tallow	309(*b*)	Free.	
Former classification—			
Vegetable tallow	307 per 100 kilos....	4	00

PORTUGAL.

Customs Decisions.

The Portuguese *Diario do Governo* for the 24th Jul last contains a Royal Decree, dated the 19th July, providin that iron wire-gauze embedded in common glass is to l dutiable, on importation into Portugal, at the rate of 60 re per kilo. (13*s.* 9*d.* per cwt.).

PORTUGAL—MOZAMBIQUE.

Sesamum and other Oleaginous Seeds.

The Portuguese *Diario do Governo,* for the 24th ul contains a Royal Decree dated the 17th ult., providi that sesamum, "*manobi*" (? mandobi, or ground nut), a other oleaginous seeds and substances shall pay duty, exportation from the province of Mozambique, at the ra of 2 per cent. *ad valorem,* when destined for Portugue ports, and of 4 per cent. *ad valorem,* when destined f foreign ports.

SPAIN.

Covered Copper Wire.

The Spanish *Gaceta de Madrid,* for the 24th July la contains a Royal Decree, dated the 12th July, modifying t tariff classification of covered copper wire imported i Spain.

Copper wire covered with cotton, silk, or other text fibres, with or without india-rubber or other insulat materials, is to be dutiable under No. 81 of the Span Customs Tariff, at the rate of 1 peseta 25 cents per ki (2*l.* 10*s.* 10*d.* per cwt.).

Copper wire for electric conductors in public stre covered with various insulating materials, is to be dutia under No. 305 of the Tariff, at the conventional rate of pesetas 50 cents per 100 kilos. (7*s.* 6*d.* per cwt.).

The second paragraph of the note to No. 305 of Tariff, providing that copper wire covered with cotton silk, &c. is to be subject to duty under No. 78, at the r of 40 pesetas per 100 kilos. (16*s.* 3*d.* per cwt.), has been suppressed.

CHINA.

New Tariff.

The Board of Trade have received notification, to effect that the Protocol, recording the Agreement arri at between the Powers and the Chinese Government, settlement of the disturbances which took place in China last year, was signed on the 7th Sept. Article VI. of the Protocol stipulates that, in return for certain concessions, the Powers have consented to the assessment of Customs duties on goods imported into China by sea, on the basis of an effective 5 per cent. of the value of such goods, including articles hitherto admitted free of duty. The duties will be levied *ad valorem*, pending their conversion, so far as feasible, into specific rates, which is to be effected with the least possible delay.

The new tariff will come into force two months after the signature of the Protocol, and only such merchandise as is *en route* 10 days, at latest, after the date of signature, will be exempted from the provisions of the new tariff, and admitted into China on the basis of that now in force.

ARGENTINE REPUBLIC.

Salt for Preservation of Hides for Export.

The Board of Trade have received information to the effect that an Argentine Presidential Decree of the 30th April last provides that salt, intended for use in the preservation of salted hides for export, is to be exempt from import duty.

SAN DOMINGO.

Import Duties; Modifications in ——.

A decree, dated the 28th June last, makes the following alterations in the rates of Customs duties leviable upon certain articles imported into San Domingo.

Olive oil	Present duties less 50 per cent.
Salts of quinine; cod liver oil and preparations thereof.	Free.

(NOTE.—The above rates are exclusive of the various surtaxes which have been imposed from time to time.)

I.—GENERAL.

ASSOCIATION OF CHAMBERS OF COMMERCE OF THE UNITED KINGDOM.

Bd. of Trade J., Sept. 12, 1901.

A meeting of the Association of Chambers of Commerce f the United Kingdom was held at the Mechanics' Instituion, Nottingham, on Tuesday and Wednesday, the 3rd and th September, the chair being taken each day by Lord Avebury.

Among others, the following resolutions were passed:—

German Tariff.

"That this Association views with alarm the proposed ncrease of the German Tariff, and strongly protests against he same, believing that it will be injurious to the trade of his country."

Patent Law Amendment.

"That this Association approves of, and adopts, the ollowing resolutions upon Patent Law Reform, passed y a Conference of Chambers, held at Manchester on 5th June, in pursuance of a recommendation of this Association, on 13th March last.

"1. 'That this Conference heartily approves of the Report f Sir Edward Fry's Committee on the first question subitted to it, and of the separate notes relating thereto of ir Edward Fry and Mr. Herbert Hughes, and of Sir dward Fry respectively, and recommends the Association Chambers of Commerce to request the President of the oard of Trade to bring in a Bill next Session to give effect hereto.'

"2. 'That, in the opinion of this Conference, no amendent of Section 22 will be satisfactory which does not rovide for the granting of compulsory licences, in default the *bonâ fide* manufacture of the patented article in the nited Kingdom, and, therefore, this Conference disagrees ith the conclusions of Sir Edward Fry's Committee on the cond question submitted to it.'

"3. 'That this Conference approves of the findings of Sir Edward Fry's Committee on the third question submitted to it.'

"4. 'That in the opinion of this Conference, no patent right, which has previously been granted elsewhere, should be valid in this country for a longer period than in the country of origin.'

"5. 'That all patented articles, or the packages in which they are contained, should be marked with the word "Patent," and with the registered number of the patent and the date of registration.'

"That the Council be requested to urge upon the President of the Board of Trade the importance of giving legislative effect to the foregoing resolutions."

Trade Marks.

"That this Association supports the action of the London Chamber of Commerce in introducing a Bill to amend the existing Acts relating to Trade Marks, and further resolves that the Board of Trade be requested to grant facilities for a full inquiry into the unsatisfactory working of the present law, with a view to adequate legislation thereon."

Cheap Coal Supplies.

"That any investigation into the coal resources of this country should include an inquiry into the economic effect of railway and municipal charges, rates, taxes, and dock dues, with a view of providing for the re-adjustment of these burdens upon industry, before the most valuable cheap coal supplies are exhausted.

ONTARIO GOVERNMENT ASSAY OFFICE.

Eng. and Mining J., Canadian Supplement, Aug. 24, 1901.

The Assay Office is preparing a list of factories, chemical and metallurgical works, dealers, &c., in the United States, Great Britain, Germany, and France, which use ores and minerals known to occur in Ontario.

The list will also include uses and approximate market values of minerals at present commercially valuable.

Letters asking for information coming under this head will receive attention.

DRUG IMPORTS IN NATAL.

Chem. and Druggist, Aug. 31, 1901.

During the six months ended June 30, 1901, the imports into the colony included the following:—Apothecary ware, 28,994*l.*; acetic acid (368 galls.), 92*l.*; medicinal preparations, 31,582*l.*; drugs (free), 8,090*l.* (the total combined value of the aforesaid articles in the six months of 1900 was 52,291*l.*); extracts and essences, 15,388*l.*; perfumery, 5,116*l.*; photo ware, 7,938*l.*; saccharin, 1,086*l.*; saltpetre (137 cwt.), 137*l.*; sheep-dip, 4,211*l.*; toilet soap, 4,540*l.*; soap, other than toilet (4,775,866 lb.), 40,064*l.*; perfumed spirits (1,351 galls.), 2,989*l.*; spirits of wine (41 galls.), 70*l.*

MINERALS AND PHOSPHATE IN PALESTINE.

Comm. Intelligence, Sept. 7, 1901.

Valuable mineral deposits have been discovered in Palestine, on both sides of the Jordan and the Dead Sea. The waters hold magnesium chlorides, bromides, and potash salts. There are also the bituminous chalk springs of Nebi Musa, which contain from 30 to 40 per cent. of asphaltum.

The most important of all the deposits is phosphate, the immense fields of which to the east and west of the Jordan need only better means of communication in order to ensure their development.

TRADE OF MEXICO IN 1900.

Foreign Office Annual Series, No. 2693.

Imports.

The value of chemical products imported into Mexico, during the year 1900, was 525,805*l.*, as against 455,300*l.* in 1899.

Paints and varnishes, including aniline dyes and extract from dyewoods, are valued at 112,544*l.*, as against 101,016*l.* in 1899.

Drugs, patent medicines, &c., were imported to the value of 94,835*l*., as against 92,303*l*. in 1899.

The value of imports of sulphate of copper and of iron decreased from 79,005*l*. to 55,636*l*.

Caustic soda and potash, much used in cotton factories, were valued at 66,665*l*., in the year 1900

27,295 tons of cement and hydraulic lime, valued at 50,019*l*., were imported during the year 1900, as against 23,563 tons, valued at 46,362*l*, in 1899. This increase is due to the large amount of cement required for the relaying of the pavements in the city of Mexico, after the drainage has been finished. No data are obtainable as to how much cement or hydraulic lime of home production has been used in the same period.

The firebrick imported represents a value of 11,023*l*.

The greater quantity of imported cement came from the United Kingdom, but clay pipes and firebrick were of American origin.

The value of imported glassware in 1900 was 244,795*l*., as against 184,568*l*. in 1899, principally from the United States and Germany.

France and Germany supply the greater part of the earthenware and china imported into this country, which, in 1900, amounted to 71,334*l*., as against 65,802*l*., in 1899.

Imports of earthenware, china, and glass from the United Kingdom are very small.

Ammunition and dynamite come from the United States.

Paper and its manufactures were imported to the value of 450,878*l*., as against 407,056*l*., in 1899. Cigarette paper comes from Spain, and unsized paper from the United States. The new paper factory at Mexico city, equipped with all modern appliances, is producing fair qualities of wrapping and other papers.

Exports.

Dyewoods consisted of 39,435 tons of logwood, valued at 139,945*l*., and 5,750 tons of fustic, valued at 13,060*l*., as against a total value, in 1899, of 85,141*l*.

Lead, in 1900, amounted to 1,484,418 cwts., valued at 429,003*l*., as against 1,327,508 cwts., valued at 386,568*l*., in 1899.

Rubber, in 1900, amounted to 517,000 lb., valued at 48,938*l*., as against 489,280 lb., valued at 40,170*l*., in 1899.

Among industrial products, may be mentioned *sugar*, principally unrefined, valued at 1,460*l*., as against 3,851*l*. in 1899. This decrease is chiefly due to the extra local demand, either in the making of cane spirits, or in the preserving of fruits in syrup, an industry that has rapidly increased of late in the State of Vera Cruz, the towns of Jalapa, Cordoba, and Orizaba being the principal centres, on account of the quantity and diversity of fruits grown in the neighbourhood.

The export of *vanilla* decreased considerably both in quantity and value, frosts and rains in the early part of the year, and the want of the latter at the proper season, spoilt the plants, and the crop was lost. The quantity exported, in 1900, was 60,921 lb., as against 133,676 lb., in 1899, and the values were, respectively, 62,565*l*. and 181,547*l*.

This bean is now receiving the attention of many of the American agricultural companies, the properties of which are in the State of Vera Cruz, and the exports for 1901 will probably show an increase over those for 1900.

Among medicinal herbs may be mentioned jalap, valued at 3,936*l*.; and sarsaparilla, valued at 5,996*l*.

II.—FUEL, Etc.

ALCOHOL AS FUEL IN GERMANY.

Imp. Inst. J., Sept. 1901.

Prof. Behrend has carried out experiments, at the Hohenheim Technological Institute, on the use of alcohol in motors, in place of petroleum. The motors used were of German make and of six horse-power. The first experiments were made with ordinary methylated spirits, and later, with alcohol containing varying proportions of benzene. Using methylated spirit, the cost of working was 1·43*d*. per horse power, for one hour, while admixture of benzene to the extent of 68 per cent. reduced this amount to 1·25*d*., for the same amount of energy Using petroleum, the cost with the same motor amounted to 1·2*d*., so that alcohol containing about 20 per cent. of benzene could compete successfully in Germany with petroleum, as a source of power for explosion engines. The alcohol employed for trade purposes in Germany is a potato spirit, costing about 11*d*. per gallon. (See also this Journal, 1901, 853.)

IV.—COLOURING MATTERS, Etc.

DYESTUFFS IN JAPAN.

Chamber of Com. J., Sept. 1901.

Colours and dyestuffs show a decrease in importation, being in 1898 valued at 111,265 yen, and in 1899, at 74,879 yen, all intended for ship yards and manufacturers of textile goods. Large quantities of colours, cobalt, &c., are imported for the porcelain factories at Kiushiu.

DYESTUFF IMPORTS OF ITALY.

Chamber of Com. J., Sept. 1901.

Italy's importation of dyestuffs considerably diminished in 1900. The importation from Germany suffered most, and this importation will probably become still more reduced, as the native industry has recently developed to a greater extent. Cheap articles, which replace the dearer English and German goods, are already being manufactured in the country, and every effort must be made to compete with native Italian industry.

DYESTUFF IMPORTS OF THE CANARY ISLANDS.

Chamber of Com. J., Sept. 1901.

The importation of colours and dyestuffs into the Canary Islands materially increased last year, and doubled as compared with that of 1899. Germany, France, and Italy have attempted to import their productions, but England has maintained her dominant position as regards the supply of colours.

INDIGO IN INDIA.

Chem. Trade J., Sept. 7, 1901.

The collector of Customs at Calcutta shows that, in the three years preceding the appearance of synthetic indigo on the market, the average annual exports of indigo from Calcutta were 109,182 cwt., valued at 231 rupees per Indian maund (82⅔ lb.), whereas, during the last four years, the competition of artificial indigo has sent down the average exports to 70,964 cwt., valued at only 178 rupees per maund. Experience showed in 1899—1900 that the artificial indigo effectively limits the level to which prices can rise, when the output of natural indigo is deficient With a maximum limit set upon prices, the future of the industry depends on a reduction in the cost of production The area under indigo has been much reduced in the last two years. In Lower Bengal, the reduction is as great as 60 per cent. Russia is supplying her requirements largely from Java. One satisfactory feature of the year just closed is an advance from 33 to 40 per cent. in the proportion of the total shipments that went to non-European ports.

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

POTASH FROM SHEEP'S WOOL.

Chem. and Druggist, Aug. 31, 1901.

The greater part of the potash salts contained in sheep' wool is lost in the wash-waters, and little or no attempt has been made in England to save it. On the Continent as much as 2,250,000 lb. of wool-potash is produced annually by several wool-washing works. This contains from 75 to 90 per cent. of potassium carbonate and some soda. A Great Britain is the most important centre of the wool spinning and weaving industry, attention is drawn to the waste which goes on here. Mr. W. R. B. Lockie, of Liverpool, is now trying to introduce here a wool-washing machine, which saves the potash, as well, as the wool-fat The machine is largely used on the Continent, and consist entially of a battery of spray-washers, which enables the h-water to pass from one wool compartment to another, n repercolation. The wool is impregnated successively h liquids that lose in alkaline properties as they gain in t, until the wool reaches the temperature of the first hing-bath. The capacity of the machine per day of 10 rs, varies from 141 to 318 cb. ft. of greasy matter, at a sity of 12° Baumé, according to the kind of wool treated, the capacity of the washing-tub. Every 35·36 cb. ft. d about 172 lb. of wool potash, selling on the Continent bout 12*s.* 6*d.* per cwt. Some sorts of wool yield more onate of potash than others—for instance, Australian l yields about 160 grms., and fine qualities of Buenos es wool yield as high as 190 grms. of carbonate of sh, per kilogramme of combed wool.

MERCERISING AND MILLERAINISING TEXTILES IN GERMANY.

Foreign Office Annual Series, No. 2671.

he patent respecting the process of mercerising cotton, erly the property of the firm of Thomas and Prevost refeld, and afterwards of the Company Bemberg, has declared by the Patent Office null and void. The nt Office caused a thorough investigation into the er to be made by experts. An invention for the treat- t of fabrics, called "Millerainising," seems to be an oved system of hot-pressing.

VII.—ACIDS, ALKALIS, AND SALTS.

CHEMICALS IN AUSTRIA-HUNGARY.

Foreign Office Annual Series, No. 2688.

lphuric acid, sulphate of iron, alum, and the production ineral colours are confined to Bohemia. In 1899, there imported into Austria-Hungary :—

Articles.	Quantity.	Value.
	Tons.	£
uric acid	7,814	13,134
	6,038	3 482
ate of iron	475	814
al colours	1,980	4,631

e chief imports into Austria-Hungary in 1900 were : uric acid, 10,584 tons, of which nearly all came from any ; and sulphate of copper, 3,516 tons, of which nited Kingdom supplied 1,350 tons ; Germany, 374 and Italy, 316 tons.

SALTPETRE AT OPORTO.

Foreign Office Misc. Series, No. 2695.

rman saltpetre, though not considered here so good as coming from the United Kingdom, has a large con- tion owing to its cheapness. German prices tend to a factor which will operate favourably upon the rtation of the British article.

POTASH FROM SHEEP'S WOOL.

See under V., *page* 952.

ACID PLANT AT ATLANTA, GA.

See under XV., *page* 957.

PHOSPHATE IN PALESTINE.

See under I., *page* 951.

I.—GLASS, POTTERY, AND ENAMELS.

CHINA CLAY IN BRITISH GUIANA.

Eng. and Mining J., Aug. 17, 1901.

increasing use of kaolin in the manufacture of bricks, ttes, molds, tiles for roofing, pottery, pavement, t and concrete, is drawing attention to the deposits of w material. Investigations in British Guiana show that a superior grade of kaolin is produced on the Corentyne River, surface outcroppings up the Berbice and Demerara Rivers indicate good clay lands. Recently a New York company took a 45 years' lease of some Corentyne deposits, agreeing to take 100,000 tons annually, shipments to be made to New York. Just now the crude methods of working make it almost impossible to produce more than 20,000 tons a year, but a modern plant will probably be erected and the output materially increased. Vessels of 14 ft. draft can navigate the Corentyne River, and the freight rate to New York on clay shipped in ballast is estimated at about 2·40 dols. per ton.

GLASS INDUSTRY OF BOHEMIA.

Foreign Office Annual Series, No. 2688.

In Gablonz the manufacture of imitation jewellery, buttons, beads, ornaments, decorated glass, &c., is largely carried on, and some 30,000 persons are employed in this branch alone ; the value is about 40,000,000 kr. (1,666,666*l.*). About 180 export firms are engaged in this trade. Decorated and coloured glass is manufactured at Haida and Steinschönau, where from 6,000 to 7,000 people are employed. In the neighbourhood of Pilsen, window glass is manufactured. In the Eyer district, near Elbogen, the firm of Siemens has established the manufacture of wire glass.

The export in 1899 was 55,649 tons, worth 2,082,515*l.* ; in 1900, 57,076 tons, worth 2,150,811*l.* 13,514 tons were sent to Germany ; 11,348 tons to the United Kingdom ; 2,916 tons to Italy ; 2,846 tons to France ; 1,977 tons to Switzerland.

The porcelain industry is carried on in the neighbourhood of Carlsbad, where the bulk of the factories in Austria are found. The export was, in 1899, 9,648 tons, worth 462,218*l.* ; in 1900, 9,512 tons, worth 513,587*l.* The increase in value, in 1900, was due to a larger export in the more expensive decorated styles. The largest importers are Germany, the United Kingdom, Italy, and Switzerland.

GLASS IMPORTS OF NAGASAKI (JAPAN).

Foreign Office Annual Series, No. 2692.

There is an increase of 600*l.* in glass manufactures. Belgium supplies the whole of this article of import.

GLASS MANUFACTURE IN JAPAN.

Imp. Inst. J., Sept. 1901.

The manufacture of glass in Japan is still in its infancy and the greater part is imported. Japan makes electric lamps and other simple goods, but has to import window glass and other important articles from abroad. This unsatisfactory state of the Japanese glass trade is due to two causes, *viz.*, the want of capital, which prevents the installation of first-class machinery, and the scarcity of skilled workmen. All attempts to produce plate glass have failed. The import of broken glass from Europe and America has ceased, as the Japanese can now make glass entirely from raw material in their own country.

IX.—CEMENTS, Etc.

PORTLAND CEMENT IN AMERICA AND THE WEST INDIES.

U.S. Cons. Reps., Vol. LXVI., No. 251, *Aug.* 1901.

CANADA.

About half the imported cement comes from Great Britain ; Belgium, Germany, and the United States follow in the order named. It is suggested that other countries take unfair advantage of the preferential tariff in favour of Great Britain, by exporting cement to England for re-export to Canada as British cement.

BRITISH COLUMBIA.

Imports are chiefly of British origin, since cement forms the return freight of the salmon fleet, and much is re-exported to neighbouring American cities on the Pacific coast. The demand is increasing owing to large building operations.

New Brunswick.

Annual imports amount to 10,000 bbls. (of 350 lb. each), of which the greater part comes from Belgium and England.

Cement imported in barrels finds the readiest scale.

Ontario.

Canada supplies the demand, and four new factories are in course of erection. Over production is probable.

Mexico.

England sends nearly one half of total imports, the remainder coming from Germany, the United States, and Belgium. There is a large demand. (See "Trade of Mexico," page 951.)

British Honduras.

Very little cement is used here. Tariff—12½ per cent.

Costa Rica.

The United States send one half of total import, followed by Germany and Spain.

Much of the American cement is of English or German origin.

The market is small, and cement, which should be quick-setting, should be imported in iron barrels.

Customs dues:—1 cent. (United States gold) per kilo.

Guatemala.

During 1900, about 4,000 100-lb. bbls. were imported, nearly all from Germany.

Salvador.

The principal ports of exportation are San Francisco, where cement is of Belgian origin, and Hamburg, where it is of German or Belgian origin. Annual import is 1,500 tons.

Customs dues:—Nil. Cement should be packed in iron cases.

Antigua.

The market here is limited.

Bahamas.

Imports:—460 bbls. per annum, chiefly German.

Duty.—20 per cent. *ad valorem.*

Dutch West Indies.

A small quantity only is imported and all is German. Duty, 3 per cent.

Haïti.

Imports:—About 2,000 bbls., chiefly from Germany, England, and France.

Duties:—25 cents per bbl., with 50 per cent., 33⅓ per cent. and 25 per cent. surtax.

Barrels should be strong enough to bear rough handling.

Terms:—6 months' credit.

Martinique.

Cement, known as "artificial cement," or "the half-slow process," is imported chiefly from France.

Duty.—19·5 cents per bbl. of 180 kilos.

Argentine Republic.

Germany, France, and England control the market by giving credit.

Chile.

Terms.—Wholesale, for 50 bbls. and upwards, 8 per cent. discount for cash on delivery, 6 per cent., payable in 30 days, and net at six months. A barrel weighs (gross) 400 lb.

Germany tends to control the market.

Customs Valuation.—$4 (Chilean) per 100 kilos., gross weight, with an *ad valorem* duty of 15 per cent., payable in Chilean gold.

Ecuador.

Demand very slight. Germany and Belgium are th principal exporters.

Weight (gross) of a barrel is 180 kilos. (397 lb.).

Duties.—1 per cent. per kilo., plus 100 per cent. per bb

British Guiana.

Annual import is 13,660 bbls., all from England. Dut 25 cents per bbl.

Dutch Guiana.

Annual imports amount to 2,500 bbls. Customs duties n

French Guiana.

Annual imports are about 2,500 bbls., and come most from France, but English cement is preferred.

Paraguay.

Annual importation is 3,000 bbls., each weighing 1 kilos., coming chiefly from Belgium. There is a sm demand.

Duty.—30 cents gold per barrel.

Uruguay.

The importation of 4,500,000 kilos. comes chiefly fr England, Belgium, France, and Germany; and Engli brands are preferred.

Duty.—50 cents per bbl.

Bauxite in New South Wales.

Eng. and Mining J., Aug. 17, 1901.

The occurrence of bauxite in New South Wales was known until 1899, when the geological surveyor recogn it at Wingello, in the county of Camden, where it occup considerable areas. Extensive deposits were also discove in the Inverell and Emmaville districts. The location the bauxite deposits are as follows: (1) Wingello, 105 m from Sydney, on the railway, near Uringelly Creek; Inverell, 468 miles north of Sydney (nearest railroad miles); (3) Emmaville, 463 miles north of Sydney (nea railroad 18 miles).

X.—*METALLURGY.*

Aluminium Soldering Flux.

Engineer, 1901.

Aluminium soldering flux consists of about 90 per cen lard oil, with 10 per cent. paraffin wax. Almost any oil solder aluminium, but animal oils are best. All th necessary in using lard oil for soldering aluminium i take the greatest care as regards cleanliness. Grit, or slightest trace of dirt on the tinning of the copper bit quite fatal, and the process is rather slow. A strip of aluminium, 6 ins. long and ½ in. wide, takes about minute to tin, but after tinning it may be soldere another similarly tinned strip as readily as tinplate. Mixt of stearic and oleic acids have been patented for this pose. Hydrocarbon oils will answer, but not so we animal oils. (See also this Journal, 1901, 47.)

Molybdenite in Ontario.

Eng. and Mining J. (Canadian Supplement),
Aug. 24, 1901.

Molybdenite, or sulphide of molybdenum, having composition MoS_2, and containing about 56 per cen molybdenum when pure, is at present of comm value. It is found in numerous localities in Eastern On associated with sulphides, such as pyrites and pyrrhotite also occurs as small segregations in syenite. It is gray in colour, soft and greasy, marking on paper; generally found in flakes or scale. It resembles gra but is heavier, lighter in colour, and gives a sulphur re with silver coin after fusing with sodium carbonate.

ANTIMONY MINING IN BOHEMIA.

Foreign Office Annual Series, No. 2688.

British company has recently commenced mining opera- in Bohemia for antimony. The antimony ore mined ohemia in 1899 was 399 tons, worth 3,128*l*. The ant of antimony produced was 271 tons, worth 7,036*l*.

IRON DEPOSITS IN NORWAY.

Bd. of Trade J., Sept. 12, 1901.

ith regard to the reported purchase of the Dunderland leposits, in the north of Norway, by a British company, moderate sum, the contract has been completed with Norwegian Government. In two years' time, the com- expects to get to work with Edison's patent "Magnetic rators," which, in successive sets, are to extract from ery low-grade ore, when crushed, the iron particles. shipping facilities from the property are exceptional, hese fields will afford a valuable new supply of ore to British iron industries. In Sweden the ironmasters omewhat sceptical as to the actual working results of new enterprise, and do not view the new company's sive undertaking with any apprehension, at present. new process, if entirely successful, will effect a derable revolution in the iron industry.

COPPER MINING IN MEXICO.

Foreign Office Annual Series, No. 2693.

pper mining in Mexico is increasing. In 1899 the er of mining properties in existence was 258, while on nber 31, 1900, 352 were returned as paying the nment tax on mining properties.

greatest increase was in the State of Sonora and in California, the number in the former having increased 32 to 69, and in the latter from 15 to 42; most of belong to the Boleo Company, the principal centre rations of which is near Santa Rosalia, on the Gulf of California, whence the ores are shipped to Guaymas, e mainland, for transmission overland, through the n house of Nogales, to the United States.

quantity of copper exported in 1900 was 27,483 tons, at 949,523*l*., as against 25,103 tons, valued at 6*l*., in 1899.

export of copper ore was 402 tons, as against 209 n 1899; the remainder was exported in the form of regulus, or copper matte, but does not include the t of argentiferous copper, as that is classified as a us metal.

rly all this ore, or refined metal, found its way to the l States, which acts as a great distributing centre. ly other country that supplies the United States with , either in ore, bullion, or matte, is British Columbia, the output from the Mexican mines or smelters es, exports will increase, and that Colony will have up the first place to Mexico.

XII.—OILS, Etc.

COANUT OIL AND VEGETABLE TALLOW IN THE STRAITS SETTLEMENTS.

Chem. Trade J., Sept. 7, 1901.

anut Oil. — There was imported, during 1900, 733 lb., the import value of which was 1,011,679 Mexican (76,320*l*.). About 97 per cent. of the oil rom Ceylon. During 1900, cocoanut oil was exported amount of 14,740,533 lb., the export value of which 500,910 dols. Mexican (140,885*l*.). There went to 30 per cent.; to Sumatra, 15 per cent.; to Penang, ent.; to Selangor, 6 per cent.; to Dutch Borneo, ent.; to Perak, 4 per cent.; and to Java, 4 per cent.

table Tallow. — Imports during the year 1900 ed to 52,533 lb., valued at 7,034 dols. Mexican , while exports amounted to 91,900 lb., valued at dols. Mexican (3,611*l*.). About 60 per cent. of nports came from Japan, and the remainder from ; all was exported to Great Britain.

MAFOUREIRA NUTS IN EAST AFRICA.

Foreign Office Annual Series, No. 2630.

There is a large trade in "mafoureira," a nut containing a large percentage of fat. Lubricants, soap, and candles can be made from "mafoureira." The supply is practically unlimited; the tree bearing the nut grows wild all over the country, and the nut itself can be bought for about a ½*d*. per kilo. It sells in Marseilles, where it is much used, for 8*l*. per ton. Freight on this produce to Marseilles comes to 50*s*. per ton, a rate which, owing to want of competition, is excessive.

CANDLES AND GREASE IN EGYPT.

Chamber of Com. J., Sept. 1901.

The import of candles from the United Kingdom has rapidly declined until it has almost ceased to exist, £E354 worth having been imported in 1899, as against £E5,919 in 1895. Belgium and France have driven the British trade in this article quite out of the field. The import of grease increased from £E9,227, in 1895, to £E21,732, in 1899, the United Kingdom possessing the practical monopoly of this branch of trade.

LUBRICATING OIL IN NAGASAKI.

Foreign Office Annual Series, No. 2692.

An item of 6,544*l*. appears in the list of imports for lubricating oil. The United States have practically a monopoly of this trade.

OIL TRADE OF GOTHENBURG (SWEDEN).

See under XV., *page* 957.

XIII. A.—PIGMENTS, PAINTS, Etc.

ACETYLENE BLACK IN GERMANY.

Comm. Intelligence, Oct. 7, 1901.

The soot produced by the combustion of acetylene is superior in fineness and purity to any other form of carbon, particularly for pigments or ink. It would be well adapted for the preparation of black writing ink or printing ink. The soot contains 99·8 of pure carbon. Its colour is a pronounced black with a very faint touch of blue. (See also this Journal, 1899, 284.)

PAINT IMPORTS OF NAGASAKI.

Foreign Office Annual Series, No. 2692.

The import of dyes and paints, in 1900, was nearly double that of 1899. The principal items were paints in oil, value 3,580*l*., and paint for ships' bottoms, value 6,515*l*., both from the United Kingdom.

XIII. C.—INDIA-RUBBER, Etc.

ARTIFICIAL GUTTA-PERCHA.

Bd. of Trade J., Aug. 29, 1901.

The Imperial German Postal Authorities have agreed to give a trial to the "artificial gutta-percha," invented by A. Gentzsch (this Journal, 1899, 927). A further process by the same inventor for raising the fusion point of resins, waxes, and such like substances, which is employed in the manufacture of the above, was described in this Journal, 1899, 502. Mr. Gentzsch desires to sell his patent in the United Kingdom, and has forwarded to the Foreign Office, through the Commercial Attaché to His Majesty's Embassy at Vienna, specimens of his "artificial gutta-percha" in blocks and in the form of cable, which may be seen by those interested, on application to the Commercial Intelligence Branch of the Board of Trade, 50, Parliament Street, S.W.

RUBBER COLLECTION IN EAST AFRICA.

Bd. of Trade J., Aug. 22, 1901.

H.M. Commissioner for the East Africa Protectorate states that, though information as to the india-rubber forests is limited, a quantity of the article is even now exported.

It is collected by natives, who cut the plants so that they often die after a single tapping. To prevent this destruction, responsible British firms should undertake the collection of the rubber, which they would find a paying business. At present the india-rubber industry is in a backward condition.

XIV.—TANNING, LEATHER, GLUE, SIZE, Etc.

Disinfection of Imported Hides in U.S.A.

Bd. of Trade J., Aug. 29, 1901.

A Circular, issued by the Treasury Department at Washington to United States Customs officials, contains the following instructions, regarding the disinfection of the hides of neat cattle shipped to United States ports:—

"It having been stated that hides of neat cattle are shipped to the United States without proper disinfection, officers of the Customs are hereby directed, with a view to prevent the introduction and spread of contagious or infectious diseases among the cattle of the United States, to treat the same as prohibited importations, and to refuse entry for warehousing or consumption of all hides of neat cattle, including calf skins, hide-cuttings or parings, and glue stock, the product of neat cattle, shipped from, or the product of, the countries of Europe, Asia, Africa, Australia, and South America, except hides, parings, cuttings, and such glue stock which have been dry salted or arsenic-cured, or lime dried after a soaking for 40 days in a strong solution of lime, and except abattoir hides the product of Sweden, Norway, and Great Britain, in all cases where the invoices are not accompanied by proper certificates of disinfection. As Consular officers have been instructed by the Secretary of State to refuse authentication of invoices of hides not properly disinfected, the disinfection in this country, or storage of such hides in 'general order warehouse' will not be permitted, as the passage of diseased hides through the country or storage with other goods, would tend to the dissemination of cattle disease in the United States."

Hides and Leather Imports of Egypt.

Chamber of Com. J., Sept. 1901.

British trade in hides increased steadily and considerably up to 1898, but declined again, in 1899, to the extent of £E12,000, partly due to a reduction in the import of hides, which fell from £E20,756 in 1898 to £E8,794 in 1899.

Tanning Materials at Fiume (Austria) in 1900.

Foreign Office Annual Series, No. 2694.

Imports comprised:—

	Tons.
Valonia	6,000
Sumac	300
Other extract	500
Resin	6,000
Asphaltum	2,200

and 16,000 tons of extract of oak were exported.

Hide and Skin Industry of Mexico.

Foreign Office Annual Series, No. 2693.

The preparation of hides and skins has increased very much of late years, chiefly in the Northern States of the Republic, where tanneries fitted with modern appliances have been erected for the preparation of hides and skins, for home consumption or for export. Formerly only ox hides, sheep skins, and goat skins were salted, and were sent abroad for finishing, but now they are properly prepared, and sometimes tanned, and the preparation is being extended to other skins, especially those of the "lagarto," a species of lizard. Skins of the javali, or wild boar, the native fox, native lion or puma, and mountain cat are also exported.

The preparation of goat skins is carried on in the States of Puebla and Oaxaca.

The quantity of hides and skins of the three princ varieties exported during the past five years will be see the following table:—

—	Quantity.				
	1896.	1897.	1898.	1899.	19
	Lb.	Lb.	Lb.	Lb.	I
Goat skins ...	2,920,434	4,124,141	4,192,329	4,525,693	4,17
Ox hides	7,313,154	10,822,963	9,620,235	7,982,962	8,01
Deer skins ...	507,626	421,956	408,958	442,683	61

The export of the lagarto skins in 1900 amounte 601,421 lb., valued at 9,359*l*.

XV.—MANURES.

Fertilisers in South Australia.

Bd. of Trade J., Aug. 29, 1901.

The official *Journal of Agriculture and Indust South Australia*, for July, publishes information, which it appears that the use of fertilisers is practica its infancy, as, prior to 1897, only a few hundred tons annually used by the farmers. Since then, their us rapidly increased. In 1899, about 12,500 tons of im and 4,000 tons of locally manufactured fertilisers, or of 16,500 tons, were used for manuring the South Aust wheat crop. In 1900, the figures were:—Imported, tons; local, 3,400 tons; total, 24,600 tons. This (1901) the amounts are estimated as follows:—Im manures, 26,400 tons; local, 5,000 tons; total, 31,40

The following figures may be taken as a fairly ac statement of the quantities of fertilisers used for the wheat crop:—

——	Tons.	Val
		£
Imported fertilisers	26,400	108,
Local fertilisers	5,000	22,
Total	31,400	130,

This total of 31,400 tons is made up approxima follows:—

	Tons.
Mineral super-phosphate	25,500
Bone and guano supers	2,700
Thomas phosphate	1,600
Bone-dust and other fertilisers	1,600

Of imported fertilisers, Great Britain supplies 21,500 tons; Germany, 2,500 tons; New South 1,300 tons; and Victoria, 500 tons. Except in bo bone manures, the South Australian does not apply n to his crops, the soil and climatic conditions being res for this reversing of European practice. Phosphatic n only have given a profit, and the great demand is for phosphate.

At the close of 1900, the South Australian Par passed a new Fertilisers Act to regulate dealings mercial fertilisers, and this has had a very sati result in many ways. Fifty-seven brands of fertilis registered in accordance with the Act, and seve grades of bone-dust were withdrawn from the marke

Phosphates in Cape York Peninsula, Sou Australia (Northern Territory).

Bd. of Trade J., Sept. 5, 1901.

Considerable interest is being taken in the recent di of extensive and valuable deposits of phosphates north-eastern portion of Cape York Peninsula. Fo strata, varying in width from 2 ft. to 3 ft. 6 ins., ha traced to a considerable depth, in one instance 40 ft., the phosphates improving as the depth in Between these strata there are layers of powd appear to be pure phosphates. The largest depo rd to be lying in projections between two rises, and these cations have been traced for over a mile and a quarter ng the coast, wherever similar formations occur. The osit is within four miles of Port Clinton, and is only ut 30 miles distant from the present phosphate works at llaroo.

he following report has been received from the School lines' analyst on specimens of phosphatic rock from the e tiad:—"The sample was found to consist of rock sphate, and contained phosphoric acid, 31·56 per cent., valent to 75·44 per cent. tricalcic phosphate."

:w FERTILISER AND ACID PLANT AT ATLANTA, GA.

Chem. and Druggist, Aug. 21, 1901.

essrs. Armour and Co., of Chicago and London, are ting a large plant for the production of chemical isers, at Atlanta, Ga., at a cost of about 500,000 dols. buildings will comprise a sulphuric acid plant capable roducing 60 tons of acid per day, and a plant for pulating the materials used in the manufacture of nercial fertilisers. (See also this Journal, May 1901,)

ANO AND OIL TRADE OF GOTHENBURG (SWEDEN).

Foreign Office Annual Series, No. 2690.

the 24 guano and oil mills on this coast, only five were ork, for a short period, owing to the high price and ity of fish, the total production consisting of about) tons of guano and 150 barrels of oil.

e supply of rape-seed oil was very small and prices high.

e price of train oil has been higher, and the supply very quate, in fact the article has scarcely been obtainable nes.

XVI.—SUGAR, STARCH, Etc.

SUGAR IMPORT DUTIES IN GREAT BRITAIN.

See under Tariff Changes, *p.* 948.

UGAR PRODUCTION IN GERMANY DURING 1900–1 CAMPAIGN.

Bd. of Trade J., Aug. 22, 1901.

Reichs-Anzeiger of the 13th August publishes statistics production of sugar in Germany during the month of last, and during the 1900–1 sugar campaign. During last, 10,018 metric tons of raw sugar and 91,096 c tons of refined sugar were produced in German ries and refineries. In July, 1900, the production of ugar was 3,847 metric tons, and that of refined, 89,170 During the 1900–1 sugar campaign 1,739,303 metric of raw and 1,289,999 metric tons of refined sugar were iced, or a total of crystallised sugar in terms of raw to 1,974,786 metric tons, as compared with 1,573,008 of raw and 1,215,204 tons of refined, during the 1899— campaign, or 1,791,252 metric tons of crystallised , in terms of raw.

SUGAR INDUSTRY OF BOHEMIA.

Foreign Office Annual Series, No. 2688.

e effect of the sugar duty levied by the United Kingis closely watched by the industry here, and the emian Sugar Industrial Society" expresses the n that the tax will be an undoubted benefit to British rs, and that the duty on raw sugar may favour the ation of the sugar beet in the United Kingdom and a sugar industry in the British Isles, thus dealing a blow to the export trade of Bohemia.

st of the large refineries are fitted with machinery for llising sugar expressly for the British market.

e existing agreement between the refiners and raw producers comes to an end next year, and the latter he refiners to guarantee a minimum price of 32 kr. s. 8*d*.), in lieu of the present 30 kr. (1*l*. 5*s*.) per 100 on its being renewed. The term of the trust was for ears.

The raw sugar produced, in 1899—1900, in Bohemia was 551,338 tons; refined, 426,416 tons, the production being 50·3 per cent. of the total in Austria-Hungary.

The export was 76,746 tons of raw and 292,028 tons of refined sugar, or 56·7 per cent. of the total exported from the Dual Monarchy.

SUGAR TRADE OF NAGASAKI IN 1900.

Foreign Office Annual Series, No. 2692.

The import of sugar, during 1900, shows an increase of 62,706 cwts. in quantity, and 40,523*l*. in value, as compared with 1899. This increase does not denote greater demand; the quantity imported in 1899 was exceptionally small, owing to the large stocks carried over from 1898.

The absence of refineries in Kiushiu has necessitated the importation of a higher grade of sugar into Nagasaki than into Kobe or Yokohama. The lowest grade recognised by the Customs—below No. 14 Dutch standard in colour—includes not only raw but also partially refined and refined sugar of low quality. The sugar imported is composed of low refined grades from Hong Kong, though appearing in the category which includes raws. The bulk of the sugar imported consists of granulated white grades of the highest quality, the demand steadily increasing in this direction.

The greater part of the trade with Nagasaki is in the hands of the Hong Kong refineries, which supply a sugar refined from the best qualities of Java and Philippines cane. Beet sugar from Germany and Austria-Hungary is also imported, but its failure to stand the long voyage and its unsatisfactory condition after a few weeks' storage has militated against its success in the local market. Small quantities of Formosan and South China raws are occasionally brought in, but the demand for low grades is declining, and where still existing is amply supplied from the Goto and other islands in the south of Kiushiu.

XIX.—PAPER, PASTEBOARD, Etc.

PAPER INDUSTRY OF BOHEMIA.

Foreign Office Annual Series, No. 2688.

The paper industry of Austria is chiefly carried on in Bohemia.

In the Riesengebirge, in the valley of the Upper Elbe, and in the Aupa districts, there are no fewer than 17 paper mills and 18 cellulose factories, and there are also minor establishments at Gablonz, Reichenberg, and Friedland.

In the southern districts there are a large number of wood-pulp and cellulose factories and paper mills. Cigarette, parchment, and writing papers, playing cards, &c. are manufactured. Papier-maché articles come from Reichenau, near Gablonz.

In Böhmisch Kannitz a paper mill was recently built, and steam is used here, for the first time in Austria, in the production of paper. The engine is of 1,200 horse-power, and also works the electrical plant.

There are 42 paper mills in the Empire, 29 being in Bohemia. In 1899, the export was 102,419 tons, worth 1,650,218*l*., and in 1900, 126,486 tons, worth 1,955,947*l*. 25,068 tons were exported to Germany, 20,511 tons to Italy, and 8,071 tons to the United Kingdom.

PAPER IN ROUMANIA.

Chamber of Com. J., Sept. 1901.

In Roumania there exist four paper factories, *viz.*, a paper factory at Letea; a cardboard factory at Busteni; a paper factory at Campulung; and a paper and cardboard factory at Saceni. In addition, there are a wood-pulp factory at Cheia, and two cardboard factories, one at Cosmeneschti, the other at Grozeschti. The capital engaged in these factories amounts to 7,468,000 lei, of which 3,637,000 lei are appropriated for the land, buildings, and canals, and 3,831,000 lei for machinery and installation of the works. The working capital amounts, approximately, to 2,350,000 lei.* The productions of the paper and cardboard factories amounted, in the year 1899, to 6,697,000 kilos., in 1900 to 7,050,000 kilos., the value of these productions being 3,910,000 lei in 1899, and 4,160,000 lei in 1900. The entire quantity was used in the country itself. In 1899 there were sold 5,956,000 kilos., of the value of 3,541,000 lei. By the law of Feb. 13th, 1898, the public authorities are bound to procure the paper they require from the four factories in the country. Thus, in the year 1899, the authorities used 1,454,000 kilos., of the value of 1,220,500 lei. The total consumption of paper and cardboard, in the year 1899, reached 7,833,000 kilos., 2,456,000 kilos. of which remained in the country, whilst 1,877,000 were exported.

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* A lei is nearly equivalent to 1 franc.

WOOD-PULP IN GOTHENBURG (SWEDEN).

Foreign Office Annual Series, No. 2690.

Chemical wood-pulp, both sulphite and sulphate, occupied a firm position throughout the year, the greater part of the output being disposed of during the early part of the season, and this industry has been attended with a good result.

The prospects of 1901 are also very satisfactory, notwithstanding the increase in production and the new mills. Contrary to there being an over-production, the demand appears to be increasing steadily.

Quotations for good brands of sulphite and sulphate have been about 8*l.* 6*s.* 8*d.* to 8*l.* 17*s.* 3*d.* per ton, f.o.b. at Swedish port of shipment.

Mechanical wood-pulp, which was affected by the severe drought during the autumn of 1899, met with a favourable market, and the manufacturers of this article have had a good season.

Prices were, for dry pulp, 5*l.* to 6*l.* 13*s.* 4*d.*, and for moist pulp, 2*l.* 10*s.* to 3*l.* 6*s.* 8*d.* per ton, f.o.b. at Swedish port of shipment, depending on quality and time of delivery.

XX.—FINE CHEMICALS, Etc.

QUININE IN COREA.

Foreign Office Annual Series, No. 2687.

Quinine continues to be an important item in the import trade. Last year, the quantity imported was 120 cases of 100 1-oz. bottles each, valued at about 8,000*l.* The business is in the hands of a German firm.

PERUVIAN BARK FROM A COMMERCIAL STANDPOINT.

J. H. Stallman, N.Y. J. of Pharmacology, July 1901.

Mr. Stallman calls attention to the increase in the consumption of cinchona of late years. The annual production of bark in all countries twenty years ago, he says, was about 6,000,000 lb.; in 1890, the production had increased to over 18,000,000 lb. In 1900, the production was not over 14,000,000 lb., but of a high test, while the accumulated stocks in Europe had become reduced.

It appears that consumption has at last overtaken production, and increased shipments from Java will be required to supply manufacturers, and make up for the expected deficiency from British East India and Ceylon. In any case, the days of quinine selling below 1*s.* per oz. are numbered, and the average value of the unit during the next three years will be above the average of 1896–98. The present state of the cinchona and quinine markets do not now seem to favour this view, especially if the increased shipments from Java (which already show an excess of 1,710,000 Amsterdam lb. over 1901) continue.

XXII.—EXPLOSIVES, Etc.

MATCH TRADE OF INDIA.

Comm. Intelligence, Sept. 7, 1901.

No matches are manufactured in India; all are imported. Japan has, for the past six years or more, headed the list, with the Straits Settlements a close second, and Belgium and Sweden follow in the order named. The value of the match trade in India, last year, was nearly 40 lakhs of rupees (say 265,000*l.*), of which these four countries supplied about four-fifths. The remainder was furnished by ourselves, Germany, Norway, and other countries.

In the following table are given the imports by countr during the last three years, and the total furnished by countries each year:—

Matches Imported into India.

Country.	1899–1900.	1900–1901.
	Rupees.	Rupees.
Belgium	481,744	696,712
Sweden	346,444	433,865
Japan	830,376	1,021,097
Straits Settlements	806,247	996,879
Other countries	1,011,127	835,020
Total	3,475,938	3,983,573

The great bulk of these matches are of the "safet variety. Twelve boxes, wrapped in a blue paper-cove package, retail in the bazaars of Bombay at 1 anna 6 p (about 1½*d.*) per package.

BOARD OF TRADE RETURNS.

SUMMARY OF IMPORTS.

Articles.	Month ending 31st Aug	
	1909.	1901.
	£	£
Metals	2,753,097	2,787,
Chemicals and dyestuffs	399,956	441,1
Oils	1,000,893	884,2
Raw materials for non-textile industries.	7,288,367	6,078,
Total value of all imports	11,442,313	10,193,

SUMMARY OF EXPORTS.

Articles.	Month ending 31st Aug	
	1900.	1901.
	£	£
Metals (other than machinery)	4,112,122	3,692,
Chemicals and medicines	711,962	665,
Miscellaneous articles	3,063,918	2,934,
Total value of all exports	7,888,002	7,293

IMPORTS OF RAW MATERIAL FOR NON-TEXTILE INDUSTRIES FOR MONTH ENDING 31ST AUGUST.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	19
				£	
Bark, Peruvian	Cwt.	1,658	4,009	3,791	1
Caoutchouc	„	37,531	35,673	410,817	41
Gum:—					
Arabic	„	8,901	7,668	24,167	1
Lac, &c.	„	8,557	8,823	27,071	2
Gutta-percha	„	13,115	8,632	154,358	12
Hides, raw:—					
Dry	„	73,498	27,985	180,317	
Wet	„	45,934	59,852	106,828	6
Ivory	„	614	566	27,585	2
Manure:—					
Guano	Tons	3,628	3,537	20,885	
Bones	„	7,202	3,314	31,077	
Paraffin	Cwt.	69,735	56,705	99,310	
Linen rags	Tons	1,167	1,121	12,504	
Esparto	„	17,961	14,943	68,572	
Pulp of wood	„	42,212	34,343	232,270	1
Rosin	Cwt.	164,005	183,524	42,258	
Tallow and stearin	„	262,955	125,852	339,951	1
Skins:—					
Goat	No.	1,048,434	1,974,505	101,658	1
Sheep	„	1,687,797	1,066,497	175,061	
Nitrate of soda	Tons	3,246	11,576	26,321	
Phosphate of lime	„	24,362	35,886	37,976	

PORTS OF METALS FOR MONTH ENDING 31ST AUGUST.

Articles	Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
C per :—			£	£
e ..... Tons	6,082	9,307	73,825	119,240
gulus ..... „	5,680	7,740	242,302	304,646
nwrought ..... „	6,303	6,239	400,441	435,038
I d, pig and sheet „	17,558	18,883	309,099	230,984
I tes ..... „	56,102	66,193	96,121	115,578
Q ksilver ..... Lb.	67,604	50,867	8,540	6,435
S er ore ..... Value £	..	..	55,403	115,521
T ..... Cwt.	57,369	71,059	398,841	415,604
Z ..... Tons	4,584	5,613	91,912	106,435

PORTS OF CHEMICALS AND DYESTUFFS FOR MONTH ENDING 31ST AUGUST.

Articles.	Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
			£	£
B ching materials Cwt.	30,399	16,770	16,537	5,812
compounds... „		29,713		8,969
B x, &c. ..... „	9,297	17,234	14,483	8,932
B stone ..... „	12,228	64,678	3,587	14,638
N te of potash.. „	3,965	14,603	12,593	12,952
C nicals, other Value £	..	..	131,357	140,117
C h and gambier. Tons	1,244	1,280	22,899	27,233
D :—				
zarin ..... Value £	..	..	12,322	19,140
iline and other „	..	..	37,691	45,631
I go ..... Cwt.	163	984	2,650	14,063
B ..... „	32 669	52,030	14,100	17,268
V nis ..... Tons	2,314	2,904	23,599	29,841

PORTS OF OILS FOR MONTH ENDING 31ST AUGUST.

Articles.	Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
			£	£
nut ..... Cwt.	38,968	36,981	46,729	45,465
..... Tuns	953	1,208	37,034	47,783
..... Cwt.	83,403	133,554	91,945	148,936
leum :—				
minating.. Gall.	21,386,930	15,273,146	420,774	268,374
ricating... „	2,675,129	2,722,503	87,394	86,885
..... Tons	3,660	1,800	94,742	46,507
, &c. ..... Tuns	4,429	4,202	72,923	81,225
entine ..... Cwt.	47,388	71,936	66,851	93,508

PORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 31ST AUGUST.

Articles.	Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
			£	£
nt ..... Tons	9,080	22,782	18,588	41,093
and earth-are. Cwt.	29,045	31,375	75,294	88,455
..... Value £	..	..	98,300	74,539
:—				
et ..... Cwt.	110,817	111,144	62,704	61,309
e ..... „	9,171	36,923	10,766	40,999
nt ..... „	41,354	51,842	73,861	88,164
tles ..... Gross	127,658	119,807	56,626	53,741
er ..... Cwt.	31,255	25,398	56,065	52,215
nd gelatin. „	15,275	17,754	33,659	37,263
er, unmanu-ured. „	108,920	98,482	700,741	627,671
ed cake .... Tons	28,235	23,726	186,879	162,373
and pig-ds. Value £	..	..	113,233	107,195
pasteboard Cwt.	574,476	486,397	390,640	342,552
ific instru-ts. Value £	..	..	45,040	59,948
and soap der. Cwt.	15,475	21,173	19,668	22,773
manufac-s. „	35,891	42,201	45,798	48,083

EXPORTS OF METALS (OTHER THAN MACHINERY) FOR MONTH ENDING 31ST AUGUST.

Articles.	Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
			£	£
Brass ..... Cwt.	9,887	8,214	54,108	42,456
Copper ..... „	60,331	77,110	233,925	291,002
Lead ..... Tons	3,982	2,668	75,057	38,522
Plated wares... Value £	..	..	38,373	44,957
Tin ..... Cwt.	7,994	10,035	57,582	61,217
Zinc ..... „	12,375	12,371	12,826	19,963

EXPORTS OF DRUGS AND CHEMICALS FOR MONTH ENDING 31ST AUGUST.

Articles.	Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
			£	£
Alkali ..... Cwt.	261,678	..	83,579	..
Bleaching materials „	84,739	62,418	24,485	20,887
Copper sulphate .. Tons	412	307	9,777	7,004
Chemical manures „	48,212	63,950	222,344	234,832
Medicines ..... Value £	..	..	109,421	91,699
Soda compounds :—				
Ash ..... Cwt.	..	97,392	..	21,339
Caustic ..... „	..	80,824	..	41,004
Bicarbonate .... „	..	22,189	..	7,672
Crystals ..... „	..	17,508	..	2,695
Sulphate ..... „	..	56,751	..	4,267
Other sorts ..... „	..	25,492	..	11,075

EXPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 31ST AUGUST.

Articles.	Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
			£	£
Gunpowder. ... Lb.	389,300	Cwt. 7,083	7,483	16,755
Candles ..... „	1,518,600	1,674,200	27,018	29,032
Caoutchouc ..... Value £	..	..	120,159	80,990
Cement ..... Tons	28,776	23,272	54,139	44,326
Products of coal. Value £	..	..	114,367	62,267
Earthenware ... „	..	..	184,171	153,342
Stoneware ..... „	..	..	18,222	17,943
Glass :—				
Plate ..... Sq. Ft.	172,739	Cwt. 4,043	11,665	7,086
Flint ..... Cwt.	11,289	8,171	23,573	20,035
Bottles ..... „	68,086	62,921	34,367	31,265
Other kinds ... „	16 397	20,477	17,423	23,806
Leather :—				
Unwrought .... „	11,773	10,047	126,227	98,277
Wrought ..... Value £	..	..	47,940	47,650
Seed oil ..... Tons	2,475	2,627	72,171	75,764
Floorcloth ..... Sq. Yds.	2,362,600	2,052,800	122,030	100,352
Painters' materials Val. £	..	..	177,933	155,535
Paper ..... Cwt.	91,069	72,783	140,413	117,960
Rags ..... Tons	4,075	5,823	24,232	34,284
Soap ..... Cwt.	61,917	66,200	71,148	70,746

Monthly Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

APPLICATIONS.

16,597. J. Critchlow. Improvements in apparatus for sifting potters' slips and other semi-liquids and dry materials. Aug. 19.

16,691. W. Fairweather.—From H. R. Wolff, Java. Improvements in centrifugal machines. Aug. 20.

16,734. A. Pulbrook and E. H. Pulbrook. Improvements in or connected with the separation from one another of substances having different specific gravities. Aug. 20.

16,943. L. J. Bizet. Improvements in the manufacture of receptacles for liquids or gas under pressure. Complete Specification. Aug. 23.

17,075. J. Ross and A. W. Mackenzie. Improvements in bungs or stoppers for casks and other storage receptacles for liquids generating or giving off gases or waste vapours. Aug. 26.

17,131. J. T. Pearson. Improvements in and relating to the cooling of condensing-water and other liquids. Aug. 27.

17,358. M. M. Waite and E. K. Storey. A new or improved apparatus for mixing and stirring. Complete Specification. Aug. 29.

17,364. O. M. Hillig and W. Müller. Improvements in vacuum drying apparatus for continuous working. Complete Specification. Aug. 29.

17,432. R. Simon. Improvements in evaporating apparatus. Aug. 30.

17,478. J. W. Macfarlane and A. R. Robertson of the firm of Watson, Laidlaw, and Co. Improvements in centrifugal machines. Aug. 31.

17,555. O. Francke. An improved non-conducting material for coating steam pipes or the like. Complete Specification. Sept. 2.

17,581. J. Lowe. Improvements in and relating to separating apparatus. Sept. 3.

17,624. F. C. Crean. Improvements in apparatus for disintegrating and drying pulp. Complete Specification. Sept. 3.

17,670. W. Wyatt. Controlling the flow of liquids into vessels or chambers, or from one vessel or chamber into another. Sept. 4.

17,671. J. J. Royle and Royles, Ltd. Improvements in or applicable to sterilising apparatus. Sept. 4.

17,726. M. M. Brophy. Apparatus for regulating the flow of, and separating mechanical impurities from, water, steam, and other fluids. Complete Specification. Sept. 4.

17,884. V. Schwaninger. Improvements in apparatus for raising fluids. Complete Specification. Sept. 6.

17,977. W. P. Thompson. Improvements in and apparatus for evaporating brine or other liquids, and in separating the resulting vapour and solid matter. Sept. 9.

18,085. H. S. Marsh. Improvements in and relating to refrigerating apparatus. Sept. 10.

18,174. F. Olai and C. Brown. Improvements in and relating to carburetters. Sept. 11.

18,183. E. Shaw. Improvements in the method of and apparatus for evaporating water from solutions. Sept. 11.

18,233. J. R. Greenhalgh. Improvements in distilling apparatus. Sept. 12.

18,335. P. Naef. Improvements in and relating to the treatment of liquids, for the precipitation of solids, for evaporating or for distilling them. Filed Sept. 13. Date applied for Feb. 13, 1901, being date of application in the United States.

18,373. J. Wilson and the Wilson Filter Syndicate, Ltd. Improvements in filter presses. Sept. 14.

Complete Specifications Accepted.

1900.

9508. R. Thomson. Improvements in kilns. Aug. 28.

9575. J. O. O'Brien.—From A. G. Enock and D. Enock, Natal. Pumps or apparatus for the compression of gas or air, applicable to compressors for refrigerators, mining, and other purposes. Aug. 28.

15,969. J. Westaway. Apparatus for compressing peat pulp, powder, or other material into blocks or other forms Sept. 11.

18,645. A. Parker. Electric furnaces. Sept. 11.

1901.

14,389. F. Strickeisen. Evaporating apparatu Sept. 18.

14,403. P. M. Knopp. Apparatus for filtering or purifying liquids. Aug. 21.

14,989. C. Friesleben. Centrifugal separators. Aug. 2

II.—FUEL, GAS, and LIGHT.

Applications.

16,661. S. Hersey. Improvements in apparatus f washing or scrubbing gas. Aug. 19.

16,662. S. Hersey. Improvements in apparatus f washing or scrubbing gas. Aug. 19.

16,699. G. Westinghouse.—From W. J. Knox, Unit States. Improvements in or relating to a process a apparatus for the manufacture of gas. Aug. 20.

16,700. G. Westinghouse.—From W. J. Knox, Unit States. Improvements relating to the supply of heat receptacles, such as coking ovens, annealing ovens, and t like. Aug. 20.

16,702. G. G. Smith. Improvements in acetylene g generators. Aug. 20.

16,737. J. G. L. Bormann. Improvements relating the combustion of fuel in furnaces. Aug. 20.

16,777. A. J. Gabriel, M. Lindahl, and E. G. Svenss Improvements in acetylene gas generators. Aug. 21.

16,895. C. Cory. Improvements in artificial fuels a their manufacture. Aug. 22.

16,969. H. J. Haddan.—From J. B. de Lery, Unit States. Improvements in mantles for incandescent lighti Aug. 22.

17,171. E. B. Cornell and W. C. Alderson. Process a apparatus for making a fixed gas for lighting, heating, any other purpose. Complete Specification. Aug. 27.

17,219. P. R. de Faucheux D'Humy. An improv apparatus for the manufacture of fuel. Aug. 28.

17,292. T. H. Oswald and F. E. Bowman. Impro ments in gas-producing plant. Aug. 29.

17,329. A. A. Masters. A combustible fluid for lighti and heating purposes. Aug. 29.

17,455. W. Doman and S. W. Bullas. Improvement acetylene apparatus. Aug. 31.

17,494. F. W. C. Schniewind. Improvements relating the manufacture of gas. Complete Specification. Aug.

17,507. C. Scott-Snell. An improved pressure sys for incandescent gas lighting. Aug. 31.

17,510. F. W. C. Schniewind. Improvements apparatus for the manufacture of gas. Complete Specifi tion. Aug. 31.

17,517. F. J. C. Jones. Improved method of mak combustible gas. Sept. 2.

17,524. W. H. Davis. Improvements relating to candescent gas burners. Sept. 2.

17,566. G. Belin. Apparatus for generating acetyl Complete Specification. Sept. 2.

17,637. H. Wolf. Improved process and apparatus incinerating, shaping, and hardening incandescence man Sept. 3.

17,852. S. F. Pierce. *See* Class X.

17,863. F. Chailly. Improvements in the manufacture fuel briquettes, blocks, or pieces. Complete Specification. pt. 6.

17,893. W. Doman and S. W. Bullas. Improvements in etylene gas apparatus. Sept. 7.

17,968. J. M. Tavernor and H. Wheatcroft. A generator r generating and supplying acetylene (principally) and her gas for illuminating and motive purposes. Sept. 9.

17,975. J. O. O'Brien.—From M. Wagner, France. Improvements in acetylene lamps and generators. Complete ecification. Sept. 9.

18,012. G. C. Marks. Improvements in burners for andescent gas lighting. Sept. 9.

18,285. A. Anderson. Improvements in acetylene gas nerators. Sept. 13.

18,347. A. Henke. Improvements in and relating to an angement for the purification of smoke, soot, and dust, d the prevention of sparks. Complete Specification. pt. 13.

18,361. J. F. Hearne and T. Ashton. Improved petrom. Sept. 14..

Complete Specifications Accepted.

1900.

15,700. T. Macalpine. Manufacture of improved fuel. t. 11.

6,780. H. Howell. High-pressure accumulator for andescent gas lighting. Sept. 4.

7,004. W. H. Bennett. Apparatus for generating and ning mineral oil gas for heating purposes. Sept. 11.

18,527. Sir C. S. Forbes, Bart. Carburetter. Sept. 11.

8,674. D. C. Beggs and W. Fielding. Apparatus for generation of acetylene gas. Aug. 28.

18,703. A. Granang. Filling vessels with liquefied gases, l apparatus therefor. Aug. 28.

8,913. E. C. Thrupp. Apparatus for liquefying air and arating oxygen therefrom. Sept. 11.

9,061. W. T. Sugg. Incandescent gas burners. Aug. 28.

9,143. E. Stauber. Coke oven. Sept. 18.

9,398. C. E. Watts and C. J. Watts. Machine for the lomeration of fuel and other substances. Sept. 11.

9,853. S. Csáky, J. Sárkány, and S. Centiàn. Acetylene generator. July 26.

9,859. G. Mayer. Incandescent bodies for lighting pures. Sept. 18.

0,369. H. de Thiersant and W. A. Coulson. Acetylene generators. Sept. 4.

2,129. K. Gossweiler. Process or apparatus for the iminary heating of gas generators. Sept. 18.

1901.

215. P. Jensen.—From G. Heine, Norway. Treating t. Sept. 18.

129. C. H. Schill and W. G. Primrose. Apparatus for manufacture of gas. Sept. 11.

0,024. L. Breittmayer. Apparatus for extracting the hthaline contained in illuminating and heating gases. t. 18.

5,646. E. J. Duff. Gas producers. Sept. 11.

6,134. J. W. Mason. Process for purifying hydroon oils and rendering them non-explosive. Sept. 18.

.—COLOURING MATTERS AND DYESTUFFS.

Applications.

,811. J. Y. Johnson.—From The Badische Anilin und Fabrik, Germany. Improvements in the manufacture zo-colouring matters, and the production of new matter se therein. Aug. 21.

16,875. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of indoxyl and its homologues. Aug. 22.

16,876. A. G. Bloxam.—From Chemische Fabrik Brugg A. G. vormals Zimmermann and Co., Switzerland. Manufacture of greenish-black sulphurised directly dyeing dyestuffs for cotton. Complete Specification. Aug. 22

16,945. A. Rak. Improvements in batteries for the diffusion process by which certain juices, saps, essences, pigments, and the like are obtained from certain consistent matters, as beet-root, can, odorous plants, colour woods, tannics, and the like. Complete Specification. Aug. 23.

16,957. O. Imray. — From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of disazo dyestuffs for wool, and an intermediate product. Aug. 23.

17,091. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of orange-yellow to red mordant dyestuffs. Aug. 26.

17,273. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of new substantive colouring matters containing sulphur, and intermediate products relating thereto. Aug. 28.

17,356. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of new azo-colouring matters and materials for use therein. Aug. 29.

17,564. C. D. Abel.—From Actiengesellschaft für Anilin Fabrikation, Germany. Manufacture of colouring matters directly dyeing cotton. Sept. 2.

17,635. Sadler and Co., Ltd., and A. Driedger. Improvements in the manufacture of pure anthraquinone. Sept. 3.

17,807. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. The manufacture or production of new colouring matters, and of intermediate products therefor. Sept. 5.

17,809. H. J. H. Fenton. The preparation of an oxidation product of tartaric acid applicable to the manufacture of dyes. Sept. 5.

18,333. H. H. Lake.—From Chuit, Naef, et Cie., Switzerland. An improved process for the preparation of alpha-ionone. Sept. 13.

18,389. I. Levinstein, C. Mensching, and Levinstein, Ltd. Manufacture of black, sulphur-colouring matters, directly dyeing cotton. Sept. 14.

Complete Specifications Accepted.

1900.

18,533. H. H. Lake.—From Chemical Works, formerly Sandoz, Switzerland. Manufacture of sulphur dyes, and materials for use therein. Sept. 4.

18,726. B. Willcox.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture of derivatives of aromatic amines, including new colouring matters. Aug. 28.

18,756. I. Levinstein, C. Mensching, and Levinstein, Ltd. Production of new azo colouring matters and of dyestuffs therefrom. Sept. 18.

18,939. H. E. Newton. — From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of new azo-colouring matters, and of new intermediate products for use therein. Sept. 11.

19,062. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture and production of new azo dyestuffs, and of new intermediate products for use therein. Aug. 28.

19,125. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of new derivatives of the stilbene series. Aug. 28.

19,689. B. Willcox.—From The Badische Anilin und Soda Fabrik, Germany. Production of indigo powder. Aug. 28.

23,231. The British Oil and Cake Mills, Ltd., and A. G. Wass. Manufacture of printing ink. Sept. 4.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Applications.

16,765. R. Mellor. Improvements in means to be employed in dyeing yarns of woollen, worsted, silk, or other like fibres. Aug. 21.

16,772. H. O. Brandt. Improvements in treating fabrics with dyes and other liquids, and apparatus therefor. Aug. 21.

16,785. The Commercial Trading Syndicate, Ltd., and C. J. Dear. A machine and process for the treatment of fibres and fibrous substances. Aug. 21.

16,901. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the printing of vegetable fibre with colouring matters. Aug. 22.

16,919. C. O. Weber and I. Frankenburg. Improvements in the recovery of volatile solvents used in the treatment of textile fabrics, and apparatus therefor. Aug. 23.

17,129. A. Barraclough and H. Barraclough. A new or improved manufacture of yarn. Aug. 27.

17,965. H. Davies. A new or improved method of roller for dyeing, mercerising, and other purposes similar. Sept. 9.

17,974. R. Bridge and B. Helm. Improvements in the construction of rollers and bowls applicable for use in dyeing and bleaching machines, and for other purposes. Sept. 9.

18,196. H. Jowett, J. Jowett, and A. E. Walworth. A new or improved machine for dyeing and washing textile materials. Sept. 12.

18,412. C. Pelham, Jun. Improvements in waterproofing materials. Sept. 14.

Complete Specifications Accepted.

1900.

11,077. W. H. Crompton and W. Horrocks. Machines for mercerising and the like, treating yarn in hank form. Aug. 28.

18,853. G. W. Johnson.—From Kalle and Co., Germany. Production of discharge effects on dyed goods. Sept. 11.

19,668. O. Imray. — From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Process for rendering wool incapable of absorbing dyestuffs. Sept. 18.

19,670. H. E. Newton. — From The Farbenfabriken vormals F. Bayer and Co., Germany. Process for printing cotton with the aid of dyestuffs containing sulphur. Sept. 18.

20,332. W. Coventry. Machines for dyeing or otherwise treating yarn in the form of cops, bobbins, or the like. Sept. 18.

21,130. H. E. Newton. — From The Farbenfabriken vormals F. Bayer and Co., Germany. Process for producing on wool blue shades fast to light. Sept. 18.

1901.

11,858. A. J. Boult.—From C. Masse and La Sociét Francaise de Ramie, France. Treatment of ramie, chin grass, and other fibrous materials. Aug. 28.

VII.—ACIDS, ALKALIS, and SALTS.

Applications.

16,750. R. Pearson and O. March. Process of producin ammonia. Aug. 20.

16,751. R. Pearson and O. March. Method of producin ammonia. Aug. 20.

16,752. R. Pearson and O. March. Process of producin nitrogen oxides. Aug. 20.

16,761. G. T. Beilby. Treatment of gases for th recovery of nitrogen compounds. Aug. 21.

16,849. H. Spence and P. Spence and Sons, Ltd. In provements in the manufacture of compounds of alumin Aug. 22.

17,875. A. Descamps. *See* Class XV.

Complete Specifications Accepted.

1900.

11,912. G. Craig and R. M. Paterson. Obtainment alkaline cyanides from crude materials containing cyanoge July 10.

15,873. C. Hoepfner. Manufacture of alkali salts a by-products therefrom. Sept. 11.

17,953 F. Stahlschmidt. Process for the production solutions of saccharate of iron. Aug. 28.

18,218. A. Shearer. Manufacture of compounds chromic acid. Sept. 4.

18,852. B. Willcox.—From The Badische Anilin und So Fabrik, Germany. Means for rendering solid hydr sulphites stable upon keeping. Sept. 11.

21,819. G. W. Johnson.—From Deutsche Gold- u Silber Scheide-Anstalt vormals Rössler, Germany. Man facture or preparation of cyanamide and its compoun Sept. 18.

21,820. G. W. Johnson.—From Deutsche Gold- u Silber-Scheide-Anstalt vormals Rössler, Germany. Man facture or preparation of alkali cyanides. Sept. 18.

1901.

2039. E. C. Paramore. Method of and apparatus f generating, treating, and utilising chlorine gas. Sept. 11.

3530. C. A. Flanagan. Apparatus for concentrati sulphuric acid. Sept. 18.

11,919. E. Teisler. Processes for preventing the esc of silicon fluoride in the decomposition of phosphat Aug. 28.

VIII.—GLASS, POTTERY, and ENAMELS.

Applications.

17,161. P. M. Justice.—From The Mississippi Gl Company, United States. Improvements in machines rolling configured wire glass. Complete Specificati Aug. 27.

17,162. P. M. Justice.—From The Mississippi Gl Company, United States. Improved method of a apparatus for making corrugated sheet glass. Comp Specification. Aug. 27.

17,656. C. G. Redfern.—From Société Anonyme de Industrie Verrière et ses Derives, Belgium. Improve-ents in the manufacture of glass by electricity. Sept. 3.

17,708. H. H. Bridgwater and J. Haley. Apparatus for arging an annealing oven with glasses or like articles. ept. 4.

17,920. T. Shore. Improvements in or applicable to otters' jiggers for making dishes of circular, oval, or other rms. Sept. 7.

18,345. A. Aufort. Improvements in tunnel kilns for rning ceramic articles. Sept. 13.

18,364. F. J. Bourne. "Asbestos Saggar Marl" for aking saggers, saggers' bats, kiln bats, kiln bricks, cranks, d setters for pottery use. Sept. 14.

Complete Specifications Accepted.

1900.

10,907. L. Grote. Machines for manufacturing glass ttles or the like. Sept. 18.

18,152. G. Leuchs and K. Leuchs. Process for produc- clouded glasses and enamels by burnt titanic acid. g. 28.

.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Applications.

6,640. O. Hertwig and E. Liebaug. Improvements in relating to the manufacture of artificial marble and the . Complete Specification. Aug. 19.

7,431. W. Wood and H. Bartlett. Improvements in the nfacture of woodite. Complete Specification. Aug. 30.

7,438. W. Schwarz. An improvement in the manufac- of refractory calcareous sandstone. Aug. 30.

7,540. H. W. C. K. Dyson. Improvements in red regates for the manufacture of artificial stones, pavings, s, cements, and plasters; applicable also to brick-making decorative sanded surfaces, and for use in hour-glasses, , and the like. Sept. 2.

7,661. P. A. Newton.—From The New Jersey Wire th Company, United States. Improvements in fire- of constructions, and method of making the same. plete Specification. Sept. 3.

,886. A. J. Boult.—From Devise Frères, France. roved pressing mould for the production of artificial . Complete Specification. Sept. 6.

,982. P. Preston. Improvements in or relating to the ufacture of concrete, and to means therefor, partly icable for other purposes. Sept. 9.

,008. S. Höyer-Ellefsen. Improvements in fireproof s. Complete Specification. Sept. 9.

,077. J. Steinbach and F. Duderstadt. Improvements e composition of a mixture of asphalt and other sub- es in the formation of blocks or slabs. Sept. 10.

,163. W. Schwarz. Machine for preparing materials he manufacture of artificial stone. Sept. 11.

Complete Specifications Accepted.

1900.

,374. W. L. Wise.—From The Salubratapetenfabrik, , Switzerland. Wall coverings, and in the method of facturing thereof. Sept. 4.

698. R. J. Friswell. Manufacture of refractory rials for building and other purposes. Sept. 11.

1901.

11,715. C. Lorene. Manufacture or production of mortar and the treatment of stone, and the construction therewith of masonry work. Sept. 4.

12,073. S. Sborowitz. Process for producing imitation marble. Sept. 4.

15,316. C. A. Allison.—From C. S. Lawrence and F. McCornick, United States. Preserving wood. Sept. 4.

X.—METALLURGY.

Applications.

16,758. S. Cowper-Coles and Co., Ltd., and S. Cowper-Coles. Improvements in the application of vanadium to iron and steel. Aug. 21.

16,864. C. P. Sörensen. A process for preparing aluminium for soldering. Complete Specification. Aug. 22.

16,926. J. Nicholas. Improvements in the recovery of metals from sulphide ores and other material, and in the plant employed therein. Aug. 23.

17,244. F. M. David. An improvement for the recovery of gold. Aug. 28.

17,323. A. J. Boult.—From J. Miskolczy, United States. Improvements in densifying and solidifying metals. Aug. 29.

17,415. L. Braunfels. Method for the reduction of zinc ores. Complete Specification. Aug. 30.

17,580. A. J. Boult.—From A. D. Carmichael, New South Wales. Improved process for desulphurising sulphide ores. Sept. 2.

17,639. F. C. Crean. Improvements in the manufacture of iron or iron alloys. Complete Specification. Sept. 3.

17,752. H. R. S. Coleman. An improved process for reclaiming tin or zinc from tinned or zinc scrap. Sept. 5.

17,779. C. F. Eckert, jun. Improved manufacture of chrome iron. Sept. 5.

17,852. S. F. Pierce. Improvements in heat-producing devices for the smelting of ores and the fusing of minerals in furnaces. Complete Specification. Sept. 6.

17,898. H. R. S. Coleman. An improved process for reclaiming tin or zinc from tinned or zinc scrap. Sept. 7.

18,149. D. Laird. An improved furnace for the cupellation of precious metals, and for oxidising and reducing ores. Complete Specification. Sept. 11.

18,150. D. Laird. Improvements in or connected with smelting furnaces. Complete Specification. Sept. 11.

18,162. J. Baxeres de Alzugaray. Improvements in obtaining oxides from ores and the like. Sept. 11.

18,230. H. H. Lake.—From W. R. Bennett, United States. Improvements relating to the hardening and tempering of steel. Complete Specification. Sept. 12.

Complete Specifications Accepted.

1900.

17,243. L. Sterne and S. Cowper-Coles. Process for rendering silver surfaces untarnishable. Sept. 4.

19,316. J. R. Hatmaker.—From C. T. Hennig, United States. Alloy and process for making same. Sept. 4.

19,659. J. Szirmay and L. von Kollerich. Process of coating metal goods and articles with zinc. Sept. 11.

21,357. F. W. Bühne. Process for comminuting metals. Sept. 4.

1901.

5166. J. Kennedy. Apparatus for charging blast furnaces. Sept. 4.

8333. A. D. Elbers. Process of treating molten blast furnace slag. Sept. 18.

8376. H. Brandenburg and A. Weyland. Process for extracting tin from ores or slags. Aug. 28.

15,831. E. Ferraris. Zinc or other distillation furnaces. Sept. 11.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

Applications.

16,651. V. Jeanty. Improvements in secondary batteries. Aug. 19.

16,677. R. Pörscke. Improvements relating to the manufacture of electrodes for galvanic batteries. Complete Specification. Aug. 20.

16,874. J. Mactear. Improvements in electrolytic apparatus for production of chlorine and alkali. Complete Specification. Aug. 22.

17,187. A. Lessing. Improvements in cells of primary batteries. Complete Specification. Aug. 27.

17,250. E. G. Scott. Improvements in the treatment of galvanisers' and like waste liquors. Aug. 28.

17,320. P. E. C. Corbin. Improvements in or relating to the electrolytic manufacture of chlorates and perchlorates. Filed Aug. 29. Date applied for March 25, 1901, being date of application in France.

17,348. E. B. Viles. Improvements in and relating to plates for secondary batteries. Aug. 29.

17,480. Siemens Bros. and Co., Ltd.—From Siemens and Halske Actiengesellschaft, Germany. An improvement in aluminium electrolytic cells. Complete Specification. Aug. 31.

17,660. The Pile-Bloc Battery Company, Ltd. Improvements in electric batteries. Filed Sept. 3. Date applied for Aug. 30, 1901, being date of application in France.

17,702. The Metals Corporation, Ltd., and S. Cowper-Coles. Improvements in the electrolytic refining of copper. Sept. 4.

18,023. L. Bristol. Improvements in electric storage batteries. Sept. 9.

18,256. M. J. B. A. Colletas. Improvements in electric accumulator batteries. Complete Specification. Filed Sept. 12. Date applied for Feb. 12, 1901, being date of application in France.

Complete Specifications Accepted.

1900.

9731 S. O. Cowper-Coles. Apparatus for use in the electro-deposition of metals. Sept. 4.

11,358. H. U. Wollaston and T. V. Sherrin. Secondary batteries. July 3.

15,470. A. J. Boult. — From E. Andreas, Germany. Process of forming metallic electrode plates. Aug. 28.

22,388. J. Bleichrode. Method for making an incandescent pile. Sept. 11.

1901.

14,967. H. H. Lake.—From A. G. Betts, United States. Apparatus for refining metals by electrolysis. Sept. 18.

XII.—FATS, OILS, AND SOAP.

Applications.

17,988. C. Weygang. Improvements in the treatment oils, fats, and other saponaceous materials. Sept. 9.

18,298. G. F. Carter. Improved oil purifier. Fil Sept. 13. Date applied for Feb. 13, 1901, being date application in United States.

Complete Specifications Accepted.

1900.

9261. E. Petersen. Means for extracting or separati oil or other substances from water. Aug. 28.

1901.

15,603. A. M. Clark.—From L. Rissmuller, United Stat Bleaching whale and seal oils. Sept. 11.

16,134. J. W. Mason. *See* Class II.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, ETC.

Applications.

16,930. G. Willock. Composition for removing pa Aug. 23.

16,945. A. Rak. *See* Class IV.

17,555. O. Francke. *See* Class I.

17,668. J. W. Rowlands and O. R. Jones. Bro antifouling paint. Sept. 4.

Complete Specification Accepted.

1901.

7242. A. S. Ramage. Production of oils applicable use in the manufacture of paints and varnishes. Sept. 4

XIV.—TANNING, LEATHER, GLUE, AND SIZE

Applications.

16,797. T. H. Cobley. Improvements in the treatmen leather waste for the recovery of tannin and tannates, the production of a special guano and nitrogenous ag for the manufacture of manures. Aug. 21.

17,012. J. F. Butterworth and C. Marter. Improveme in the manufacture of compressed and moulded arti from waste leather and animal skins. Aug. 24.

17,404. W. S. Smith. A further improved method leather dressing. Aug. 30.

XV.—MANURES, ETC.

Applications.

16,797. T. H. Cobley. *See* Class XIV.

17,875. A. Descamps. Improvements in the treat of poor phosphates. Sept. 6.

18,326. E. Jonas. An improved fertiliser. Sept. 13

XVI.—SUGAR, STARCH, AND GUM, ETC.

Complete Specifications Accepted.

1901.

10,741. F. Singer. Machine for turning green Sept. 11.

15,853. G. Hallenscheid. Twisted auger. Sept. 11.

XVII.—BREWING, WINES, SPIRITS, Etc.

Application.

16,887. J. A. Ruckdeschel. An improved process for caramelising or colouring beer wort. Aug. 22.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

Applications.

A.—Foods.

17,133. T. Kerfoot. Improvements in desiccated milk and products made therefrom. Aug. 27.

17,331. C. T. V. Bruun. Improved method of preserving eggs. Complete Specification. Aug. 29.

18,269. J. H. Hooker. Improvements in the manufactur f alimentary products. Sept. 12.

B.—Sanitation. Water Purification.

17,218. P. R. de Faucheux d'Humy. Improvements in nd connected with retorts for carbonising and for distilling lecayed vegetable and other carbonaceous matters. Aug. 28.

17,396. C. W. Beissel. Improvements in water softening nd purifying apparatus. Aug. 30.

17,649. A. Sorge, jun. Improvements in water purifying pparatus. Complete Specification. Sept. 3.

17,805. J. Harris. Improvements in and relating to the urification of air. Sept. 5.

18,366. W. J. Newton. Improvements in apparatus for ewage treatment. Sept. 14.

18,405. E. Peake. A new or improved system of sewage urification. Sept. 14.

C.—Disinfectants.

16,736. B. Sieber. A process and apparatus for the sification of disinfecting media. Aug. 20.

17,700. J. Baxeres de Alzugaray. Improvements in and nnected with the manufacture of disinfecting and anti-ptic fluids and compounds. Sept. 4.

Complete Specifications Accepted.

B.—Sanitation; Water Purification.

1901.

6217. F. Breyer. Process for softening water. Aug. 28.

7388. P. D. Hahn and O. Lenz. Process for deodorising d clarifying sewage and effluents from breweries and hnical establishments. Sept. 4.

C.—Disinfectants.

1900.

20,034. R. J. Yarnold. Obtainment of disinfectant and tiseptic preparations. Sept. 11.

XIX.—PAPER, PASTEBOARD, Etc.

Applications.

6,685. D. N. Bertram and S. Milne. Improvements ting to machines used in the manufacture of paper, er pulp, and the like. Aug. 20.

6,865. J. St. Clair Legge and S. Lambert. A process treating paper for transfer purposes. Aug. 22.

17,006. C. H. Jackson, G. I. Levy, A. Barnett, and T. R. Marigold. An improved method for producing and applying a solution of xylonite, celluloid, and the like substances. Aug. 24.

17,624. F. C. Crean. *See* Class I.

Complete Specifications Accepted.

1900.

14,992. J. J. Tinker. Blotting paper and the like. Aug. 28.

1901.

249. F. Billing. Manufacture of paper. July 26.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

Applications.

16,750. R. Pearson and O. March. *See* Class VII.

16,751. R. Pearson and O. March. *See* Class VII.

16,968. H. E. Newton. — From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in the manufacture or production of pharmaceutical compounds. Aug. 23.

17,081. J. Montgomery. A process for making chemically pure camphor. Aug. 26.

17,924. W. Smith. Improved process in the manufacture of cineol (eucalyptol) by the use of arsenic acid. Sept. 7.

Complete Specifications Accepted.

1901.

14,507. H. Froehling. Process and apparatus for extracting alkaloids and oils from vegetable substances. Sept. 11.

15,447. J. M. Schutz and C. G. Hawley. Coffee compound or composition, and process of producing the same. Sept. 4.

XXI.—PHOTOGRAPHY.

Applications.

17,100. C. K. Mills.—From La Société Anonyme des Plaques et Papiers Photographiques A. Lumière et ses Fils, France. Improvements in combined toning and fixing bath for photographic purposes. Aug. 26.

17,283. H. O. Cooper, J. Reardon, and W. Beresford. Improvements in the manufacture of photographic films. Aug. 29.

Complete Specifications Accepted.

1900.

19,331. A. Watkins. Photographic actinometers. Sept. 11.

1901.

2637. W. G. Perks and H. G. M. Fletcher. Method of separating flexible photographic films, cards, and the like. Aug. 28.

XXII.—EXPLOSIVES, MATCHES, Etc.

Applications.

16,668. J. Hübner. Ignition strips made of prepared nitrocellulose, and a process for manufacturing the same. Aug. 19.

16,693. Sir H. S. Maxim. Improvements in explosive compounds for use with armour-piercing projectiles Aug. 20.

16,694. Sir H. S. Maxim. Improvements relating to fuses for armour-piercing projectiles. Aug 20.

17,626. H. H. Lake.—From Eastern Powder Company, United States. Improvements relating to the manufacture of explosive powder. Complete Specification. Sept. 3.

17,628. H. H. Lake.—From F. Blake, United States. Improvements relating to machines for making matches. Complete Specification. Sept. 3.

17,860. Sir W. G. Armstrong, Whitworth, and Co., Ltd., and G. Stuart. Improvements in electrical primers. Sept. 6.

18,161. F. W. Jones. A new or improved explosive, and process for the manufacture thereof. Sept. 11.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

21,068. J. Bonnet. Manufacture of explosive substances. Aug. 28.

1901.

8365. O. Imray.—From J. L. Norris, United States. Explosive. Sept. 18.

9984. J. E. Blomén. Manufacture of high explosives. Sept. 18.

14,525. J. U. Mackenzie. — From The Robin Hood Powder Company, United States. Explosives. Sept. 18.

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Mr. J. W. Hinchley. "The Separation of Materials of Different Specific Gravity."

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Chairman's Address. "Novelty in Patents, according to German Patent Law."

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NOTICES.

Subscriptions for 1902.

Foreign and Colonial Members are reminded that the ubscription of 25*s.* for 1902, payable on January 1st next, hould be sent in good time to the Hon. Treasurer (Mr. Samuel Hall), in order to ensure continuity in the receipt of he Society's Journal. Any changes of address to appear n the new List of Members now in course of preparation hould reach the General Secretary not later than January 5th, 1902.

Changes of Address.

When notifying new addresses, members are requested to rite them distinctly, and state whether they are temporary r permanent. Multiplication of addresses is also to be voided as tending to create confusion. When sending ubscriptions, the use of the form attached to the application elps in the verification of addresses, on which the safe elivery of the Journal depends.

Communications.

Authors of communications read before the Society, or ny of its Local Sections, are requested to take notice that nder Rule 43 of the Bye-laws the Society has the right of riority of publication for three months of all such papers. nfringement of this Bye-law renders papers liable to be jected by the Publication Committee, or ordered to be bstracted for the Journal, in which case no reprints can e furnished to the author.

Arsenic.

In view of the great public interest which has been oused by the Arsenic Epidemic, it has been decided to publish, in pamphlet form, uniform with the Journal, the apers, discussions, and abstracts dealing with the detection nd determination of Arsenic and other associated elements, hich have appeared in the Journal since the beginning of is year. To these have been added extracts bearing on e subject from other sources, including a description, from 'anklyn's new book on Arsenic, of the Marsh test, in the ventor's own words, and dated 1836. Copies, price 1*s.* ch, may be obtained from Messrs. Eyre and Spottiswoode.

Foreign Office Reports.

With reference to the notice from the Foreign Office hich appeared on page 761 of this Journal, inviting hambers of Commerce and other bodies to suggest special bjects upon which H.M. Consular Officers might be rected to report, it should be noted that such suggestions ould be addressed to the Commercial Department of the reign Office. On page 859 of the Journal for this year ll be found a report furnished by Consul-General Gurney, rough the Foreign Office, at the request of this Society, "Castor Oil Manufacture at Marseilles." It is hoped at members will avail themselves, through the Society, of e facilities thus placed within their reach by the Foreign fice.

The University of Durham has conferred the degree of Sc. upon Mr. Joseph Wilson Swan, M.A., F.R.S., mediate past President of the Society of Chemical dustry.

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New York Section.

TITLES OF PAPERS FOR THE COMING SESSION.

Aspinwall, H. C.	Tests to Determine the Stability of Nitro Explosives.
Brown, H. F.	Influence of the Lower Oxides of Nitrogen in Mixed Nitric and Sulphuric Acids used in the Nitration of Cotton
Coblentz, Virgil	Relationship of Chemical Structure to Physiological Action.
Curtis, Marion	Wines.
Eddy, Harrison P. . .	Chemical Phenomena connected with the Treatment of Sewage either by Filtration or Septic Processes
Granja, Rafael	Tin Foil and Bottle Caps Manufacturing.
Jackson, D. D.	Precipitation of Iron, Aluminium, and Manganese by Bacteria.
Lane, N. J.	Addition of Foreign Fats to Cocoa Preparations.
Love, E. G.	Work of the International Commission on Photometry.
Machette, F. V.	Rare Earths.
Matos, Louis J.	Sulphur Blacks and their Action on lulose.
Matthews, J. Merritt.	(1) Influence of Indigo Red in Ind Dyeing. (2) Action of Caustic Soda on Wool.
Moore, R. W.	(1) Differences in Composition of Co mercial Barium Sulphate. (2) Composition of Precipitated Bario Carbonate. (3) Examination of Albuminoid Food P parations. (4) Potassium Cyanide.
Morison, S. L.	Purification of Public Water Supply.
Nagel, Oscar	Ricinus Oil Cake.
Norris, Geo. L.	(1) Determination of Arsenic in Iron a Steel. (2) Determination of Silicon in Fer silicon.
Richardson, Clifford..	Uniformity in Technical Analysis.
Schupphaus, R. C. ...	Notes on Nitrocellulose.
Schweitzer, H.	Artificial Musks.
Taylor, B. F.	Refining Cotton-Seed Oil.
Toch, Max	Chemistry of Paints.
Wallerstein, M.	Natural and Artificial Pure Yeast Cultur
Woodman, Durand. .	Chemical Method for Detecting Defect Welding in Boiler Tubes.

The Hon. Secretary would respectfully ask those members w have promised papers but have not yet given exact titles, selected dates for reading them, to communicate with him at so that suitable arrangements may be made.

Meeting held on Friday, October 25th, 1901

MR. CLIFFORD RICHARDSON IN THE CHAIR.

THE REDUCTION OF ALUMINA BY CALCIU CARBIDE.

BY SAMUEL AUCHMUTY TUCKER, PH.B., F.C.S., AND HERBERT R. MOODY, B.S., M.A.

It has already been suggested by some authors that ‘ bod exothermic, on decomposition, if they are mixed with charge, tend to help to reduce oxides of the metal Acetylene and calcium carbide are examples of su bodies.

During an investigation of the properties of cert mixtures of carbides, a charge consisting of 100 grms. alumina, 112 grms. of lime, and 125 grms. of coke was us This was heated for ten minutes in the electric furnace 150 amperes and 70 volts. Although the carbide prod exhibited no peculiar properties, an interesting fact w noticed. Near the masses of aluminium carbide there w found buttons of metallic aluminium. These showed th metallic nature by being unacted upon by water, were eas soluble in warm dilute hydrochloric acid, were quite mal able, and showed crystalline character or structure un the microscope. On qualitative analysis they proved to elementary metallic aluminium slightly contaminated w iron. Quantitatively, they consisted of 99 per cent metallic aluminium and the rest iron and mechanica enclosed carbon. The metal was undoubtedly produced the following reaction: —

$$Al_2O_3 + CaC_2 = 2Al + 2CO + CaO.$$

The (at least theoretical) impossibility of reduc aluminium oxide by simple carbon is wholly upon therm chemical grounds, and therefore anything evolving heat decomposition must tend to help the reduction.

Richards (Richards' Aluminium, pp. 241 and 242) say “It is well known that alumina may be in contact w carbon at a white heat and yet not be reduced by it,” a gives data showing the great amount of heat given out the decomposition of acetylene. Hunt, on the contra holds that alumina will be reduced by charcoal alone, a that some of the metal will result even in the absence some substance like copper to alloy with it. This id however, although shared by Chapelle (Comptes Re 1854, vol. 37, p. 358), does not seem to be held by ma thorities. Hempel (Chem. Zeit. 1888, **12**, p. 391) is a table example of one holding a different opinion. He s that reduction of alumina by carbon alone is highly probable on thermo-chemical grounds.

he following table gives data relative to our experintal work upon this reaction:—

Charges.	Ampères.	Volts.	Time	Remarks.
			Mins.	
100grms. Al_2O_3 112 „ CaO.. 125 „ coke .	150	70	10	
Same	150	70	20	More metal produced.
Same	150	70	40	No metal formed.
112 grms. CaO 100 „ Al_2O_3 125 „ coke .	150	70	15	Some metal, but less than in No. 1.
Same as No. 4.	100	40	5	No metal. Re-heated 5 mins. more and still no metal.
„ „ ..	275	45	5	No metal. Re-heated for 3 mins., same current, fair sized button.
48 grms. CaO 400 „ Al_2O_3 250 „ coke ..	100	95	10	No metal. The furnace used was resistance type, the others being arc.
150 „ Al_2O_3. 60 „ coke . C_2H_2 *ad lib.* .	150	60	12	Perfect fusion. No metal.
150grms. Al_2O_3 60 „ coke . 100 „ CaC_2 .	175	70	10	Small yield of metal. Re-heated for 5 mins. gave increase of metal. It was then re-heated for 6 mins. more, which resulted in no metal.
100grms. Al_2O_3 112 „ CaO.. 200 „ coke .	150	60	10	No result.
175 „ Al_2O_3 112 „ CaO.. 125 „ coke .	250	80	8	Usual yield, but no increase from excess of alumina.
100 „ Al_2O_3 200 „ CaO.. 112 „ coke .	200	60	8	Very little metal.
150 „ Al_2O_3 200 „ CaC_2 . 60 „ coke .	200	50	9	Best yield of metal thus far obtained.
Al_4C_3 from 13 with equal weight of CaC_2.	2 0	45	12	No metal.
Same as No. 13	275	50	5	Still better yield than No. 13.
150grms. Al_2O_3 200 „ CaC_2 .	275	80	5	As good, but no better than No. 15. Almost no aluminium carbide.
150 grs. Al_2O_3 400 „ CaC_2 .	250	70	5	No better than No. 16.
Same as No. 16	275	80	7	Little metal. Much aluminium carbide.
300grms. Al_2O_3 200 „ CaC_2 .	225	70	5	Smaller yield of metal.
150 „ Al_2O_3 200 „ CaC_2 . 120 „ coke .	250	60	10	No fusion. No metal.
150 „ Al_2O_3 200 „ CaC_2 . 30 „ coke .	250	60	5	Good yield of metal, but no better than Nos. 15 or 16.
ame as No. 21	250	60	10	Marked improved yield, but much aluminium carbide.
50grms. Al_2O_3 300 „ CaC_2 . 30 „ coke .	325	70	12	Perfect fusion. Largest yield of metal thus far obtained.
ame as No. 23	325	80	15	Same result as No. 23.
„ „	325	80	8	„ „
l_4C_3 10 grms. aC_2 10 „ oke 5 „	275	70	7	No metal.

clusions to be drawn from this series of experiments follows:—

t. Aluminium oxide is not reduced by carbon to any iable extent, even when both are heated to the aely high temperature of the electric arc.

ond. The addition of lime and the necessary excess on forms an alkaline earth carbide, which is in turn posed, and being a body exothermic on decomposition, s up a large number of calories, and thus raises the ature to such a degree that reduction of the oxide place to an appreciable extent.

d. The carbide may be made in separate fusion and to the alumina, with or without carbon, but the presence of some carbon seems to increase the yield of the metal. The production of the carbide in a separate fusion would, however, be condemned on economic grounds.

Fourth. As regards time, anything over twelve or fifteen minutes is prejudicial to good results, and converts the reduced metal to carbide in amounts increasing directly as the excess over the maximum admissible time increases.

Fifth. Aluminium carbide was found to be produced from the metal, and not the reverse.

The whole subject may be summed up as follows: Results obtained favour the use of high ampèrage and voltage for not more than fifteen minutes. The presence of both carbon and a carbide of an alkaline earth is required. Air should be excluded. And, lastly, the amount of alumina should be considerably in excess of the theoretical amount of coke.

PRODUCTION OF ETHYLENE FROM INORGANIC SOURCES.

BY SAMUEL AUCHMUTY TUCKER, PH.B., F.C.S., AND HERBERT R. MOODY, B.S., M.A.

In producing the following electric furnace products, the fundamental idea was to form such a combination of carbide, or carbides and silicides, that, when the product was acted upon by water or dilute acids, there might result, either directly or by interaction, a different gas than is evolved from any of them taken alone. It was thought probable that ethylene might be so formed.

As everyone knows, simple calcium carbide reacts with water as follows: $CaC_2 + 2H_2O = Ca(OH_2) + C_2H_2$.

The carbide of aluminium, however, decomposes water differently, and causes the following reaction:—*

$$Al_4C_3 + 12H_2O = 3CH_4 + 4Al(OH)_3.$$

Knowing this, it seemed possible that the acetylene and methane might react in the nascent state or that the mixed carbides might form a combination which would decompose with water, giving the desired gas directly.

A method for the analysis of a mixture of ethylene and acetylene has been worked out by the authors, and is shortly to be published in a separate paper.

The following fusion was the first of a series in which a mixed calcium and aluminium carbide was produced, which it was hoped might yield a gas other than methane or acetylene. The charge used consisted of 112 grms. of lime and 72 grms. of coke for the calcium carbide, mixed with 49 grms. of metallic aluminium and 17 grms. of coke for the aluminium carbide. This mixture was in molecular proportions. It was heated for five minutes at 150 ampères and 70 volts. The product was not homogeneous. It consisted of yellow glancing plates of aluminium carbide irregularly placed in a matrix of calcium carbide. An analysis of the gas evolved from this product showed that it consisted of nothing but acetylene and methane.

In all subsequent fusions, alumina was substituted in corresponding amounts for the metal.

In a series of 12 or more fusions, variations in the composition of the charge, the current strength, and the time of heating were made. No other results were obtained, however, than in the foregoing, and consequently this combination was abandoned.

Manganese carbide decomposes with water as follows:† $Mn_3C + 6H_2O = 3Mn(OH)_2 + CH_4 + H_2$. Here, also, if this were combined with calcium carbide, there seemed a possibility of interaction or direct evolution of ethylene. After consultation of authorities and experiments made personally, it was found impossible to make this mixture, since manganese carbide requires quite different conditions for its formation from the calcium compound. No evidence of the presence of manganese carbide was ever obtained, that element always appearing as a metallic button.

The mixed carbides having proved so unsatisfactory for this purpose, attention was turned to the mixed silicides and carbides. The silicides, principally known through one representative silicide of carbon (carborundum), are an interesting class of bodies analogous to the carbides, and have the general formula $R\ Si_2$, in which R represents any bi-valent element. These silicides may be made (1) by direct combination of the elements used and elementary silicon; (2) by the method given in the text books, which is by fusing a metallic chloride, common salt, sodium-silico fluoride, and metallic sodium; (3) by heating oxides, carbonates, phosphates, &c., with silicon oxide and carbon.

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* Moissan, Le Four Electrique, p. 325.

† Moissan, Le Four Electrique, p. 328.

Moissan[*] uses the first method largely and has produced silicides of iron, chromium, &c., which are bodies unsuited to this work.

Jacobs,[†] however, has produced alkaline earth silicides according to the following reactions:—

$$CaCO_3 + 2SiO_2 + 6C = CaSi_2 + 7CO.$$

$$CaO + 2SiO_2 + 5C = CaSi_2 + 5CO.$$

$$Ca_3P_2O_8 + 6SiO_2 + 20C = 3CaSi_2 + 2P + 20CO.$$

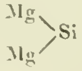
These compounds are found to decompose with water, producing not acetylene, but hydrogen according to the following: $CaSi_2 + 6H_2O = Ca(OH)_2 + 2SiO_2 + 5H_2$. Strangely enough dilute acids with calcium silicide do not produce gas according to the above, but form silico-acetylene according to the following reaction:

$$CaSi_2 + 2HCl = CaCl_2 + Si_2H_2.$$

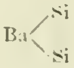
The corresponding barium salt acts differently, producing silicon hydride as follows:—

$$2BaSi_2 + 4HCl + 6H_2O =$$
$$2SiH_4 + 2BaCl_2 + 2\ H_2O + 2SiO_2 + 2H_2.$$

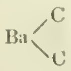
It is to be noticed that silicides differ in formation from magnesium silicide as commonly known and spoken of in text books. The formula given for that is Mg_2Si or—



which differs radically from $BaSi_2$, which when written—



shows the relationship which exists between these bodies and the carbides, as for example:—



The barium compound seemed the most likely to fulfil the desired object, and that was first selected. The witherite which had been used in previous work was selected and should act as follows:—

$$BaCO_3 + 2SiO_2 + 6C = BaSi_2 + 7CO.$$

With water this compound should react as follows:—

$$BaSi_2 + 6H_2O = Ba(OH)_2 + SiO_2 + 5H_2.$$

It was thought that this hydrogen in the nascent state would be very likely to combine with the acetylene, changing it to ethylene or similar compounds. The first trial was made with a charge consisting of 100 grms. of witherite, 60 grms. of silica, and 43 grms. of coke. This was mixed with a carbide charge of 150 grms. of witherite and 25 grms. of coke These two mixtures were thoroughly incorporated and subjected to a heat at 150 ampères and 60 volts for seven minutes. The product was blackish, gave off gas slowly in cold water, but vigorously in warm water, 50 c.c. of this gas was found to contain 15 per cent. of ethylene. The analysis was repeated several times with lumps from various portions of the fusion, and quantities of ethylene varying from 8 to 15 per cent. were obtained.

It was found that an increase of the cartide part of t charge diminished the quantity of ethylene obtainable 2 per cent. A decrease in the carbide charge al diminished the ethylene content to a fraction of one p cent.

The substitution of strontianite for witherite was of particular value, the percentages of ethylene obtainal being from 3 to 5 per cent. Increase of heat during t fusion of the above was of no advantage The presence an oxidising agent such as chromic acid added to the wat in the evolution flask had no effect.

The use of calcium instead of barium or strontium gav rather poor product evolving gas containing about 2 cent. of ethylene. The use of dilute acids instead of wat was found to be undesirable, as would be expected from t reactions already given

It thus seems possible to obtain a product by th reactions which will on the addition of water simultaneou evolve a mixture of ethylene and acetylene.

Nottingham Section.

Meeting held on Wednesday, October 30*th*, 1901.

MR. L. ARCHBUTT IN THE CHAIR.

THE HEAT PRODUCING POWER OF FUEL.

BY ARTHUR ADAMS, F.I.C., F.C.S.

Many pieces of apparatus for determining the calor power of fuel have been devised, which give more or l accurate results, but only two forms are in common use.

In the first, due to Lewis Thompson, the fuel is mix in sufficient proportion, with substances rich in oxygen, mixture ignited by a fuse, and the heat produced co municated to a known quantity of water (see this Jour 1888, 868). There are many sources of error and results are only of relative value.

In the second form, devised by William Thomson, combustion takes place in a stream of oxygen, the prod of combustion, together with the excess of oxygen u bubbling through the water of the calorimeter, to wh they communicate their heat, the amount carried away be trifling (this Journal, 1886, 581).

A review of the whole subject by Rowan will be foun this Journal, 1888, p. 195.

Some experiments recently made with William Thoms calorimeter have shown two errors of considerable mag tude, which have hitherto been disregarded, beside wh the heat carried away by the escaping gases, not be cooled, or neglect of heat absorbed by crucible, &c., trifling. The gases escaping from the apparatus are bably saturated with water vapour, and the evaporati this water means the loss of many heat units. An atte was made to measure the loss thus caused by closing top of the beaker by a piece of sheet rubber, forcing dry through the apparatus—instead of oxygen—and passing issuing moist air through weighed drying tubes. 0·15 g of water was obtained as a mean value for three experime proving that much heat was removed, but not that the was saturated. As no measurement of the correspon volume of air was made, no correction which would be general use was possible.

It was considered desirable to repeat the experi under actual working conditions; but as the rubber which had to be tied on the beaker, took some tim adjust, it was obvious that the use of a wax vesta or a thing of the nature of a fuse was inapplicable. Elect ignition by means of an accumulator, insulated wires pas through the water up into the combustion chamber terminating in a loop of platinum wire dipping into fuel, was tried. In use the oxygen was turned on ge Contact made with the accumulator rendering the wire w hot, the fuel at once ignited and contact was broken. heat developed by the current during the short tim isted was not worth consideration. The method was found atisfactory in every way, and was retained in all the other xperiments.

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[*] Moissan, Le Four Electrique, pp. 351—355.

[†] U.S. Pat. 656,353, Aug. 21, 1900.

Moisture was carried off by the escaping gases in coniderable quantity, partly also in the form of spray, but so nuch of it condensed in the leading tubes as to render the esults worthless. Even if the gases were proved to be aturated with moisture, no correction could be made for e heat lost, unless the volume of gas passed in were easured in some way.

Passing the oxygen from the holder through a wash ottle, kept at the mean temperature of the experiment, in ich a way as to saturate the inflowing oxygen with oisture, was then tried; as this is practically equal to the oisture carried away by the gases leaving the calorimeter, o loss of heat occurs by evaporation. A convenient turator is a 16-oz. three-necked Woulff's bottle, half filled ith water and completely filled with large beads or broken ass; the end of the inlet tube terminates in a fine end, d a thermometer is fixed in the middle neck. This turation of the oxygen with water vapour was what was iginally intended, and was arrived at on purely theoretical ounds, the other experiments being subsidiary.

Three very careful determinations of the calorific power a coal were then made; the first two with oxygen turated with water vapour, the third with oxygen direct om a steel bottle. The temperatures and radiation errors ere determined by a Geissler thermometer graduated to 100th of a degree C., but easily read to 1/200th degree C. The results were:—

	Oxygen, moist.		Oxygen, dry.
	I.	II.	III.
rrected rise of temperature.	3·47° C.	3·4625° C.	3·36° C.
an value	3·466° C.		..
l. power in cent.-units ..	7203·4		6983·1

ving a difference of 220·3 units in favour of the moist ygen. A number of determinations with the same fuel dry oxygen had previously been made; but as they had en done less carefully and on different days, variations in e dryness of the fuel may have occurred. They are only ferred to here as the mean of a large number of deterinations giving a rise of 3·41° C. and a cal. power = 7,087, result giving 7,203·4 − 7,087 = 126·4 units or calories in vour of the saturated oxygen.

These results alone show the advisability of supplying oisture, but a further consideration of the figures is structive. In the five last determinations, including the ree given, 1·7 cb. ft. of oxygen were used as shown the gauge, giving about 0·34 cb. ft. for each experiment. s 1 cb. ft. of gas, saturated with moisture at 17° C., the ean temperature of the experiment, carries with it 0·405 m. of water as vapour, 0·34 cb. ft. would therefore rry away 0·1377 grm. The latent heat of water at ° C. is 594·7 calories. The heat carried by 0·1377 grm. vapour therefore = 594·7 × 0·1377 = 81·9 cals. Taking e least favourable number, 126·4, there is a gain of 6·4 − 81·9 = 44·5 cals. unaccounted for when using satued oxygen, *i.e.*, a gain of more than ½ per cent. While if single but more carefully determined result is taken, 0 3, there is an unexpected gain of 220·3 − 81·9 = 131·4 s., or more than 1·9 per cent.

Only one explanation of these figures appears possible, d that is, that with dry oxygen the combustion is less mplete than with oxygen charged with moisture, and ere is fortunately ample justification for this belief. The portant experiments made during the last twenty years the influence of moisture on chemical changes almost volutionise our earlier ideas. Those more directly bearing this investigation are by Dixon and Baker, and are quoted the end of this paper. Summing up the results of their rk, we find that carbon burns with difficulty in *dry* ygen, and in doing so forms a large percentage of bon monoxide, apparently directly, while the presence of moisture or finely divided platinum causes the complete burning to carbon dioxide. Also that carbon monoxide will only combine with *dry* oxygen with difficulty, even in presence of excess of oxygen, so much so that the flame of carbon monoxide is extinguished when plunged into *dry* oxygen.

In these experiments *dry* is to be taken as meaning as dry as can possibly be obtained by the best drying agents. Ordinary compressed oxygen is dry, but not so completely as this; but probably something of the same kind occurs, *viz.*, formation and incomplete combustion of carbon monoxide.

The determination of the unburnt portion of the fuel, whether solid or gaseous, has of course always been done in such standard experiments as those of Favre and Silbermann, Berthelot, and others, but in any of the commonly used calorimeters, no attempt at correction has been made. Here the presence of moisture seems to be a simple and ready method of correction by promoting complete combustion.

Lack of time and opportunity have prevented the determination (1) of the amount of carbon monoxide in the gases issuing from the calorimeter when dry oxygen was used, and (2) of the absence of it when moist oxygen was used. Some preliminary experiments, using Haldane's method with blood solution, showed its presence in an ordinary dry oxygen determination.

In this Journal, 1886, p. 159, is an abstract of a paper by F. Fischer on Calorimetric Determinations. Charcoal was burned in a crucible placed in a closed chamber, supplied with oxygen at the top in almost exactly the same way as in the Thomson calorimeter. The products of combustion did not come into contact with the water surrounding the combustion chamber, but left by a tube after cooling. Fischer points out that part of the water formed leaves as vapour, and introduces the necessary correction, which he says has been previously neglected. (The correction of 610 cals. for 1 grm. of water appears to be inaccurate, as the latent heat at 0° C. is only 606·5 calories.)

The escaping gases in the experiment quoted were analysed, and were found to contain carbon monoxide and hydrogen, while carbon and hydrogen were also left in the ash. Roughly, about 1·3 per cent. of the carbon was burned to carbon monoxide, the correction being 77 units, or about 1 per cent. The total correction for the hydrogen was 20 units, five-sevenths of this being in the ash, and for the unburned carbon 120 units.

As in the Thomson calorimeter, if ordinary care is taken, the carbon can be completely burned from the ash, the hydrogen correction becomes trifling, and only the carbon monoxide needs to be considered. The results of the experiments recorded in this paper show that introducing moisture in quantity with the oxygen must compensate for the error due to evaporation, and at the same time add a quantity approximately equal to that due to incomplete combustion. In practice it should be added to the oxygen used in the operation as usually conducted.

The following points are of interest:—

	Per Cent.
An error of 1 mm. in the reading of the water-level causes an error of about	0·25 – 0·3
An error of about $\frac{1}{100}$° C. for 1 grm. of fuel burned, about	0·3
Neglect of radiation error varies greatly; say ...	2—3
Error due to evaporation at 15° C.	1
Formation of carbon monoxide	1—2

Most of the experiments have been carried out at the Victoria Institute, Walsall, and both the work and the slight expenses attending it have been shared by one of my students, Mr. S. L. Thacker, of Walsall, to whom my best thanks are due.

Papers bearing on the combustion of carbon and carbon monoxide in dry oxygen have established the following points:—

Non-propagation of explosion in dried oxygen and carbon monoxide. (Dixon, Brit. Assoc. Rep. 1880, 503.)

Explosion in moist gases dies out in dry. (Dixon, Chem. News, 1882, 46, 151.)

Flame of carbon monoxide in air is extinguished by plunging in dry air. (Traube, Ber. 1885, 6, 1890.)

Dry carbon monoxide and oxygen act as if they were incapable of rapidly uniting. (Dixon, Phil. Trans. 1884, Pt. 2, 671.)

Dried carbon does not glow when heated in dried oxygen, but burns to carbon monoxide. Finely divided platinum causes formation of carbonic acid. (Baker, Phil. Trans. 1888, A 571.)

See also :—

The mode of formation of carbonic acid in the burning of carbon compounds. (Dixon, Chem. Soc. Journ. Trans. 1898, 774.)

Experiments on the effect of nascent state on combination of carbon monoxide and oxygen. (Russell, Chem. Soc. Journ. 1900, 361.)

On the mode of burning of carbon. (Dixon, Journ. Chem. Soc. 1889, 630.)

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I.—PLANT, APPARATUS, AND MACHINERY.

PATENTS.

Ammonia absorption Process for working Cooling and Ice-making Machines. A. Osenbrück, Bremen, Germany. Eng. Pat. 12,767, June 22, 1901.

In ammonia refrigerating machines, an additional water-cooling apparatus is introduced between the temperature exchanger and the ammonia absorber.

Explosion by Ignition; Apparatus for Preventing ——, in Vessels containing Explosive Fluids. R. Scheuffgen, Salzkotten, Germany. Eng. Pat. 2384, Feb. 4, 1901.

The gauze arrangement used to protect the openings of vessels containing explosive fluids is here modified so that it can be attached or removed with a minimum of trouble. A cylindrical sieve, as long as the vessel is deep, is passed into the bunghole or aperture, and fixed to a socket on the floor of the vessel, by means of a screw or other union formed on the lower end of this sieve. A collar at the upper end forms a screw-union at the bunghole sin taneously. To avoid torsion of the sieve, a long-hand key is employed, which reaches to the bottom, and enga a square hole cut into the specially formed sole-piece. upper end, projecting from the vessel, is closed by a scr cap.—R. L. J.

II.—FUEL, GAS, AND LIGHT.

Gas Plants for Gas Engines; Efficient Working of — J. E. Dowson. Proc. Inst. Civil Eng. 1901, **154,** Part

The author points out that the only true basis on which value the efficiencies of gas-producers is a balance-sheet the heat units. For engine work the gas must be free fr tar and other impurities—a desideratum only obtained most plants by the use of anthracite or coke as fuel. question how far the production of a gas-producer may diminished without affecting the quality of the gas, sho also be considered; with anthracite, the output of gas n be diminished 30 per cent. in small, and 50 per cent. in la generators, without appreciable alteration of the quality the gas. Meyer's conclusion, from experiment, that generator is better than two, should be modified to the sta ment that one generator at full power is better than two half power. Appendices give results of trials of Dow plants, the heat efficiencies averaging 80 per cent. Ot plants are also discussed.—J. W. H.

Fuels employed in Malting; Examination of ——, w Special Reference to the Arsenic they contain. A Ling and B. E. R. Newlands.

See under XVII., *page* 1008.

Blast-Furnace Gases; Probable Utilisation of Power from ——. B. H. Thwaite.

See under X., *page* 993.

Refuse Destructors in Combination with Electric Powe Stations. J. S. Highfield.

See under XVIII. B., *page* 1012.

Acetylene; Explosive Properties of Compressed and Liquefied ——. Engineer, Sept. 20, 1901, 308.

See under XXII., *page* 1021.

Ethylene from Inorganic Sources; Production of —— S. A. Tucker and H. R. Moody.

See page 971.

PATENTS.

Fuel; Manufacture of Improved ——. T. Macalpine Chiswick. Eng. Pat. 15,700, Sept. 4, 1900.

Block fuel from peat, sawdust, or wood shavings is form by saturating the material with a light hydrocarbon oil a temperature of 212° F. If peat be used in the fibro condition, it is treated with oils, fats, resins, tars, pitches heated to a temperature of about 400° F. Exce oil, &c. is, in either case, removed by pressure, and t material is formed into blocks. The material may previously treated to extract water.—R. S.

Fuel; Manufacture of Artificial ——. J. A. Lewis, Swansea. Eng. Pat. 16,303, Sept. 13, 1900.

The waste known as "anthracite duff," or similar mater is mixed with a binding agent, compressed, and partial coked in closed receptacles.—R. S.

Fuel and other Substances; Machine for the Agglomer tion of ——. G. E. Watts and C. J. Watts, Guerns Eng. Pat. 19,398, Oct. 30, 1900.

The fuel, &c. is fed by a hopper to one end of a reto which may be made of two adjustable parts and may tap towards the outlet end. The retort may be heated in furnace. At the charging end is a plunger, worked by suitable engine, for compressing the fuel. The apparat is intended for use in making briquettes.—R. S.

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* Any of these specifications may be obtained by post by remitting 8*d*.—the price now fixed for all specifications postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

el; Manufacture of ——. J. Greenwood and J. Greenwood, jun., Cornholme, Lancashire. Eng. Pat. 13,675, July 5, 1901.

OKELESS and odourless substitutes for charcoal are med of two or more of the following ingredients:—arcoal, coke or ashes, lime, anthracite, cement, sodium rate, and brick clay. Materials and approximate proportions are given for six different compositions.—R. S.

ts; Manufacture of ——. C. H. Schill and W. G. 'rimrose, Manchester. Eng. Pat. 8129, April 20, 1901.

prevent clinkering of the fuel in a generator of the Lane e (Eng. Pat. 17,762 of 1900) and similar apparatus, the entors provide one or more smoke passages leading m the upper part to the lower part of the generator. ese pipes cause an up-draught of part of the blast roduced through the blow-holes, conduct part of the oke generated from the raw fuel in the upper part or e between the pipe and the blow-holes in the generator, introduce the smoke at any desired point, where gnites, the products of combustion passing into the enerator with the products of combustion from the down-ught.—C. S.

Generators. W. J. McClurg, Pittsburg (Pa.), U.S.A. Eng. Pat. 12,940, June 25, 1901.

claims include the combination, in a gas producer, of mbustion chamber and a distilling chamber, with fuel s forming the top of the combustion chamber and the om of the distilling chamber; openings through the s of the producer at the ends of the beds, for charging h coal thereon, and openings through the said beds to le the partially distilled coal or coke to be discharged the combustion chamber, and the gases to flow from latter into the distilling chamber. The generating nber has a gas outlet near the top, and a bye-pass, the of which is below the normal level of the fuel in the lucer, whilst the outlet is connected to the generating nber above the normal fuel level. There are also two oustion chambers; two fuel-gasifying chambers (above combustion chambers), connected for the passage of ited fuel from one to the other; a conduit connected the gasifying chamber, and a fixing chamber between ombustion and gasifying chambers, the said chambers ng common side walls.—C. S.

as Producers. M. Taylor, Paris. Eng. Pat. 14,100, July 10, 1901.

upper part of the producer is fitted with a charging e and with a funnel, the lower and smaller end of h projects within the producer proper, below the level e gas outlet, so as to leave an annular space between ning and the said lower end of the funnel.—C. S.

as Producers. M. Taylor, Paris. Eng. Pat. 14,183, July 11, 1901.

claim is for a combination comprising an annular inserted in the supporting base of the apparatus and nding a refractory lining of the lower part of the ucer; a ring, air and steam passages and openings, a r supporting the refractory lining of the said annular , the washer being in turn supported by slightly curved rods extending through the supporting base of the ucer.—C. S.

Producers. E. J. Duff, Liverpool. Eng. Pat. 15,646, Aug. 2, 1901.

mprovements comprise a rotating shell or casing, the nal surface of which is of polygonal outline in plan, hell having a lower depending piece dipping into a -sealed ash trough, whilst a liquid seal and cover suspended from the charging platform, are arranged nnection with the upper end of the casing. The shell vided with rollers or wheels travelling on a circular he driving pinion working in a circular toothed rack e outer circumference of the shell. There is also a r-piece, or air-distributing nozzle, fixed to a pipe in wer part of the producer, and consisting of a number of sloping plates overlapping each other, like louvre boards, whilst curved vane pieces are provided in the openings between the overlapping parts.—C. S.

Furnace Gases; Apparatus for Ascertaining and Recording the Composition of ——. M. Arndt. Eng. Pat. 18,931, 1901.

See under XXIII., *page* 1025.

Gas Burners for Heating Purposes. C. M. Seifert, New York. Eng. Pat. 11,903, June 11, 1901.

THE invention described, which is applicable to burners used for heating boilers, &c., relates to an "economiser" for heating the gas and air supplies of the burners, by means of the heat of the gaseous products of combustion. The waste gases flow from the fire-chamber of the boiler through a tortuous flue, within which, and surrounding which, are arranged pipes and chambers, through which the combustible gas and air respectively flow on their way to the burners.—H. B.

Bunsen or like Burners for Lighting or Heating. K. Zehnpfund, Berlin. Eng. Pat. 14,250, July 12, 1901.

IN a Bunsen burner for use in incandescent gas lighting, the usual solid central portion of the burner head is dispensed with, and a short tube is fixed centrally in the burner head. The upper part of this tube, which "ends at or above the border line of the lower "air cone" of the flame, is open, while the lower end is closed, with the exception of three openings, which communicate, through narrow pipes, with the outer air. By this means a secondary air supply is introduced into the flame some distance above the burner mouth, "creating fresh air cones and fresh hottest zones." Instead of only one tube, two or more may be used, all arranged concentrically one above the other, each being of less diameter than the one beneath it; and in this way a corresponding number of additional air supplies are introduced at different heights into the flame, the central core of the flame being correspondingly extended.—H. B.

Vapour-Burners for [Motor] Steam Generators. H. H. Lake, London. From W. P. Kidder, Boston, U.S.A. Eng. Pat. 10,365, May 18, 1901.

THIS relates to vapour burners for steam boilers, in which the heat of the steam and water in the boiler is utilised to vaporise the gasoline or other volatile hydrocarbon constituting the fuel. The fuel supply pipe, or an elongation of it, passes down through the water in the boiler, between the fire-tubes. The vapour generated issues in a downward direction from a valve-controlled jet placed near the top of the boiler, and passes down an air-mixing tube to a vapour chamber beneath the fire pot of the boiler. Through the vapour chamber, which extends across the bottom of the fire pot, there pass several air conduits communicating with the outer air, and the combustible gases issuing from the vapour chamber mingle with the air and burn beneath the boiler. Within the fire pot itself is mounted an auxiliary-burner, which is supplied with vapour from an auxiliary valve-controlled jet, and provided with an auxiliary air mixing tube placed close to those referred to above.—H. B.

Acetylene Gas; Apparatus for Manufacturing ——. J. F. Smyth, Saintfield, co. Down, Ireland. Eng. Pat. 16,409, Sept. 15, 1900.

FROM the top of a tank, containing water maintained at a constant level, depend three chambers open at the base. One contains a carbide holder with perforations at base, by which the amount of water which enters it can be regulated. The gas evolved passes into the second chamber, from which it passes into the gasholder through a pipe with valve, which is automatically closed when the gasholder is about three-fourths full. The back pressure then depresses the level of the water in the generating chamber below the carbide holder, and any gas subsequently evolved through the moisture left therein passes to the third chamber and thence direct to the gasholder. Purifiers are provided, and means for lowering and raising the carbide holder.
—J. A. B.

Acetylene Gas; Treatment of ——. G. W. Johnson, London. From A. Wolf, jun., and Co., Frankfort-on-Maine. Eng. Pat. 18,181, Oct. 12, 1900.

The gas is passed over light petroleum spirit, gasoline, benzene, ether, or similar volatile bodies, and thereby absorbs vapour from them. When thus treated it is stated to be well adapted for lighting by incandescence and use in gas engines.—J. A. B.

Acetylene Gas; Apparatus for the Generation of ——. D. C. Beggs and W. Fielding, both of Ballyclare, co. Antrim. Eng. Pat. 18,674, Oct. 19, 1900.

Improvements, more particularly applicable to the generating apparatus claimed under Eng. Pat. 25,917 of 1898 (this Journal, 1900, 333) are described. They comprise means for introducing gas to the rear of the piston-head in the carbide cylinder, a gas tight piston-head, an incurved top to the gasholder, a safety valve, a sludge receiver, and a rack connected with the piston-rod of the carbide cylinder.—J. A. B.

Acetylene Gas Generators. H. de Thiersant and W. A. Coulson, both of London. Eng. Pat. 20,369, Nov. 12, 1900.

In acetylene generators of the kind claimed under Eng. Pat. 29,571 of 1897 (this Journal, 1898, 568), a solid bottom, having a water inlet adapted to be closed by a fixed conical plug, is provided for the carbide holder, in order to prevent access of water or moisture to the carbide when the apparatus is not in action.—J. A. B.

Acetylene Lamps. S. L. Budzinski, Bagnolet, France. Eng. Pat. 11,085, May 29, 1901.

An outer casing contains water, and supports therein, by means of an incurved rim, a generating vessel, to which the water is admitted through a hole near its base, by operating a rod which passes over the hole. A perforated casing within the generating vessel contains carbide, and is secured by clamps, which compress packing material, to the bottom plate of the generating vessel. Water reaches the carbide in sufficient quantity, when only a small quantity of gas is required, through the packing material.—J. A. B.

Carburetting Air with Carburetted Hydrogen; Process and Apparatus for ——. P. R. van der Made, Breukelem, Holland. Eng. Pat. 12,858, June 24, 1901.

The apparatus comprises two pumps, worked in regular sequence from the same shaft, one of which pumps forces water into a container and displaces there a predetermined volume of carburetted hydrogen, which is delivered from the top of the container, through a dipping tube, into a mixing chamber, whilst the other pump compresses a predetermined corresponding volume of air, which it forces through a spray in the lower part of the mixing chamber and in fine jets through the carburetted hydrogen. The mixing chamber is characterised by connecting several cylindrical mixers or vessels, arranged one above the other, by means of pipes for the purpose of distributing the carburetted hydrogen over as many air sprays as there are mixers, and also by connecting the empty space of one mixer with the next following spray pipe, in order to progressively impregnate the air introduced into the lowest spray pipe.—C. S

Air and the Vapour of Volatile Liquids; Apparatus for Producing a Constant Mixture of ——. R. Haddan, London. From B. A. Guy, Paris. Eng. Pat. 19,054, Oct. 24, 1900.

The apparatus consists of an air-blower, a carburettor or vaporising vessel, a gas meter through which the carburetted air passes, a reservoir for the volatile liquid, and a feeding apparatus placed beneath the reservoir and communicating with the carburettor. The horizontal shaft of the meter extends through a stuffing box to the outside of the meter, and carries a pulley, which is connected, by means of a chain, with another pulley attached to the feeding apparatus, so that the feeder and meter operate simultaneously. The feeder is so constructed as to admit into the carburettor an amount of volatile liquid proportionate to the carburetted air discharged by the meter. Fi shows one form of feeder, in which the plug c of a coc provided with a number of cavities, 5; as the pulle revolves, each cavity i turn filled with the vol liquid from the reser above, and in turn discha the liquid into the carbi tor below. Fig. 2 shov second construction, in w the cavities or cups 7 arranged on the peripl of a wheel, 9, the shaft which is horizontally clined. About three-fou of the wheel are imme in the mercury, 10, forn a seal between the pa (which communicates the reservoir, and is ful hydrocarbon) and the p (which communicates the carburettor). Thu each revolution of the ley *p*, so many cupful volatile hydrocarbon will into the carburettor. suitable forms of air-blo carburettor, and reser may be used in combina with the feeding arra ment.—H. B.

Fig. 1.

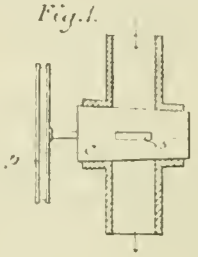
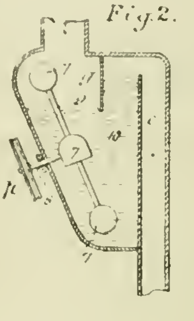


Fig. 2.



Hydrocarbons, Alcohols, and other Combustible Liq for Heating Purposes; Apparatus for Burning ——. J. A. and J. M. B. Rey, Paris. Eng. Pat. 10,023, Ma 1901.

The improvements relate to burners of the class desc in Eng. Pat. 3057 of 1900 (this Journal, 1900, 522) which the combustible liquid, under pressure, is vapo in a worm which is in contact with the flame. The cl are for placing the inlet orifice of the "diffusing mixer an angle to the outlet orifice of the same; and for he the air in a closed casing, surrounding the vapor worm, and having an air-outlet tube surrounding the which conveys the vapour to the diffusing mixer. latter consists of a tube, the sides of which converge short distance, and then gradually diverge towards mouth of the burner.—H. B.

Lighting or Heating Gas, either previously forme simultaneously generated as Carburetted Air; Pr for Mixing Oxygen with ——. F. Dannert, B Eng. Pat. 5149, March 11, 1901.

Porous substances, such as vegetable carbon or pu stone, which are capable of condensing gases on the sur are saturated with oxygen and formed into cartridges, w are inserted into gas mains, so that the lighting or hea gas has to pass through the porous bodies, thereby ta up a proportion of oxygen. The impregnated bodies also be arranged inside carburettors used for gener carburetted-air gas.—H. B.

Spirits; Manufacture of Solidified Carburetted —— *or Heating or Lighting Purposes.* L. Denayrouze, Ne France. Eng. Pat. 17,687, Oct. 5, 1900.

The process claimed consists in compounding a solidif material with ordinary alcohol ("spirit") and a rich hy carbon, preferably benzene, with or without finely subdiv bodies rich in carbon and hydrogen, such as cotton w According to the first example given, nitrocellulo dissolved in alcohol containing some ether; the eth allowed to evaporate, and a combustible transparent is obtained, which burns without leaving a residue. second example, benzene is combined with the produ the first, and there may be incorparated small quan of soap, cotton waste, lycopodium, sawdust, &c. If suffi benzene is added, the flame of the burning materi luminous and may be used for lighting.—H. B.

s; Manufacture of Pellets for Automatically Igniting
——. J. Bleichrode, New York. Eng. Pat. 22,388,
)ec. 8, 1900.

CONCENTRATED solution is prepared containing 1 part of
oride of platinum and 1 part of thorium nitrate to 0·1
t of cerium nitrate. Vegetable tissue is soaked in the
ition and incinerated, and the ash is moulded into pellets
h water and subjected to a red heat.—H. B.

candescent Gas Burners. W. T. Sugg, Westminster.
Eng. Pat. 19,061, Oct. 21, 1900.

e burner described is designed to prevent "lighting
k." A gas injector is screwed into the lower end of a
er tube (provided with air-inlets as usual), which is
ened at its upper end to form a circular chamber of
ut $1\frac{3}{4}$ ins. in diameter. Across the chamber stretches a
of perforated metal. A tubular extension, of less dia-
er than, and extending from the top of, the chamber,
ies the burner proper, which consists of a steatite cap
vided with holes in the top, drilled at a suitable angle as
r the edge of the cap as possible, leaving a solid central
tion.—H. B.

andescent Gas Lighting; High-Pressure Accumulator
or ——. H. Howell, London. Eng. Pat. 16,780, Sept.
0, 1900.

THIS a cylindrical pipe or tank, closed at the bottom, is
nged concentrically a second cylinder, twice the length
he former, the diameter of the two cylinders being such
the area of the annular space between them is equal
hat of the inner cylinder. The outer cylinder is closed
he top by a gas-tight annular cover, which is fitted with
ck serving as an overflow cock for water and as an
let for the compressed gas. The lower end of the inner
nder, which rests upon the bottom of the outer cylinder,
rovided with openings which permit free communication
ween the two. Water is poured into the inner cylinder,
il it overflows from the above-mentioned cock, and a
is then placed upon the top of the cylinder. Compressed
is now pumped into the outer cylinder through a pipe
ch enters the gas-tight cover already referred to, the
er being thus depressed in the outer cylinder and raised
hin the inner one. A branch of the compressed-gas
e passes through the upper part of the inner cylinder,
re it is provided with a float valve, and beyond this
e it communicates with the gas main. When the
ssure in the apparatus becomes too high, the water rising
the inner cylinder lifts the float, thus relieving the
ssure in the outer cylinder. The float valve actuates a
r attached to the compression motor, regulating the
ed of the latter as required. By means of a regulator
ched to the gas-outlet cock, the gas issuing from the
aratus is regulated to 9 ins. pressure, whatever may be
pressure inside the apparatus.—H. B.

ncandescence Bodies; Manufacture of Electric ——.
F. Dannert, Berlin. Eng. Pat. 8434, May 7, 1900.

ERE is claimed "the production of electric incandescence
ies having a covering formed of mixtures of carbon and
allic oxides, the distinguishing feature being that the
ntity of metallic oxides contained in the coating, or
ering, is gradually decreased, whilst the quantity of
oon, on the contrary, is increased, inwardly." For
mple, a filament is first boiled in a solution containing
rts of sugar and 1 part of lime; it is then baked in a
ffle furnace, next boiled in a solution of equal parts of
ar and lime, and again baked. This filament is said to
tain more metallic oxide towards the exterior. Or, a
odion filament may be boiled in a solution of calcium
ride, and afterwards dipped into a solution of sodium
oonate, whereby a deposit of calcium carbonate,
inishing in proportion towards the centre of the
nent, is produced.—H. B.

iments [Carbide]; Manufacture of ——, *for Incan-*
escing Electric Lamps. W. L. Voelker, London. Eng.
at. 11,344, June 22, 1900.

manufacture carbide filaments, a thread of cotton or
r carbonisable fibre is soaked in a solution of an easily decomposable compound of the metal which is to form the metallic base of the carbide. The thread is dried, spooled upon a cylinder of paper, heated gradually during 12 hours to about 400° F., then placed in a crucible, well packed with sugar-carbon and powdered carbide of the kind to be produced, and carbonised by bringing the sealed crucible to a white heat in a suitable furnace. After the crucible has been allowed to cool, the thread is passed through an electric arc enclosed in a reducing atmosphere, which may be charged with the vapour of the metal forming the base of the carbide, of which the thread now consists. Instead of producing a filament by the soaking process, an ordinary carbon filament may be passed through an electric arc in a reducing atmosphere, and then passed through an arc in the presence of the vapour of the metal to be combined with the carbon. In treating the carbonised thread in the electric arc, the end of the thread is passed up through the axis of two longitudinally perforated carbon electrodes, mounted co axially, and capable of being moved apart; or several carbon pencils may be arranged vertically about a central passage through which the filament is led. The spool carrying the thread is placed in the lower part of the apparatus, and the thread is wound, as treated, upon a reel at the top, the whole apparatus being filled with hydrogen. The arc is surrounded by a cylinder of the metal intended to form the base of the carbide, or of the carbide itself, the cylinder being enclosed within a tight-fitting globe.—H. B.

Electric Furnaces [Continuous Arc]. A. Parker, Chorley. Eng. Pat. 18,645, Oct. 18, 1900.

A ROTARY platform, operated by a worm and worm wheel, or other mechanism, is carried by a foundation plate, suitably mounted and insulated, and on it is placed a crucible rotatable about its vertical axis. A positive carbon of oblong cross section extends diametrically across the crucible, and hoppers or shoots for feeding the material to be fused at the sides of the carbon are so arranged that the material is directed into the arc and becomes fused before reaching the crucible. Means are provided for raising the positive electrode as the crucible fills up.—G. H. R.

Electric Furnaces. [Pyro-electrolyte.] The British Thomson-Houston Co., Ltd., London. From C. P. Steinmetz, Schenectady, U.S.A. Eng. Pat. 15,920, Sept. 7, 1900.

MANY refractory materials, such as refractory oxides, silicates, &c., are of comparatively high resistance at ordinary temperatures, but increase in conductivity when heated, their conductivity increasing with the temperature. These conductors are termed "pyro-electrolytes" by the patentees. The material to be heated is enclosed in a furnace, the walls of which are formed of a pyro-electrolyte which can be initially heated in various ways. A source of current of high electromotive force is connected to terminals passing through the walls of the furnace, and between them extends a conductor of relatively small cross section.
—G. H. R.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Wood Charcoal; Manufacture of ——, *by the Von Heidenstam Process.* Jürgensen and Bauschlicher. Chem.-Zeit. 1901, **25**, 635.

THIS is a process for manufacturing coherent blocks of charcoal, of uniform size and shape, from the sawdust, chips, and shavings of wood-working factories. The waste material is first passed through special roller-grinding machinery, which reduces it to a rough powder and simultaneously lowers the proportion of moisture from 50 or 60 per cent to 15 or 25 per cent. The product next passes through apparatus heated by means of the gases issuing from the carbonising plant, where it is completely dried; and then it enters the presses, where it is converted into cylinders. Finally it travels to the ovens—vertical iron vessels surrounded by a fireplace and brick walls. The exit for the products of distillation is at the bottom of the retorts, the lid of each of which is a cast-iron plate, which constantly applies pressure to the carbonising wood. The charcoal is therefore made under continual pressure, whilst the gases, &c., are free to escape, uncompressed, into the condensing plant. The volatile constituents pass off from the retorts, and after condensation as tar and crude acid, these are worked up as usual for acetic acid, acetone, wood creosote, &c. The pitch remains behind, and eventually serves as a cement for the charcoal briquettes. The process of distillation requires 14 hours for completion, and the charcoal is left 12 or 14 hours longer in the retorts to cool. The finished material has a calorific value of 7,800. Von Heidenstam's process is in operation at one of the largest sawmills in Sweden.—F. H. L.

Paraffin; Extraction of ——, from Lignite Tar. Ger. Pat. 123,101, Aug. 18, 1900. R. Pauli, Berlin. Zeits. angew. Chem. 1901. **14**, [35], 883.

This process, which renders possible the complete removal of paraffin from tar in 10 hours, consists in treating the tar in an autoclave with 10 times its weight of 90 per cent. alcohol at 80° C., the alcoholic liquid being afterwards cooled until the paraffin separates. The alcohol, creosote, and oil are then removed in a centrifugal and the paraffin is washed with alcohol, the last traces of which are got rid of by distillation, and finally decolorised by means of bone black.—T. H. P.

PATENT.

Paraffin; Purification of ——. N. M. Henderson, D. R. Steuart, and J. Calderhead, Broxburn, N.B. Eng. Pat. 19,711, Nov. 3, 1900.

The decolorising agent used (*e.g.*, animal charcoal) is subjected to the action of a liquid and vaporised solvent, such as shale spirit of sp. gr. 0·730, to extract the retained paraffin, the solvent being then expelled from the decolorising agent and the recovered paraffin by the aid of steam.

The apparatus consists of a still, fitted with an inlet pipe for the solvent, a condenser for the vaporised solvent, a close and a perforated steam coil, and also with a movable pan with perforated bottom, for containing the decolorising agent to be treated.—C. S.

IV.—COLOURING MATTERS AND DYESTUFFS.

Aniline and Analogous Bases: New Method of Preparing ——. P. Sabatier and J. B. Senderens. Comptes Rend. **133**, [6], 321—324.

When the vapour of nitrobenzene, mixed with excess of hydrogen, is passed through a tube containing finely divided copper at 300—400° C., it is completely reduced to aniline. The aniline and water formed can be collected in an appropriate receiver, and are then easily separated. The proportion of hydrogen present must reach twice that theoretically needed, or the product will contain azobenzene, or even unaltered nitrobenzene.

By a similar process, ortho- and metadinitrotoluene yield the corresponding amino compounds, and other amines can be prepared in the same way. Freshly reduced nickel is more active than copper; but if it be used for the reaction, the temperature must be carefully regulated, and kept near 200° C. At 250° C. ammonia is found among the products ($C_6H_5.NO_2 + 4H_2 = C_6H_6 + NH_3 + 2H_2O$), and at 300° C. ammonia and benzene are the chief products, whilst with a great excess of hydrogen at 300° C. the benzene itself is hydrogenised, and methane is formed. Above 300° C. a certain amount of diphenylamine is found in the products; this is formed by the action of the nickel on the aniline ($2C_6H_5NH_2 = NH_3 + NH(C_6H_5)_2$). Cobalt and iron, reduced from their oxides by hydrogen, behave similarly to nickel; so does finely divided platinum, but in this case any deficiency in hydrogen leads to the formation of hydrazobenzene. Water-gas or coal-gas may be substituted for hydrogen; and, from the low price of these materials, and the fact that the same quantity of metal may be used indefinitely, the method promises well as an industrial process.—J. T. D.

Diphenylamine; New Derivatives of ——. P. Coh
Monatsh. Chem. **22**, 385—397.

Primary aromatic amines and their substitution proc combine readily with *o*- and *p*-nitrochlorobenzenes to derivatives of diphenylamine—

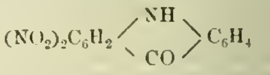
$$C_6H_5NH_2 + ClC_6H_3(NO_2)_2 = C_6H_5NHC_6H_3(NO_2)_2 +$$

The author has made use of the dinitrochlorobenzoic m.pt. 199°—200° C., which is patented by Kalle and C Biebrich (Ger. Pat. 106,510), for the production of derivatives of diphenylamine. This acid is capabl liberating acetic acid from its salts, and is characte by the easy solubility and fine crystalline form of its a salts. The chlorine atom can be readily substitute a hydroxyl group by means of excess of alkali, or b amino group by means of excess of ammonia. 3.5-Din 2-aminobenzoic acid (m. pt. 265° C., Salkowski, Ann **173**, 45) is formed on boiling with ammonia; 3.5-din salicylic acid (m. pt. 173° C., Hübner, Annalen, **194**, on boiling with two molecules of caustic soda. constitution of the acid is therefore represented by formula—

$$C_6H_2COOH(NO_2)_2Cl[COOH : NO_2 : NO_2 : Cl = 1:3:5$$

The ethyl ester melts at 54° C.

Condensation Products: *o-p-Dinitrodiphenylan carboxylic Acid*, $COOH(NO_2)_2.C_6H_2.NH.C_6H_5$.—6·1 g of dinitrochlorobenzoic acid and 2·3 grms. of anilin aqueous alcoholic solution are boiled, with reflux conde for two hours, in the presence of 7 grms. of sodium ace The substance is obtained on acidifying, in yellow nee melting when pure at 214° C. It dissolves readily in alc and glacial acetic acid, but only with difficulty in hot w Of the salts described by the author, very characteristic the potassium salt, which crystallises in fine red nee sparingly soluble in cold water; and the ammonium (red translucent monoclinic prisms). On treating product obtained by condensation of aniline with dinitro-6-chlorobenzoic acid, with 10 parts of concentr sulphuric acid, *Dinitro-acridone*—



$$(NO_2)_2C_6H_2\begin{matrix}\diagup NH \diagdown\\ \diagdown CO \diagup\end{matrix}C_6H_4$$

is formed. This substance is sparingly soluble in mo the usual solvents, but can be purified by crystallisa from pyridine, in which it readily dissolves. The mel point is above 300° C.

o-p-Dinitro-p hydroxydiphenylaminecarboxylic Acid,-

$$COOH(NO_2)_2C_6H_2.NH.C_6H_4OH.$$

12·3 grms. of dinitrochlorobenzoic acid, 5·2 grms. of *p*-am phenol, and 7 grms. of sodium acetate in aqueous alco solution are boiled, with reflux condenser, for three-qua of an hour. The condensation product crystallises from water in beautiful dark red needles melting at 103 (Ger. Pat. 108,872). The salts are mostly very solu An acetyl derivative, m. pt. 97°—99°, and a benzoyl d vative, m. pt. 123° C., are described.

o-p-Dinitrophenyl-α-naphthylaminecarboxylic Acid,—

$$COOH(NO_2)_2C_6H_2.NH.C_{10}H_7.$$

6·1 grms. of dinitrochlorobenzoic acid, 3·5 grms. of α-na thylamine, and 7 grms. of sodium acetate in aqueous alco solution are heated on the water-bath until the sme α-naphthylamine has disappeared. Red needles are obtai melting at 150°—151°, dissolving readily in hot alcohol glacial acetic acid, but sparingly in boiling water.

o-p-Dinitrophenyl-β-naphthylaminecarboxylic Acid.— grms of dinitrochlorobenzoic acid, 3·5 grms. of β-naphth amine, and 7 grms. of sodium acetate in aqueous alco solution are heated on the water-bath for half an h Microscopic needles of an orange-red colour are obtai m. pt. 238°—239° C., dissolving sparingly in hot water readily in hot alcohol and glacial acetic acid. Both um and potassium salts crystallise well from water in ge-red leaflets. A dinitronaphthacridone is obtained on ting with concentrated H_2SO_4, analogous to the subce obtained from the aniline condensation product.

p Dinitrodiphenylaminedicarboxylic Acid,—

$$COOH(NO_2)_2C_6H_2NH.C_6H_4(COOH).$$

grms. of dinitrochlorobenzoic acid, 3·7 grms. of anthranilic , and 10·2 grms. of sodium acetate are boiled for one hour queous solution. The substance is obtained on acidifying, crystallises well from dilute alcohol in shining yellowin needles. It begins to sinter at 135°, and melts een 153° and 159° C. The substance dissolves readily ot water, in alcohol, and in glacial acetic acid. The li salts are very soluble in water, and do not crystallise The barium salt crystallises in orange-coloured les. The calcium salt is insoluble. An acetyl comal was prepared, melting at 234°—235° C.—H. L.

go; Natural and Artificial ——. A. Turnbull. J. Soc. Dyers and Colourists, 1901, **17**, [8], 198

e United States, synthetic Indigo has found practical cation in certain branches of dyeing, whilst in others it ailed to produce results equal to the natural product.

calico-printing, where the hydrosulphite vat is used, r for resist or discharge styles, it has practically driven he natural product; the whites are clearer and better, he yield is increased, as the vat remains longer clean n good condition. Wherever the hydrosulphite vat is whether for wool or cotton, synthetic Indigo has ced the natural; but in the woad vat it has not been at success, as it is almost impossible to maintain the ntation. In this vat, and in the potash and molasses atural Indigo is still employed.

s everywhere admitted that the synthetic is quite as s the natural product under the same conditions, both gards light and scouring. The synthetic also gives the ter colour, but this is a detriment in the dyeing of s, where a heavy, dull, dark blue is wanted, and here natural Indigo still holds the market.—R. B. B.

ylglycine-o carboxylic Acid [*for Indigo*]; *Preparaof Esters of* ——. Chemische Fabrik von Heyden, debeul, Dresden. Ger. Pat. 122,687, March 30, 1899. ts. angew. Chem. 1901, **14**, [34], 857.

is made for the preparation of the acid esters of lglycine-o carboxylic acid—which are used as starting ets in the manufacture of indigo—by treating (1) nilic acid with esters of chloracetic acid, or (2) esters hranilic acid with chloracetic acid.—T. H. P.

in and Coeruleïn; Constitution of ——. W. R. dorff and C. E. Brewer. Amer. Chem. J. **26**, [2], –158.

uthors first refer to the researches of Baeyer (Ber. **4**, and Buchka (Annalen, **209**, 251) on the constitution leïn, and then give the results of their own investigation e subject. The more important facts ascertained by may be summarised as follows:—

The only reduction product of galleïn by zinc dust, er in acid or alkaline solution, is gallin.

Galleïn forms mono-esters, showing that it contains rboxyl group.

Three phenylisocyanate groups may be introduced molecule of gallein, proving that it contains three l hydroxyl groups.

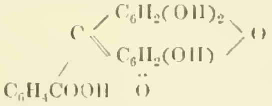
Two classes of tetra-alkyl ethers, *coloured* and *less*, are derivable from galleïn, indicating that it in tautomeric modifications.

Galleïn yields a colourless tetra-acetate, as shown by g determinations of the number of acetyl groups uced. This proves that galleïn may act as a tetra acid l.

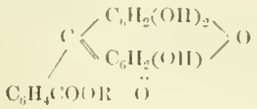
Colourless trialkyl derivatives of galleïn, which ble phenolphthaleïn, are obtainable.

A colourless mono-acetyl trimethyl galleïn is de- d.

The structure of galleïn in the free condition must therefore, according to the authors, be represented by the formula—

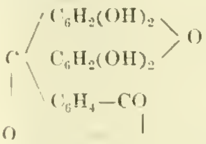


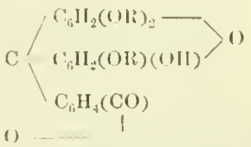
The highly coloured methyl and ethyl esters would have the formula—



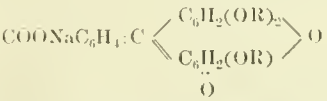
The above formula for galleïn explains also the formation and properties of the coloured triphenyl carbonate and of the coloured tetramethyl and tetraethyl ethers.

On the other hand, the trimethyl and triethyl ethers, which, when uncombined are colourless, but dissolve in an aqueous solution of sodium carbonate with red colour, seem to be derived from the tautomeric form of galleïn, corresponding to Bayer's formula—



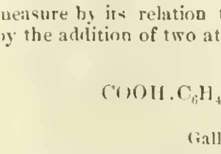


I. Galleïn trialkyl ether (colourless).

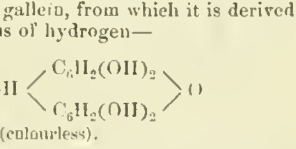


II. Sodium salt of gallein trialkyl ether (red).

The trialkyl ethers represented under formula I. can be readily transformed into (III.) colourless tetra-alkyl ethers, and (IV.) into colourless acetyltrialkyl ethers of galleïn—



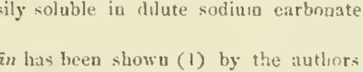
III.



IV.

These substances are unaffected by alkalis.

Gallin.—The structure of gallin is established in a measure by its relation to galleïn, from which it is derived by the addition of two atoms of hydrogen—



Gallin (colourless).

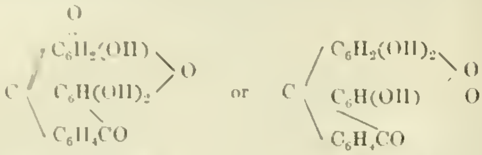
In support of this formula the authors have prepared—

(1) A colourless tetra-acetate, a compound with acid properties, which dissolves in an aqueous solution of sodium carbonate, and forms a silver salt.

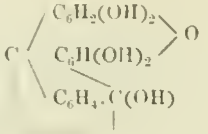
(2) A pentamethyl ether which is insoluble in cold alkalis. By heating with dilute alkalis it is hydrolysed, forming a product easily soluble in dilute sodium carbonate, without colour.

Coeruleïn has been shown (1) by the authors to form a triacetyl derivative, by the determination of the number of acetyl groups introduced. (2) Coeruleïn forms *two* monomethyl ethers (three are possible), and also a methyl ether which is insoluble in alkalis (it was probably coeruleïn trimethyl ether); likewise a monoethyl ether. (3) Coerulin forms a penta-acetyl derivative, as shown by making determinations of the number of acetyl groups introduced.

Coeruleïn is derived from galleïn, probably by the loss of one molecule of water. Its formula must be either—



Coerulin, which is derived from coeruleïn by the addition of two hydrogen atoms, was proved to form a penta-acetyl derivative by making determinations of the number of acetyl groups introduced. Probably the constitution is represented by the formula—



—H. L.

Dialkylaminobenzoylbenzoic Acids and Tetrachlorodialkylamino-m-oxybenzoylbenzoic Acids; New Derivatives of ——. Corresponding Dialkylamino-anthraquinones and Dialkylamino-oxyanthraquinones. A. Haller and H. Umbgrove. Bull. Soc. Chim. 1901, **25**, [15], 745—749.

The authors, in continuation of their previous work (Bull. Soc. Chim. **25**, 598), have now prepared certain derivatives of the tetrachlorodimethyl- and diethylaminobenzoylbenzoic acids and their ethers already described. By the action of nascent nitrous acid or nitric acid on the dimethylamino acid they have obtained nitroso and nitro derivatives. For instance, by gradually adding sodium nitrite to a solution of the dimethylamino acid in glacial acetic acid, and subsequently distilling off the acetic acid *in vacuo*, a residue is obtained which is dissolved in sodium carbonate. This solution deposits yellow crystals which are dissolved in water, and the solution is then neutralised with sulphuric acid. The red gum which precipitates is crystallised from methyl alcohol, from which the product separates in yellow leaflets melting at 130° C. It has the formula—

$$HO_2C.C_6Cl_4.CO.C_6H_3.NO.N(CH_3)_2 + H_2O,$$

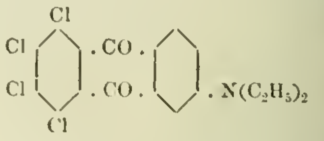
and is almost insoluble in water, but soluble in ethyl, less so in methyl alcohol, and gives Liebermann's nitroso reaction with phenol and sulphuric acid. In a similar manner, the action of nitric acid in place of sodium nitrite produces the nitro compound having the formula—

$$HO_2C.C_6Cl_4.CO.C_6H_3.NO_2.N(CH_3)_2.$$

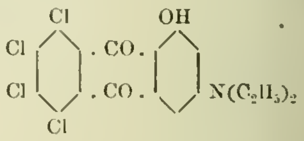
This product crystallises from methyl alcohol in yellow leaflets melting at 147° C.

For the preparation of tetra-chlorodiethylamino-*m*-hydroxybenzoylbenzoic acid, diethyl-*m*-aminophenol and tetrachlorophthalic anhydride are heated with constant agitation in an oil-bath to 150° C. After cooling, the melt is powdered, extracted with a small quantity of alcohol to remove Rhodamine and any unaltered products. The residue is recrystallised from alcohol and yields colourless crystals melting at 198° C. to a reddish mass. The product is soluble in alcohols, very soluble in acetic acid, less so in benzene and toluene. Heated with concentrated sulphuric acid to 180° C. it decomposes into tetrachlorophthalic acid and diethyl-*m*-aminophenol, which latter combines with some of the unaltered benzoyl derivative, giving tetrachlorotetraethyl-rhodamine. When heated on the water-bath in sulphuric acid solution with the corresponding quantity of diethyl-*m*-aminophenol, it forms tetrachlorodimethyldiethylrhodamine, which, after purification, yields bronzy violet crystals dyeing silk a fluorescent violet red. On reduction in acetic acid solution with granulated zinc and hydrochloric acid, the tetrachlorodiethylamino-*m*-hydroxybenzoyl benzoic acid is converted into the *m*-hydroxybenzyl derivative, which crystallises from methyl alcohol in small white nodules melting at 205° C.

The conversion of tetrachlorodiethylaminobenzylbe acid into the corresponding anthraquinone is effected i same way as that already described by Haller and G (Comptes Rend. **126**, 1544; this Journal, 1898, 655 the non-chlorinated derivatives, by heating with ten its weight of concentrated sulphuric acid on the water for two hours. After diluting the brownish melt water, the violet solution obtained is boiled with an e of ferric chloride. A reddish oil precipitates which crystallises, and after washing with sodium carbonat water is dissolved in toluene. The toluene is distille and the residue crystallised from acetic acid and alc giving dark red needles of tetrachlorodiethylaminoan quinone melting at 144° C., and having the formula—



In order to obtain the anthraquinone derivative fro tetrachlorodiethylamino-*m*-hydroxybenzoylbenzoic aci latter is heated on the water-bath with 8 parts of fu sulphuric acid (30 per cent. SO_3) for about 20 minute melt then being poured into cold water. The precipit dissolved in acetic acid, mixed with an equal volu boiling alcohol, and on cooling, violet bronzy leaflets o product—



melting at 192° C., separate out.—T. A. L.

Ortho-Nitro-anthraquinone and 1.5- and a-Dinitro-an quinones; Electrolytic Reduction of ——. J. Möl

See under XI. A., *page* 1001.

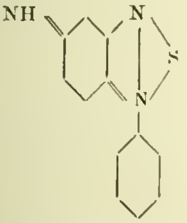
Chrome Dyestuffs, Violet, derived from Diphenylcarb P. Cazeneuve. Bull. Soc. Chim. 1901, **25**, [15], 761.

The author has already pointed out (Bull. Soc. Chim **24**, 701) that diphenylcarbazide is a sensitive reage chromic acid and chromates, giving even in a str acid medium a stable violet dyestuff. He has now sepa this dyestuff, in which chromium appears to act chromophore, and finds that it is an organo-m chromium derivative, somewhat fast to acids. The a of chromium present depends upon the medium in the oxidation with chromic acid is performed. For inst 12 grms. of diphenylcarbazide are dissolved in 25 gr acetic acid and 25 c.c. of water. A solution of ch acid (5 grms. in 50 c.c. of water) is gradually a Carbon dioxide is given off, and the solution turns a violet shade. On cooling, the greater part of the dy separates, and is purified by recrystallisation from alc from which it is deposited as an amorphous powder. analysis, it approximates to the formula $C_{41}H_{44}N_{10}$ and is probably an oxazine with ketonic or phenolic g in the benzene nuclei. When dry, it forms a violet bla mass, with a golden reflex, and it dissolves without a tion in concentrated sulphuric or acetic acid. The alc solution remains unchanged on addition of hydroc acid, whilst chloroform, benzene, amyl alcohol, and extract the dyestuff from its strongly acid aq solution. It is noteworthy that diphenylcar $C_6H_5.N_2.CO.NH.C_6H_5$ gives no similar reaction chromic acid, whilst symmetrical dimethyldiphenylcarb $[C_6H_5.N(CH_3).NH]_2CO$ gives an analogous violet dy With regard to the dyeing properties of the subst which, however, have no technical value, it is found the dyestuff acts as a tolerably strong base. In neutr slightly acid solution, it dyes silk a reddish-violet, the of Dimethylbenzoxylsafranine, and is somewhat fast light than this colour. It stands acids tolerably well, alis redden it slightly, and its fastness to soaping is)ut similar to that of the safranines. It dyes tannined ton a reddish-violet, very fugitive to light, whilst wool rdanted with bichromate is dyed at 45° C. by immersion a bath containing diphenylcarbazide acetate in suspension. similar dyestuff, but containing a smaller proportion of omium, is obtained by treating 5 grms. of diphenyl-bazide acetate, suspended in 1 litre of water, with grm. of chromic acid, dissolved in 100 c.c. of water. e product possesses the same dyeing properties as that eady described.—T. A. L.

lphur Dyestuffs; Constitution of ——. Geigy. Bull. Soc. Ind. Mulhouse, Procès-verbaux, 1901, 123—125.

RTAIN sulphur compounds containing, as chromophors, thiol groups, or SH-groups attached to nitrogen atoms, known (Ber. **22**, 2895; **33**, 796).

'he sulphur dyestuffs of the Vidal Black group belong to class. A compound of the same class is formed on ting diaminodiphenylamine (obtained by reducing the duct resulting from the action of dinitrochlorobenzene niline) with aqueous sulphurous acid at 180—190° C. black substance which is produced has the character- properties of the sulphur dyestuffs, namely, insolubility most solvents, solubility with a greenish colour in a tion of sodium sulphide, and affinity for unmordanted on, dyeing this a black which is rendered more intense oxidising agents. The constitutional formula of the pound is probably—



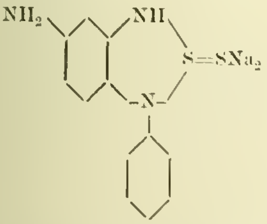
dissolves in nitrobenzene with a green colour. On ction with zinc and hydrochloric acid, it is decomposed diaminodiphenylamine and hydrogen sulphide.

sulphonic acid derivative is readily dissolved by im carbonate, but the solution does not dye cotton, pt in the presence of sodium sulphide.

ne hydroxy derivative, obtained from diaminohydroxy enylamine by the same method, has similar properties.

ie above reaction is capable of general application; , *p*-aminophenol and *p*-diaminobenzene, when acted in the manner described, yield compounds which dye n blue-black.

is probable that the sodium sulphide solutions contain ive compounds of the type—



—E. B.

)yeing of Metallic Oxide Mordants. R. Buntrock.

See under V., page 983.

PATENTS.

go Powder; Production of ——. B. Willcox, London. om The Badische Anilin und Soda Fabrik, Ludwigs-fen, Germany. Eng. Pat. 19,689, Nov. 2, 1900. econd Edition.)

THER experience has shown that the Indigo obtained ding to Eng. Pat. 23,122 of 1899 (this Journal, 1900,) requires, after drying, wet grinding before use. In the present specification, the patentees claim as a new product a "light, voluminous, and easily reducible Indigo powder" they obtain by submitting synthetic or purified natural Indigo to the action of a disintegrator, which does not grind by pressure, but which subjects the material to the shearing stress of blades rapidly passing one another. The product obtained by this tearing process is very light, soft, and voluminous.—T. A. L.

Indigo; Manufacture of ——. O. Imray, London. From The Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 21,731, Nov. 30, 1900.

A MIXTURE of *o*-chloro- or bromobenzoic acid and glycocoll in the form of their alkali salts is heated to a high temperature (250° C.) with caustic alkalis out of contact with the air, the melt being subsequently dissolved and oxidised, when Indigo separates.—T. A. L.

Azo Colouring Matters [Violet]; The Manufacture and Production of New ——. B. Willcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 18,366, Oct. 15, 1900. (Second Edition.)

THE new dyestuffs giving valuable shades of violet on wool, which equalise well and are fast to light and alkalis, are obtained by combining the diazo compounds of 1.1′.4′.2′- or of 1.1′.4.2′-amino naphthol disulphonic acid with α-naphthylamine in the usual manner.—T. A. L.

Aromatic Amines including New Colouring Matters; Impts. in the Manufacture of Derivatives of ——. B. Willcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 18,726, Oct. 19, 1900. (Second Edition.)

ACCORDING to Eng. Pat. 1387 of 1900 (this Journal, 1901, 36), the sulphurous acid esters of phenolic bodies (described as new substances), when acted on by ammonia, yield aromatic amines. The patentees have now extended this reaction, and find that by acting with fatty mono- or di-alkylamines on the sulphurous acid esters, they obtain mono- or di-alkylated aromatic amines. Similarly, the employment of aromatic instead of fatty amines yields alphylated aromatic amines. Moreover, if the amine be a dyestuff such as Magenta, the resulting substance is also a dyestuff. The following is a typical example of such a product:—About 25 kilos. of Magenta are dissolved in 1,000 litres of water, together with 40 kilos. of 2.3′-naphthol sulphonic acid and 350 kilos. of sodium bisulphite solution (40 per cent. $NaHSO_3$). Stir and heat to 90°—100° C. until no further increase in the formation of the new dyestuff takes place. Filter from unattacked Magenta into an excess of hydrochloric acid, boil to expel sulphur dioxide, when the new dyestuff separates as a dark blue flocculent precipitate. Filter off, wash with dilute hydrochloric acid to remove any traces of Magenta, and purify by dissolving the product in a small quantity of hot water and precipitate with salt. The new dyestuff, when dry, has a bluish-black appearance. It dissolves readily in hot, sparingly in cold water, and dyes wool bright blue shades. —T. A. L.

Dyestuffs [Blue] of the Triphenylmethane Series; Manufacture and Production of New ——. H. E. Newton, London. From The Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 18,448, Oct. 16, 1900.

IN Eng. Pat. 19,062 of 1891 (this Journal, 1892, 1000) a process is described for producing dyestuffs of the triphenylmethane series by condensing tetra-alkyldiaminodiphenylcarbinols with dibenzylaniline disulphonic acid and oxidising the leuco compounds obtained. According to the present specification, valuable blue dyestuffs, fast to alkalis, are formed if the dibenzylaniline disulphonic acid be replaced by symmetrical dibenzyl-*m*-xylidine disulphonic acid, $1.3.5\text{-}C_6H_3(CH_3)(CH_3)N(CH_2.C_6H_4.SO_3H)_2$. The valuable properties of the dyestuffs obtained are due to the presence in them of two methyl groups ortho to the methane carbon.

The patentees further claim the production of similar dyestuffs, in which the two methyl groups are in different nuclei. These are obtained by condensing one molecular proportion of *p*-dialkylaminobenzaldehyde with two molecular proportions of alkylbenzyl-*m*-toluidine sulphonic acid, and oxidising the leuco compound formed. These products dye wool from acid baths brilliant blue shades fast to alkalis and milling.—T. A. L.

Azo-Colouring Matters and of New Intermediate Products for Use therein; Impts. in the Manufacture or Production of New ——. H. E. Newton, London. From The Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 18,939, Oct. 23, 1900.

THE aminonaphthols or their derivatives, referred to in Eng. Pat. 3615 of 1900 (this Journal, 1901, 117), that is those which do not contain the amino or hydroxy group in the ortho or peri position will condense with ethylene chloride or bromide, yielding products which combine with one or two molecular proportions of a diazo or with a tetrazo compound to form dyestuffs for unmordanted cotton. The ethylene chloride may also be replaced by chlor-acetylchloride, when similar condensation products of similar properties are obtained. The same is also the case with the new guanidine derivatives, which are formed by acting with ammonia, primary fatty or aromatic amines in presence of sulphuretted hydrogen absorbing agents, such as lead oxide, on the thiourea derivatives obtained by heating with thiophosgene or carbon bisulphide, the aminonaphthols or their derivatives characterised above. The azo dyestuffs obtained from the guanidine derivatives have similar properties to those prepared from the urea or thiourea compounds, or from the condensation products referred to above. The products dye unmordanted cotton orange, red, and bluish-red shades, and are distinguished for their fastness.—T. A. L.

Azo Dyestuffs [Orange, Bluish-Red], and of New Intermediate Products for Use therein; Manufacture and Production of New ——. H. E. Newton, London. From The Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 19,062, Oct. 24, 1900.

PYRAZOLONE derivatives obtained from hydrazinonaphthol sulphonic acids and aceto-acetic ether, oxalo-acetic ether, dioxytartaric acid, and the like, combine with one or two molecular proportions of a diazo compound to form valuable azo dyestuffs for unmordanted cotton. The hydrazinonaphthol sulphonic acids are obtained preferably from 2.4′.2′- or from 2.1′.3′-aminonaphthol sulphonic acid. The shades obtained vary from orange to bluish-red.—T. A. L.

Stilbene Series; Manufacture or Production of New Derivatives of the ——. H. E. Newton, London. From The Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 19,125, Oct. 25, 1900.

BY reacting with aromatic aldehydes, such as benzaldehyde, on *o*-*p*-dinitrotoluene in presence of ammonia or amines, such as piperidine, the methyl and aldehyde groups interact, water is eliminated, and an asymmetrical dinitrostilbene is produced. For instance, a mixture of 6 kilos. of benzaldehyde, 9 kilos. of *o*-*p*-dinitrotoluene and 400--500 grms. of piperidine is heated to about 170° C. until water begins to separate, when the melt is allowed to cool to 130°—140° C., and kept at this temperature for about two hours. When cold the crystalline mass is ground with alcohol, dried, and recrystallised from glacial acetic acid, from which the new dinitrostilbene separates in light yellow crystals, melting at 110° C. If *p*-nitrobenzaldehyde be employed in the above example, the resulting trinitrostilbene melts at 240° C.

—T. A. L.

Sulphur Dyes [Black, Blue, Brown], and of Materials for Use therein: Impts. relating to the Manufacture of ——. H. H. Lake, London. From The Chemical Works, formerly Sandoz, Bâle, Switzerland. Eng. Pat. 18,533, Oct. 17, 1900.

THE chlorine atom in 1·4-chloronitronaphthalene, its nitro and sulphonic acid derivatives, may be readily substituted by an amino or alphylamino group, yielding new derivatives of oxy- or amino-alphyl-1.4-nitronaphthylamine, w when treated with sulphur and sodium sulphide give stuffs for unmordanted cotton, producing from an alk sulphide bath, black, blue, bronze, and brown shades to washing, light, acids, and alkalis.—T. A. L

Sulphurised Dyestuffs [Black] from 1.8- and 1.5-Din naphthalene and Derivatives thereof; Manufactu Directly Dyeing ——. O. Imray, London. From Farbwerke vormals Meister, Lucius und Brüning, Hoc a/Main, Germany. Eng. Pat. 19,271, Oct. 27, 1900.

WHEN the 1.1′- or 1.4′-dinitronaphthalene is he with sulphur and sodium sulphide above 150° C., or sodium sulphide alone in presence of zinc salts, very st dyestuffs are directly obtained. The same process also be applied to the products obtained from the dini naphthalenes by the action of sulphites or bisulphites. example, 40 kilos. of 1.1′-dinitronaphthalene, 320 kilos crystallised sodium sulphide, 120 kilos. of sulphur, 30 kilos. of zinc chloride are mixed at about 105°—130 and then heated for several hours with constant agita to 150°—160° C. The temperature of the oil-bath is fin raised to 220° C. for several hours. The powdered m may be used directly for dyeing. The solution is green black, and gives a brownish-black on unmordanted cot The dyestuff from 1.4′-dinitronaphthalene gives violet shades on unmordanted cotton, which become black treatment with copper salts.—T. A. L.

Mordant-Dyestuffs; Manufacture of Orange-Yellow Red ——. O. Imray, London. From The Farbwe vormals Meister, Lucius und Brüning, Hoechst a M Germany. Eng. Pat. 20,276, Nov. 10, 1900.

THE diazo compounds of *o*-aminophenol or of 2.3-ami naphthol and their derivatives combine with 5-pyrazol and its derivatives (not substituted in the position 4), yi ing orange-yellow to bluish-red azo dyestuffs. Their f ness is considerably increased by the formation of chromi lakes, either by mordanting the fibre or by subsequ treatment with chromium fluoride or bichromate. example, the diazo compound from 2-aminophenol-4- phonic acid is added in presence of sodium acetate carbonate to an equimolecular proportion of the disodi salt of 1-*p*-sulphophenyl-5-pyrazolone-3-carboxylic acid, product being finally separated as a crystalline redd brown powder by adding salt.—T. A. L.

Sulphurised Dyestuff [Reddish-Violet] directly Dy Cotton; Manufacture of a ——. C. D. Abel, Lond From The Actiengesellschaft für Anilinfabrikati Berlin. Eng. Pat. 19,667, Nov. 2, 1900.

BY boiling together in aqueous solution dinitrochlo hydroxydiphenylamine,—

$$1.3.4.(NO_2)_2.C_6H_3.NH.C_6H_3.OH.Cl.1.2.5,$$

with sulphur and alkaline sulphides, a dyestuff is obtai giving dark reddish-violet shades on unmordanted cott The proportions employed are 90 kilos. of crystalli sodium sulphide, 31 kilos. of sulphur, 30 kilos. of dinit chlorohydroxydiphenylamine, and 90 litres of water. T reaction is complete in about 22 hours, when the dyest is precipitated by a current of air. If the proportions sulphur and alkaline sulphide be increased, the sha becomes more brownish-red, whilst if diminished, or if t boiling be continued for a longer time, the shade becom more violet. If the dinitrochlorohydroxydiphenylamine fused with sulphur and sodium sulphide according to G Pat. 113,515, a greenish-black cotton dyestuff is formed.

—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Silk Finishing. Textile Manufacturer, Aug. 1901.

FOR softening black-dyed silk yarn and at the same ti imparting to it a "scroop" effect, the material is treat in a solution of citric acid, olive oil, water, and soda tash. For boiled-off silk, 1—2 per cent. (on the weight the yarn) of olive oil; for soupled silk, 5—15 per cent.; d for fringe silk, 5—20 per cent. of olive oil is used, e proportion being varied according to the nature of the lk, and to whether it is to be employed as warp or weft. or the finishing of satin taffeta or other woven fabrics, ive oil mixed with double its quantity of water and nulsified with 65 per cent. soda solution, is used; if e scroop effect is desired, an addition of 20—25 per cent. citric acid is made, and the mixture cooled to 35° C. lue or gelatin is also sometimes added to the emulsion improve the handle of the goods.

For softening silk yarn intended for goods which are to ceive a moiré or watered finish, the material is treated a sulphonated olive oil well diluted with water, and dried thout being extracted. According to another process, e silk is handled for half an hour at 30° C. in a 20—30 r cent. solution of white soap.

Sewing silk is handled for half an hour in a mixture of ter and fullers' earth.

Attention is drawn to the fact that the practice of ighting silk with a material such as acetate of lead, en drying and impregnating with olive oil without dition of acid, is very objectionable from a hygienic andpoint.

For imparting finish mechanically, the means chiefly ed consists in stretching the yarn, which is done either hand or by machine. In order to give the yarn a lustre, e skeins are drawn sideways as well as lengthways, so at the threads are made to rub against each other. A ich higher lustre is given by means of machines in which e silk is drawn over metal cylinders and steamed in osed vessels.

Pure silk fabrics do not require the application of an tificial finishing material, hot pressing, mangling, or light lendering, with or without friction, being sufficient. Light k fabrics are usually finished on one side only, the ishing material being applied to the back of the material, ilst it is stretched on tenter bars. For giving a lustre silk fabrics, metallic (Cu, Bi, Pb, &c.) oxide solutions e used; basic acetate of lead may also be used, and eatly heightens the lustre of black silk. Resin soaps e used as waterproofing materials. For finishing silk rics, the following preparations may be used:—

(1) 22 lb. of rice are treated with 13 galls. of water, e rice water strained through a sieve, and 110 lb. of white h glue added, together with, if desired, albumin and xtrin.

(2) A solution of gum tragacanth and glue in soft water, aporated to the consistence of syrup.

(3) The warp is sized with gelatin. The weft is wound v on the bobbin, but, as it is unwound, passes on to a wet onge fastened to the shuttle. The woven goods are ped in a hot solution of gelatin, half dried, hung out, d finally dried on tenter bars.

(4) For finishing silk on one side. Gelatin, ½ lb.; ter, 5 galls.; paraffin, 3½ lb.; white wax, 1 lb.; castor , 2½ lb.; and soap, 2 lb.

(5) Full finish for silk. Glue, 33 lb.; water, 25 galls.; gacanth mucilage, 1 pint; "soap, 1 pint"; and cocoa-t oil, 1 pint. If the goods possess too high a polish er calendering, they are steamed over a jet or on rolls.

—A. S.

o-Dyestuffs; Dyeing with Some New Insoluble ——. E. C. Kayser. Färber-Zeit. 1901, 12, [16], 245—247.

rple Dyestuff from Naphthylamine Ether and Para-raniline.—The tissue is prepared with the hydrochloride "naphthylamine ether N" (30—45 grms. per litre), ed, and printed with or passed through a solution of zotised *p*-nitraniline with which sodium acetate is admixed. blue-purple dyestuff is thus produced, which becomes ter and brighter on soaping. It is very fast, and cannot discharged. Reserve effects may be obtained by means alkali sulphites or stannous acetate.

Brown Dyestuff from Diazotised α-Naphthylamine.—hen a cotton tissue is passed through a solution of zotised α-naphthylamine and dried at a high temperature, is coloured a fast brown. To produce a full shade, a solution containing 100—150 grms. of the diazo salt per litre is required. Tendering of the fibre is precluded by adding a sufficient amount of sodium acetate to the solution. The best result is obtained by rapidly drying the impregnated tissue, steaming it once or twice in a Mather and Platt's steam ageing machine, washing, and soaping. Wool may be similarly dyed. The colour can be resisted in the same manner as the insoluble azo colours.

A brown, which is fast to soap, is also formed when a tissue prepared with α-naphthylamine hydrochloride (25 grms. per litre) is treated with diazotised *p*-nitraniline or benzidine, and sodium acetate, but the tissue, even after prolonged soaping, retains the smell of α-naphthylamine.

Orange Dyestuff from β-Naphthol and Diaminotriphenylmethane.—An orange which is less bright than that from β-naphthol and *m*-nitraniline, but which is nevertheless serviceable, is obtained on tissues prepared with sodium β-naphtholate from diazotised diaminotriphenylmethane (15—30 grms. per litre). The latter compound is almost quantitatively formed when a mixture of aniline, aniline hydrochloride, and benzaldehyde is heated for several hours on the water-bath, being purified by rendering the solution alkaline and driving off the unchanged aniline with steam. The dyestuff is fast to soap, light, and hot pressing. Reserves may be readily produced under it with alkali sulphites. The homologous base derived from *o*-toluidine gives an orange of redder shade.

A dull orange may be obtained from α-naphthylamine by combining this with diazotised α naphthylamine.—E. B.

Dyestuffs faster to Water, Soap, and Acids; Method of Rendering Certain Basic ——. C. Rumpf. Färber-Zeit. 1901, 12, [15], 229—230.

Basic dyestuffs which contain free amino groups may be rendered insoluble in water and faster to soap and acids by treatment, after dyeing upon cotton or silk, with formaldehyde, or better, with a mixture of formaldehyde and a phenol. For example, 100 parts of cotton dyed with 2 parts of Magenta are treated with 1·5 parts of resorcinol and 0·75 part of a 40 per cent. solution of formaldehyde. In the case of Magenta, which contains three amino groups, each of these may be acted upon, the colour of the resulting compound becoming bluer as the groups are successively attacked, a red-violet dyestuff being finally formed. Safranine, in which one free amino group is present, is also rendered bluer by this treatment. Chrysoïdine becomes redder. The brilliancy of the dyestuffs is not affected.

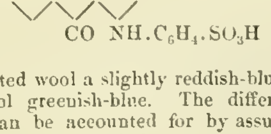
—E. B.

Dyeing of Metallic Oxide Mordants. A. Buntrock. Rev. Gén. des Mat. Col. 1901, 5, [56], 193—195.

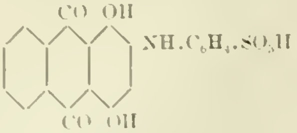
In reply to Liebermann (this Journal, 1901, 710), the author draws attention to the following facts:—

First, although it does not contain a hydroxyl group and is incapable of dyeing upon mordants, the sulphonated condensation product from Quinizarin and 2 mol. proportions of aniline is a valuable dyestuff for wool. It appears, therefore, that anthraquinone derivatives which do not contain hydroxyl groups may still be dyestuffs. The existence of such compounds serves to refute the generalisation found in treatises on dyeing concerning the anthraquinone dyestuffs; it does not, however, affect Liebermann and Kostaoecki's rule regarding the dyeing of mordants by such dyestuffs.

Secondly, the sulphonic acid of the compound obtained from Quinizarin and aniline—

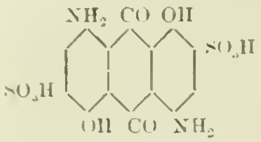


dyes unmordanted wool a slightly reddish-blue and chrome-mordanted wool greenish-blue. The difference is much greater than can be accounted for by assuming it to be due to the green colour of the mordant. The dye upon the mordant is much faster to milling than that upon the unmordanted wool. The dyestuff, moreover, gives a bluish green chrome-lake upon cotton. Liebermann thinks it is possible that the sulphonic acid group may be present in the molecule in the *o*-position to the hydroxyl group, but this is not the case. Further, the sulphonic acid of the mono-anilide of Purpurin (Ger. Pats. 86,150, 84,509, and 98,271)—

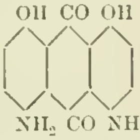


yields a red upon unmordanted and a deep purple upon chrome-mordanted wool. It also dyes alumina-mordanted cotton red and chrome-mordanted cotton blue-violet. The difference between the shades produced on the unmordanted and on the mordanted wool is greater than is the case with the isomeric dyestuff described in Ger. Pat. 116,867.

Thirdly, diamino-anthrarufin disulphonic acid—



like the analogously constituted diaminochrysazin disulphonic acid, dyes both unmordanted and mordanted wool, forming a colour-lake in the latter instance. Liebermann assumes that the sulphonic acid in the *o*-position to the hydroxyl group, the position in which it exists in the molecule of these compounds, confers upon them dyeing properties. But *p*-diaminochrysazin—



which does not contain any such group, behaves similarly, dyeing mordanted wool a greenish-blue and unmordanted wool a reddish-blue.

The following classification of the dyestuffs derived from anthraquinone is suggested :—

1. Derivatives containing hydroxyl groups only. Liebermann and Kostanecki's rule (this Journal, 1887, 721) applies solely to these.
2. Hydroxy-amino derivatives. These dye unmordanted animal fibres and mordanted vegetable and animal fibres.
3. Derivatives containing amino groups only, which dye unmordanted animal fibres alone and have no affinity for mordants.—E. B.

Chromic Acid in Cotton Dyed with Chrome Yellow; Detection of, by Means of Diphenylcarbazide ——. P. Cazeneuve.

See under XXIII., *page* 1029.

Indigo; Chromic Acid Process for the Discharge of —— [in Calico Printing]. E. Clayton. J. Soc. Dyers and Colourists, 1901, **17**, [8], 194—197.

The author gives an outline of the method of producing white and coloured designs on a blue ground by the well-known indigo discharge style, in which the indigo is destroyed by means of chromic acid. The dyed material is printed with a soluble bichromate, suitably thickened, and then passed through a bath of dilute sulphuric and oxalic acid. For coloured discharges, pigments are employed which withstand the action of the acid; such are lead chromate, Guignet's green, vermilion, &c.

Sodium bichromate is usually preferred to the potassium salt on account of its greater solubility. The thickening for a white discharge is generally flour; for coloured discharges gum tragacanth is employed, in addition to albumin required with the coloured lakes.

For pale blues, the discharge paste should contain fr 6 to 20 oz. of sodium bichromate per gallon, while d blues require almost three times this amount.

In printing with the pigment colours, there is a tende for the pastes to partly remain in the engraving of roller, resulting in a bare appearance of the printed pa this defect is known as "sticking in." The best remed for this are—(1) to be careful in the selection of pigments, and to bring them into a fine and smooth st if necessary, by grinding in a mill with a little glycer (2) to have a small stud wheel on the end of the br furnisher, and to revolve it in the opposite direction to printing roller; (3) to add to the colour a small proport of turpentine or oil.

When a black discharge is required, an ordinary cop or vanadium Aniline Black is employed.

After the pieces are printed, they are dried on cylinders, those containing Aniline Black as a part of pattern being aged in a warm room or given a short pass through the Mather and Platt steamer. The pieces now ready for the developing or "cutting" process, wh consists in passing in the open width through a mixt of dilute sulphuric and oxalic acids contained in a le lined tank fitted with copper rollers at the top and bott The temperature of the bath is about 60° C., and pieces remain in the bath for less than a minute bef passing on to a series of washing tanks.

If the amount of bichromate used is too great, or if speed at which the pieces pass through the cutting bath is low, defects will occur known as "tailing," and taking form of streaks branching off from the edges of the prin colour.

Tendering is also liable to take place if the discharge too strong, or if the cutting liquor is not thoroug removed. In the former case, only the printed parts affected, in the latter case the whole piece.

An addition of ammonia is made to the bichrom discharge paste; a portion of this reacts to form ammoni chromate, and the remainder probably retards the coagu tion of the albumin until it reaches the acid bath. this bath the formation of chromic acid, the coagulation the albumin, and consequently the firm fixation on t fibre of the coloured pigments, take place simultaneously.

—R. B. B

Prussian Blue Reserve under Paranitraniline R M. Richard. Bull. Soc. Ind. Mulhouse, Procès-verba 1901, 103.

The tissue prepared in a solution of 300 grms. of β-naphth 600 grms. of caustic soda-lye at 22° B., and 600 grms. "Para soap," is printed with a mixture of 200 grms. of g solution, 40 grms. of ammonium chloride, 1 kilo. powdered potassium ferrocyanide, 360 grms. of powde potassium ferricyanide (which are heated together on t water-bath before the addition of the other ingredient 150 grms. of tartaric acid, 180 grms. of oxalic acid, 600 of water, and 2·2 kilos. of stannous ferrocyanide pas The tissue is steamed for a few minutes, and then pass into a bath of diazotised *p*-nitraniline, slightly thicken with gum tragacanth. It is next passed into the air, a then through a bath of potassium bichromate, after wh it is washed, soaped, soured with hydrochloric acid 1° B., washed, and dried. To obtain a more violet sha of blue, the tissue may afterwards be dyed with a dir pink dyestuff.—E. B.

PATENTS.

Hydrosulphites; Rendering Solid——, Stable upon Keeping. B. Willcox. Eng. Pat. 18,852, 1900.

See under VII., *page* 988.

Rovings or the like; Apparatus for Subjecting ——, to t Action of Fluids. J. O. Obermaier, Lamprecht, Rhe pfalz, Germany. Eng. Pat. 15,329, Aug. 28, 1900.

Rovings are placed on perforated bobbins, which truncated at each end. These bobbins are placed vertical one above the other, on a rod having a valve seating at t wer end and a wing nut at the other. The whole then s into a perforated tube having a false bottom. The lve seating is placed in a hole on the top of the false ttom. By means of pumps, liquids can be forced from e bottom chamber, up through the core of the bobbins, d out by percolating through the rovings.—C. M.

amie, China Grass, or other Fibrous Material; Treatment of ——. A. J. Boult, London. From C. Masse and La Société Française de Ramie, France. Eng. Pat. 11,858, June 10, 1901.

ILD or green ramie stems are placed in a potash or soda th of 4°—5° B., in an autoclave, and gradually brought to iling point, and maintained at that temperature for 15—20 nutes. The operation is over when the pellicle can be ily detached by the finger. After draining and drying, stems are immersed in the following mixture, *viz.*:— ater, 675 parts; alkaline carbonate (soda or potash), 50 ts; ordinary soap, 50; calcium carbonate, 25; magnium silicate, 50; rice or corn starch or other amylaceous stance, 150 parts. The soaking in this bath is continued 30 mins. at 25° C. The stems, after being drained and ed, are passed between rollers, and a material resembling ap or stripped flax is obtained.—C. M.

rtile Materials with Liquids; Apparatus for Treating ——. W. E. Heys, Manchester. From E. Plantru, Paris. Eng. Pat. 14,453, July 16, 1901.

e principle of this apparatus is to force water through between materials from below, thus forcing the air out n the interstices, and securing a thorough wetting of the ics. The latter are placed in a tank having inlets at bottom and a perforated lid at the top. The lid is wed down on to the materials and then water forced up a below.—C. M.

rcerising, Scouring, Bleaching, Dyeing, Washing, izing, and like Treatment of Yarn in Hank Form; lachines for ——. W. H. Crompton and W. Horrocks, adcliffe, Lancashire. Eng. Pat. 11,077, June 19, 1900.

elaborate machine in which hanks are stretched over s in pairs, with suitable gearing for regulating the ion on both. After revolving in the mercerising or r fluid a sufficient length of time, the whole frame, ying the two pairs of reels, is lifted out of the bath and ed on a shelf to drain, preparatory to washing and being ed in the wet tank. Several sets of pairs of reels are ed in one tank and the whole geared up to one driving t.—C. M.

ers and the like from Combing Machines; Apparatus r Dyeing ——. H. J. Haddan, London. From F. esnrmont, Tourcoing, France. Eng. Pat. 13,894, July 8, 01.

RGE drum is fixed so that half its body is in the dye . Its periphery consists of a perforated and corrugated l plate. The slivers are placed in this periphery and overed by corrugated and perforated segments, clipped olted down to the true periphery. The drum, charged the slivers, revolves in the dye bath and the liquor is ped up and sprayed on to the drum above the bath. is way the slivers are always evenly soaked with the olution and even dyeing results.—C. M.

l Goods; Production of Discharge Effects on ——. W. Johnson, London. From Kalle and Co., Biebrich-Rhine. Eng. Pat. 18,853, Oct. 22, 1900.

CHARGE paste which has the advantage of not injuring the goods, or rollers and doctors is the following:— arts of British gum-thickening previously boiled with arts of water, are mixed on cooling with 200 parts of sium bisulphite and 30 parts of aluminium dust.

silk fabric dyed with 5 per cent. "cloth scarlet" say, lischarged with the above paste by steaming for 5 to nutes, gives a white pattern on a red ground.

obtain a yellow pattern on a blue ground, dye with cent. Naphthamine blue 5B, and discharge with the ing:—30 parts of Chromine G. in 490 parts of water. Thicken with 250 parts of British gum, 200 parts of potassium bisulphite, and 30 parts of aluminium dust. Print goods and steam for 20 minutes.—C. M.

Colours for Chemical Printing. A. Hoz, Rorshach, Switzerland. Eng. Pat. 1366, Jan. 21, 1901.

SUITABLE mordants are added to solutions of the dyestuffs, and the mixtures are then evaporated down as far as possible. It is then mixed thoroughly by rubbing down with a greasy substance such as linseed oil varnish. The colour is printed on and in the majority of cases developed by steaming the fabric. As an example of a dye for animal fibres without mixing the mordants, the following may be given:—In 20 c.c. of a dilute solution of Turkey red oil (1:1) 13 grms. of brilliant Rhodulin G. is dissolved. Add 10 c.c. with 2 grms. of Fuchsin G. Precipitate with 1 c.c. of hydrochloric acid of 22° B. Filter off the paste and add 100 grms. of linseed oil varnish Mark III. This mixture is now ready for printing.—C. M.

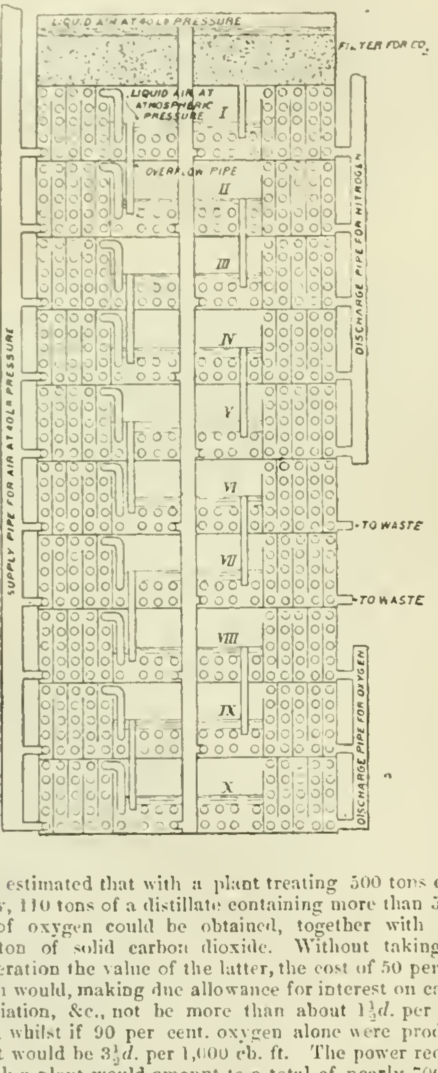
VII.—ACIDS, ALKALIS, AND SALTS.

Oxygen Separation Process; Pictet's ——. Engineering, Sept. 13, 1901, 368.

A PROCESS for the separation of oxygen from the air, on a commercial scale, by means of fractional distillation, based on the fact that when liquid air is allowed to evaporate, the gas which comes off at first, is almost pure nitrogen, whilst after nine-tenths of the liquid have evaporated, the remaining tenth is nearly pure oxygen. By a system of heat interchanges, the incoming air is cooled to the point of liquefaction by the gases evolved in the apparatus, but in order to cover unavoidable leakages of heat, it is necessary to maintain a constant supply of energy to the apparatus; this is attained by keeping the air in the inlet pipes under a pressure of 30—40 lb. per sq. in. is attained, whilst the exhaust takes place at atmospheric pressure.

The apparatus consists of 10 stills, one above the other, I. to X. (see Fig.). At starting these are filled with liquid air to a level fixed by an overflow pipe, the overflow from each one passing through this pipe into the still below.

Immersed in the liquid in each still is a coil of piping, one end of which opens into a central vertical pipe passing through the whole column of stills into a filter chamber at the top. At the other end each coil is continued by an interchanger coil, forming a series of windings round the central chamber of the still, and terminating at the air-inlet main. By means of heat-insulating partitions between the successive windings of the interchanger coils, the gases evaporated from the liquid in each still, flow round these coils on their way to the exit pipe. By using sufficiently long coils, the interchange of heat between the fresh supply of air entering the still through the coils, and the outgoing gases, can be made practically complete, so that on their final escape from the apparatus, the gases evaporated are at atmospheric temperature, whilst the incoming air, on reaching the central chamber of the still, has been reduced to a temperature corresponding to the boiling point of the liquid in the still. The latter is, however, at atmospheric pressure, whilst the incoming air is at a pressure of about 40 lb. per sq. in., and accordingly condenses to a liquid. The liquefied air passes into the central vertical pipe, and is delivered into a chamber at the top, provided with a filter. The liquid passes through the filter, which separates the solidified carbon dioxide, and is delivered into the topmost still, whence it passes successively, by means of the overflow pipes, into the other stills. The latent heat set free in the condensation of the incoming air in the coils, causes the evaporation of a corresponding amount of the liquid in each still. In the top still practically pure nitrogen is alone evaporated, and consequently the liquid which overflows into still No. II. contains a larger proportion of oxygen than common air. This holds throughout the series; the liquid, as it passes down the column, contains less and less nitrogen as it approaches the bottom still, the contents of which consist of more than 90 per cent. of oxygen. The combined distillate from the five uppermost stills contains 90 per cent. of nitrogen; in that from stills VI. and VII. the nitrogen is in about the same proportion as in common air; whilst from the remaining three cells the combined discharge contains about 55 per cent. of oxygen. If necessary the distillate from still X., which contains more than 90 per cent. of oxygen, can be collected separately, but for many industrial uses, as for metallurgical purposes, the combined distillate from the three lower stills will serve every purpose. It is essential that the air, before it enters the apparatus, be quite free from moisture, which would deposit as ice and clog the interchanger coils. This can be effected by previously cooling the air well below the freezing point of water by an auxiliary refrigerating plant.


LIQUID AIR AT 40 LB PRESSURE
FILTER FOR CO2
LIQUID AIR AT ATMOSPHERIC PRESSURE
I
OVERFLOW PIPE
II
III
IV
V
VI
VII
VIII
IX
X
DISCHARGE PIPE FOR NITROGEN
SUPPLY PIPE FOR AIR AT 40 LB PRESSURE
TO WASTE
TO WASTE
DISCHARGE PIPE FOR OXYGEN

It is estimated that with a plant treating 500 tons of air per day, 110 tons of a distillate containing more than 50 per cent. of oxygen could be obtained, together with about 0·25 ton of solid carbon dioxide. Without taking into consideration the value of the latter, the cost of 50 per cent. oxygen would, making due allowance for interest on capital, depreciation, &c., not be more than about $1\frac{1}{2}d.$ per 1,000 cb. ft., whilst if 90 per cent. oxygen alone were produced, its cost would be $3\frac{1}{2}d.$ per 1,000 cb. ft. The power required for such a plant would amount to a total of nearly 700 h.p., of which 100 h.p. would be needed for the refrigerator used in dehydrating the air.—A. S.

Tanks for Acid or Alkaline Liquids; Construction of——. O. Markfeldt. Zeits. angew. Chem. 1901, **14**, [32], 801—804.

Kohler (Zeits. angew. Chem. 1898, 6) showed that concrete drains and tanks are soon completely destroyed, even by the residual acid or alkali left in waste waters after purification. He recommended salt-glazed earthenware pipes, jointed with asphaltum cement. It is possible to obtain excellent results from Knauff's acid-resisting plates set in asphaltum cement, if the work is very carefully done, and liquids at higher temperatures than 35° C. are not to be treated. Warmer liquids make the cement pliable and force it out of the joints. Acid-proof tanks are constructed of special brick (see Fig. 1), which have a channel running round the edg 2 cms. deep and 3 cms. wide. A wall built of these brick would have very narrow joints (the bricks are uniform i size), but the walls would contain a network of channe into which a suitable binding material could then be poure This operation is not easy, even with a fluid cement, an only a few bricks in position could be treated at once. Th difficulty would be far greater with a viscous binding ma terial, to be used hot, such as asphaltum cement.

A substance, known as acid-proof asphaltum, has bee recently introduced for the construction of tanks pro against acids and alkalis. The tank is built of masonr asphaltum cement being used in place of mortar, if it required to be very durable; each horizontal joint is hollowe out to a depth of 1—2 cms., as at *c* (Fig. 2), the joints them selves being not too narrow. An iron plate *d*, about 1 r high, bent over at the upper edge *e*, at an angle of 15 to form the channel *g*, is fixed at the ends against two iro plates, 10 cms. wide and 2 cms. thick, resting on the wal thus leaving a space of 2 cms. between the large plate an the wall. The remaining holes are stopped with clay. Th melted acid-proof asphaltum is then poured into the spac between plate and wall; it penetrates into the joints, th layer of asphaltum then adheres firmly. Whilst the fir casting cools, others are made. In 2—3 hours the plat which is polished on the one side or covered with sheet-zin may be readily loosened from the asphaltum; after cleanin with benzene, if necessary, it may be at once used agai The surface of the asphaltum is as smooth as glass, and ca thus be readily cleaned.

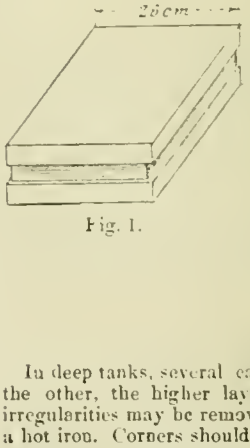


Fig. 1.

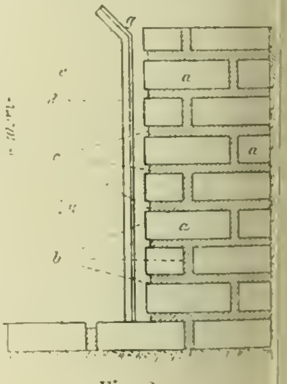


Fig. 2.

In deep tanks, several castings must be made, one ov the other, the higher layer unites well with the lowe irregularities may be removed by means of the blow-pipe a hot iron. Corners should be rounded; iron pipes, cover with sheet zinc, are used in place of the iron plate.

Small repairs are effected with the blow-pipe; in the ca of more extensive injuries (which must be the result great carelessness in cleaning the tank) the damaged ar is separated from the remainder by cutting with a hot bro and sharp iron, removed from the masonry, the asphaltu melted with a little fresh material, and the vacant place fill by casting, as in the original construction. If the tank removed, the asphaltum is ready for use again after washi and drying.

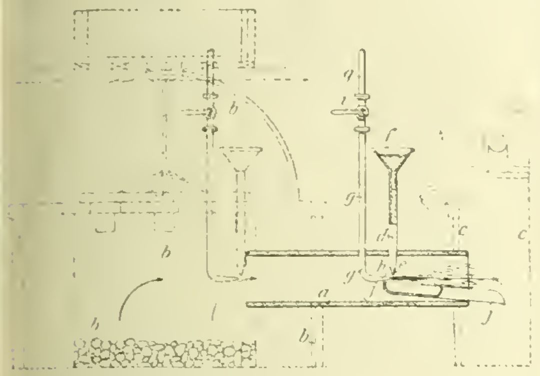
The condition for the adherence of the asphaltum to t masonry is the complete dryness of the latter before t asphaltum is applied.

Acid or alkaline liquids may be kept in these tanks f several days at 50°—60° C., without injury, and liqui which remain at 80° C. for a few hours, may be introduc In such a tank hydrochloric acid of 21° B. was kept f several weeks, then nitric acid of 1·32 sp. gr. for seve weeks; sulphuric acid of 50° B. was then introduced at 65 allowed to cool and remain for about a year. The wa were then absolutely intact. Solutions of salts within t above limits of temperature do not injure the asphalt layer.—A. C. W.

Sulphuric Acid; Manufacture of ——. Ger. Pat. 122,920, March 6, 1900. J. Potut, Paris. Zeits. angew. Chem. 1901, **14**, [35], 881—882.

The process here described makes use of the reaction between nitric and sulphurous acids, the former being finely divided by means of a jet of steam and then mixed with strongly heated sulphurous acid.

In the view of the apparatus given, the vertical tube *d*, which contains the nitric acid, is made of clay, glass, porcelain, ebonite, &c., and is fitted at the top with a funnel *f*, while the lower end is drawn out to a fine point *e*. The steam tube *g*, is provided with a platinum nozzle *h*, and the flow of steam is regulated by the cock *i*; the steam from *h* forms a spray with the nitric acid from *e*, and carries it into the lead tube *a*, and the leaden chamber *c*. An inclined clay or earthenware trough *j* catches any drops of nitric acid falling from *e* and carries them into the leaden chamber, where they become diluted and thus rendered harmless to the lead. The steam pipe *g*, and the nitric acid pipe *d*, may be placed under the Glover tower *b*, as is shown by the dotted lines, and in this case the trough *j* is not needed. The process may be regulated so that the reaction is complete, and no loss, either of sulphurous or nitric acid occurs.



—T. H. P.

Hydrochloric Acid; Production of Chemically Pure ——. Ger. Pat. 121,886, April 27, 1900. Zeits. angew. Chem. 1901, **14**, [29], 734.

Crude hydrochloric acid, free from arsenic, is purified by running it into a leaden still containing dilute sulphuric acid, heated by means of leaden steam-coils, to a temperature just above the boiling point of pure hydrochloric acid; the acid distils off, and may be collected in the usual way.

—J. W. H.

Potassium Ferricyanide Solutions; Formation of Prussian Blue from ——, *by the Action of Sunlight.* J. Matuschek. Chem.-Zeit. 1901, **25**, [71], 742—743. (Compare this Journal, 1901, 757, 897.)

Further experiments show that, on exposing to sunlight a number of potassium ferricyanide solutions, the concentrations of which form a decreasing arithmetical progression, the total quantities of Prussian blue (soluble and insoluble) formed, likewise form a decreasing arithmetical series, whilst the amounts of ferric hydroxide separated also vary arithmetically, but in this case increase with the dilution. The total quantity of the two products formed depends on the intensity of the light acting on the solution and on the rise of temperature caused by it. The results also show that in all cases, the amount of Prussian blue formed is greater than that of the ferric hydroxide.

—T. H. P.

Alkali Chloride Solutions; Influence of Carbon Anodes on the Electrolysis of ——. F. Foerster.

See under XI. A., *page* 999.

Chlorates; Determination of —— *in Electrolytic Bleach Liquors, and in the Absorbing Vessels in the Potassium Chlorate Manufacture.* H. Ditz.

See under XXIII., *page* 1026.

PATENTS.

Nitric Acid; Condensing Apparatus used in the Manufacture of ——, *and for other Purposes.* O. Guttmann, London. Eng. Pat. 13,694, July 5, 1901.

The object of the invention is, in the condensation of nitric acid vapours, to condense the acid at a comparatively high temperature, when it is less liable to absorb nitrous gases, and to withdraw it rapidly from contact with these gases; and also to obtain less liability to fracture of the condensing apparatus due to changes of temperature than has been hitherto experienced. The apparatus consists of "a number of connecting units, each having an inlet and outlet at the upper part for the passage of the gas or vapour, and an outlet at the lower part for the escape of the condensed fluid, in combination with, and forming a cover to a receiving channel for the reception of condensed fluid, said receiving channel having an outlet placed so as to maintain a constant level of fluid to form a seal to the condensed fluid outlets of the said collecting units, and also provided with transverse tubes or passages for the purpose of assisting the attemperation of the condensed fluid contained in and passing through the said receiving channel." Also, an attemperating vessel is claimed, in which the channel receiving the condensed acid is set, the vessel having suitable inlets and outlets for the passage of an attemperating fluid, vapour, or gas.—E. S.

Caustic Alkalis and other Metallic Oxides; Manufacture of ——. J. Wetter, London. From E. Besemfelder, Charlottenburg, Germany. Eng. Pat. 15,134, Aug. 24, 1900.

The gas manufacturing plant described in Eng. Pat. 13,830, 1899 (this Journal, 1900, 725), is applied in the production of caustic soda and other alkalis, and of metallic oxides, and especially of strontium and barium oxides. According to the first claim, the process consists in subjecting a mixture of the salt to be treated, with coal or the like, and with a material to prevent fusion, "to a preliminary heating and gas-extracting process (which, in the case of oxygen salts is also a reducing process), and then treating the resulting mixture in a water-gas producer, or group of producers alternately with superheated steam and with air (or the carbonic acid resulting from the introduction of the same), the acids or other gaseous products driven out with the water gas or waste producer gas being subsequently recovered," as also the oxides from the solid residue remaining in the water-gas producer or producers. The heat of the producer gases is utilised for heating the preliminary gas extracting apparatus from inside, or both internally and externally.—E. S.

Heavy Lyes and other Liquids; The Concentration of ——. L. Kaufmann, Aachen, Germany. Eng. Pat. 12,096, June 13, 1901.

The lyes are admitted to a cast-iron cylindrical vessel, in which a vacuum is maintained, the vessel being jacketed for steam (or gas) and supplied with a mechanical agitator the blades of which come to within 10 to 15 mm. of the heated jacket, so that the lye is continually impelled in thin streams against the heated surface. It is stated that the lye of caustic soda (or salts) flowing off, may thus be brought up to 85 per cent., and be at once discharged into packing drums.—E. S.

Alkali Salts, and By-products therefrom; Manufacture of ——. C. Hoepfner, Frankfort-on-the-Main, Germany. Eng. Pat. 15,873, Sept. 6, 1900.

A mode of preparation of alkali sulphites and "metallic by-products," is described, though the latter are in some cases of most importance. As an example, roasted zinc ores are exposed to contact with sulphurous acid, preferably under pressure, and the sulphites produced are decomposed by alkali salts, such as sodium chloride. The sodium chloride may be used simultaneously with the sulphurous acid. A solution is thus obtained containing, for instance, sodium sulphite or bisulphite and zinc chloride, which solution, when separated from residual matters, may be concentrated, or it may be saturated with sodium chloride, to precipitate the alkali sulphite or bisulphite. By treating an alkali sulphite solution with lime, caustic or carbonated alkali is obtained; the production of thiosulphates, and hydrosulphites from the same source is also claimed, as well as the application of the sulphite as a flux for the smelting of ores containing lead, silver, or copper. The zinc chloride solution obtained in the process described, after completely freeing it from sulphite by calcium chloride, is electrolysed to obtain zinc and chlorine, or is used for the production of zinc oxide.—E. S.

Chromic Acid; Manufacture of Compounds of ——. A. Shearer, Manchester. Eng. Pat. 18,218, Oct. 13, 1900.

The invention relates to the production of sodium-ammonium chromate and of bichromates thence obtainable. According to one process, chrome ore is furnaced with sodium carbonate or hydrate and lime in such proportions that the soda shall be sufficient to combine with more than one-half, and preferably with two-thirds of the chromic acid; the finely ground furnaced mass is treated in presence of water with carbon dioxide and ammonia. Or, sodium sulphate may be mixed, instead of the carbonate, with the ore to be furnaced, and the product be lixiviated. On treating the solution with carbon dioxide and ammonia, sodium bicarbonate is precipitated, and is separated, in either case a solution of the sodium ammonium chromate being obtained. Or calcium chromate is suspended in water and treated with carbon dioxide and ammonia, and to the ammonium chromate thus obtained, the proper proportion of sodium chromate is added; but in all cases, to obtain the double salt, more than one-half and not more than two-thirds of the chromic acid must be in combination with sodium. Sodium chromate solution, treated with carbon dioxide and ammonia, gives a precipitate of sodium bicarbonate, and on concentration, crystals of the double salt. However obtained, the solution of the double salt may be concentrated at a temperature not above 70° C. to obtain the crystals. Sodium bichromate is produced by heating the double salt to a temperature not exceeding 135° C., the ammonia evolved being recovered. Potassium bichromate may be prepared from the ammonium sodium salt by treating its solution with potassium chloride or sulphate separating the salts precipitated, and boiling to expel the ammonia.—E. S.

Hydrosulphites; Rendering Solid ——, *Stable upon Keeping.* B. Willcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Eng. Pat. 18,852, Oct. 22, 1900.

Solid hydrosulphites taken from the filter press, with or without washing with alcohol or acetone and then with ether, are dried in a vacuum with the aid of a desiccating agent like sulphuric acid, and are then stored in an air-tight receptacle, filled with nitrogen, or other indifferent gas. Or the hydrosulphites, washed as described, may be dried in a current of dry nitrogen. They may be washed free from water, for instance, first with alcohol and then with ether, may be stored moistened with a suitable liquid, such as would not be likely to dissolve thiosulphates, or other products of intra-molecular decomposition thereof. Ether, benzene, carbon tetrachloride, carbon bisulphide and petroleum spirit are substances named. Several examples of modified processes are given, and reference is made to Eng. Pats. 19,762, 1899; and 901, 1900 (this Journal, 1900, 900; and 1901, 43).—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Glass; Influence of Air and Dust on the Decomposition of ——. E. Zschimmer. Chem.-Zeit. **25**, [69], 730—732.

The author has examined microscopically a number of specimens of optical glass from the workshop of Carl Zeiss, at Jena, which had been kept for a number of years exposed to air and dust. He classifies the glasses according to their composition as:—A. Silicates and borosilicates (up to 20 per cent. B_2O_3).—I. Free from lead: (*a*) free from alkali, (*b*) containing alkali; II. Containing lead: (*a*) free from alkali; (*b*) containing alkali. B. Silicoborates (over 20 per cent. B_2O_3) and borates. C. Phosphates; according to their behaviour, as (1) those showing sur decomposition on simple exposure to air; (2) those st in air, but showing decomposition where dust has fall (3) those unaffected by either air or dust.

Those in the first class show under the microscope (8 120 diameters) a uniformly spread alteration of the wl surface, consisting either of minute drops or of a netw of crystals, due to the slow separation of potash or s from the silicate, and the subsequent formation of quescent potassium carbonate or crystalline sodium bonate. Borate glasses absorb moisture without becom damp, and simply swell on the surface, which is not vis altered till the expansion becomes so great as to away the surface from the layers beneath, when the wl surface becomes cracked and fissured. This cracking be produced at an earlier stage if the glass be heated 170° C.

Those in the second class show surface alterations onl the vicinity of specks of dust. The alterations consis the deposition of minute drops of water, in the formatio crystals radiating from the speck, in a combination of l of these appearances, or, in the case of lead glasses, i blackening near the speck, due to metallic lead or its phide. The nature of the dust (whether a hygrosc body or an organic or sulphur-containing substance) is course, operative, as well as the composition of the gl in determining the nature of the alteration of the surfac

In lead-free silicates, the decomposition depends on amount of alkali in the glass. With 10 per cent., d decomposition readily sets in, and with 20 per cent. or o the separation of alkali sets up air-decomposition. In le containing silicates, the proportion of lead, as well as t of alkali, determines the ease with which decomposit occurs; but dust-decomposition will occur in silicates c taining 20 per cent. or more of lead, even though free fi alkali.

The decomposition of borate glasses has been alre described; when these glasses contain lead, however, the extent of 20 per cent. or more of PbO, the separat of the lead oxide occurs, not only on the outer surface, in some of the layers below, producing an iridesce similar to that observed in labradorite and similar miner This iridescence is not removed by rubbing or polish the surface, and is increased in intensity by heating glass.

The borosilicates are, on the whole, the least ea decomposable glasses; the alkalis seem to separate out l easily than from the silicates, and with a given alk content there is thus much less tendency to the appeara of hygroscopic moisture or of crystals on the surface tl in the case of silicates.

Phosphate glasses are all hygroscopic. Their mic scopic appearance is similar to that of the hygrosco alkali silicates, though the crystals of phosphoric acid o phosphate are easily recognisable.—J. T. D.

Porcelain and Glass at High Temperatures; Expans of ——. L. Holborn and E. Grüneisen. Ann. d. Phy **6**, [4], 136—145; Chem. Centr. 1901, **2**, [11], 675.

For Berlin porcelain between 0° and 625° C., the expan of a rod of circular cross section (6·5 mm. diameter) expressed by the formula $\lambda = [3027\,t + 1{\cdot}177\,t^2]$1 whilst for a rod of rectangular cross section (5·5 × mm.), $\lambda^1 = [3188\,t + 0{\cdot}936\,t^2]10^{-9}$. At about 700° the increase of expansion is smaller, and above 800° greater than before. The permanent alterations that a suffers, vary considerably. With rapid cooling fr 1,000° C., a lengthening, and from 750° C., a shorten occurs. These alterations disappear on frequently repea heating, whilst heating to 500° C. appears to cause change. The rods were measured at ascending tempe tures.

Two samples of "Jena borosilicate glass 59''''" ga in the cooled condition $\lambda = [5814\,t + 0{\cdot}804\,t^2]10^{-9}$ a thermometer tube (5·2 mm. outside diameter), a $\lambda = [5852\,t + 0{\cdot}959\,t^2]10^{-9}$ for a rod (5·7 mm. diamete The observations refer to temperatures up to 500° C.

—A. S

Stoneware Industry. C. Schärtler. Zeits. angew. Chem. 1901, **14**, [29], 728—733.

OMMON earthenware, which generally contains from 10 to 2 and even occasionally as high as 25 per cent. of calcium rbonate, and is fired at such a low temperature that e carbonic acid is still retained, is quite unfit for chemical dustrial purposes. Stoneware suitable for chemical plant fired at a higher temperature, is close-grained, and free om porosity; it is salt-glazed, and is then impervious to th acids and alkalis. Great progress has lately been ade, and it is now possible to obtain apparatus of ost any form and size made in this material. Figs. 1 to 3d 4 to 5 represent two patterns of injector or exhauster to Oscar Guttmann; they may be worked either by m or compressed air. Fig. 6 represents a continuous montejus, a modification of the "mammoth pump," designed by the same engineer. The liquor to be raised is admitted by the inlet *e*, a back-pressure valve *h* being interposed; the pipe *f* admits compressed air, and the liquor is raised through the pipe *g*. When in action, the delivery pipe *g* receives air and liquor alternately, so that it becomes filled with little pistons of liquor separated by compressed air. Other apparatus is described, among which may be mentioned a sealed apparatus for testing continuously the specific gravity of corrosive or other liquors, a glass dome cemented in the stoneware permitting the hydrometer to be read.

—J. W. H.

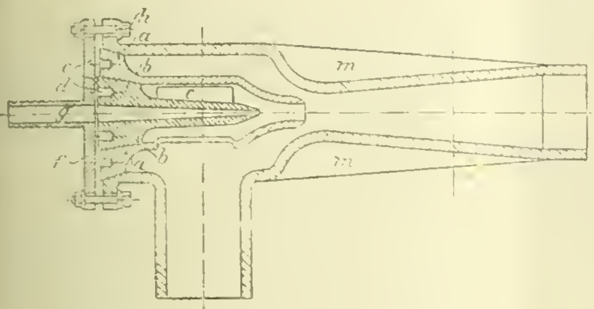


Fig. 1.

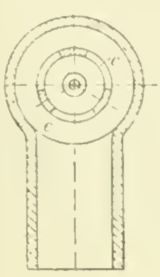


Fig. 2

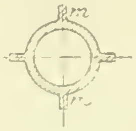


Fig. 3.

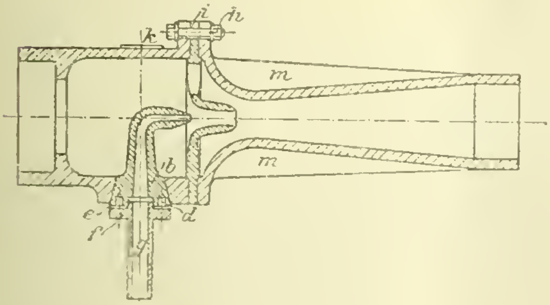


Fig. 4.

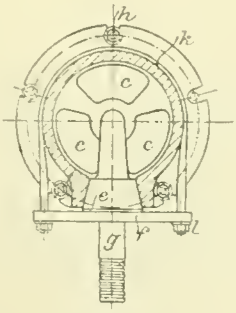


Fig. 5.

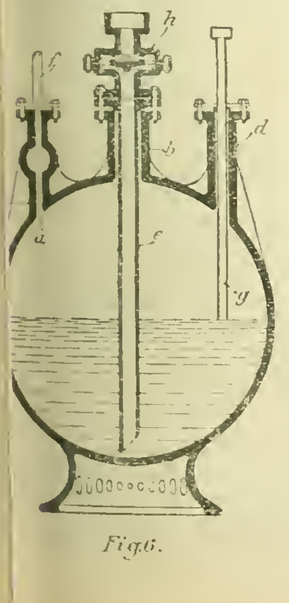


Fig. 6.

Enamels and Silicates; Estimating the Fusibility of ——. E. Kochs and F. Seyfert. Zeits. angew. Chem. 1901, **14**, [29], 719—728.

HITHERTO it has been impossible to judge the properties of enamels from their percentage composition, and to improve a given enamel it has always been necessary to carry out wasteful experiments. The authors obtain figures representing the fusibility of silicates by calculations based on their percentage composition; by dividing the number representing the percentage composition of each constituent, simple or compound, by its molecular weight, and dividing those numbers obtained representing fluxing bases by those representing silicic acid, a quotient is obtained which indicates the fusibility of the material. On examining clays by this method of calculation, the "fusibility quotient" of those which may be considered fireproof is a number always greater than 1; in the case of enamels, glazes, &c. the "fusibility quotient" is a proper fraction. The authors have applied their method to the investigation of the "Seger cone" system of determining high temperatures, and point out certain errors in it. Typical fusibility quotients are given as follows:—

Blast furnace slag, iron	0·008
„ „ copper	0·003
„ „ lead	0·002
Basic Bessemer slag	0·002
Pottery glaze	0·007
Stove tile glaze	0·003
Jena glass (alkali-free	0·0027
Rolled glass	0·0002
Bohemian glass	0·00004
„ „	0·00002
Rolled glass (faulty, soft)	0·00001

—J. W. H.

Enamelling Iron; A Mechanical Process of ——. G. Caye. La Nature, Feb. 2, 1901, 148. Proc. Inst. Civil Eng. 1901, **145**, [3], 48.

THE ordinary process for enamelling iron with a lead glaze is attended with serious consequences to the health of the workmen, the fine dust of the lead compound employed being not only inhaled, but also entering the pores of the skin. A. Dormoy has invented a process of applying a coating of lead enamel to iron surfaces by mechanical means, with avoidance of danger of injury to the health of the workpeople. The articles to be enamelled, after being heated to redness, are placed in a double, hermetically sealed chamber, with glazed sides; each half of the chamber can be worked alternately, and the surplus enamel powder, which is dusted over the metal by means of a sieve, is removed from the chamber by the draught from a high chimney. The mechanism for introducing and rotating the objects to be enamelled, is worked from the outside of the chamber; the sieves are subjected to a vibratory motion by means of an electrical beater. It is stated that the new process has proved extremely successful in working.—A. S.

Lead Poisoning and Pottery Manufacture. Times, Sept. 24, 1901.

In this article is discussed the impracticability of pottery manufacturers conforming to the Home Office regulations concerning lead-poisoning and carrying on business. The writer points out that lead-poisoning has rapidly diminished among potters and increased among other trades, as the following official statistics show:—

——	Potters.	Other Trades.
1897	439	745
1898	463	954
1899	219	1,009
1900	200	1,057

The increase is marked in the trades of file-cutters, painters, sheet-lead workers, coach-painters, and paint and colour makers. The cases reported amongst potters for the six months (Jan.–June) in the last four years show a decrease of from 226 in 1898 to 59 in 1901. This remarkable change, he admits, has been produced by the special rules introduced in 1898, and accepted by the manufacturers without demur, providing for the protection and inspection of lead-workers, especially the women and young persons. But a crisis, the writer asserts, has been reached by reason of Rule 2, which enacts that—

After July 1, 1902, no glaze shall be used which yields to a dilute solution of hydrochloric acid more than 2 per cent. of its dry weight of a soluble lead compound calculated as lead monoxide when determined in the manner described.

By this rule, he maintains, the materials to be used by the manufacturer are prescribed for him, and he is tied down to a chemical formula, an innovation of so sweeping and drastic a character as to have no parallel. The manufacturers point out that strict conformity to that rule is impracticable with the carrying on of business. The question concerns the glaze only used to make ware watertight or to face tiles. Since 1899 fritted lead has been used for these purposes, and Professor Thorpe's theory that if the ratio of the bases to the acids in a frit does not exceed 1·45 to 1, such a frit is practically insoluble, has been controverted by other authorities of greater experience, who contend that frits may conform exactly to this ratio and yet contain lead compounds which are soluble up to 100 per cent. But it is in the practical working of the proposed standard frits that the greatest trouble appears. Experience has shown that the percentage composition of finished glazes is fugitive, and cannot be relied upon. It is impossible, the writer asserts, to guarantee a standard composition, and the manufacturers, in view of these facts, are minded, if the rule is established, either to ignore it or close their works.

PATENT.

Glasses and Enamels; Process for Producing Clouded ——, by Burnt Titanic Acid. G. Lenchs and K. Lenchs. Eng. Pat. 18,152, Oct. 12, 1900.

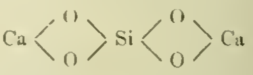
In the production of clouded glasses and enamels, titanic acid as powdered rutile, is usually melted with the other ingredients, with the result that perfect products are difficult to obtain: the inventors mix burnt titanic acid powdered, finished, or enamel glass, coat the articles, an the mixture produced, by burning.—J. W. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

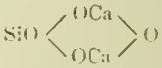
Hydraulic Cements; Theory of the Hardening of K. Zulkowski. Chem. Ind. 1901, 24, [10], 290— [11], 317—321; [12], 345—348; [13], 369—371; 420—423; [15 and 16], 445—449.

The author first refers to previous communications (1 353, 668), and also to his work on the constitution of (this Journal, 1899, 760), which has an important be on the subject. He then describes the preparatio different hydraulic bodies or hydraulites, and discusses constitution and the reactions which take place in course of their hydration.

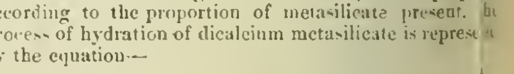
Dicalcium Metasilicate ($SiO_2.2CaO$).—After givin views of Le Chatelier (this Journal, 1888, 567, 817), Sp and Newberry (this Journal, 1897, 887), and Erdme (this Journal, 1893, 834, 1035) on the dicalcium sil the author states that none of these authors have cl explained the cause of the different behaviour of th modifications of this body. There are really two di isomeric compounds, the orthosilicate—



and the basic metasilicate—



of which the former is inactive, and the latter active regard to hydraulic properties. On heating a mixtu silica and lime in the proportions $SiO_2:2CaO$, the o silicate is gradually formed, and this has the tenden form, at higher temperatures, the metasilicate, the rea being reversible as the temperature is reduced. At peratures at which the mixture fuses or even softens, is obtained by sudden cooling (granulation) a pow hydraulite — dicalcium metasilicate, but by slow coo there is formed a mixture of the two isomeric silicate which the ortho compound appears to solidify in a cryst condition, whereupon in consequence of the tension set the heterogeneous mass, disintegration occurs. The pow product has either slight or else no hydraulic prope according to the proportion of metasilicate present. process of hydration of dicalcium metasilicate is represe by the equation—



In the alkaline liquid which results, the monocalcium sil swells up, and the increase of volume causes the mat to bind.

Attempts to prepare the pure dicalcium metasilicat heating together carbonate of lime and silica did not p successful, as the highest temperature attainable was sufficient to fuse the mixture. Trials with a mixtur silica, carbonate of lime, and carbonate of barium, results which appear to confirm Rebuffat's conclusion $SiO_2.2CaO$ yields on hydration, the body $2(SiO_2.2CaO)$ (this Journal, 1899, 44, 761), but the author gives rea for rejecting this theory. The author finally succeede heating together a mixture of lime, silica, and boric the latter in the proportion necessary to form the hydr compound $B_2O_3.4CaO$. At the temperature of the S furnace, in 4½ hours, a glass-like substance was prod which was a mixture of dicalcium metasilicate, monocal silicate, and a little calcium borate. This was rem from the furnace and plunged into water until it ceas glow. The powder made from it, when mixed with w became warm, and, after 1½ hours, it set and became very hard. In the course of 30 days, it took up 6·97 per cent. of water, which agrees satisfactorily with the amount, 7·13 per cent., calculated according to the author's theory that the active compound in hydraulic cements is dicalcium metasilicate.

The so-called Tricalcium Silicate, $SiO_2.3CaO$.—It is almost generally accepted that in Portland cements the silica exists as the tricalcium compound, but the author draws attention to the contradiction which exists between the proportions of the components and the valency of orthosilicic acid. As a hexavalent silicic acid is not known, it follows that with a mixture in the above proportions, 1 molecule of lime must remain in the free condition. The author criticises the views of Le Chatelier and Rebuffat as to tricalcium silicate being the active constituent of hydraulic cements, and states that a hydraulite prepared by heating a mixture, $SiO_2 + 3CaO$, consists of dicalcium orthosilicate, dicalcium metasilicate, and free lime.

The author then describes the preparation of calcium barium silicate, dibarium metasilicate, dimagnesium metasilicate, tetracalcium borate, dicalcium aluminate, monocalcium aluminate, dibarium aluminate, dicalcium ferrite, monocalcium ferrite, dicalcium orthostannate, and dicalcium plumbate, and gives equations showing their behaviour on hydration, these, in all cases, being based upon actual experimental results.

Kaolin Lime Cement.—A mixture of Zettlitz kaolin, $2SiO_2.Al_2O_3.2H_2O$, and lime was heated in a Seger furnace n the proportions necessary to form the product—

$$2(SiO_2.2CaO) + Al_2O_3.2CaO.$$

A sample, when ground and mixed with water, set in hour, and was exceptionally hard in 1½ hours. The quantity of water taken up was in accordance with that calculated for the two constituents, dicalcium metasilicate and dicalcium aluminate, and proves the incorrectness of Rebuffat's assumption that the hydrate $2(SiO_2.2CaO).H_2O$ s formed by the hydration of dicalcium silicate.

Kaolin Baryta Cement.—A cement of the composition $(SiO_2.2BaO) + Al_2O_3.2BaO$ set hard with water, but, fter some time, it split and became soft, and crystals of baryta were deposited. The amount of water taken up greed with the equation $2(SiO_2.2BaO) + Al_2O_3.2BaO + 6H_2O = 2SiO(OH)_2 + 6Ba(OH)_2 + Al_2O(OH)_4$. It ppears therefore that the hydration process, or the splitting p of those basic silicates which contain a water-soluble ase, can become complete under favourable circumstances.

Portland Cement (*Stettin-Züllchow*).—The author nally applied the results obtained as to the composition of ndividual hydraulic bodies, and the amount of water of ydration taken up by them, to the examination of a Portand cement, in order to ascertain whether the amount of ater of hydration calculated in this manner approximates to the amount actually taken up. The cement experimented ith had the following composition:—Sodium silicate (with ome potassium silicate), 3·43; $CaSO_4$, 2·45; $SiO_2.2CaO$, 1·89; $Al_2O_3.2CaO$, 12·14; $Fe_2O_3.2CaO$, 4·35; MgO, 97; and CaO, 14·22 per cent. The amount of water of ydration in the hydrated product from this cement should e 14·67 per cent. according to the author's calculaon. The results actually obtained were: in one day, 4·30; two days, 6·47; in seven days, 11·32; in 21 days, 14·44; nd in 30 days, 14·44 per cent., the agreement between eory and practice being thus very satisfactory.

The author concludes that the following processes occur the manufacture of hydraulic cements:—Taking as a sis a pure kaolin of the following composition—

$$HO.SiO.Al(OH).O.Al(OH).SiO.OH,$$

en by the action of lime, several intermediate reactions ke place, leading finally to the formation of the hydraulites $O_2.2CaO$ and $Al_2O_3.2CaO$. But in practice there are so present silica, iron oxide, and alkalis, and these at the gh temperatures attained, form saturated compounds. The ished cement therefore contains an excess of lime in the ee condition, hydraulic lime compounds of silica, alumina, d iron oxide, and some alkali silicate. The iron compound d the alkali silicate act favourably, in that they render the mixture more fusible. The proportions of the different compounds depend upon the composition of the raw materials, and partly also on the temperature and duration of heating.

Conclusions.—The author criticises the loose and defective manner of working frequently followed in investigations on the subject of cements, and states that one cause of error is that not enough compounds are studied. Results are deduced by analogy, which, as a matter of fact, may be entirely incorrect. In proof of this the author points out that he was almost led into the error of assuming that alumina would behave like silica, whereas experiments showed that these otherwise allied compounds exhibited notable differences when present as components of hydraulites. Silicic and boric acids behave similarly, but stannic acid, which also belongs to this series, shows considerable variation. Still greater is the difference between silica and alumina, and between these and iron oxide.

The results of the investigation leave unexplained the influence on the properties of a hydraulite exerted by the presence of another body with which no chemical action could be presumed or detected. There is, for example, the favourable influence of alkaline substances on the swelling or hardening of hydraulites. Again, hydraulic compounds of iron oxide, when pure, are of more inferior quality than when they contain a little silica and alumina. It is also noteworthy that whilst it is very difficult to prepare pure dicalcium metasilicate, Portland cement, which contains this compound, can be readily prepared.—A. S.

Cements; Reaction of Sulphate of Calcium with ——.
M. Deval. Bull. Soc. d'Encouragement pour l'Ind. Nat. 1901, **101**, [t], 96—105.

Since three equivalents of calcium sulphate must be fixed to form sulpho-aluminate of calcium from aluminate of calcium, it would appear that the reaction might serve as a means of estimating aluminate of calcium in cements. To carry out the estimation, precipitated calcium sulphate slightly in excess of that required to fix all the aluminate of calcium present is mixed with the powdered cement, made into a paste with water, and allowed to stand; the amount of calcium sulphate fixed is determined by washing out the excess present by means of sufficient water, and estimating the remainder. Anhydrous cements fixed the sulphate more slowly than hydrated cements. With hydrated cements, apart from the action of the calcium aluminate present, the paste retained calcium sulphate, which increased in quantity with the time of action, and could not be removed by washing with suitable proportions of water; with mixtures of calcium silicate and sulphate, calcium sulphate and carbonate, calcium sulphate and sulpho-aluminate, and calcium silicate and sulpho-aluminate, no such action occurred; with a mixture of silica, alumina, and lime, such action did occur, which would show that the phenomenon is peculiar to cements.—J. W. H.

PATENTS.

Wood: Process for the Preservation of ——. H. H. Lake, London. From T. Guissani, Milan. Eng. Pat. 11,927, June 11, 1901.

The wood is immersed in a liquid of high boiling point, *e.g.*, tar-oil, heated above 100° C., and then transferred in succession to baths of two or more impregnating liquids which are not miscible, avoiding contact with the air while doing so; on cooling, the evacuated wood absorbs the liquids, which become intimately mixed in its pores. A special means consists in immersing the wood, after the first operation, into an open bath containing two liquids, such as creosote, 14° B., and zinc chloride solution, 4° B., lowering or raising it from one to the other as desired.
—J. W. H.

Wood; Method for Producing Artificial ——. E. Helbing, Wandsbek, Germany. Eng. Pat. 13,136, June 27, 1901.

Peat or turf, after having been washed out, the natural fibres being retained, is mixed with hydrate of lime and an aluminium compound such as the sulphate, pressed while wet, and hardened in the open air.—J. W. H.

Wood Preserving. C. A. Allison, London. From C. S. Lawrence, Plainfield, Wisconsin, U.S.A. Eng. Pat. 15,316, July 29, 1901.

Pockets are formed on the surface of the timber, which are filled with a composition containing sodium chloride, arsenious acid, and bichloride of mercury as essential ingredients, and sealed; the formula given consists of chloride of sodium, 16 parts; arsenious acid, 8 parts; bichloride of mercury, 1 part; potassium nitrate, 2 parts; subacetate of copper, 1 part.—J. W. H.

Bricks, Furnace Linings, Crucibles, and other Articles; Manufacture of Refractory ——. W. S. Rawson, London, and R. D. Littlefield, Thornton Heath. Eng. Pat. 16,004, Sept. 8, 1900.

Calcined magnesite is ground with from 2—12 per cent. (according to the proportion of lime present) of a fusible boron compound, such as boracic acid, made into a paste with water, moulded into any desired form, and fired.
—J. W. H.

Refractory Materials for Building and other Purposes; Manufacture of ——. R. J. Friswell, London. Eng. Pat. 18,698, Oct. 19, 1900.

The invention has reference to Eng. Pat. 4628, Feb. 24, 1898 (this Journal, 1899, 585), china clay or other clay being substituted for the earthy carbonates there specified; silicious or aluminous minerals are mixed with asbestos fibre and cemented together by means of gelatinous silica, suitable carbonates being added if desired.—J. W. H.

Marble; Producing Imitation ——. S. Sborowitz, Berlin. Eng. Pat. 12,073, June 13, 1901.

1,500 parts of colouring matter are kneaded with 150 parts of asbestos fibre, or other fire-resisting material, previously saturated with a solution of 50 parts of shellac in 100 parts of spirit; the mixture is then compressed into moulds, heated to drive off the spirit, again compressed, dried in the air and polished; pearl, metal turnings, &c. may be added to enhance the effect, or the asbestos may be coloured prior to kneading.—J. W. H.

Mortar; Production of——, and the Treatment of Stone, and the Construction therewith of Masonry Work. C. Lorenc, Prague, Bohemia. Eng. Pat. 11,715, June 7, 1901.

The feature of the invention consists in the use of a mortar of the same tensile strength as the building stone. Good building stone has a tensile strength of 20—40 kilos. per sq. cm., the strength of good clinker bricks being 40—130 kilos. per sq. cm. Now, a cement made of water-glass, infusorial earth, and trass has a maximum tensile strength of 80—130 kilos. per sq. cm., and a cement consisting of 2 parts of a mixture of water-glass, infusorial earth, trass, and Portland cement, and 1 part of sand, after hardening 32 days, has a maximum tensile strength of 50—100 kilos. per sq. cm. By varying the ratio of sand to cement the tensile strength may be altered; with a ratio of cement to sand of 1:1, the maximum tensile strength is 40—80 kilos. per sq. cm.; with ratios of 1:2 and 1:3, the figure becomes 30—65 and 25—30 respectively. By the use of these data the strength of the mortar may be altered to suit the building material, with the result that the necessity for the use of ironwork supports for openings in walls &c., disappears. The building stone, prior to use, is soaked in water and then in a solution of water-glass containing fine infusorial earth; the masonry, when completed, is painted with this mixture or with one made with clay or fluorides.—J. W. H.

Cement; Process for Producing First-Class ——. H. Passow, Blankenese, Germany. Eng. Pat. 14,278, Aug. 9, 1900.

The ordinary raw materials for cement making, or blast-furnace slag, are treated, while liquid, with oxygen, air, or gases containing oxygen.—J. W. H.

Sampling, Averaging, Mixing, and Storing Mate [Portland Cement, &c.] in Bulk; Process and Ap ratus for ——. The Edison Ore-Milling Syndicate, L London. From T. A. Edison, New Jersey, U.S.A. Pat. 14,353, Aug. 10, 1900.

Invention specially designed for use in the manufac of Portland cement. The process of averaging the mate in bulk, so that an even assay can be secured, consist depositing the material so as to form a series of lay simultaneously drawing off material from each of the layers, redistributing the material in another series of lay and finally withdrawing the material from the latter se Limestone may be mixed, as required, with cement-rock treated. The material may be first deposited in a con pile, composed of a series of inclined layers or pa cones. In one arrangement of apparatus for carrying the process, the material is deposited by a feed-belt i bin, from which it is withdrawn by another belt, deposited on a mixing belt, which re-deposits it in a sec bin, a belt being also provided beneath the latter bin withdrawing the material. A similar arrangement of b may be employed in a stock house having a capacity f plurality of deposits in bulk. In another arrangement material is deposited in a number of bins through inclined feed-spout extending into each bin, a numbe openings in the bottom of said spout being provided manually-controlled valves.—R. A.

Cement; Manufacture of ——. K. Müller, Lüneberg Prussia. Eng. Pat. 19,392, Oct. 30, 1900.

The cement consists of calcium sulphate and a satura solution of magnesium sulphate, with the addition of bu magnesia to modify its hardness.—J. W. H.

X.—METALLURGY.

Metals; Minute Structure of ——. G. T. Beilby. Assoc. Glasgow, Sect. B, 1901.

Microscopic examination of metallic surfaces produ by breaking, tearing, or filing, by rolling, drawing, hamm ing, or polishing, has shown that the metals, as they ordinarily met with, appear in two forms: (*a*) as minute sc or "spicules"; (*b*) as a transparent glass-like substa These two forms of "metal substance" occur in all metals examined, and, taken together, they do not ap to depend in any way on the particular thermal or mec nical treatment to which the metal has been subjected, upon the greater or less mass of the particular piec metal examined. Their existence is, therefore, to a gr extent, independent of the conditions which determine particular crystalline structure in metals and alloys.

In form (*a*) the scales or "spicules" do not vary m in size in the different metals examined, which incl among their number representatives of most of the gr groups. The diameter of the scales is estimated to ra from $\frac{1}{300}$ to $\frac{1}{400}$ of a millimetre. Their thickness has yet been measured, but they can be seen by reflected li when their thickness is certainly less than $\frac{1}{12000}$ o millimetre.

Form (*b*) is seen as a transparent glass-like film on m surfaces which have been exposed to certain forms pressure. In the transparent form the metals have t characteristic colours by transmitted light; for insta gold is green, iron is blue.

The scale form (*a*) passes into the transparent form when the metal is pressed or hammered upon a h polished surface. The same effect takes place whe mirror-like polish is produced by ordinary methods. F or cutting tools, in passing over the surface or through substance of metals, leave the cut or scraped surf covered with a more or less continuous film of transpar metal. All polished metallic surfaces are covered wit thin layer of transparent metal like a lacquer or enamel.

By suitable treatment, a coating of transparent me can be formed of varying degrees of thickness, so that, reflected light, scales can be seen more or less deeply bedded in the transparent coating. The light from deeper scales shows the characteristic colour of the me ı some cases the colour of the coating, as seen by the icroscope, is so intense that no reflected light reaches the ırface.

Attempts have been made to measure the thickness of the ın by focussing for its upper and lower surfaces, or for e upper surface, and for scales embedded in the film, and easuring the movement of the microscope between these oints. As the measurements appear to give rather aggerated results their publication is held over for the eantime.

The transparent metal (*b*) passes back into the scale rm (*a*) under the influence of certain kinds of mechanical d chemical treatment.

The metals already examined include gold, silver, platim, cobalt, nickel, chromium, iron, copper, lead, bismuth, timony, tin, cadmium, magnesium, aluminium, zinc, and lium.

The highly crystalline metals, such as antimony, bismuth, l zinc, exhibit the same features as the softer and more lleable metals. The crystalline faces and cleavages are ered with a film of transparent metal, while scales are tinctly seen in fractures at right angles to the cleavage nes. Certain ores show similar appearances.

The zinc and tin alloys of copper show the same minute ucture and appearances as the pure metals.

The persistence of these minute scales or "spicules" ler all kinds of mechanical and thermal treatment, the ıarkable uniformity of their size and appearance in metals all the leading groups, their disappearance into the ısparent form, and their reappearance again, apparently hanged in size or otherwise, seem to afford fair ground the conjecture that they are, in some way, definite units he structure of metals.

st-Furnace Gases; Probable Utilisation of Power from —. B. H. Thwaite. Iron and Steel Inst., Autumn leeting, 1901.

ER reviewing the progress made in the utilisation of t-furnace gases and the advantages of the system of et power as employed in the large internal combustion engines, the author suggests a scheme for using ıucer gas as fuel, similar to that employed in the open-th furnace, for firing the hot-blast stoves in such a way it need not involve the loss of the heat recovered from blast-furnace gas itself during the cooling which is ssary for its purification from dust. The sensible heat ıe latter gas is used to raise the temperature of the air ired to support the production of the producer gas and the combustion of this gas in the hot-blast stoves, so the thermal loss in the blast-furnace gas, cooled and tied for the gas engine, would be transferred to the nment of high efficiency in the stoves.

ıe power potential of a blast furnace of a given tonnage ut can be considered and formulated under four different nptions, *viz*:—(A) If the blast-furnace gas is displaced ıe hot-blast stoves, as suggested, by producer gas, sing the former gas for motive power purposes, but out interfering with the steam-blowing engine equip-; (B) The same condition, but including the displacement ıe steam boilers and steam-driven blowing engines by riven ones; (C) In addition to B, the prevention of the of blast-furnace gas during the charging operations, he power utilisation of the gas; (D) The displacement e present steam-blowing engines by gas-driven ones, ıe hot-blast stoves to be heated with blast-furnace gas present. Two examples are worked out of the ıted horse power attained under these four assumptions the data of two blast-furnace operations, the first ng with 10 lb., and the second with 5 lb. air blast, both ı daily output of 100 metric tons, but with slightly ıg conditions. In the first example the available works out as follows:—A, 3,253 I.H.P.; B, 5,093; 07; and D, 3,665. In the second example, with n r original power, the respective figures are 5,933, 7,013, and 5,435 I.H.P., so that in both cases the assumption s the best results. These figures are converted into c horse-power and into kilowatts reduced by 25 per An approximate estimate of the cost per kilowatt-f 8,000 hours, based on a plant capacity of at least 1,000 kilowatts, works out at 5*l*. 1*s*., or equivalent to 0·15*d*. per kilowatt-hour in the case A, and to 0·14*d*. in the cases B and D. The average cost for fuel per kilowatt-hour in British electric light supply stations is about 1·06*d*., which, with stores, waste, wages, repairs, &c., is increased to 1·93*d*. In many cases it will be found possible for the ironmaster to charge 0·3*d*. per kilowatt hour for electric supply at a distinct profit, which is equivalent to 10*l*. per kilowatt-year of 8,000 hours.

The author then deals with the application of this energy, which is continuous in its supply through the year, to processes which in themselves are continuous. The present electric applications for mechanical purposes in iron and steel works are enumerated, but it is possible that the steel works may occasionally be closed while the production of pig iron continues, in which case the outlet for the power would be stopped. To utilise it to the maximum, therefore, the full load output should be absorbed during the 8,000 hours year by a continuous process, and consequently the electric lighting companies will constitute a poor outlet unless they succeed in their efforts to level up the load line by providing a day load for power or traction purposes. A more appropriate and profitable field lies in the modern electro-chemical and electro-metallurgical industries, and the author advocates that these industries should be harnessed to the iron works, since all the additional necessary requirements, such as staff, labour, locality, shipping and railway facilities are already provided. In the event of the blast furnaces blowing out, the power for these subsidiary industries would be provided by the gas producers, since their product would not be required for the hot-blast stoves and blowing engines. At present over 200,000 kilowatts of energy are utilised in these industries, and as the calorific efficiency of the electric furnace has increased by 35 per cent. during the past four years, it would appear that this field of application was one of great promise.

A first installation embodying the author's views is now being constructed at an iron works in Germany. Its scope includes the continuous supply of 1,300 E.H.P. to coal mines for power purposes, 800 for lighting, 500 for chemical, metallurgical, and other industries, 200 for town lighting requirements, and 1,500 E.H.P. for a special electro-chemical industry during the hours that the supply for lighting is not required.

The estimated cost of the electrical energy, including a payment for the blast-furnace gas, is 0·3*d*. per kilowatt-hour.—A. W.

Basic Bessemer Blow; Spectra of Flames at different Periods during ——. W. N. Hartley and H. Ramage. Iron and Steel Inst., Autumn Meeting, 1901.

THE authors have examined the flame spectra of the basic Bessemer blow, and have found them to differ in some respects from those of the acid process. Owing to the quantity of lime dust, &c., ejected, and the reflection of light therefrom, the spectra were at first complicated by a superposed feeble solar spectrum, and this necessitated night observations. A large number of spectrum photographs was obtained, and the general observations and conclusions are as follows:—The flame, which is visible from the commencement of the blow or as soon as the lime-dust cloud has dispersed, is caused by carbonaceous matter in the lining of the vessel, and its luminosity is due partly to volatilisation of alkalis and to the incandescence of the lime dust. Volatilisation occurs largely at an early period of the blow, and the metals are readily volatilised by the reducing atmosphere, rich in carbon monoxide. A large amount of fume is formed towards the end of the second period, when there is little or no carbon remaining, due to the heat produced by the oxidation of the iron and phosphorus. The flame is short, and the vapours carried up are burnt by the blast. The overblow is characterised by a strong yellow illumination, with the production of a dense fume of oxidised vapours, chiefly iron. The spectrum of this indicates a low temperature, and the light therefore emanates from a torrent of very small liquid or solid particles. The low temperature and the small reducing power accounts for the feeble lines of lithium, sodium, potassium, and manganese seen at this stage. The difference of the spectra from those of the acid process, depends upon the fact that the manganese bands are comparatively feeble, and on the presence of new lines of elements contributed by both the metal and the basic material of the charge. Lithium, sodium, potassium, rubidium, and cæsium, have been traced mainly to the lime; and manganese, copper, silver, and gallium, to the metal. Other metals, such as vanadium and titanium, yield no flame spectra, but pass, together with the chromium, into the slag in an oxidised state. The intensity of the lines of a metal varies with the amount present in the charge, but there is also a variation in intensity in the lines of a spectrum of a single metal. The latter is due to changes in temperature, some lines fading and others becoming stronger as the temperature rises.

The authors observed a new and sharp line which they traced to potassium. Its brilliancy was increased by diminishing the quantity of metallic vapour in the flame, so that the molecules would appear to be endowed with greater freedom of motion as the vapour pressure of the metal was decreased. The line was of greater intensity, using potassium compounds, with the oxygen and carbon monoxide flame than with the oxyhydrogen flame, but not so great as in the Bessemer flame. Although prominent at low temperatures, it has not been recorded in Bunsen flame spectra.—A. W.

Steel; Correct Treatment of ——. C. H. Ridsdale. Iron and Steel Inst., Autumn Meeting, 1901.

This paper, which covers 47 pages, is divided into six sections.

Section 1 is a preliminary statement of the objects in view.

Section 2 illustrates the effect that composition and initial treatment have, as compared with subsequent treatment, on the ultimate properties of steel. Too much importance is attached to the composition *per se* and far too little to the right treatment. A soft wire hardened by rolling remained rigid under a torsional strain that readily twisted an annealed medium hard wire, showing that rolling produced an effect greater than an extra 0·15 per cent. of carbon and 0·40 per cent. of manganese. Frequently an impure and hard iron will behave better and last longer than a purer and softer one, and an instance is quoted of a "soft" American steel with 0·24 per cent. of carbon being used indiscriminately with British 0·10 per cent. carbon steel. Whilst the maker employs every means to produce good metal, the fact is emphasised that the user is frequently without the slightest control over such items as the finishing temperature and the equable and proper rate of cooling.

Section 3 treats of the composition of steel, and states that every steel has a character of its own, and that one made by one process may be softer than a similar metal made by another process, so that to condemn the second as bad because it suffers under certain treatment suitable to the first, is obviously wrong.

Section 4 deals with the effect of work on steel at different temperatures. In cooling from the molten condition, the iron crystallises first, but the grains have no cohesion owing to the softness of the impure mother-mass or cementing portion, so that the material will easily break or be "red-short." As the cement becomes more plastic, the metal can be readily worked, since the grains can move freely in it, but, in cooling, the grains are likely to grow and produce brittleness. At a lower temperature the critical point is reached at which the cement and grains are of equal hardness. This, for soft steel, is about 1,000° C., or orange or bright red heat. Work at this stage breaks up the grains and imparts toughness by the interlocking of the grain and cement. If the finishing temperature of rolling be high, the metal will soften, but may become brittle with slow cooling from growth of grain, whilst on the other hand if it is too low, the hardness of rolling is not entirely eliminated, so that the temperature of finishing should be between these tendencies. The relative plasticity of the two constituents becomes less through the lower or red heat stages, until it reaches its minimum state at blue heat, about 316° to 370° C. At this stage the metal does not uniformly receive the force a
to alter its shape, and internal strains are set up
owing to the low temperature, have no time to
themselves during further cooling. The result is th
metal is liable to rupture with sudden shock, altho
may yield to a slowly applied strain. As the tempe
gets below straw heat, 250° C., and until cold, the st
more plastic than at a blue heat, but becomes harder
below zero. If a coarse grain steel be rapidly heate
grains are broken up more efficiently than if slowly h
so that it is obvious that the process of annealin
delicate one which should be well understood by
dealing with varying qualities of steel or with the
steel for varying purposes.

Section 5.—In this part the processes of treatment
steel has to undergo, both by the maker and the us
discussed, and modifications suggested. A table is
in which the temperatures by colour observatio
arranged, with the actual degrees, as ascertained
pyrometer, and curves for the limits of finishing
peratures of steels, ranging from 0·03 to 0·44 pe
of carbon. The stacking of rolled girders, to ensur
cooling throughout, so as to prevent strains and ine
of metal by the cooling of the flanges first, whilst th
is hot, is described, and the possibility of great strain
set up in a metal by the chilling of one portion by d
water, especially if any part be maintained at a bl
during the remainder of the cooling, is pointed ou
regards the user's treatment, the faults and su
remedies are given in detail for forge work, w
making tubes, plates, sheets for tinplate, strips, hoop
rods for wire and drawing, pickling, galvanising, u
drawing and rolling. Many of the faults resultin
wrong treatment in these processes can be remed
annealing, and the author recommends that this sh
effected by rapid but thorough heating and slow
The metal should not be over annealed, and large
should not be cooled in pits, annealing furnaces, or in
since very slow cooling gives a large grain.

Section 6 deals with the standards which sh
required, and tests for the same, but the author ad
local testing according to material and requirements
scientific principles. He concludes with a few p
that rqeuire elucidation. In this section is included
of manifestations, in which the faults are classifi
probable original causes and originators, with p
causes and identifying tests respectively enumerated.–

Steel Ingots; Variations of Carbon and Phosph
——. A. Wahlberg. Iron and Steel Inst., A
Meeting, 1901.

The author was instructed by the Board of Dire
the "Jernkontoret" to investigate the above su
ascertain:—(1) The limits of variation of carb
phosphorus as found in soft, medium hard, and ve
steel, which has been cast, at normal temperatu
10-in. to 12-in. ingots, and then rolled into 4-in.
either directly or after cooling down and re-heatin
(2) whether and to what extent chemical ana
absolutely identical samples vary in their results a
percentages of carbon and of phosphorus, when m
different chemists. The ingots were carefully cast
different steel works, each making a set of three, co
from 0·10 to 0·20 per cent., 0·50 to 0·60 per ce
1·00 to 1·20 per cent. of carbon, and were then ro
4-in. square billets, cut transversely, and a sla
from about 5 ins. from both ends. From each
24 slabs three samples were drilled, *viz.*, from the c
outer portion, and the intermediate portion, and the
separately submitted to analysis at Stockholm to p
variations in composition. The core and outer
were further analysed by commercial methods, bo
bustion and colorimetric for carbon, by J. E. S
England and by Jüptner von Jonstorff in Austri
colour tests and phosphorus analyses for the secon
were made at Kopparsberg, Sweden. The large
of results so obtained in these four different laborat
given side by side in full, and are also classifi
separate tables for specific objects.

An examination of the variations between the outer face and axis and between the top and bottom parts of ingots, yields a result in distinct opposition to what ght have been expected, *viz.*, that the variation in both nents appear more pronounced in the softer than in the der steels. The variation is more or less accentuated the following influences—(*a*) the casting temperature, smuch as ingots cast at low temperatures are more nogeneous than at high ones; (*b*) the size of mould, nogeneity improving with smaller ones; (*c*) the carbon tents, the composition being more uniform with increased centages of carbon; and (*d*) the method of casting with ds, which appears to promote homogeneity. The iations of phosphorus are found to be much more siderable than the variations in carbon. An exceptional ult was noticed in the ingots cast with heads, which was the metal was, as regards chemical composition, of ter homogeneity, and in one case was richer in carbon phosphorus at the bottom than at the top. This is ibuted to the head, through cooling slowly and lastly, iving the liquated portions.

n respect to the variations in analysis at different oratories and by methods which were essentially in y day use for commercial purposes, it is observed that, st there are some serious discrepancies, the respective age results of the same tests are, with few exceptions, y uniform. The discrepancies are in some cases arkable. For instance, the carbon combustion deter- ations made at Stockholm were lower than those of the r laboratories in the soft and medium hard samples were higher in the very hard samples. These results confirmed by fresh samples. The Austrian combus- values of the low-carbon steel differed to the extent 0 per cent. above the English and Stockholm results, in the high carbon about 2 per cent. below, whilst e was a similar difference with the colorimetric values. average results with the phosphorus showed the English Stockholm values to be about identical, whilst the trian and Kopparsberg were somewhat higher.

e conclusion is arrived at that the custom of specifying narrow a margin as to the percentage of carbon and phorus is liable to involve serious risk. The margin metimes so limited as to be inside the variations in the itself, and certainly inside the error of analysis. The test defects of homogeneity are found in the cross ons, or between the outer surface and the axis, and may be modified or annulled by mechanical treatment with repeated annealings, but the difference between top and bottom of the ingot will remain unaltered, pendently of any subsequent treatment, and this is a r which should always be taken into account. Until factory analytical methods are duly recognised and blished by international agreement, the possible dis- ancies will continue to be a source of commercial ble.—A. W.

; *Effect of Copper on ——, for Wire Making.* J. E. ead and F. H. Wigham. Iron and Steel Inst., Autumn eeting, 1901.

authors have investigated the effect of copper on steel ire drawing, by adding quantities varying from 0·46 to per cent. to four Bessemer rail steels, containing about o 0·5 per cent. of carbon, and to a crucible steel, con- ng 0·97 per cent. of carbon, the copper added to the being 9·46 per cent. The wires were drawn, with ional, and towards the end, frequent annealings, side de with the original steels, and torsional, bending, and le tests were made of each pair of steels, cupreous and upreous, after each draught. The results show that opper has a prejudicial effect on the torsion and bend- apacity, especially in the 2·0 per cent. sample, and the carbon is high, and this effect is shown more or ught through, from the first to the last of the 13 hts which were made in reducing the wires from 0·216 040 inch diameter. The elongation also is diminished e copper. The effect on the tensile strength was to ase it slightly at first, but after a time it became c, a circumstance which is not remarkable with pered wires. The copper has an especially marked effect upon the high carbon wires when tempered, and with the last five draughts of the crucible steel, the average difference between the two samples was 7 tons per square inch against the cupreous one, whilst the torsions on the average were over 40. The actual breaking strains of these samples, after the final draught, were 114·4 and 98·1 tons, or a reduction of 16·3 tons per square inch, as the result of the presence of 0·16 per cent. of copper. The effect of smaller quantities of copper in steels remains to be examined, but the results with the present metals indicate that its presence in high carbon steel for wire-drawing purposes should be avoided. The microscope seems to show that the copper-iron portion of the steel is distributed unequally on setting, and this would point to a more evil effect on the mechanical properties with a high than with a low carbon steel. The samples with copper were invariably condemned by the workmen making the tests, who, without knowing of any difference beyond the mark, complained that they did not break so toughly or were "short in the hand."

Copper increased the electrical resistance in two cases, and reduced it in three, so that further research is required in this direction. Corrosion test experiments confirm F. H. Williams' results and conclusion that copper in steel retards corrosion.—A. W.

Copper and Iron; Alloys of ——. J. E. Stead. Iron and Steel Inst., Autumn Meeting, 1901.

The author finds that copper and iron in the pure state will alloy in any proportions by direct fusion, and the resulting metals have no tendency to separate into layers, and are free from globules and knots of copper or iron. The series of alloys may be classed into three distinct sections—A. Alloys with traces to 2·73 per cent. of iron and 97·20 per cent. of copper. These are apparently homogeneous and contain only one micrographic constituent. They have the appearance of copper, becoming gradually harder and slightly magnetic. B. Alloys between the above proportions and those containing 92·0 per cent. of iron and 8 per cent. of copper. In this section crystallites begin to appear with slightly more than 2·73 per cent. of iron present, and they increase with further additions of iron, until they eventually interfere with their individual growth, and assume the form of crystalline grains separated by envelopes of copper, containing 2·73 per cent. of iron in solution. These envelopes then grow thinner, until with 90 per cent. of iron and 10 per cent. of copper, they only partially cover the grains. When this alloy is broken, the fracture follows the copper films chiefly and the iron grains partially, and shows a colour nearly similar to the alloys containing respectively 90 per cent. and 20 per cent. of copper. This effect, as observed without the microscope, has probably led to the belief that the copper and iron were not alloyed. Polishing reveals the true structure, which then appears to the naked eye to have no copper present. The magnetic properties increase in this section with the iron. C. Alloys containing between 8·0 per cent. and traces of copper. No sign of copper or copper constituents is visible in this section, either upon the rough fractured surface or with the microscope.

Carbon interferes with the true alloying of iron and copper, and, by combining with the former, throws out the latter with the formation of two conjugate layers of separate metals. On melting the 50 per cent. alloy in a charcoal lined crucible, carbon was absorbed, and the upper metal consisted of iron containing 10·34 per cent. of copper and 2·07 per cent. of carbon, whilst the lower metal was copper containing 9·60 per cent. of iron, which carried with it a small quantity of carbon. On melting the upper metal with charcoal, a small globule of copper further separated, which contained 2·73 per cent. of iron and no carbon. The remaining iron still contained 7·64 per cent. of copper, the carbon having increased only to 2·39 per cent., so that copper in solution in iron limits the absorption of carbon.

In a grey hematite iron with 3 per cent. of silicon, the limit of copper absorption is about 7·5 per cent., and in steel with 1 per cent. of carbon, about 15 per cent. In most of the carbon-iron-copper alloys, however, there are suspended globules of copper. The latter metal in cast iron does not appear to have any influence in retaining the carbon in the combined form or in causing it to separate as graphite. In steels it retards the formation of pearlite. Its only effect on foundry iron appears to be to raise its tenacity, so that its presence need not be feared.—A. W.

Nickel Steel as used in Commercial Work. H. F. J. Porter. Eng. and Mining J. 1901, **72**, [8], 232.

Nickel steel has a lower melting point than ordinary steel with the same carbon content; in the cooling process, nickel tends to reduce segregation and liquation, so that a nickel steel ingot is more homogeneous throughout than one of simple steel, and there is less tendency to form blowholes. Nickel steel in process of manufacture is very sensitive to changes of temperature; therefore, in forging or rolling, care must be taken to maintain a uniform temperature throughout the body of metal. The tensile strength and elastic limit of nickel steel are somewhat reduced by annealing, but are raised by oil tempering to an extent beyond which the annealing has lowered them. Nickel steel forgings are not hard to machine, but are exceedingly tough. For ordinary forgings, nickel steel of 3—3·5 per cent. of nickel and 0·25 per cent. of carbon is used; it has the same elastic limit and tensile strength, but 20—30 per cent. greater elongation than simple steel of about 0·50 per cent. of carbon, and has 40 per cent. greater strength than simple steel of 0·25 per cent. of carbon, with practically the same elongation and reduction of area. Nickel steel forgings of high elastic limit are considered best for service where rapid alternations of tensile and compressive stresses are applied. Ordinary steel corrodes about twice as much as nickel steel of the same carbon content on submersion in salt water. 5 per cent. nickel steel, with 0·25 per cent. of carbon, after oil tempering and annealing, has an elastic limit of from 150,000 to 175,000 lb. per square inch, and is especially serviceable for hydraulic cylinders, where very high bursting pressures are applied.—A. S.

Ferro-Chromium; Process for Making Mild ——. Armengaud, jun., Paris. From Société Électro-Métallurgique Française de Froges Isère, France. French Pat. 301,804, July 5, 1900; through Monit. Scient. 1901, **15**, [717], 224.

The claim is for a mild ferro-chromium made in the electric furnace, and containing 60 per cent. of chromium, 39 to 29 per cent. of iron, the carbon being reduced to 1 per cent. This is distinguished from ordinary ferro-chromium by the following properties. It is magnetic, tough, does not scratch iron, and can be drilled by steel.—R. L. J.

Alumino-thermic Welding and Casting; Improvement in the Goldschmidt Method of ——. L. Cohn. Jour. für Gasbeleucht., 1901, **44**, [33], 615—617.

The Goldschmidt process (described this Journal, 1900, 908) has the disadvantage that it generally required the use of skilled labour, especially for the welding of tramway rails. But with the new modification, an ordinary workman can effect a good weld, and the time required for making the mould and running the metal need not be greater than that necessary for jointing a rail, including bonding with copper, by the method commonly used. The "thermit" mixture (of which 1 kilo. yields 150 grms. of molten iron) is placed in a crucible made of iron-plate lined with refractory material, mounted on a substantial tripod, and closed at the bottom with one or more small iron plates, according to the quantity of "thermit" used. The thermit is covered with a layer of kindling, or priming mixture, and an iron plate with a central hole, through which the charge can be ignited by means of a fusee, is placed over the whole. The crucible thus prepared is placed with its tap-hole immediately above the gate of a refractory mould built around the ends of the two rails to be jointed, which are so clamped together that the surfaces to be welded are pressed against each other. When all is ready, the charge is ignited, and in a few seconds the contents of the crucible should become fluid, and, melting away the supporting iron plates, should flow into the mould and make the required joint. In this process it is the molten iron which first enters the mo and the molten corundum slag floating on the top pa out last, instead of first as in the older teeming proc The method lends itself well to the jointing of rails alre laid, and ensures a sound electrical contact; it is of no however, for rails of which the ends are worn, as it d not assist in checking the hammering of the wheels on rails. The process cannot well be applied to the weld of tubes, as the hot metal is liable to melt its way thro the tube at first contact; it is, however, very suitable the repair of broken shafts or axles, and is especi recommended for use on board ship, as the applia required are exceedingly simple and convenient.—W. G.

Aluminium and its Alloys ——. L. Tetmajer. Chem Zeit. Rep. **25**, [64], 243.

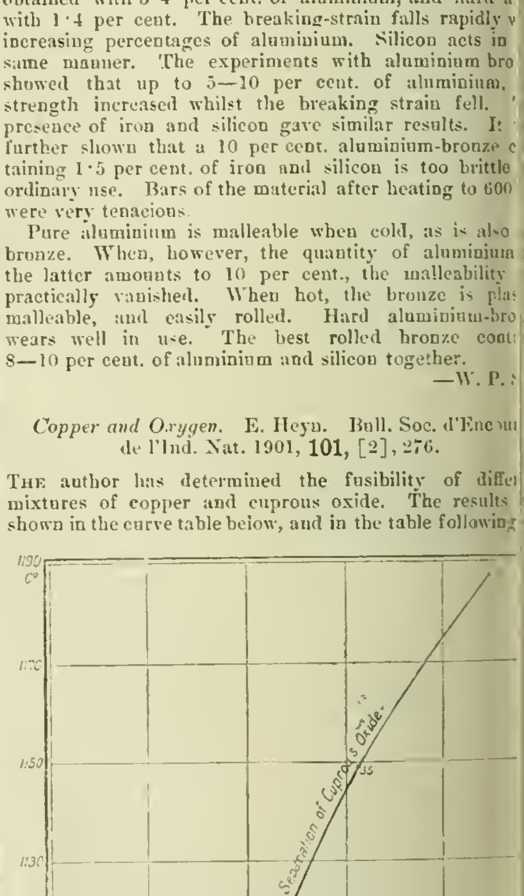
The results of a series of experiments with pure alumini copper, aluminium-bronze, &c. are given in this pa In the case of aluminium-brass, the best soft alloy obtained with 3·4 per cent. of aluminium, and hard a with 1·4 per cent. The breaking-strain falls rapidly w increasing percentages of aluminium. Silicon acts in same manner. The experiments with aluminium bro showed that up to 5—10 per cent. of aluminium, strength increased whilst the breaking strain fell. presence of iron and silicon gave similar results. It further shown that a 10 per cent. aluminium-bronze c taining 1·5 per cent. of iron and silicon is too brittle ordinary use. Bars of the material after heating to 600 were very tenacious.

Pure aluminium is malleable when cold, as is also bronze. When, however, the quantity of aluminium the latter amounts to 10 per cent., the malleability practically vanished. When hot, the bronze is plas malleable, and easily rolled. Hard aluminium-bro wears well in use. The best rolled bronze cont 8—10 per cent. of aluminium and silicon together.

—W. P. S

Copper and Oxygen. E. Heyn. Bull. Soc. d'Encou de l'Ind. Nat. 1901, **101**, [2], 276.

The author has determined the fusibility of diffe mixtures of copper and cuprous oxide. The results shown in the curve table below, and in the table following



The curve shows a minimum point at 1,084° C., co sponding to 3·45 per cent. of cuprous oxide; this repres the eutectic mixture.

Cu_2O.	Solidification Point.
Per Cent.	° C.
0·08	1,102
1·16	1,095
1·75	1,089
3·4	1,084
3·5	1,084
4·7	1,116
6·3	1,149
9	1,186

Micro-photographs of the mixtures are also given.—A. S

Metallography; The Nomenclature of ——.
See under XXIV., *page* 1033.

ine Lead; Determination of Arsenic, Antimony, and Bismuth in ——. M. Liebschütz.
See under XXIII., *page* 1028.

Copper; Analysis of Commercial ——. P. Truchot.
See under XXIII., *page* 1027.

ium in High-Grade Ferro-Silicon; Presence of ——, *and Analysis of the latter.* G. Watson Gray.
See under XXIII., *page* 1027.

mina by Calcium Carbide; Reduction of ——. S. A. Tucker and H. R. Moody.
See page 970.

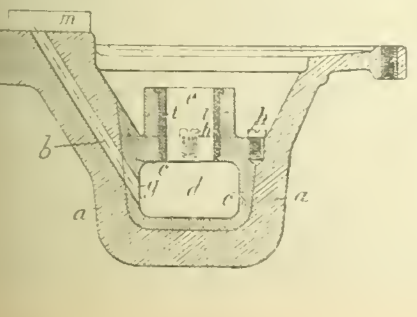
PATENTS.

quetting Pulverised Material. The Edison Ore-illing Syndicate, Ltd., London. From T. A. Edison, lewellyn Park, U.S.A. Eng. Pat. 14,356, Aug. 10, 1900.

emulsion is formed by adding a resinate of soda or sh to the residue obtained by distilling petroleum, or to r non-acid material which is not soluble in water. emulsion is then added to the pulverised material, such re or coal. The mixture is afterwards formed into ks, and finally baked.—R. S.

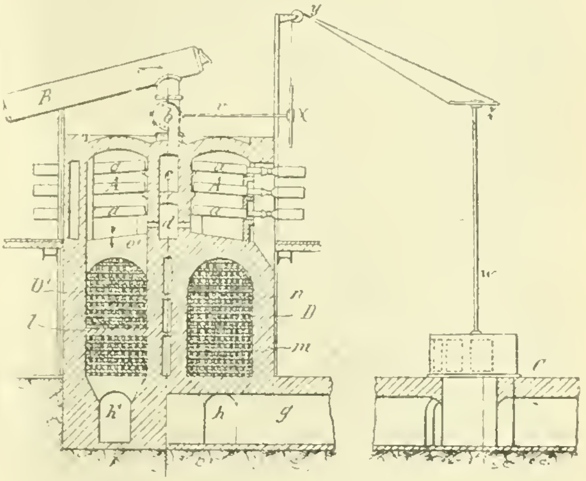
ys and Fusible Metals of all kinds; Crucible for Cast-g under Pressure ——. A. F. Cothias, Ivry, France. ig. Pat. 13,042, June 26, 1901.

crucible is characterised by the arrangement in the enclosing crucible of an interior removable crucible er, provided or not with a removable sleeve of hard ctory material as a bearing surface for the compression n; the exterior enclosing crucible carrying the metal-ressing conduit and being capable of being fastened anently to the furnace whilst the interior crucible is ved for the purpose of being repaired or replaced. forms of crucible are described, of which one is shown accompanying drawing. The exterior or enclosing ble *a* is fixed upon the hearth of a suitable furnace, he mould *m* is placed above a passage *b* formed in the f the said crucible. The interior removable crucible *c* is composed of a chamber *d*, in which are placed the ingots of metal to be moulded, and a conduit *e* in which the compression piston descends. A passage *g* is made as a continuation of *b*, and the crucible is fixed by screws *h*. The conduit *e* may or may not have a refractory lining *i*, made of hard material, such as carborundum, to form a bearing surface for the moulding piston. In the event of caking or stoppage, the interior crucible can be readily removed and repaired or replaced without dismounting the crucible from the furnace.—A. W.



Zinc or other Distillation Furnaces. E. Ferraris, Sardinia, Italy. Eng. Pat. 15,831, Aug. 6, 1901.

The claims are for a furnace, with retorts and recuperator, for heating the air intended for combustion, in which the air enters at the extreme end of the furnace after being heated in the recuperator, whilst the gas is introduced through openings beneath the retorts, beginning at the same end as the air inlet and extending to less than half the length of the furnace, so that the flames, after heating one end of the retort chamber, traverse horizontally and heat the other end. The recuperators have horizontal passages which at the end are divided into two or more sections by one or more partitions, and the furnace is provided with valves connected together for reversing the direction of the air and of the introduction of the gas.



The furnace may be single or double, but complete drawings are given of a double furnace, of which the accompanying transverse section is one, the half above the flue *h* being close to the centre, and the half above the flue *h'* being at one end. It consists of the chambers A containing the retorts *a*, situated over two pairs of recuperators or regenerators D D′, running from the two ends to a partition wall in the centre. The gas enters through B, and, by a butterfly valve *b*, is passed into the flue *c* to either one end or the other of the furnace. It then passes down into the flue *d*, whence it is distributed through openings into the chambers A under the retorts, to a distance less than half the length of the furnace. The air coming in by *g* and *h*, and passing through the recuperator D, enters the retort chambers at the same end as the gas. Each chamber A has both an inlet and outlet recuperator, the entrance to both of which are in the centre of the front of the furnace, so that air entering through *g* passes along the flue *h* to the end of the structure, upwards into the recuperator D, which is divided horizontally into two sections, along the lower section *m* towards the centre, backwards again through the upper section *n* to the end, and upwards through an opening into the end of the combustion chamber. The combustion products, after passing through the entire length of the retort chamber, pass down into and through the other recuperator to other flues corresponding to *g* and *h*. In the drawing, the recuperator D is shown as the inlet to one chamber, and D′ as the outlet to the other chamber, with the horizontal partition *l* dividing D′ into upper and lower sections, and with the arrow head pointing downward through the opening *o′* leading from the exit end of the retort chamber above, into the upper section of the recuperator, which latter receives the waste heat ready for reversal.

The air-inlet flue *g* and the corresponding exit flue run out, side by side, from the centre of the furnace, and open into the valve C, which is so constructed that it can alternately open one flue to the air and the other to the flue beyond, leading to the stack, and thus reverse the air current through the whole furnace. The valve C is in communication with the gas valve *b* by means of rods *v w* and levers and chains *x y z*, so that the gas and air are reversed together and at equal intervals, thereby obtaining an equal temperature in the retort chambers.—A. W.

Metal; Casting of ——. H. Elmqvist, Florence, Italy. Eng. Pat. 9263, May 4, 1901.

The improved process consists in making the model from a mixture obtained by melting together paraffin 45, resin 8, wax 30, vaseline 3, and colours soluble in oil 3 to 5 parts, into the form, then retouching the model thus obtained in a manner similar to the finishing of clay models, and finally kilning the form, preferably in a specially constructed oven, for the purpose of eliminating the mixture, which flows out without leaving a residuum. The oven is built in the form of three concentric vertical cylinders over a fireplace, the annular space between the two inside cylinders being enclosed and forming an annular muffle, in which the article is heated, surrounded by flues formed by the central cylinder on the inside and the annular space between the second and outer cylinders on the outside.—A. W.

Magnetic Separating Apparatus. The Edison Ore-Milling Syndicate, Ltd., London. From T. A. Edison, New Jersey, U.S.A. Eng. Pat. 14,354, Aug. 10, 1900.

An endless belt, having an elastic rim at each side, and supported at both ends, is caused to travel at one end concentrically with respect to a magnetic field, its linear travel being substantially parallel to the zone of maximum magnetic attraction, and means are provided for feeding magnetic and non-magnetic material to it in an area out of line with such zone, so that the magnetic particles are caused to move laterally with respect to the non-magnetic ones, while the latter are subjected to the centrifugal force which is generated by driving the belt at a high surface speed. The endless belt, which is supported at an incline, passes over a rotating magnet having two adjacent poles forming a gap between them, and material is fed by an inclined feed chute to the belt out of line with, and on either side of the gap, at a speed of delivery corresponding approximately to the surface speed of the belt. A deflecting partition on the feed chute subdivides the material into two streams or zones, and there is a non-magnetic extension or ring at each end of the magnet over which the belt also passes.—G. H. R.

Magnetic Separating Apparatus. [*Gravity.*] The Edison Ore-Milling Syndicate, Ltd., London. From T. A. Edison, New Jersey, U.S.A. Eng. Pat. 14,355, Aug. 10, 1900.

The apparatus, which is intended particularly for the separation from gangue and for the concentration of material which is only slightly magnetic, comprises a magnet having two coils and two adjacent poles, the upper of which overlaps the lower. "A plurality of magnetic separators may be arranged successively above each other, the upper of each pair of rolls overlapping the latter, and through which material is caused to progress by gravity, the rejected material of such separators being subjected successively to the succeeding separators. Another series of separators is arranged in a second set, one above the other, to which the concentrated material of the first set is successively directed, the magnetic particles withdrawn from the circulation by the separators of the second set being successively subjected to such separators." "The process of magnetic separation consists in feeding a stream of magnetic and non-magnetic particles past a succession of magnets, whereby the magn particles are caused to deviate from a vertical path, and collected, and the particles not deflected by each mag are submitted to the succeeding magnets in the sa manner, the particles being fed on to the magnet poles w the lowest possible velocity."—G. H. R.

Tin; Extracting ——, *from Ores and Slags.* H. Br denburg and A. Weyland, both of Kempen-on-Rh Germany. Eng. Pat. 8376, April 23, 1901.

Ores of tin, especially silicates, and tin slags, are pulveri and treated with a boiling solution of bisulphate of sodi whereby the tin and any iron are converted into sulph with evolution of hydrogen and the production of gelatin silicic acid. The solution is filtered and treated for recovery of the tin by precipitation or electrolysis, &c. —A. W

Alloy [*Cu, Zn, Fe, Mn*], *and Process for making* J. R. Hatmaker, London. From C. T. Hennig, Brookl U.S.A. Eng. Pat. 19,316, Oct. 29, 1900.

The alloy may contain from 50 to 65 parts of copper, f 33 to 50 of zinc, from 1 to 12 of iron, and from one-fo to 8 parts of manganese. The metals are melted toget the copper first, with the iron and manganese, and the added last, the whole being mixed with carbonate of po or other alkali, and preferably stirred with a piece of previous to casting. The manganese may be added in form of oxide, or of cupro- or ferro-manganese. Def mixtures for specified purposes are given, and cobalt ma used in place of manganese if desired.—A. W.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Secondary Batteries; Replacement of Lead by *Metals in* ——. St. V. Laszczynski. Zeits. für I trochem. 1901, **7**, [58], 821—827.

The author reviews the recent attempts which have made to replace the lead in secondary batteries by metals, and then describes some experiments with a composed of spongy zinc and nickel oxide electrodes solution of alkali carbonate. During the proces charging, the reaction is represented thus:—

$$\begin{array}{c|c|c} \mathrm{ZnCO_3} & \mathrm{K_2CO_3} & \mathrm{2NiO} \\ +\ \mathrm{K_2} & & \mathrm{CO} \end{array}$$

$$\mathrm{Zn} \quad \Big| \quad \mathrm{K_2CO_3} \quad \Big| \quad \mathrm{CO} \quad \Big| \quad \mathrm{Ni_2}$$

The CO_2 forms bicarbonate with the alkali carbonate, the composition of the cell when charged is—

$$\mathrm{Zn} \quad \Big| \quad \mathrm{2KHCO_3} \quad \Big| \quad \mathrm{Ni_2O_3}$$

The E.M.F. is 2·1—2·2 volts. The practical obje to the cell is that traces of nickel dissolve in the co trated solution of bicarbonate after it has been at wor a few days, and cause local action at the zinc electrode —J.

Nickel Oxide Cell; The Alkaline ——. A. L. Ma Eng. and Mining J. 1901, **72**, [8], 232.

Fisher observed that when an alkaline solution of tartrate is electrolysed, there is separated at the po pole a brownish-black deposit. This oxide of n $Ni_2O_3.2H_2O$, is a strongly electro-negative substance ducing, in alkaline solution, an E.M.F. of about 1·65 with zinc and 1·35 volts with cadmium. The E. produced, varies slightly with the strength of current in depositing the oxide coating. Nickelic oxide, prepared in any way except electrolytically, is inert is, it produces no E.M.F. when opposed to zinc or cad in an alkaline solution. When, however, an el current is passed through the solution from the n oxide plate to the cadmium, the couple becomes active is probable that the substance of the active nickeli ate is a higher oxidation product. The author finds that e oxide layer, which is quite black while the current is ıs-ing, immediately grows lighter in colour when the rcuit is broken, and the reduction proceeds to the forma- on of some green oxide, NiO; if, however, the coating be oroughly washed whilst the current is passing, no con- lerable reduction takes place, and the product will remain ithout apparent change for an indefinite length of time a solution of alkali.

In Edison's new nickel-iron cell, the peroxide is formed the action of electrolytic oxygen on nickelic oxide in kaline solution; it is stated by Edison to have the rmula NiO_2, but Wicke regards it as Ni_4O_7, and Bayley "Ni_3O_3." According to E. F. Roeber, the discharge of e cell is represented by the equation—

$$NiO_2 + Fe = NiO + FeO.$$

The author considers it more probable that NiO_2 is reduced Ni_2O_3, but even then the theoretical weight efficiency a nickel peroxide plate is about 1·75 times that of a lead roxide plate with its required amount of sulphuric acid. however, the peroxide has the formula Ni_4O_7, the eoretical weight efficiency would be less than that of a d peroxide plate. The decrease in weight of the new lison cell is chiefly due to the use of iron for the negative ate (theoretical weight efficiency about five times that of a d plate with its necessary sulphuric acid), and to the aller amount of liquid required.

The author finds that a fully charged cell having zinc for negative plate may show an initial voltage of 1·9 per l, whilst by substituting finely divided cadmium for the c, a little more than 1·6 volts per cell can be obtained at beginning of discharge. The E.M.F. in the case of the lmium cell drops gradually to zero, and in order to get a od return in ampère hours, a considerable part of the rent must be taken at less than one volt per cell.—A. S.

ston Cadmium Cell; Irregularities in the ——, in the Neighbourhood of 0° C., with 14·3 *per Cent. Amalgam.* W. Jaeger. Ann. d. Phys. 1901, **4**, 123—136. From Zeits. fur Elektrochem. 1901, **7**, [59], 842.

TWEEN 10° and 30° C. the E.M.F. of the cell can be calcu- d from the formula given by the Reichsanstalt, but ow 10° C. the results are not always certain. The mula still applies, however, down to − 16° if a 12·5 per t. amalgam is substituted for the 14·3 per cent. amalgam. —J. S.

n Cathode in Ammonium Nitrate Solution; Action on n ——. [A New Ferroso-Ferric Oxide.] A. Kaufmann. Zeits. für Elektrochem. 1901, **7**, [52], 733—741.

E results are summarised as follows:—

. The peculiar action on an iron cathode in ammonium ate solution, referred to by Haber (Grundriss der tech- hen Elektrochemie, 504), is confirmed.

. Metallic iron is dissolved, with liberation of gas, in a rated solution of ammonium nitrate in ammonia, forming ous ammonium nitrate. Other ammonium salts behave a similar way, but to a less extent. The process is tened by employing finely divided iron and applying t.

. The action on iron cathodes in an ammonium nitrate tion is explained by the increase in concentration of nonia and ammonium nitrate at the cathode during the sage of the current.

In a solution of ferrous ammonium nitrate in ammonia, iron exists entirely or chiefly in the form of a complex ion.

. On heating this solution, a magnetic ferroso-ferric le, 2FeO, $3Fe_2O_3$, is precipitated. The colour of the oxide is deep black with a bluish tinge, and not nish-black like the oxide, Fe_3O_4.—J. S.

bon Anodes; Influence of ——, on the Electrolysis of lkali Chloride Solutions. [Valuation of Carbon nodes.] F. Foerster. Zeits. angew. Chem. 1901, **14**, 26], 647—652.

conjunction with L. Sprösser the author describes a hod for testing the value of commercial carbon anodes, employed for the electrolysis of alkali chloride solutions. A rectangular plate, provided with a shank, was cut from each of the carbons to be tested, and suspended in a vertical position, without a diaphragm, between two parallel platinum cathodes contained in a vessel provided with a rubber stopper. The electrolyte employed was a 20 per cent. solution of sodium chloride at about 60° C., to which was added some sodium chromate. The object of the addition of the sodium chromate is to form a film diaphragm (this Journal, 1901, 257). In circuit with the above cell and an ammeter were a oxy-hydrogen voltameter and a copper voltameter. By comparing, at any instant, the volume of the mixed hydrogen and oxygen, liberated from the cell with the volume set free in the oxy-hydrogen voltameter, the current yield of hypochlorite and chlorate oxygen could be ascertained at that instant, provided that no action on the carbon anode has taken place. The mean value, during the whole course of the electrolysis, was ascertained by repeated determinations. On the other hand, the true current yield of active oxygen was found by analysing the gases and comparing the value so found with that obtained by calculation from the amount of copper deposited in the copper voltameter. The difference between the value obtained by gas analysis and the true current efficiency is a direct measure of the current expended on the destruction of the carbon anodes.

The results so obtained are contained in the table on next page, together with determinations of the porosity and the amount of ash contained in each specimen of carbon. In addition are given the relative values of the carbons when these are employed with diaphragms, and especially the quantity of carbon dioxide evolved in the anode gases and the diminution of weight of the carbons during long-continued electrolysis.

It will be seen that the numbers representing the chemical action on the carbons are subject to large variations. Artificial graphite is best, and many artificial carbons are not inferior to good retort carbon. The table also shows that it is immaterial whether or not a diaphragm is used since a carbon, such as No. 10, which is bad when tested without a diaphragm remains bad even if a diaphragm is interposed, whilst good carbons remain good.

Besides the chemical action on the carbon there is always an extensive mechanical disintegration. The sum of both kinds of destruction is represented by the loss of weight of the anodes during use. The evolution of gases at the anode is not directly responsible for the mechanical disintegration, since the same carbon, when used as a cathode (*i.e.*, when hydrogen is liberated from it) is not destroyed. It therefore follows that the primary action is of a chemical nature.

The products liberated at the anode during electrolysis are chlorine and oxygen. Chlorine does not attack carbon, but it is conceivable that it might attack hydrocarbons present in the anode. Considering, however, the high temperature employed in the manufacture of anodes it is unlikely that any hydrocarbons still remain undecomposed. Out of a total of 15 carbons examined only one contained a constituent capable of chlorination, and hence it appears that the destructive chemical action is due to a process of oxidation; the principal products being carbon dioxide, together with other substances of the nature of humus or resins, of which very little is known at present. They appear, however, to be colloïds, and can be precipitated by salts, giving a deep brown colour to the solution. Under the influence of the current they gradually migrate towards the cathode, and cover it with a black film, thus giving rise to the erroneous idea that carbon could be electrolytically deposited like metals.

When the above carbons were subjected as anodes to electrolysis in 20 per cent. sulphuric acid, the destructive action was particularly great, even at the ordinary temperature. Over 90 per cent. of the current was employed for the combustion of the carbon in all cases, including graphite. It has often been proposed to utilise the loss of weight of carbons treated in this way to estimate their value as anodes for the electrolysis of alkali chloride solutions. Since, however, the chemical action is always of the same order of magnitude it will be seen that the differences in the loss of weight are due to the mechanical disintegration

Number of the Carbon.	Description of the Carbon.	Volume of the Pores compared with the Total Volume.	Percentage of Ash in Carbon.	Behaviour during Electrolysis in Sodium Chloride Solution.								
				Without Diaphragm.				With Diaphragm.				
				Fraction of the Anode Current* employed for		Loss of Weight after consuming 370 Amp. Hours at 60° C.		On Electrolysing† at 18° C. the Anode Gas contained				Loss of Weight at 18° C.
				Production of Active Oxygen.	Destruction of the Carbon Anode.	By Oxidation.	By Disintegration.	After 5 Hours.		After 23 Hours.		
								CO_2.	O_2.	CO_2.	O_2.	
					%	Grms.	Grms.	%	%	%	%	Gr
1	Graphite from the Acheson Co., Niagara Falls	22·9	0·8	60	7·5	..	..	..	..	..	..	.
2	Graphite from the Le Carbone Cie., Paris.	23·2	3·0	54	16	..	..	..	..	..	..	
3	Retort carbon, very dense, and of a leafy structure.	11·2	0·4	63	12	7·3	3·7	..	..	..	..	.
4	Retort carbon, dense and fine grained	12·6	2·3	52	24	10·4	3·4	1·7	4·1	5·4	11·1	2·
5	„ less dense	18·3	0·8	..	..	..	..	1·5	4·4	5·3	12·7	5·
6	Artificial carbon anode, soft, taken from a Haas-Oettel bleaching apparatus.	22·2	1·8	61	20	..	..	..	..	..	..	.
7	Artificial carbon anode, very fine grained (Conradty's Kronenkohle).	21·1	2·3	56	27	13·0	10·6	1·6	1·3	7·0	8·7	3·
8	Artificial carbon anode, exceptionally hard	..	6·1	45	31	..	..	..	..	..	..	.
9	Artificial carbon anode, very hard, from Lessing.	22·5	1·1	43	37	16·0	5·0	..	..	..	..	.
10	Artificial carbon anode, soft and easily worked.	27·8	4·2	44	41	16·4	32·5	2·9	1·0	13·6	3·7	18·

* 250 c.c. of a solution containing 50 grms. pure NaCl and 0·5 grm. K_2CrO_4 was electrolysed for six hours at 60° C. with a curren 2·1 amp. Da = 3·33 amp. sq. dcm. since the anodes measured 7·0 × 4·5 cm.

† In a rectangular Pukall cell there was at the commencement 400 c.cm. of a 5N NaCl solution. The current strength was 3 a the anodes being adjusted so that 1 sq. dcm. (counting both sides) of surface was exposed to the electrolyte. The cathode electr consisted of 800 c.cm. of a 20 per cent. NaCl solution. After 23 hours electrolysis, the cathode solution was alkaline to the extent of whilst the chloride concentration in the anode compartment had diminished to 2·5—2·9 N.

accompanying the chemical action. When some of the particles are attacked chemically this will produce a loosening of the adjacent unattacked particles which are then easily subject to a mechanical disintegration. The method of testing in sulphuric acid solution may therefore, when properly carried out, be used as a confirmatory test of the method already described. Experiments have shown that the particularly hard carbons do not suffer from a mechanical disintegration although from a chemical point of view they do not appear to be very satisfactory.

When caustic soda is used to replace the sulphuric acid, the action is not nearly so great. The graphite, No. 1, was only very slightly attacked at 60° C. The action, however, was greater in the case of the amorphous carbons, but the differences were not so great and the relative values of the carbons did not arrange themselves in the same series.

Since the destructive oxidation of the carbons always takes place to the same extent their different behaviour during electrolysis must be due to some other cause. The author considers this cause to be the variation in the degree of porosity. The electrolyte penetrates into the pores and during electrolysis the concentration of the electrolyte so absorbed soon changes. In the case of the electrolysis of an alkali chloride solution, the enclosed electrolyte becomes more dilute; but the larger the amount of solution absorbed by the anode, the more will the electrolytic action take place within the relatively dilute electrolyte in the pores. For a given current density, however, the evolution of oxygen becomes greater as the concentration of the salt solution diminishes, so that porous carbons are much more easily attacked than dense anodes.

At the same time the volume of the pores as compared with the total volume of the carbon is not the only factor. The disposition of the pores is also important. If these unite to form channels leading outwards, the more readily will the electrolyte be absorbed and the greater will be the amount of destruction during electrolysis.

Anodes for the electrolysis of alkali chloride solutions should therefore be as free as possible from pores and from ash, and should be capable of being made of large dimensions. Carbons used for the manufacture of calcium carbid r aluminium do not necessarily require to fulfil all the al e conditions. The author considers that graphite or graphit d carbons might be used instead of platinum-iridium and s in the manufacture of chlorate and that it might pa o utilise a portion of the electric energy produced at water for the purpose of graphitising the anodes.—J. S.

Nitrites; Electrolytic Reduction of ——. B. S Zeits. für Elektrochem. 1901, 7, [59], 831—842, d [60], 847—855.

The author has studied the influence of concentrat n, current density, and temperature on the electrolysi of potassium nitrite, with the following results :—

1. *Influence of Concentration.*

Concentration.	Average Current Yield.	
	Hydroxylamine.	Ammonia.
Per Cent.	Per Cent.	Per Cent.
5	51·28	32·46
10	21·0	64·2
15	6·6	73·45
25	2·0	75·44

2. *Influence of Current Density.*

Current Density.	Average Current Yield.		
	NH_2OH.	NH_3.	Loss
Amp. per Sq. Dcm.	Per Cent.	Per Cent.	Per C
2	54·28	32·46	13·2
5	33·1	13·75	53·1
10	27·6	10·26	62·1

3. *Influence of Temperature.*

Temperature.	Average Current Yield.	
	NH_2OH.	NH_3.
° C.	Per Cent.	Per Cent.
0	59·7	34·6
14–17	54·28	..
45—53	17·6	..
75–80	8·64	..

The experiments were all made in a comparable manner in a divided cell. The anode compartment consisted of a porous pot containing a strong solution of potassium carbonate and a narrow strip of platinum foil. This was placed in a stout beaker containing the solution under examination. A cylinder of sheet zinc formed the cathode.

Full details of all the experiments are given, including the methods adopted for the estimation of the hydroxylamine and ammonia formed.—J. S.

Fused Lead Iodide and Lead Chloride; Electrolysis of ——, and its Bearing upon the Application of Faraday's Law, and the Theory of the Electrolysis of Fused Salts. G. Auerbach. Zeits. anorg. Chem. **28**, 1—45. Chem. Centr. 1901, **2**, [9], 569.

The experiments with lead iodide were carried out with a view of explaining the deviations from Faraday's law noted by Helfenstein (this Journal, 1900, 670). The analytical results show that the supposed formation of PbI_4 does not take place, or, at least, not to any noteworthy extent. According to the author, the deviations are due to the solubility of iodine in the melt.

The experiments with lead chloride were concerned more particularly as to how far Faraday's law holds good for the processes at the anode. The yield at the anode is at first appreciably smaller than that at the cathode, but after some time the difference disappears. The loss appears to be due to absorption of chlorine by the carbon. If care be taken to restrict the conditions which cause losses, yields can be obtained which approximate very closely to the theoretical.—A. S.

Semi-Complex Salts; Constitution of ——. E. Rieger. Zeits. für Elektrochem. 1901, **7**, [61], 863—868, and [62], 871—876.

By determining the transport numbers in a series of complex salt solutions with a modified form of Hittorf's apparatus, the author has arrived at the conclusion that in he following salts, potassium copper sulphate, potassium silver iodide, potassium mercuric iodide, potassium mercuric cyanide, potassium zinc cyanide, potassium cadmium cyanide, potassium ferrous oxalate, and potassium ferric oxalate, he more noble metal migrates towards the anode. It is herefore, in all these salts, a component of the complex anion. This is also confirmed by measurements of the lectrical conductivity.—J. S.

Nitro Compounds to Amines; Electrolytic Reduction of ——. A. Chilesotti. Zeits. für Elektrochem. 1901, **7**, [54], 768—773.

T has been shown that good yields of amines are obtained hen nitro compounds are subjected to electrolytic reduction, especially when small quantities of the salts of tin, opper, &c. are present in the electrolyte (this Journal, 900, 893—894, and 1901, 725). The author confirms this tatement, and gives his results in tabular form. He has lso made experiments to ascertain the mechanism of the eaction. According to these experiments, it would appear hat in Boehringer's process the first action of the current to reduce (at any rate, in the presence of copper and erric salts) the nitro compound to the corresponding ydroxylamine, and to precipitate at the same time spongy opper, or else convert the ferric to ferrous salt. These ubstances, as the detailed independent experiments show, pidly reduce the hydroxylamine to amine. The copper dissolved, thus supplying fresh copper ions for the current to act upon, whilst the ferrous ions are converted into ferric ions. It thus would seem that an electrolytic action first takes place, and that this is then followed by a purely chemical action.

There is, however, no evidence to show that precisely the same action occurs in the presence of the more positive metal cathodes, such as tin, lead, zinc, &c., since these directly reduce aromatic nitro compounds to the corresponding amines with a considerable velocity. Probably the primary action of the current is to produce the hydroxylamine. The precipitated metal in this case is capable of reducing both the hydroxylamine and the nitro compound itself, but the former is likely to be attacked first, since its reduction takes place with the greater velocity.—J. S.

o-Nitroanthraquinone to o-Aminoanthraquinone; Electrolytic Reduction of ——. J. Möller. Zeits. für Elektrochem. 1901, **7**, [52], 711—713.

The cathode electrolyte was obtained by dissolving pure, specially prepared *o*-nitroanthraquinone in the heat in alcohol and sulphuric acid, in the proportion of 1 grm. of nitro-compound in 270 grms. of alcohol and 30 grms. of concentrated acid. A platinum cathode was employed. The anode compartment contained dilute sulphuric acid (1 : 10) and a platinum anode. The E.M.F. was 3—3·5 volts, and the current density 1 ampère per sq. dcm. At the beginning the temperature was 50° C. On cooling, some of the substance separated out, but this subsequently re-dissolved on stirring.

After the completion of the electrolysis, the bulk of the alcohol was distilled off, and the remainder poured into five times its volume of water. The dark red precipitate was filtered off, dissolved in concentrated hydrochloric acid, reprecipitated by water, and recrystallised from alcohol or glacial acetic acid. 70 per cent. of the theoretical yield of *o*-aminoanthraquinone was obtained.—J. S.

Ortho Nitro-anthraquinone and 1·5 *and α-Dinitroanthraquinones; Electrolytic Reduction of ——.* J. Möller, Zeits. für Elektrochem. 1901, **7**, [56], 797—800.

The author has already described the electrolytic reduction of *o*-nitroanthraquinone in acid solution (see preceding abstract). He now finds that practically the same result is obtained in a slightly alkaline solution, the composition of the cathode bath being 1 grm. of nitro-compound, 300 grms. of alcohol, and 10 grms. of sodium acetate.

On reducing 1, 5, and α-dinitroanthraquinone in acid solution, a small quantity of the corresponding diamino-compounds were obtained, the chief product in both cases being a substance having a blue colour in alkaline solution.
—J. S.

PATENTS.

Cement and Insulator, Electrical; An Improved Material or Composition suitable for Use as a ——. E. Tatham, Lewisham. Eng. Pat. 15,730, Sept. 4, 1900.

The cement is made as follows :—80 parts of sulphur are melted and 18 parts of diatomite (Kieselguhr or infusorial earth) stirred in; after the mixture is complete, $1\frac{1}{2}$—3 parts of oil or hydrocarbon of high specific gravity are thoroughly incorporated with the mass; the product may be coloured by non-metallic pigments, and when cold may be worked by ordinary cutting tools.—J. W. H.

Electrode Plates [Battery]; Process of Forming Metallic ——. A. J. Boult, London. From E. Andreas, Dresden. Eng. Pat. 15,470, Aug. 30, 1900.

In forming storage battery plates, a diluted solution of hydrogen sulphide, acidified with sulphuric acid is employed as electrolyte. The hydrogen sulphide is oxidised into sulphuric acid.—J. C. R.

Electric Batteries; Construction of Electrodes containing Zinc for Use in ——, and Method of Producing and Employing the same. W. Erny. Halle-on-the-Saale, Germany. Eng. Pat. 3416, Feb. 16, 1901.

With the object of enlarging the surface of zinc for use in batteries, a porous electrode is constructed of spongy zinc amalgam, placed either on the inside of a zinc cylinder or between two zinc cylinders, the inner one being provided with holes.

A special kind of electrolyte is employed, consisting of ammonium chloride, calcium chloride, barium peroxide, barium chloride, hydrogen peroxide and water, which may be converted into a gelatinous mass by the addition of a suitable fixing agent, like starch, &c.—J. C. R.

Storage Batteries [Alkaline]. T. A. Edison, New Jersey, U.S.A. Eng. Pat. 10,505, May 21, 1901.

This is a development on the lines of a prior Eng. Pat. 2490, of this year (this Journal, 1901, 589). A reversible battery is now claimed of the type employing an alkaline electrolyte, whose negative electrode or oxidisable element is characterised by the employment of anhydrous ferrous oxide, which is reducible to the metallic state electrolytically. Also a depolariser consisting of a non-colloidal hydrated oxide of nickel. Perforated elastic, crimped edge, corrugated receptacles for holding active material are shown. Mixed with the active material is non-active, flake-like, conducting material, *e.g.*, micaceous graphite, the particles of which are larger in size than the perforations in the receptacle. Methods are described of obtaining ferrous oxide by reduction of ferric oxide by hydrogen at about 260° C., and by oxidation of thin sheets of Norwegian iron. Nickel hydroxide is obtained from a boiling nitrate solution by precipitation with magnesium hydroxide.—J. C. R.

Electrodes [Carbon] for Electrolytic Cells. P. M. Justice, London. From The Castner Electrolytic Alkali Company, Niagara Falls, U.S.A. Eng. Pat. 10,974, May 28, 1901.

An anode of carbon is shown of ⊥, or inverted Tee-section. The broad lower face is slotted or channelled transversely to facilitate escape of gases. A short shank extends along the upper side of the anode, which is recessed to engage and interlock with a Portland cement mass in the cover get a tight seal. Connection is made to the carbon l arc-lamp, copper-plated, tinned head carbon plugs driv into holes in the carbon. These project through the ceme and are soldered to lead terminal conductors, having plurality of projections, zig-zag shaped.—J. C. R.

Chlorine Gas [Electrical]; Method of and Apparatus f Generating, Treating, and Utilising ——. E. C. Par more, Germantown, U.S.A. Eng. Pat. 2039, Jan. 29, 190

Chlorine, generated by ordinary means, is passed into chamber wherein it is subjected to the action of elect discharges, and is then drawn by a pump through a ves charged with pulp or other material intended to be treat with chlorine. The apparatus consists of a chlorine generat connected to a four-armed glass structure, whereby t tubes or arms constitute a passage way for the gas, and t other two arms, at right angles, the housing for the t electrodes, one in each arm. The electrodes are a plurali of wires, each enclosed air-tight within a tube or bulb "dielectric" material, which bulbs approach near to o another at their extremities. An induction coil is electrical connected to the electrodes. The entire apparatus is fre from air before the evolution of the chlorine begins. T structure is such that the gas has no contact with t electrodes, enclosed as described. In another form apparatus, the electrodes, instead of being bunched, a coiled wires, separately enclosed in glass tubes, which a hermetically sealed.—E. S.

(*B.*)—ELECTRO-METALLURGY.

Silver; Electrolytic Precipitation and Separation fr other Metals. W. H. Fulweiler and E. F. Smith. Amer. Chem. Soc. 1901, **23**, [8], 582—585.

The details of the authors' method of working are b indicated by the following test examples:—

Silver.	Copper.	Cadmium.	Zinc.	Nickel.	KCN.	Dilution.	Current N.D. 100.	Voltage.	Temperature.	Time.	Silver found.
Grm.	Grm.	Grm.	Grm.	Grm.	Grms.	C c.			° C.	Hours.	Grm.
0·2133	..	..	..	..	2	125	0·03 A	2·25	65	4	0·2134
0·1066	0·2106	..	..	..	2	125	0·02	1·25	60	3½	0·1066
0·1066	0·5265	..	..	..	4	125	0·03	1·2	65	3¼	0·1066
0·1065	0·1053	0·1128	..	..	3	125	0·02	1·25	65	3¾	0·1063
0·1099	0 1053	0 1128	0·1244	..	4	125	0·02	1·25	80	5	0·1092
0·1090	0·0526	0·0564	0·0622	0·0111	4·5	125	0·02	1·2	75	5½	0·1086

It was found necessary to heat the electrolyte to 75°—80° C. in order to prevent simultaneous deposition of cadmium. The addition of nickel apparently retarded the precipitation of the silver to a slight extent.—C. A. M.

Mercury: Electrolytic Purification of ——. W. M. Johnson. Zeits. für Elektrochem. 1901, **7**, [53], 761. From Electric. World and Engineer, **37**, 634.

Instead of dropping the mercury in a fine stream through a high column of dilute nitric acid, to remove the more positive metals, *e g.*, Zn, Cd, Cu, Pb, the author proposes to employ the mercury as anode. The mercury is placed in a crystallising basin and above it are suspended carbon cathodes, the electrolyte being dilute nitric acid (4 per cent. KNO_3 and 17 per cent. HNO_3). An E.M F. of 1 volt is employed, and the current must be interrupted at the proper time to prevent mercury from going into solution. If silver has also to be removed from the mercury, some potassium chloride is added to diminish the concentration of the silver ions. The process works best with very weak currents of long duration, the electrolyte being renewed from time to time.—J. S.

Electrolytic Manufacture of Polishing Tools. J. Rieder. Zeits. für Elektrochem. 1901, **7**, [54]. 765—767.

In order to obtain emery or carborundum powder in a suitable form for polishing purposes, the author proposes to fix the powder in an electrolytic deposit of a convenient metal, such as copper or lead. As an example of the process, the powder is first rendered conducting and th distributed on a cathode lying on the bottom of an elect lytic bath. It is thus bound into a suitable form.

The powder is graphitised by moistening with a soluti of wax or paraffin in benzine. After drying, each parti is enveloped in a fine skin of the dissolved substa to which graphite adheres when the two are shaken together.

Various modifications are described and figured.—J. S.

Tin; Its Precipitation from Sulpho Salts, and its separ tion from Antimony by Electrolysis. H. Ost a W. Klapproth.

See under XXIII., *page* 1028.

Uranium; Electrolytic Determination of ——. L. G. Kollock and E. F. Smith.

See under XXIII., *page* 1029.

Mercury from Copper; Electrolytic Separation of — C. R. Spare and E. F. Smith.

See under XXIII., *page* 1027.

PATENTS.

Electro-Deposition of Metals; Apparatus for Use in t [Rotatory Cathode, &c.]. S. O. Cowper-Coles, Londo Eng. Pat. 9731, May 26, 1900.

A cathode so mounted that it may be revolved, is employ and a wheel or turbine connected therewith against whi he electrolyte is impinged under pressure for rotating the athode. Eng. Pat. 21,974 of 1898 (this Journal, 1899, 132) is referred to.—J. C. R.

Silver Surfaces ; Process for Rendering ——, Untarnishable. L. Sterne and S. Cowper-Coles, both of London. Eng. Pat. 17,213, Sept. 28, 1900.

HE silver article is coated with cadmium or cadmium lloy by immersing it in an electrolyte, preferably of a ouble cyanide of cadmium and potassium, passing an lectric current through and then reversing the direction f the current, so that a small quantity of silver may first e taken into solution and then deposited with the film of admium or cadmium alloy. The article may constitute ither the anode or the cathode first, but preferably the node first and then the cathode.—A. W.

inc ; Coating Metal Goods and Articles with ——. I. Szirmay and L. von Kollerich, both of Buda-Pesth. Eng. Pat. 19,659, Nov. 2, 1900.

N electrolytic process for coating metals, &c. with zinc. he electrolyte is composed of a mixture of solutions of lphate of zinc, of sulphate of magnalium,—

$$(MgSO_4 + 7H_2O + Al_2(SO_4)_3 + 18H_2O),$$

nd dextrose, dissolved separately, the proportions of the wo latter being in direct ratio to the extent of surface of he goods to be zinc-coated. The anode should consist of ure rolled zinc, and the sulphate of magnalium may be sed without the dextrose. "Magnalium" is the name iven for an alloy of pure Mg with pure Al.—A. W.

XII.—FATS, OILS, AND SOAP.

Pumpkin-Seed Oil. W. Graham. Chem. Rev. Fett- u. Harz-Ind. 1901, 8, [9], 187.

HE samples of this oil found in commerce differ conderably in their properties. The oil is usually obtained extraction with solvents; the expressed oil, which seldom met with, is dearer. The author obtained by traction of the seeds with acetone, 25 per cent. of a clear d-coloured oil, with a pleasant odour and taste. It d the following constants: Specific gravity at 15° C., 9208; saponification value, 192·5. The acid value of e sample was 18·9. It was soluble in all proportions carbon bisulphide, ether, and chloroform, and in 20 parts absolute alcohol. On standing for a considerable time, dried into a yellowish transparent mass.

A sample of commercial oil examined by the author gave e following results:—Specific gravity at 15° C., 0·9197 ; saponification value, 195·2. The acid value was 3·5. In its other properties it resembled the oil extracted by the author.

Attempts were made to express the oil, but in spite of the application of great pressure, only a very small yield was obtained, which was insufficient for the determination of the constants.

According to Lewkowitsch, the expressed oil has the following characteristics:—Specific gravity at 15° C., 0·9231 ; saponification value, 188·1 ; iodine value, 113·4—121 ; solidification point, −15° C. ; and melting point of fatty acids, 28° C.—C. A. M.

Mixed Glycerides in Natural Fats [Olive Oil]. D. Holde and M. Stange. Ber. 1901, 34, [11], 2402—2403.

THE occurrence of a mixed glyceride in Mkani fat was demonstrated by Henriques and Künne (this Journal, 1899, 377, 590), who confirmed Heise's results by a different method.

The authors have continued Henriques' investigations, and have examined the solid constituent of olive oil which are usually regarded as consisting essentially of a mixture of triolein with smaller quantities of tripalmitin and tristearin.

From 45 to 90 grms. of the oil were dissolved in from three to five times the quantity of ether, and the ethereal solution cooled to −40° to −45° C. in a bath of alcohol and solid carbon dioxide. The solid glycerides which crystallised out were collected on a filter cooled to about −30° to −35° C. by means of alcohol and solid carbon dioxide. They were then repeatedly reprecipitated at −40° C., recrystallised from smaller quantities of ether at −20° C., and finally freed from liquid glycerides by repeated crystallisation alcohol-ether at the ordinary temperature. In this way 5 to 10 grms. of pure solid glycerides were obtained from 100—700 grms. of oil. In one experiment the filtrate from the solid glycerides was chilled to −50° to −60° C., and yielded a crystalline deposit, which melted to an oily substance at the ordinary temperature, had an iodine value of 82, and was thus considered to consist, in the main, of olein.

The solid glyceride thus obtained formed a white mass resembling porcelain in appearance. It invariably melted at about 1° above or below 30° C., according to whether the substance had been previously fused or not. A similar double melting-point was observed by Henriques and by Heise in the case of oleo-distearin (this Journal, 1899, 377, 693).

The following table gives the physical and chemical constants of the glyceride, together with the theoretical values for oleodimargarin and oleodipalmitin:—

—	Solid Glycerides from Olive Oil.		Theory for—	
	Oil I.	Oil II.	Oleodimargarin— $C_3H_5\begin{array}{l}\diagup C_{18}H_{33}O_2\\ \diagdown (C_{17}H_{33}O_2)_2\end{array}$	Oleodipalmitin— $C_2H_5\begin{array}{l}\diagup C_{18}H_{33}O_2\\ \diagdown (C_{16}H_{31}O_2)_2\end{array}$
ponification value	196·2, 196	196·6 (193·4)	195·2	201·8
ecular weight	859, 859·6	857 (871)	860·9	832·9
ine value	30·1	29·8	29·5	30·5
lting point	29°—31° C.	29·2°—31·7° C.	..	..
tical rotation	0°	..	..	..
ty acids, per cent	..	95·82	95·6	95·16
cerin radicle (C_3H_5), per cent	..	3·65	..	..
cific gravity	..	0·9948	..	..

Constants of the Mixed Fatty Acids.

—	Solid Acids of the Glyceride.	Theory for Margaric Acid.	Theory for Palmitic Acid.	Liquid Acids of the Glyceride.	Theory for Oleic Acid.
onification value	210·9, 211·9 (215·6)	208	219	193·1	198·9
an molecular weight	265·4	270	256	282·0	282
ine value	0	0	0	90·0, 91·9	90·5
ting point	52°—53° C., 54°—56° C. 54·6°, 57°, 59°—61° C.	59·9° C. (?)	62° C.	Liquid at ordinary temperature.	Liquid at ordinary temperature.

The ratio of solid to liquid fatty acids was as 2·2:1, whilst the theoretical ratio for $C_3H_5.C_{18}H_{33}O_2.(C_{17}H_{33}O_2)_2$ is as 1·9:1. The liquid fatty acids were separated from the solid fatty acids by extracting the dried lead soap with ether, and the oleic acid was purified by extracting its barium salt with hot alcohol.

From these results the authors conclude that olive oil contains from 1 to 2 per cent. of a mixed glyceride of the above formula.

Margaric Acid.—The solid fatty acids did not show an absolutely constant melting point. At first they melted at 53°—55° C., but by repeated crystallisation from petroleum spirit, the melting-point was raised to 60° C. Yet even by fractional precipitation with magnesium acetate it was not possible to obtain a fraction melting above 60°—61° C. On the other hand, artificially prepared mixtures of stearic and palmitic acids melting at 55° C. could be readily separated into their pure constituents of the right melting-points by Heintz's method, so that the authors regard this as a confirmation of their view that this acid was a definite compound of the formula $C_{17}H_{34}O_2$. Fatty acids containing an uneven number of carbon atoms have not often been discovered beyond doubt in natural fats, although Nördlinger (Ber. 1892, **25**, 578) claims to have found about 1 per cent. of Gerard's daturic acid in palm oil.

Bone Oil.—The solid glycerides were separated by crystallisation at a low temperature from a mixture of alcohol and ether. In two experiments a yellowish and a white mass were thus obtained, which melted at 58°—59° C. and 52° to 53° C., and had iodine values of 2·2 and 7·7. From this the authors conclude that it was unlikely that mixed glycerides containing oleic acid were present in this fat (see this Journal, 1899, 77).—C. A. M.

Soap; Structure of ——. A. A. Shukoff. Seifensieder Zeit. **28**, 393. Zeits. angew. Chem. 1901, **14**, [30], 757.

Eschweger, or mottled soaps separate on standing in the melted condition into two, three, or more layers, in cases where the difference between the melting point and the boiling point (?) is from 60° to 100° C. When, however, the difference is from 80° to 90° C., weeks or even months are required for an effectual separation. Between the two main layers of the separated constituents there is almost invariably a layer consisting of a mixture of both. In one sample of Eschweger soap examined by the author, the upper layer contained from 68 to 70 per cent. of the alkali salts of fatty acids and 0·7 to 2 per cent. of alkali not in combination with fatty acids; whilst the under layer contained from 21 to 39 per cent. of alkali in combination with fatty acids and from 8 to 4 per cent of free alkali. The upper layer was thus a curd soap and the lower layer a highly "filled" soap. The nature of the fatty acids in the two layers was almost identical, so that the separation of the soaps does not effect any separation of the fatty acids, at least in the case of Eschweger soap prepared from tallow and cocoanut oil, and "filled" with soda and soluble glass. The author regarded these results as a proof that the soap under examination consisted of a mixture of curd and mottled soap.

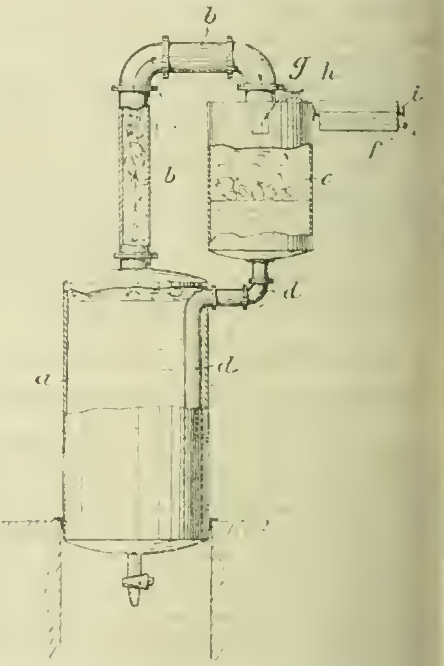
As regards the structure of Eschweger soap he came to the conclusion that the curd soap begins to separate in small globules while the soap is still in the fused state in the process of manufacture, and that these globules agglomerate into short thick threads. Hence the solidified soaps, so far as they are not crystalline, show a fibrous structure in the vertical direction, and appear granular in horizontal sections. This can best be observed in transparent soaps, since in Eschweger soap the crystallisation (formation of mottle) interferes. The mottling is due to the colour falling down in the fluid "filled" soap, between the fibres of the curd soap. The general direction of the mottle is vertical, as is seen on comparing vertical and horizontal sections. The streaks are rendered somewhat irregular, however, by the fact that a gradually increasing quantity of cocoanut oil or palm nut oil soaps separates out as the temperature falls.

The firmness of Eschweger soap depends exclusively on the structure and not on the saponification values of the fats. For its manufacture, fats should be used which yield soaps dissolving readily in salt solutions, so that the separation of curd and mottled soaps ceases at an early stage. Cocoa oil and palmnut oil are both suitable fats for the purpc A further point to be observed is that a sufficient quant of salts is present.—C. A. M.

Rosin Soap; Boiler for ——. M. Erfurt. Ger. 155,321. Papier Zeit. 1901, **26**, [63], 2371—2372.

The object of this patent is to obviate the disadvanta caused by the frothing of the liquid during the saponifi tion of rosin at a high temperature. It is also of use boiling other frothing substances, *e.g.*, in the removal water and ammonia from tar.

The apparatus consists of a boiler *a*, connected means of the tube *b*, with a safe *c*, from the bott of which a tube *d*, leads again into the boiler. The bo is charged with a mixture of rosin, soda, and water, and



temperature gradually raised. The escaping gases vapours produce considerable frothing, and the froth pa into the receiver *c*. If this is open the gases escape the atmosphere, whilst the liquid rosin soap falls back the boiler. If the opening *h*, of the receiver is closed, gases escape through *f*, and when desired are conde and recovered. The interior of the froth-receiver ca observed through the window *g*.

In using this apparatus care must be taken to have boiler nearly full. A boiler with a capacity of ½ c takes a charge of 500 kilos. of rosin. It is possible to higher temperatures than usual in the saponification working this boiler, with the result that considerably soda is brought into combination with the rosin. It is required to regulate the steam, and the boiling of 500 k of rosin is finished in 15 minutes. —C. A. M.

PATENTS.

Oil-Presses; Pressing-Plates for Hydraulic ——. J Mackenzie, London. From Die Direction der G schaft der Rigaer Eisengiesserei, vormals Felser and Paris. Eng. Pat. 13,991, Aug. 3, 1900.

The improvement claimed consists in providing mean the oil to pass through the plates instead of over the hitherto. The plates are composed of an upper and a l part, connected by an intermediate wrought-iron plate. these parts may be constructed in a single piece. external surfaces are corrugated, whilst the inner surf have channels communicating with holes in one of outside parts.—C. A. M.

ils; Bleaching of Whale and Seal ——. A. M. Clark, London. From L. Rissmuller, New York City, U.S.A. Eng. Pat. 15,603, Aug. 1, 1901.

the process claimed, the oil is converted into as fine an nulsion as possible, and then mixed with oxidising salts id acids at a low temperature, care being taken to prevent e separation of the emulsion. Bichromates or permanmates with sulphuric or other acid are mentioned as itable oxidisers. After their addition the temperature is owly raised to the point at which oxygen is evolved, after hich the steam supply is cut off, and the agitation of the ass continued until the bleaching is finished.—C. A. M.

nseed Oil, Boiled; Substitute for ——, *and Process for Producing same.* S. Ammundsen. Eng. Pat. 9828, 1901.

See below.

ap, Soft; New Manufacture of ——. F. A. Hulme, rading as John Hulme and Sons, Stockport. Eng. Pat. 17,278, Sept. 29, 1900.

VEGETABLE oil, preferably cotton-seed oil, is heated and red with an equal weight of resin (rosin) until the er has dissolved. A solution of caustic potash, practily free from caustic soda, is then introduced until the cture is sufficiently saponified, after which the process is apleted by the addition of strong lye (say 50° Tw.).
—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

PATENTS.

Ultramarine for Blueing Sugar. A. Herzfeld.

See under XVI., page 1007.

sed Oil; Substitute for Boiled ——, *and Process for Producing same.* S. Ammundsen, Copenhagen. Eng. Pat. 9828, May 11, 1901.

product claimed is prepared by mixing, in approxiely the proportions mentioned, 100 parts of casein with o 25 parts of a 10 per cent. solution of soap, and adding to 50 parts of slaked lime. When the mass is comely homogeneous, from 25 to 40 parts of oil of turpentine introduced, and the mixture diluted with water to the sistency of boiled oil. When it is required to keep the luct for a long time, from 0·05 to 5·0 parts of ammonia added to prevent the separation of the casein-lime.

is stated that this preparation can be used with colours xactly the same way as boiled linseed oil, and that the urs so prepared can be applied to moist wood and brick s. When once dry the mixture is insoluble in water, the colours can be removed with alkalis in the same as those prepared with linseed oil.—C. A. M.

Printing Ink; Manufacture of ——. The British Oil and Cake Mills, Ltd., London, and A. G. Wass, Deptford, Surrey. Eng. Pat. 23,231, Dec. 19, 1900.

THE alkaline mucilage obtained when cotton-seed oil is refined is mixed with sufficient acid tar (from mineral oil refining), and also, if desired, with some of the acid mucilage of linseed and rape-seed oil, to nearly neutralise it. A mineral acid is added in excess, and the fatty matter is collected, freed from moisture, and then heated with resin or resinous matter. This product is incorporated with lamp-black or other pigment, and when levigated forms a cheap and serviceable printing ink.—R. L. J.

(B.)—RESINS, VARNISHES.

PATENT.

Oils applicable for Use in the Manufacture of Paints and Varnishes; Production of ——. A. S. Ramage, Cleveland, Cuyahoga, Ohio, U.S.A. Eng. Pat. 7242, April 6, 1901.

CLAIM is made for a process of converting non-drying animal or vegetable oils into drying oils by oxidation in the presence of a substance, such as platinum, which occludes oxygen. In a special form of apparatus described, the oil is heated in a steam-jacketed vessel to about 200° F., and is then mixed with platinised asbestos (say 10 per cent.). Air is now introduced into a connected ozoniser under pressure, and the resulting ozone forced through the perforations of a coil immersed in the oil. After four or five hours the odour of the oil is completely destroyed, and the specific gravity of the product rises to 0·976. Finally, the oil is run off and filtered under pressure. It is stated that the oxidised oil thus obtained is practically a varnish, since it requires the addition of only a tenth of the quantity of gum to obtain the same results given by the oils now upon the market. When spread upon glass it dries to a firm film in about five hours.—C. A. M.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Tanning Materials; Influence of the Nature of the Water used in the Extraction of ——. E. Nihoul and R. Martinez. Bull. de la Bourse aux Cuirs de Liège, Sept. 1901.

INSTEAD of using distilled water for extracting tanning materials, the authors, imitating tanyard methods, have employed certain natural waters, in order to discover how far the *practical* yield of tannin differs from the *experimental* yield obtained by the chemist in laboratory analysis.

Five Belgian waters were selected for this purpose, each with special characteristics, the most important of which are shown in the following table. Column I. refers to distilled water, and is so numbered to facilitate comparison with a later table.

Composition of Waters used.

(Parts per 100,000.)

Character of Water.	I. Pure.	II. Somewhat hard.	III. Rich in Sulphates.	IV. Rich in Chlorides.	V. Hard.	VI. Very Hard.
hardness ($CaCO_3$)	..	19·50	39·00	41·24	46·88	78·00
rary hardness ($CaCO_3$)	..	9·92	23·34	22·90	21·68	50·54
anent „ „	..	9·58	15·66	18·34	25·20	27·46
solid matter	..	33·70	93·68	84·20	184·50	207·05
	..	3·69	10·56	4·45	27·00	33·83
	..	1·76	0·67	14·28	39·75	14·55
	..	10·67	20·50	11·20	27·64	15·89
	..	0·59	0·16	0·08	1·58	0·16
a of source (in metres)	..	4·50	..	14·00	8·50	11·50

s. V. and VI. contained appreciable quantities of iron. e tanning materials chosen were:—Oak bark from the aric Isles, somewhat deeper in colour than usual Belgian ples; pine bark (Valentian), a deep red variety, proy derived from *Pinus Halepensis*; sumach (Spanish); and valonia (English). The first three were in actual use at the Tannerie Martinez, Valentia, Spain.

Extracts were prepared by two methods.—

(*a*) *Hot Extraction.*—The material was extracted partially at 50° C. and then completely at the boiling point the manner authorised by the International Association of Leather Trades' Chemists.

(*b*) *Cold Extraction.*—The material was leached with an equal volume of water for 48 hours at the ordinary temperature (17°—19° C.), and then washed with cold water till free from tannin. The first two materials required 1¼ litres, the others 1½ litres, the strengths of solutions and methods of subsequent analysis (by hide-powder filter) being in all cases those of the I.A.L.T.C. above mentioned.

No great difference in rapidity of extraction was observed between the different waters, but the colour of the extracts varied considerably.

Water III. (rich in sulphates) intensified the red colour of the pine-bark extract and produced a strong dirty green shade in the sumach liquor. Both changes were still more marked with Water IV.—an observation of considerable importance to extract makers in view of the different shades yielded by the same extract when sold to different tanneries. Waters V. and VI. also gave deep-coloured solutions and produced so turbid a liquor with the sumach that filtration through a second filter-paper became necessary, which partly accounts for the low results in this case.

The quantities determined for each material, with c water and also distilled water, and for each method extraction were :—

Total soluble matter, ash of same, soluble organic mat total non-tannin, ash of same, *i e.*, inorganic non-tan organic non-tannin, tanning-matter absorbed by hide (tot. mineral matter absorbed by hide. Tannin, insoluble ma and moisture of sample. The variations (+ or −), du the influence of the particular water, from the normal amo obtained with distilled water were also tabulated. The m important conclusions to be drawn from the figures are :-

(*a*) That there is always a marked, and in some ca a very serious loss of tannin, if natural waters are u instead of distilled water.

(*b*) That in all cases the non-tannin is increased.

(*c*) That the hide absorbs some portion of the min constituents of the water, *i.e.*, a slight natural "weighti is produced by natural waters.

This being a matter of very great practical importa the actual quantities for tannin (T) and non-tannin (N- the percentage loss of tannin, calculated on the full amo given by distilled water, and the natural weighting du the constituents of the water, are reproduced in following table :—

Water.	Tanning Material.															
	Oak-bark.								Pine-bark.							
	Hot Extraction.				Cold Extraction.				Hot Extraction.				Cold Extraction.			
	T.	N.-T.	Loss in T.	Mineral Weighting.	T.	N.-T	Loss in T.	Mineral Weighting.	T.	N.-T.	Loss in T.	Mineral Weighting.	T.	N.-T.	Loss in T.	Mineral
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
I. Distilled water	14·2	4·4	Nil	0·2	9·9	3·1	Nil	0·0	22·4	3·1	Nil	0·2	18·0	1·6	Nil	
II. Somewhat hard......	13·1	5·6	9·2	0·4	9·3	3·5	0·5	0·1	22·3	3·7	0·4	−0·1	17·4	3·1	3·2	
III. Rich in sulphates	11·8	6·0	17·6	0·4	8·4	3·9	15·2	0·4	20·5	4·3	8·4	−0·1	18·2	2·8	+	
IV. Rich in chlorides	10·3	6·5	28·6	0·2	8·8	3·9	11·2	0·0	19·6	5·3	12·4	0·6	17·7	3·1	1·4	
V. Hard	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	
VI. Very hard	6·9	6·3	51·9	0·1	8·2	4·9	17·5	0·1	17·6	6·7	21·5	0·1	16·4	4·3	9·1	

Water.	Tanning Material.															
	Sumac.								Valonia.							
	Hot Extraction.				Cold Extraction.				Hot Extraction.				Cold Extraction.			
	T.	N.-T.	Loss in T.	Mineral Weighting.	T.	N.-T.	Loss in T.	Mineral Weighting.	T.	N.-T.	Loss in T.	Mineral Weighting.	T.	N.-T.	Loss in T.	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
I. Distilled water.......	23·0	10·9	Nil	0·0	17·9	11·1	Nil	0·0	35·8	10·8	Nil	0·0	33·1	8·4	Nil	
II. Somewhat hard......	19·6	15·7	15·1	0·1	14·3	11·2	20·2	0·2	33·9	12·3	5·4	0·5	28·0	8·7	15·5	
III. Rich in sulphates	12·1	18·0	47·6	0·1	12·6	10·9	29·4	0 5	33·2	14·5	7·3	1·0	30·1	10·3	9·02	
IV. Rich in chlorides	7·0	24·5	69·2	0·4	13·4	12·8	25·2	0·6	33·3	11·9	7·1	0·8	30·5	11·1	8·1	
V. Hard	2·1	16·3	90·8	0·0	10·7	13·2	40·2	0·3	29·1	12·8	18·7	0·6	27·0	10·1	18·5	
VI. Very hard	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	

All the above figures are calculated on the amount of tanning material used in the experiment, except those in columns marked "Loss in T," which, as stated, are percentage losses on the full amounts obtainable with distilled water.

The authors have chosen the total hardness (in German degrees) as the most useful criterion of the nature of the waters, and plotted these values, with the percentage losses, into curves, which show at a glance how the suitability of a water that is to be used for preparing tan-liquors depends on its hardness. The curves bring out the following points :—

Hot-extraction.—Chlorides present in the water used for making tan-liquors cause a serious waste of tannin in the case of oak, sumach, and pine, but not in the case of valonia.

Hard waters cause a sensible loss of tannin in the four materials examined, and an extreme loss in the case of sumach.

Cold-extraction.—Whilst the amount of tannin extra is several per cent. less than when heat is employed, composition of the water has less influence on the yi Thus, if very hard waters only are available, extraction be conducted as profitably by the cold as by the hot me and with greater advantage in the extreme case of suma

—R. L.

Tanning; Rapid ——. Thirion, Paris. From Mo French Pat. 297,475, Feb. 21, 1900. Monit. Sci 1901, **15**, [717], 221.

In this process a picric acid bath is used before, and on hyposulphite after, the usual chrome-tannage.

For two sheep-skins (about 3 kilos. each) the operati are as follows :—The skins are first agitated for half hour in picric acid solution (25 grms. to 8 litres of wa and washed in water for 5 minutes. A bath is now pared by dissolving bichromate of potassium (240 gr in hot water (3 litres) adding alum (220 grms.), sod hloride (125 grms.), and water (4 litres); to this three-ourths of its bulk of picric acid solution (strength as bove) are added, and the whole cooled. In this bath the kins are paddled for 20 minutes, lifted whilst 25 grms. of ydrochloric acid are added, and again immersed for 25 inutes. They are removed, sleeked thoroughly, and laced in a bath of the following composition; sodium yposulphite, 125 grms.; hydrochloric acid, 10 grms.; cold ater, 3 litres. After draining a still more acid bath is used, z., sodium hyposulphite, 250 grms.; hydrochloric acid, 0 grms.; water, 8 litres.

Finally the skins are washed in a tepid solution of mmonium chloride, sleeked once more, and passed forward or colouring and drying.—R. L. J.

anning; Use of Sulphite-pulp Waste liquors in ——. F. Jean, Paris. French Pat. 299,179, April 11, 1901; through Monit. Scient. 1901, **15**, [717], 221.

he skins are placed in potassium bichromate solution, cidified with sulphuric or hydrochloric acid, until quite ellow, and then entered in a tumbler or paddle with a lution of the waste liquors obtained in the manufacture f sulphite wood-pulp, diluted to 5° B., either cold or at bout 30° C.—R. L. J.

eather; Artificial ——, *or similar Products; Process for Manufacturing* ——. Duvinage, Paris. From Gevaert-Naert. French Pat. 301,143, Sept. 29, 1900; through Monit. Scient. 1901, **15**, [717], 224.

WOOLLEN or felted fabric is saturated *in vacuo* with llulose-xanthate solution (prepared in the usual manner); is is dried and again saturated with the following composition:—Carbon bisulphide, 1 litre; gutta-percha, 20 grms. outchouc, 12 grms.; asphaltum or gum-damar, 5 grms.
—R. L. J.

ides and Skins; Process for Dressing ——. De Mestral Paris. From Valentiner and Schwartz. French Pat. 303,777, Nov. 5, 1900. Monit. Scient. 1901, **15**, [717], 222.

he agent employed is fluoride of chromium, prepared by ssolving sodium bichromate (100 kilos.) in water (400 los.), adding formaldehyde (5 kilos.), hydrofluoric acid 00 kilos.), and heating to 60°—70° C.

The hide (20 kilos.) is entered in a paddle with about kilos. of the above preparation, diluted to contain "34 r cent. of fluoride of chromium." When saturated the de is rinsed and placed in weak lime, soap, or other kaline solution.—R. L. J.

Tannin; Determination of ——. G. Sesti.
See under XXIII., *page* 1031.

Leather; Analysis of Chrome-tanned ——.
Edmund Stiasny.
See under XXIII., *page* 1028.

XV.—MANURES, Etc.

PATENT.

licon Fluoride; Processes for Preventing the Escape of —— *in the Decomposition of Phosphates.* E. Teisler, Strehla-on-the-Elbe, Germany. Eng. Pat. 11,919, June 11, 1901.

PROCESS for preventing or retarding the evolution of o-silicic fumes during the decomposition of phosphates the production of superphosphate), by means of sulphuric id, which consists in the addition of sulphate of sodium, monium, or potassium in cases wherein sulphuric acid about 54° to 60° B. alone would otherwise be employed.
—E. S.

XVI.—SUGAR, STARCH, GUM, Etc.

gar Manufacture; French ——. P. Horsin-Déon. Mem. de la Soc. des Ing. Civils de France, 1900, 570. Proc. Inst. Civil Eng. 1901, **145**, [3], 77—78.

France, the beet sugar industry exceeds in value that of her coal or iron; it yields a revenue of 6,800,000*l*. The process of manufacture comprises four main stages—(1) Extraction of the juice from the beetroot. (2) Purification. (3) Evaporation to syrup. (4) Crystallisation of the sugar and separation from the mother liquor. The juice is extracted exclusively by the diffusion process; the chief difficulty is to so adapt the method of working as to obtain good results from all different qualities of beets. As regards evaporation of the juice, the author describes the progress of the method of working *in vacuo* in multiple effect apparatus; the more recent forms of apparatus are arranged for fivefold and sixfold concentration. It is stated that two sextuple effect evaporators have been constructed for sugar factories in Egypt, which are thus enabled to use bagasse as fuel, without any coal; one of these has 4,000 sq. m. (43,000 sq. ft.) of total heating surface, and each of its first three boilers has 1,000 sq. m. (10,750 sq. ft.). In the concluding process of crystallisation, Steffen's method (this Journal, 1900, 1028) has led to a great saving of time and expense, as compared with the old method. By a combination of the Steffen method with a softening or annealing appliance devised by Bocquin and Lepchinsky, and by promoting crystallisation with the aid of a priming of sugar, the centrifugal machines ultimately throw out molasses incapable of yielding further crystals. By crystallisation in motion only two grades of sugar are made, hot chambers are dispensed with, and final treacle is turned out six days after the beetroots are received, instead of six months after, as formerly. Larger crystallisers and boilers, more centrifugal machines, and complete re-arrangements are required, but more sugar is obtained, with a smaller consumption of coal.
—A. S.

Sugars; Cause of the Rapid Deterioration of Some ——. H. C. Prinsen-Geerligs. Handelingen van het vierde Congress van het algemeen syndecaat van Suiker-Fabrikanten of Java, van Ingen, Soerabaia, 1900, 95; through Zeits. Untersuch. Nahr. Genussm. 1901, **4**, [16], 761.

The author's researches show that the deterioration of sugar during storing and transit is due to inversion, the cause of which is the activity of micro-organisms taken up from the air by moist sugar. To obviate this, sugar should be packed dry, and should also be kept dry.—T. H. P.

Carbohydrates; Action of Hypochlorites upon ——. W. Bräutigam. Pharm. Zeit. 1901, **46**, 636.

The author has studied the action of hypochlorites, bleaching powder in particular, upon the carbohydrates. Hypochlorous acid converts starch first into dextrose, which then produces oxalic acid, carbon dioxide, and water. Dextrin, glycogen, and dextran behave in the same manner. Strong solutions of the hypochlorites in the cold decompose the members of the grape- and cane-sugar series into oxalic acid, carbon dioxide, and water; in dilute solutions carbon dioxide and water are the products. The members of the cellulose and melitose groups are only attacked on heating to 60°—70° C., when they produce dextrose, which is further decomposed, according to the strength of the hypochlorite solution, into oxalic acid, carbon dioxide, and water, or into carbon dioxide and water only.—A. C. W.

Ultramarine for Blueing Sugar. A. Herzfeld. Zeits. Vereins Deutsch. Zucker-Ind. 1901, **38**, 1—3; through Zeits. Untersuch. Nahr. Genussm. 1901, **4**, [16], 761.

The author has examined four kinds of ultramarine by suspending in water and boiling, the hydrogen sulphide evolved being passed into silver solution and thus determined; the quantities of hydrogen sulphide found were respectively, 0·024, 0·019, 0·009, and 0·134 per cent. The last sample was employed in the manufacture of white sugar, the colour of which changed during two to three days' water transit to an unpleasant grey tint. The evolution of hydrogen sulphide and the subsequent formation of traces of ferrous sulphide are probably the causes of the grey colour. The action of the enclosed mother-liquor on the colouring matter possibly plays a part in the action.
—T. H. P.

Apiin and Apiose. E. Vongerichten.
See under XXIV., *page* 1034.

PATENTS.

Sugar-refining Apparatus. L. Fuchs, Lundenburg, Moravia. Eng. Pat. 7634, April 13, 1901.

The patentee claims an improved osmose frame, distinguished by having at its base two triangular parts, constituted by the rod forming the lower side of the frame and by two obliquely placed rods, forming an isosceles triangle. This triangle is then divided into two by a vertical rod. The two triangular parts so formed serve as bags to receive the sediment of the molasses on entering and of the osmose water on leaving. The two bags communicate with the channel for the incoming molasses and with a channel through which passes the outgoing osmose water, as well as with discharge and cleaning channels. This arrangement permits of the use of rectangular non-perforated osmose paper, and also the filtration of muddy liquid.

The following are modifications of the apparatus:—1. The channels for the circulation of the liquids, and for the discharge of the sediment in the bags, are replaced by pipes connected to corresponding openings formed in the outer walls, and communicating with the bags to avoid weakening the cross bars. 2. Plates divide the frames into groups with collecting recipients and sediment bags, the plates being provided with channels connecting the recipients of one group with the bags of the adjoining group in such a way that the liquid mass will pass successively through the several groups. Cut-off blocks may also be used for closing the channels, these blocks allowing the liquids to be refiltered in the following groups after passing through the first group of frames.—J. L. B.

Sugar: Process for Converting Wood and other Cellulose Material into ——. A. Classen, Aix-la-Chapelle, Germany. Eng. Pat. 12,588, June 20, 1901.

The patentee mixes 100 parts of wood, containing from 25 to 20 per cent. of water, with 30 to 35 parts of an aqueous solution of sulphurous acid, heating the mixture a closed vessel to 120—145 C. from 30 to 60 minutes, the mixture being stirred meanwhile. The free sulphurous acid is then blown off, and the mass boiled with water to obtain a sugar solution. In this operation the sulphurous acid is largely oxidised to sulphuric acid, so that it is unnecessary to add an oxidising agent, as was stated in the patentee's previous invention (this Journal, 1900, 364). The second claim comprises the use of a mixture of sulphurous and sulphuric acid, the operations being carried out as described above.—J. L. B.

XVII.—BREWING, WINES, SPIRITS, Etc.

Malting; Examination of Fuels Employed in ——, *with Special Reference to the Arsenic they Contain.* A. R. Ling and B. E. R. Newlands. J. Fed. Inst. of Brewing, 1901, **7**, 315—337.

One of the authors (B. E. R. Newlands) has recently devised a process (see this Journal, 1901, 736) for retaining the whole of the arsenic in coal and coke in a fixed condition by treating the fuel with a basic substance, such as soda or lime. This serves as the basis of the method to be described for determining the arsenic in fuel. The authors first proved that the whole of the arsenic is fixed when coal to which a known amount of arsenious sulphide has been added, is burnt with an excess of lime.

If a known weight of the fuel be intimately mixed with lime and incinerated in a muffle, the arsenic in the residue will represent the total arsenic, whilst if a portion be burnt alone, and the arsenic determined in the ash, the fixed arsenic only will be obtained, and the difference between the two determinations will give the volatile arsenic. Two portions of 1 to 10 grms. of the fuel are separately burnt in a platinum dish, one alone and one mixed with half its weight of lime, which must be free of arsenic. The residues are boiled with dilute hydrochloric acid, diluted to a known volume, and an aliquot portion submitted to the Marsh-Berzelius test. Since the metalloid is in the arsenic condition, the test must be allowed to run for half an hour. The following figures show the amounts of volatile and fixed arsenic occurring in typical samples of Welsh anthra gas coke, and oven coke:—

Welsh Anthracite.

—	Ash.	Volatile Arsenic.	Fixed Arse
	Per Cent.	Grains per Lb.	Grains per
1	15·1	0·007	0·091
2	4·00	0·042	0·070
3	2·30	0·028	0·028
4	1·90	Nil.	0·042
5	2·30	0·007	0·035
6	1·20	0·014	0·014
7	1·53	0·032	0·003
8	12·64	0·252	0·115
9	2·44	0·019	0·019
10	3·80	Nil.	0·256

Gas Coke.

—	Volatile Arsenic.	Fixed Arsenic.
	Grains per Lb.	Grains per Lb
1	0·042	0·126
2	0·021	0·070
3	0·063	0·084
4	0·042	0·091

Oven Coke.

—	Ash.	Volatile Arsenic.	Fixed Arsen
	Per Cent.	Grains per Lb.	Grains per
1	10·60	Nil.	0·012
2	4·60	Nil.	0·042

It is noteworthy that the larger proportion of the arse in coke is retained in the ashes.

A series of experiments are next described with object of testing on a practical scale whether the whole the arsenic is retained in the fixed condition by addin basic substance to the fuel. Gas coke was mixed w quantities of slaked lime varying from 5 to 10 per ce and the arsenic estimated in the resulting malt. In sc cases kilning was carried out with similar fuel, but with lime. Generally it would seem that dry slaked lime is best material for retaining the arsenic, and the experime prove the possibility of using arsenicated coke for dry malt, provided it be treated by the process above describ —J. L. B

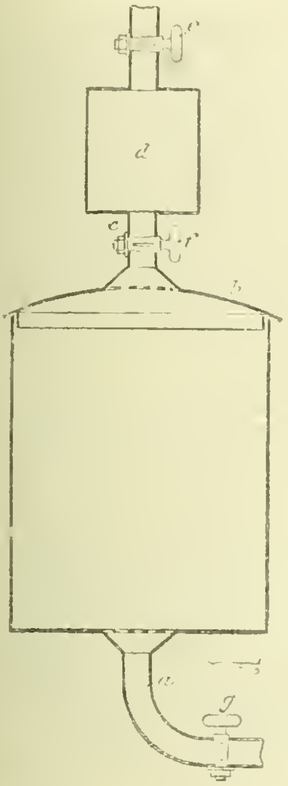
Oats in the Manufacture of Beer; Employment of —. E. Rüffer. Woch. für Brau. 1901, **18**, [32], 402.

The employment of oats in the brewing of beer dates fr very early times; but this grain was generally used connection with barley or wheat. Although beer m from oats alone has a very pleasant, sharp flavour, presents great difficulties in the clarification, or even ne clears at all. The author gives a short survey of history of brewing with oats from the middle ages down the present time. Oats are used only in the malted sta the malting process requires great caution, since the couch become warm very readily and quickly.

Oat-malt grist is only suitable as an admixture to bar and wheat malt mashes; the highest proportion admissi without detriment to the clarification, is one-sixth of total grain in the mash. The use of oats up to this ext favours and stimulates the fermentation, and imparts to beer a fine, vanilla-like flavour, whilst clarification requi only a very short time. Larger proportions of oats th the above spoil the clarification and have a very bad influe upon the stability of the beer; these effects are attributa to the presence of somewhat large proportions of solu albuminoids.—J. F. B.

Hops; Preservation of ——. D. F. Kleinke. Woch. für Brau. 1901, **18**, [34], 424—426.

A system of preservation of hops, in the proper sense the word, does not exist. The method usually employ sists in pressing the dried hops, with or without phuring, into bales, which are then placed in hermetically sed vessels and stored in a cool room: the effect, howr, is only temporary. According to a system in vogue England, the hops are stored at a temperature below the



zing point. But, whilst the hops are preserved by this tment in the very best condition and with an excellent na, they lose this aroma very rapidly after being oved from the cold chamber for use. Consequently, method is only applicable when the cold storage rooms situated in the brewery itself. This observation raises question whether, under ordinary conditions, it is ssary to protect hops not only against heat but also inst frost. The preservation of hops by storing in els from which the air has been exhausted or replaced nitrogen is uncertain, owing either to the incomplete oval of the air or to the fact that air may not be the cause of deterioration. The author has made successful eriments on a small scale by preserving hops under er, after heating them with the water to a temperature 2 C. for one hour.

he main difficulty lay in the complete elimination of all air bubbles, which appear to cling obstinately to the rior of the hops; with care, however, the results were good.

he following is a description of the apparatus which author would propose to employ on a large scale, gh, for lack of opportunity, it has not yet been tried.

he hops are packed with pressure into a tinned-iron el (see Fig.), *a* is the water inlet, provided with a tap a sieve. The cover *b* is slightly arched, and the outlet *c* is placed at the highest point, being also provided a sieve and a tap. At the upper end of *c* the vessel *d* xed, capable of holding sufficient water to fill up the cylinder after its contents have cooled down. When vessel has been filled with hops and the cover etically sealed, all the taps are opened and water at a eratnre of 75°—85° C. is forced in through *a* under sure. As soon as the vessel *d* is full of water, the tap *e* is closed, and a pressure of water is maintained in the apparatus in order to facilitate the removal of the air. The air thus displaced rises into the vessel *d*, and the tap *e* is then opened whilst more water is forced in. The operation is repeated until no more air bubbles are displaced. The hop-container is insulated so that a temperature of from 62°—56 C. is maintained for one or two hours. During the cooling, all the taps are closed with the exception of *f*; this is afterwards shut, and the apparatus is stored in a suitable place.—J. F. B.

Yeast; Buchner's Expressed Extract of ——.

A. Wroblewski. J. prakt. Chem., 1901, **64**, [13–14], 1—70.

The author draws the following conclusions from the results of the work described in his paper:—

In the course of pressing out the cell-juice, it was observed that the later runnings from the press had a lower fermentative power than the earlier portions. Yeast cell-juice does not rotate the plane of polarised light. It contains silica, derived from the kieselguhr employed. Buchner's general conclusions as regards fermentation without yeast cells were confirmed by the author in the case of pure cultures of beer and wine-yeasts. Zymase does not diffuse out of the cells during fermentation, alcohol and carbon dioxide are consequently the excreta of the yeast cell; invertase also acts mainly in the interior of the cells. Neutral salts at a concentration of about 1·5 per cent. stop the action of zymase, but small quantities of these salts are favourable; phosphates are very favourable. Small quantities of alkalis stimulate the fermentation, but larger quantities stop it; acids are also harmful. But if phosphates be added along with alkalis or acids, the harmful effect of these agents is counteracted. Hence the theory of the protective function of phosphates in the cells is deduced. Dilution with water diminishes the fermentative power of the cell extracts to a disproportionate degree; excessive dilution destroys it altogether. Formalin at 0·05 per cent. concentration stops the action of zymase; nitrites and especially nitrous acid are very harmful. Evolution of nitrogen takes place on the addition of nitrites even when the extracts have been previously boiled. From this, the author deduces the hypothesis that denitrification in the soil depends upon purely chemical processes. Alcohol at about 15 per cent. concentration retards the fermentation and at about 20 per cent. stops it, at the same time throwing down a precipitate in the juice.

The author describes a method for the estimation of the invertive power of solutions and preparations of invertase, also a process for obtaining crude invertase. The invertase preparations hitherto obtained have been contaminated with large quantities of a carbohydrate, which has been identified by other authors as a mannosane. Invertase cannot be salted out from its solutions, neither is it precipitated by acetic acid; the author has repeated the study of the actions of chemical agents upon this enzyme. The author divides the catalysing constituents of the juice into three classes: catalysers of simple constitution, enzymes which belong to the proteose group of albuminoids, and lastly, catalysers which very nearly approach protoplasm in nature, of which class zymase is as yet the only member known. The author has further observed that the action of invertase is reversible and that when allowed to act upon glucose or invert sugar under certain conditions, this enzyme brings about condensation with increase of optical rotation. The expressed cell-juice of yeast contains organic phosphorus compounds amongst which is a characteristic crystalline body.

In the qualitative examination of the expressed juice, albuminoids coagulable at various temperatures were found, including albumins and globulins. The albuminoid coagulated at 41° C possesses certain properties corresponding with those of zymase. The following bodies were also identified:—proteoses, peptones, alcohol, mucins, mannosane, a reducing body, formic acid, another volatile acid, fats, lecithin, cholesterin, aldehydic bodies, tyrosine, glutamic acid, other amino acids, a diastatic and a glycogen-hydrolytic enzyme; for the extraction of the cell-juice with ether a special apparatus was devised.—J. F. B.

Beer Yeast in Pressed Yeast; Detection of ——. A. Langfurth. Zeits. öffentl. Chem. 7, 281; Chem. Centr., 1901. 2, [12], 744.

Notwithstanding the replies of Herzfeld and of Küttner and Ulrich (this Journal, 1901, 919), the author holds to his former opinion that Bau's method cannot be accepted as a standard one for the detection of beer yeast in pressed yeast. It is undoubted that there are, in commerce, pure yeasts prepared by the aeration process which ferment a 1 per cent. melitriose solution quantitatively within 24 hours. All the yeasts prepared by the aeration process examined by the author strongly attacked melitriose. Bau's method may serve for distinguishing suspicious yeasts from those above suspicion and may thus be useful as a preliminary to further examination, but it can never be regarded as a decisive test.—A. S.

Beer Yeast in Pressed Yeast; Detection by Odour of ——. S. Küttner and C. Ulrich. Zeits. öffentl. Chem. 7, 273—274. Chem. Centr., 1901, 2, [10], 650. See also this Journal, 1901, 843, 919.

The author finds that yeasts after long standing (about four days) in closed vessels at the ordinary temperature, differ considerably as regards odour, according as they have been mixed with beer yeast or not. Samples containing beer yeast have a sour, suffocating odour. The indications of this "odour test" coincide with the results obtained by Bau's method.—A. S.

Distillery-Yeast and low Fermentation Beer-Yeast, Distinction between ——, *by the Estimation of their Fermentative Powers at different Temperatures.* C. J. Lintner, Zeits. für. Spiritusind, 1901, 24, No. 35, 359—360.

It is well known that low fermentation yeast is not so well suited for bread-making purposes as distillery yeast. Beer yeast generally raises the dough quickly but the fermentative action is not continued, with the result that the dough falls together in the oven and the bread does not have the desired porous property. Since the determination of the fermentative power of these two types of yeast at 30° C. threw no light on the question, the author considered that the difference of the behaviour of the yeasts at the temperatures reached in baking, might offer some explanation.

According to recent investigations the temperature in the centre of a mass of dough during baking does not exceed 104° C. With the slow rise of temperature different yeasts show varying fermentative powers. This point is brought out by the following determinations which were conducted according to Hayduck's method but at different temperatures.

	—	30° C. CO_2.	45° C. CO_2.	50° C. CO_2.
		C.c.	C.c.	C.c.
1	Low-fermentation beer yeast.	360	248	107
2		475	232	72
3		342	210	63
4		367	162	28
5		350	170	25
6	Distillery yeast	247	380	279
7		290	428	231
8		113	203	118
9		275	354	175
10		298	388	161
11		290	428	136
12	White beer yeast (top fermentation).	210	255	190

These figures show that low fermentation yeast are more affected by temperatures above 30° C. than distillery yeasts, and this may be the reason of their different behaviour in the bakery. The author states that if the fermentative power at 45° C. is lower than at 30° C. the yeast consists of a mixture of much beer yeast with little distillery yeast; should, however, the fermentative power be considerably higher at 45° than at 30° C., the yeast is derived from a distillery. If, in addition, the yeast be submitted to the raffinose test of A. Bau, a certain conclusion may be drawn as to its origin. The interesting point is raised whether a yeast which shows the highest fermentative power at 45—50° C. is the one best suited for baking, and in view of Hansen's and Delbrück's observations whether it is pos to acclimatise a low fermentation beer yeast to ba purposes.—J. L. B.

Mannitol Ferment; The ——. U. Gayon and E. Dubo Ann. Inst. Pasteur. 15, 527—569; Chem. Centr. 1 2, [10], 648.

The ferment examined by the authors produced man only from lævulose; with all other sugars, it gave alc together with carbon dioxide, acetic, lactic, and succ acids, and glycerin. The mannitol ferment is distingui from other microbes which form alcohol, in that it is indifferent towards sugars and alcohols, and that it yi the same products with allied compounds, for exan with glucose and galactose, saccharose, and lactose. mannitol ferment always forms glycerin and succinic simultaneously, whereas with other microbes, only the la of these two compounds appears to be formed. The duction of alcohol, carbon dioxide, glycerin, and suc acid in almost the same proportions as in normal alcol fermentation shows that part of the sugar is decompose the same manner as by beer yeast, but the whole of sugar is not split up in this way, part being decomp with formation of acetic and lactic acids; it is notewo that one of these two acids is never formed alone. sugars which, according to Fischer, can be directly mented by yeast (*d*-fructose, *d*-glucose, *d*-galactose, *d*-mannose) are fermentable by the mannitol ferment. decomposing power of the mannitol ferment is stro than that of the *Saccharomyces*, for the former can spli the sorbose molecule, and even acts upon pentoses, w the yeasts only ferment sugars with C_3, C_6, C_{12}, or C_{18}. the pentoses, *l*-xylose is readily decomposed into acetic lactic acids, and, under certain conditions, the isomer xylose are also fermentable by the mannitol ferment. characteristic property of the mannitol ferment of produ mannite only from levulose, may be used for the detec of the latter in mixtures of fermentable carbohydr. Saccharose, maltose, lactose, and raffinose are fermen directly by the mannitol ferment, and do not need to previously subjected to hydrolysis.

It is apparent from the description given of the prope of the mannitol ferment, that it cannot be the caus "sicknesses" in wine.—A. S.

Wine; The Organisms of Alcoholic Fermentation in Manufacture of ——. W. Seifert. Weinlaube, 1901, through Zeits. Unters. der Nahrungs- und Genussm 1901, 4, 790—791.

The difference in fermentative power, stability tow alcohol, acids, sugar, yeast poisons, &c., is of value in differentiation of species and races of yeast. The resist capacity towards alcohol is of considerable importance practice. Musts, to which 11 per cent. of alcohol was ad were fermented under similar conditions. After fermen tion they contained the following quantities of sugar Klosterneuberger, 1894, 2·44 grms.; Oedenburger, 18 1·48 grms., 1897, 1·84 grms.; Marcobrunner, 8·30 grm Gumpoldskirchner, 20·93 grms.; Himalaya, 2·02 grm Mazzoner, 2·90 grms.; Steinberg, 14·86 grms.

Wine yeasts also show marked divergences in the prope of spore-formation. Strasser yeasts form spores with gr difficulty after 87 hours at 25° C. In marked distin to this is the yeast of Sültyroler, 47; and Weyrer, which form them readily at 36°—37° C.—J. L. B.

Bulgarian Brandies; Examination of ——. Z. Kaliandj Oesterr. Chem.-Zeit., 1901, 4, 57—59. Zeits, Unt der Nahrungs-und Genussmittel, 1901, 4, 795.

The author has examined 13 brandies of Bulgarian or according to the methods of Lusson, Girard, and Rocq 100 ccm. of purified commercial alcohol contains, acc ing to these methods, 10 mgrms. of impurities, Fre cognacs from 300 to 350 mgrms. Lusson has used oxidation coefficient—the relation expressed in percenta of the sum of the aldehyde and acid to the total coeffic of impurities—as a measure of the age of brandies; found that the oxidation coefficient of young brandies exceed 10, whilst that of old brandies (40 years) ched 36. This law, however, does not hold good for Bulgarian brandies. The results obtained by the author are shown in the following table.

Origin.	Wine Alcohol.								Approximating Wine Alcohol.		Aromatic Commercial Alcohol.	Mixtures of Wine Alcohol with Commercial Alcohol.	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
ific gravity	0·9·87	0·9663	0·9381	0·9500	0·9488	0·9461	0·9586	0·9405	0·9274	0·9578	0·9609	0·9457	0·9651
hol, vol. per cent. ...	51·15	44·50	51·65	44·70	44·00	44·76	38·00	51·27	55·07	41·40	40·20	45·20	49·50
ract, grm. in 100 c.c..	1·00	5·26	1·94	1·54	0·78	0·41	0·54	1·76	1·40	2·12	1·40	0·57	1·39
(acetic acid)	199·4	183·4	78·80	85·9	175·6	99·8	197·7	159·4	54·7	49·3	26·8	31·9	57·2
hyde	35·26	40·9	39·2	35·8	36·5	48·1	58·3	164·13	44·0	28·5	4·5	23·7	18·8
fural	2·0	1·9	0·9	1·9	2·2	2·2	3·9	0·48	0·9	1·4	2·9	1·2	0·7
r (acetic ether)	132·5	112·7	42·60	76·80	142·0	55·4	94·9	113·44	30·0	71·4	31·9	37·8	14·2
her alcohols (isobutyl ohol).	273·7	292·1	174·20	111·9	159·2	112·4	109·6	195·30	134·6	110·6	Trace	39·5	18·0
ficient of impurity ..	643·2	631·0	331·7	312·3	515·5	317·9	165·4	439·29	264·2	261·2	60·1	134·1	108·9
lation coefficient	36·5	35·5	34·9	39·0	41·1	46·5	55·1	29·9	37·3	29·8	42·0	44·0	69·8
r + higher alcohols.	406·2	404·8	216·8	188·7	301·2	167·8	204·5	308·74	164·6	182·0	31·9	69·3	52·2
her alcohols / Esters	2·06	2·50	4·09	1·46	1·12	2·03	1·15	1·72	4·47	1·55	..	0·83	1·27

ll these samples contained reducing substances. The urs of 1 to 10, and 13 were due to tannin and caramel, st 11 and 12 were coloured with caramel.—J. L. B.

Chicory; Spirit from ——. H. Lange. Zeits. für Spiritusind, 1901, **24**, [32], 330.

ORY root is stated to contain about 24 per cent. of ohydrates, convertible into sugar by 2—3 hours steam- in presence of a little sulphuric acid. Unfortunately appear to be no data as to the degree of fermentability is sugar. Experiments made in Germany some years did not bring out any great superiority in the spirit of chicory as compared with potatoes. Assuming the e of the sugar produced to be fermentable, chicory ld give 7·2 litres of absolute alcohol per cwt. as com- l with 6 litres from potatoes. As regards the yield of , chicory may be taken at 450 cwt. per hectare, and oes at 400 cwt. Thus 1 hectare of chicory land should 32·4 hectolitres of alcohol as against 24 hectolitres potato land.

advantage about chicory is that it may be easily and stored for a long time without deleterious change. is case the spent residues from fermentation of chicory t come into use as fodder at a time when fodder is e, shortly before the commencement of the potato a. Chicory might also be employed for increasing the -content of low concentration mashes. Chicory spirit id to have a very pure flavour, and a characteristic ant aroma. But the chicory plant makes very severe nds upon the soil, far more so than potatoes or even the sugar-beet.—J. F. B.

Alcohol in Cider. Times, Oct. 1901.

H. Allen points out that bottled ciders are richer ohol than is supposed. In the course of his letter, Allen gives the proportions of alcohol (per cent. by e) contained in various beverages, each kind being to a certain range of strength:—

Cider.	Alcohol, per Cent.
French, minimum of Pomological Society	4
„ average of sweet samples (grignon).....	3·8 to 4·1
„ „ dry samples (grignon)	5·4
„ Paris municipal requirement average ...	5 to 6
„ „ „ minimum .	3
English—Bath and West of England Society's minimum.	4
„ Norfolk, bottled	6 to 9
„ Devonshire, bottled (extra dry).......	6·7
„ Herefordshire, bottled	6·6
American, dry	6·4
„ sweet	2·5 to 4

Beer.	
Ordinary draught	4·5
Burton pale ale..................................	6·3
Guinness's XX stout	6·6
Pilsen lager	3·5
American lager...................................	2·8

Wine.	
Bordeaux (vin ordinaire)	7 to 9
Beaune...	13
Rüdesheimer......................................	10
Champagne	11 to 13

With the exception of the Bath and West of England Society's minimum, all the English ciders are as strong in alcoholic content as beers and stouts.

Dry and Sweet Cider. Times, Oct. 1901.

Mr. F. J. Lloyd has found, on analysis, that one cider contains ten times as much sugar as another. To some the first would be a poison, whilst the latter would be beneficial. The manufacturers cannot produce a dry cider. Apples in some parts of England contain an abnormal quantity of acid, and the sugar is left in the liquid to hide the excess of acidity. The production of good clear cider depends not alone on skill in manufacture, but it also demands a good natural product to start with.

Wine; Detection of Citric Acid in ——. M. Spica.

See under XXIII., *page* 1030.

PATENTS.

Beer; Improved Manufacture of Non-Alcoholic ——. A. G. Bloxam, London. From Gebrüder Sulzer, Winterthur. Eng. Pat. 12,697, June 21, 1901.

THE alcohol is removed from a normally fermented beer by boiling in a vacuum apparatus which has a large surface, so that the evaporation may be as rapid as possible; in this manner no disagreeable taste is imparted to the beer, and its other constituents are not altered or volatilised by the boiling. The temperature of the contents of the vacuum pan should be from 40° C. to 60° C. The concentration of the beer may be rectified by subsequent addition of sterilised water or extract of hops. The product is then passed through a sterile filter, air being excluded, and is impregnated with carbonic acid in any known manner. Claims are also made for means for lifting the beer from the bottom of the vacuum vessel, and causing it to flow back again to the bottom over a corrugated surface within the vessel.
—J. L. B.

Beer and Ale; Means for Converting Wort into ——. A. Allison, London. From Otto Selg and J. B. and C. F. Gantrum. Eng. Pat. 12,906, June 25, 1901.

This process consists in subjecting wort contained within the same vessel to the following successive operations: first, causing fermentation by adding yeast; second, withdrawing the main body of the yeast that has separated; third, effecting clarification by the circulation of cooled brine, and developing carbonic acid by the remaining yeast; and, fourth, removing the separated sediments. The apparatus for carrying out these claims consists of an enamelled tub having an inclined top, a tapering bottom connected with a lower settling pocket, an intervening valve, and a cooling pipe within the tub.—J. L. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Eggs; Preservation of ——, *in Germany.* U.S. Cons. Reps., Sept. 1901.

Consul-General Guenther, of Frankfort, sends the following extract from an article on preserving eggs:—

Four hundred fresh hen eggs were subjected to the action of different substances for eight months. At the expiration of that time it was found that the eggs which had been put into brine were all spoiled; of those which had been wrapped in paper, and of those which had been immersed in a mixture of glycerin and salicylic acid, 80 per cent. were unfit for use. Of the eggs which had been rubbed with salt, or imbedded in bran, or coated with paraffin, 70 per cent. were spoiled; of those coated with collodion or varnish, 40 per cent.; and of those which had been placed in wood ashes or had been painted with a mixture of liquid glass and boric acid, or a solution of permanganate of potash, only 20 per cent. were bad. Almost all the eggs that had been coated with vaselin, or had been placed in lime-water, were in good condition.

Butter; Detection of Cocoa-Nut Oil in ——. F. Ranwez.

See under XXIII., *page* 1030.

Sucramin in Foods and Drinks; Detection of ——. Blarez and Tourron.

See under XXIII., *page* 1030.

PATENTS.

Food from the Seeds of the Horse Chestnut, and for the Extraction of the Bitter Resinous Principle contained therein; Manufacture of Nutritious ——. A. Flügge, Hanover, Germany. Eng. Pat. 17,768, Oct. 6, 1900.

The percentage of albuminoids in the horse chestnut, which averages about 27—28 per cent., is considerably in excess of that in lentils and peas, but owing to the bitter resinous principle which accompanies it, the fruit has not hitherto been available for human food. By first slightly roasting the seeds, removing the brown skin, reducing the pulp to fine powder, and percolating this with strong alcohol or a mixture of alcohol and ether, the bitter resin is removed, and from the remainder a food is prepared.—L. A.

Food; Utilisation of Residuary or Waste Products for ——. E. D. Bell, London. Eng. Pat. 18,936, Oct. 23, 1900.

Oilcake is disintegrated, freed from husk, &c., ground up with an equal weight of water or milk containing potassium carbonate equal to 1 to 2 per cent. by weight of the cake. The paste obtained is cooked for two hours, and then mixed with butter or margarine or cheese, and heated.—L. A.

Coffee Compound or Composition; Process of Producing the Same. J. M. Schutz and C. G. Hawley, Minneapolis, Minnesota, U.S.A. Eng. Pat. 15,447, July 30, 1901.

Roasted coffee beans are ground, mixed with half their weight of sugar, starch, or carbonate of lime, and the mixture is further ground in a centrifugal grinding mill.
—L. A.

(*B.*)—SANITATION; WATER PURIFICATIC

Sewage Effluents; The Aeration Test for ——. S. R Analyst, 1901, 26, [305] 197—202.

In examining sewage effluents as to their fitness to be with the local river water, both the closed and the ope are in use. In the former, the liquid is preserved in bottle, and the dissolved oxygen is determined at intervals. Since, however, the amount of dissolved o contained even in saturated water is insufficient to o the organic matter which may be present, sewage eff rapidly deteriorate under these conditions, whereas would become inoffensive under natural conditions. open test is, therefore, preferable. But the results obt depend so much upon the conditions, and no laborator can imitate natural conditions, that a standard proc needed. The author has therefore, instituted a seri experiments which have led him to the following clusions:—

1. The width of the vessel has, by itself, very influence on the aeration, provided the proportion of to depth be great enough to allow of sufficient circul A width of 2 ins. with a depth of 12 ins., is too narr satisfy this condition.

2. The depth, as would be expected, has a great e the amount of dissolved oxygen in large volumes of diminishes with the distance from the surface, u circulation interfere.

3. Too great a depth and too shallow a layer shoul avoided, and the relation of surface to volume shoul uniform in all experiments.

4. The following conditions appear to be the best samples should be kept at a uniform temperature in cyli 6 ins. deep and 3 ins. wide, exposed to the air and but protected from dust.

5. Even under uniform physical conditions, the varies greatly with the nature of the organisation i sewage and in the water used for dilution.

In support of the latter statement, the author give results of comparative experiments made with boiled boiled sewage, and the same sewage in a raw state. boiled sewage behaved nearly in the same way a boiled water, the absorption of oxygen from the air ca a continuous increase in the amount in solution. But i raw sewage the consumption of oxygen by ferment gradually became greater than the absorption from th and the amount in solution decreased.—L. A.

Refuse Destructors in Combination with Electric I Stations. J. S. Highfield. Electrician, 1901, 7 [1212], 606.

The author gives the following as essential points good refuse destructor:—

(1.) Forced draught, preferably provided by a blo engine, as being more economical than a steam jet.

(2.) A suitable arrangement of duplicate flues, so one set can be cleaned while the other set is working.

(3.) Charging appliances so that the refuse ca quickly transferred from the carts to the furnace wi unnecessary handling.

(4.) Baffling chambers or other devices to prevent entering the chimney stack.

(5.) Arrangements for quickly and cheaply remo the clinker.

If, in addition to the destruction of refuse, steam ra be contemplated, then the following further conditions be observed:—

(1.) A high pressure boiler in connection with furnace, of which there must be at least two, one stand-by.

(2.) The division of each furnace into two chamb cells, one of which must always be in full blast wh other is being "clinkered" or charged.

(3.) By-pass flues so that any surplus heat can be direct to the chimney.

(4.) Arrangements to prevent cold air having access to boiler during charging or "clinkering" operations.

(5.) Duplicate flues to enable the furnaces to be worked tinuously from week to week, one set of flues being led down for the necessary periodical cleaning operations.

At St. Helens, the plant consists of two Beaman and as' furnaces, each divided into two cells; each furnace ves to steam, to its full capacity, a Babcock boiler with 70 sq. ft. of heating surface. The forced draught is vided by an 18-h.p. motor-driven fan, the average ssure in the closed ash-pits being 3 in. on the water ge. At the power station there are five steam generators h a total output of 1,000 kw. In addition to the steam m the destructor boilers, steam is supplied from a battery four 30-ft. by 8-ft. Lancashire boilers. The steam ges are designed so that two steam sets, each of kw. capacity, can be run from the destructor independtly of the other boilers, or the destructor boilers and the ncashire boilers can supply the whole range in parallel; each machine circuit a watt-hour recording meter is fixed measure the output from the generator.

t has been found that the calorific value of the refuse is tinctly better in summer than in winter. The refuse ies somewhat from day to day, and therefore if no other lers were available, it would be necessary occasionally se coal under the destructor boilers, or to hold a reserve boiler ashes and clinker to use when the calorific value he refuse was poor.

The following table shows the results of the first year's king of a new plant, and gives an indication of the al value of a small destructor plant in a town where refuse has a good calorific value. Owing, however, to nsiderable amount of alteration and reconstruction, the est efficiency of working has not been attained:—

igures for One Year's Working (March 31st, 1900, to arch 31st, 1901) of a Two-Furnace Refuse Destructor.

——	Total for Year.	Average per Week.
ght of refuse burnt	9,778 tons	188 tons
tric energy used to drive fan and her motors.	70,000 units	1,346 units
ts generated by steam	365,000 units	7,019 units
es on burning	750*l.*	14*l.* 8*s.* 6*d.*
es on repairs	86*l.*	1*l.* 13*s.* 1*d.*
l wages	836*l.*	16*l.* 1*s.* 7*d*
ght of clinker produced	3,900 tons	75 tons
e of mortar sold	221*l.* 9*s.* 8*d.*	4*l.* 5*s.* 2*d.*
e of electric units generated at 3*d.* per unit.	450*l.*	8*l.* 13*s.* 1*d.*

Averages per Ton of Refuse Burnt.

Units generated	37·3
Units used on works	3·1
Cost of burning, including wages, light, and power	22·1*d.*
Cost of repairs (wages and stores)	3·0*d.*
Total cost of destruction	25·1*d.*
Cost of removing clinker not otherwise used	5·5*d.*
Total cost of destroying refuse and removing part of clinker	30·6*d.*

addition to supplying steam to the electric works, the ructor also supplies steam to drive two mortar mills a steam winch.

he author concludes that in certain cases where there suitable site for destructor and electric works, and where works are not very large, the combination can be use- made, when a traction or other good all-day load ts. For a very large works, or for a station which drives a lighting load, there are not many instances re there is any economical value in the combination. such cases it would probably be better to use the ructor furnaces to provide steam for driving mortar s or other machinery on which the calls are not so ting as on an electric power plant.—A. S.

Exhaled Air; Non-Poisonous Character of ——. H. C. Nussbaum. Gesundheits-Ing., Feb. 28, 1901, 56. Proc. Inst. Civil Eng. 1901, **145**, [3], 63.

It has been frequently suggested that a subtle poison, of the nature of an alkaloid, must be present in air expelled from the lungs, because of the ill-effects of such air on human beings in overcrowded and ill-ventilated apartments. The author refers to Formanek's research on the composition of air respired by healthy human beings. The only alkaline gas found present was ammonia, the presence of which is stated to be due to unsound teeth, and to certain abnormal conditions of the lungs and air passages. The results of the work show that for hygienic purposes in the ventilation of dwellings, it is necessary to have a supply of pure air, free from smell, and capable of being frequently changed. It is also requisite that inhabited spaces should be maintained at a regulated temperature, and that the watery vapour present in the atmosphere should not exceed 60 per cent. of that representing total saturation, at all events in spaces where the temperature may attain 30° C. and upwards.—A. S.

PATENTS.

Sewage; Apparatus for Spraying ——, upon a Filter Bed, and Apparatus connected therewith. S. H. Adams, Harrogate. Eng. Pat. 16,037, Sept. 10, 1900.

Two or more revolving sprinklers are arranged upon a tubular framework, which receives the effluent and is supported over a filter-bed.—L. A.

Water; Process for Softening ——. F. Breyer, Kogel, near Neulengbach, Austria. Eng. Pat. 6217, March 25, 1901.

Finely ground brick is heated with 50 parts of lime-water until about one-fifth of the liquid has evaporated. By subsequent cooling, microscopical crystals separate on each particle of the powder. One part of the powder thus prepared, "calculated as dry, is mixed with 1,000 parts of the water to be softened, preferably in a cylindrical vessel, and the liquid is stirred by blowing air into the vessel at the bottom. When this movement begins, caustic soda is added in such proportion that the scale-forming constituents in the water are separated, and crystallise upon the particles of the pulverulent barrier suspended in the water. During this part of the process sufficient caustic lime is added to ensure a strong alkaline reaction. Crystals of calcium carbonate now begin to attach themselves to the particles of the carrier, and favour the formation of crystalline concretion." "The excess of alkalinity is now diminished by saturation with carbon dioxide, and the liquid is filtered. The filtrate is returned to the filter so long as it is turbid, until a crystal-clear liquid runs through."—L. A.

Sewage and Effluents from Breweries and Technical Establishments; Process for Deodorizing and Clarifying ——. P. D. Hahn, Cape Town, Cape Colony, and Otto Lenz, Johannesburg, Transvaal. Eng. Pat. 7388, April 10, 1901.

Sufficient lime-water is first added to render the sewage alkaline, and the precipitate is allowed to settle. The clear effluent is drawn off, mixed with more lime water, and subjected to a stream of compressed air until it has become slightly acid; it is then passed through a filter bed.—L. A.

(C.)—DISINFECTANTS.

Formaldehyde, Determination of ——. F. Peska,

See under XXIII., *page* 1031.

PATENT.

Disinfectant and Antiseptic Preparations; Obtainment of ——. R. J. Yarnold, Streatham Hill, Surrey. Eng. Pat. 20,034, Nov. 7, 1900.

Antiseptic ointments or lotions are prepared by mixing with suitable unguent or liquid substances the viscid or syrupy product obtained by the action of ozone on terpineol. Antiseptic and disinfectant solutions are prepared by blowing ozonised air through terpineol mixed with water.—L. A.

XIX.—PAPER, PASTEBOARD, Etc.

Papers: Deodorising Certain Sized ——. A. Weichelt.
Papier-Zeit. 1901, **26**, [61], 2299.

The unpleasant odour of size may be removed from paper by sprinkling it with a dilute solution of formaldehyde (2 per cent.) containing sassafras oil (½ per cent.), and pressing for a few hours. The increase of moisture may be neglected. An alternative course is to moisten folds of thick paper with the solution and lay the paper between them for a time.—R. L. J.

Bone Glue; Frothing of ——. Papier-Zeit. 1901, **26**, [69], 2591—2595.

When trouble is caused by the frothing of bone-glue, gum arabic, varnishes, and the like, it is advisable to employ rubber rollers instead of the felt ones generally used, since these latter carry air into the viscous fluids and beat them into froth. An instance is cited in which cigarette pa had to be coloured brown by liquorice extract, and the of rubber rollers overcame all difficulties as regards froth The only direct remedy for frothing appears to be li petroleum spirit, but its employment on the large scal hardly practicable on account of the high price, and extreme danger involved. The best course is to obtain gl free from fat and acids, which do not froth even at h temperatures. Such glues are supplied to manufacturer emery papers, to whom freedom from froth is absolu essential.—J. F. B.

Casein for Technical Purposes [*Paper*]. G. Fasce Staz. sperim. agrar. ital. **34**, 439—446. Chem. C 1901, **2**, [11], 713.

After a short description of the technical application casein, particularly in paper manufacture, the author gi analyses of different caseins :—

——	Water.	Organic Matter.	Ash.	Nitrogen.	P_2O_5.	CaO.	SO
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per C
Casein (average of seven different samples) .	10·2	85·45	4·35	12·12	1·9	1·88	..
Soluble casein :—							
a. From Germany	19·32	70·43	10·22	16·33*	1·53	1·2	0·7
b. From Holland	13·12	81·26	5·62	11·4	1·22	0·32	0·32

* Organic + ammoniacal nitrogen.

The value of a sample of casein depends chiefly upon its content of albuminous substance (calculated from the amount of nitrogen).—A. S.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Hydrogen Peroxide; Determination of the Value of Commercial ——. P. Sisley.

See under XXIII., *page* 1028.

Cæsium Material; Purification of ——. H. L. Wells. Amer. Chem. J. **26**, [3], 265—268.

The author first tried precipitation of the cæsium from concentrated hydrochloric acid solutions by means of lead nitrate, but the precipitate $CsCl.2PbCl_2$ obtained, is very heavy compared with the amount of cæsium it contains, and its decomposition with ammonium carbonate produces four molecules of ammonium chloride for one of cæsium chloride. For these reasons the method was abandoned in favour of that of Godeffroy. Less concentrated hydrochloric acid than recommended by Godeffroy is used. About one-third or one-half of the total volume of concentrated hydrochloric acid answers very well, and has the advantage that it can be filtered through paper. To such a solution antimony trichloride, dissolved in hydrochloric acid, is added as long as a precipitate forms. The latter is collected and well washed with cold dilute hydrochloric acid.

To the filtrate and washings from the antimony salt, without concentrating them, lead nitrate solution is added at the rate of 2 or 3 grms. per litre. Chlorine gas is then passed in until the solution is saturated with it. After standing for a few hours, the liquid is decanted from the precipitate of the salt Cs_2PbCl_6 (usually coloured green from the presence of the dark blue salt Cs_2SbCl_6). The precipitation is so complete, as far as cæsium is concerned, that the liquid may be finally discarded. A litre of such a liquid will probably hold in solution only about 0·1 grm. of the salt Cs_2PbCl_6, but the rubidium salt is nearly one hundred times more soluble. The lead tetrachloride salt should be washed on a Buchner funnel with cold dilute hydrochloric acid. The antimony salt $3CsCl.2SbCl_3$ is decomposed by treating with boiling dilute ammonium hydroxide. The antimonious oxide thus produced is dense, and easy to filter and wash, and can easily be dissolved in hydrochloric acid and used again for precipitating cæsium. A little antimony goes into solution in the ammonia, but is removed after the liquid has become slightly acid by evaporation, by pas in hydrogen sulphide and filtering. Ammonium chlorid removed by adding to the concentrated solution of cæs and ammonium chlorides a liberal amount of concentr nitric acid, and heating until frothing has ceased. solution of cæsium nitrate in nitric acid is evaporated dryness, and the residue heated until the acid nitrat decomposed and the normal nitrate fused. Cæsium nit crystallises from a hot concentrated aqueous solutio large colourless prisms. Recrystallising this salt tend purify it from traces of rubidium, and the nitrate obtai from one or two recrystallisations is pure enough for ordinary purpose, unless the original antimony salt contaminated to an unusual extent.

The nitrate is readily converted into carbonate by mi it with 2 parts of pure oxalic acid, adding a little wa evaporating to dryness, and fusing the residue. Where highest degree of purity in a cæsium salt is desired, i converted into the salt $CsCl_2I$ by dissolving 1 part of nitrate with 1 atomic proportion of iodine in about 10 p of 1 : 1 hydrochloric acid at a temperature just below l ing. The solution takes place quickly, and, on cooling. yellow salt crystallises out. After one or two crystallisati washing each crop with dilute hydrochloric acid, a pure product is obtained. From this trihalide by ignit best at a gentle heat to avoid fusion, pure cæsium chlo may be prepared.—C. T. T.

Cæsium Bismuth Nitrate. G. S. Jamieson. Amer. Ch J. **26**, [3], 277.

Cæsium nitrate and bismuth nitrate were dissolved in di nitric acid, and the solutions evaporated until crystallisa took place on cooling. When 2·5 or more molecule cæsium nitrate to 1 molecule of bismuth nitrate present, the simple cæsium salt crystallised out; on other hand, when the ratio of cæsium to bismuth was than about 1·5 to 1, bismuth nitrate was obtained. Betw these limits a double salt was produced, particularly agitating the cold solution, in the form of colourless matic crystals, which are stable on exposure. The salt the formula $2CsNO_3 \cdot Bi(NO_3)_3$, and melts at 102°.
—C. T.

Ethers; Production of ——, *by Means of Inorganic S* G. Oddo. Gazz. Chim. Ital. 1901, **31**, 285.

Certain inorganic salts, by the aid of heat, dehyd alcohols and convert them into the corresponding eth The salts employed were anhydrous copper sulphate, fe chloride, stannous sulphate, zinc chloride, and oth ethyl, ethyl, propyl, butyl, isobutyl, and iso-amyl cohols were heated with the salt in a closed tube at 140°— 5 C. for 24—96 hours. Heptyl, octyl, cetyl, benzyl, and min alcohols were boiled with the salt under a reflux ndenser. The following results are recorded:—1. The rmation of ethers takes place the more readily, the higher e molecular weight. 2. The presence of side chains fluences the process. 3. The salts of the heavy metals, pecially those which form basic salts, and also salts of agnesium with strong acids, can convert the primary turated alcohols into ethers; the neutral salts of the kalis and alkaline earths, the oxides, hydrates, and carnates are quite without action. The mechanism of the action consists in the simultaneous formation of alcoholates the metal and compounds of the alcohol radical with the d radical; these then react, giving the ether and reerating the salt.—A. C. W.

ododendrol, Rhododendrin, and Andromedotoxin. K. Archangelski. Arch. exp. Pathol. u. Pharmak. **46**, 313—320. Chem. Centr. 1901, **2**, [9], 594.

AL found in 1883 that the leaves of *Rhododendron ysanthum* contain the glucoside ericolin, whilst Eijkman l also Plugge found there are also present *andromedoin*, a glucoside which the author calls *rhododendrin*, l the camphor-like decomposition product of the latter, *dodendrol*.

Rhododendrol, $C_{10}H_{12}O_2$.—The aqueous extract of the d leaves is precipitated with basic lead acetate, the ate freed from lead, concentrated, and extracted several es with ether, in which rhododendrol and ericolin dissolve. ethereal solution is washed with caustic potash and er, the ether distilled off, and the rhododendrol crystald out from water. It forms long colourless needles or ll plates, melting at 79·5°—80° C., and subliming hout decomposition. It is easily soluble in hot, slightly old water, and when heated with nitric acid gives a red ration, changing to yellow on addition of alkali.

Rhododendrin, $C_{16}H_{22}O_7$.—The aqueous extract, freed n rhododendrol by extraction with ether, is concentrated; lodendrin gradually crystallises out, and is purified by ystallisation from water. It has a bitter taste, melts 187°—187·5° C, and is easily soluble in hot, slightly in water.

ndromedotoxin.—The author isolated this body by centrating the aqueous extract, after removal of rhodolrol and ericolin by means of ether, and extracting with roform, in which andromedotoxin is readily, and lodendrin only very slightly soluble (see this Journal, 3, 866).—A. S.

o-tannin Compounds; Chemical Character of the so-lled ——. F. B. Power and F. Shedden. Brit. Pharm. onference, Dublin. Pharm. J. 1901, **67**, [1623], 147—50.

s generally assumed that, in the preparations made by action of iodine upon solutions containing tannin, the ne is in a state of chemical combination with the tannin. nouvin claims that he has obtained an iodo-tannin pound (Rép. de Pharm. 1892, 350) and an iodo-gallic (Rép. de Pharm. 1898, 337).

ne authors have investigated the nature of these so-called pounds. They find that, by the action of iodine upon ions of tannic and gallic acids, a small quantity of ic acid is formed, whilst the resulting liquid contains tically the whole of the iodine in the form of hydriodic The conclusion arrived at, as the result of numerous riments, is that true or definite compounds of iodine either tannic acid or gallic acid cannot be obtained by simple interaction of these bodies in the presence of r, since, under the circumstances, the iodine acts ly as an oxidising agent. The resulting products in the iodine in the form of hydriodic acid, associated more or less unaltered tannic or gallic acid, and the ation products of the latter. The crystalline product ned by Barnouvin, which he assumed to be an iodo-gallic appears to have been merely gallic acid, with a little ring hydriodic acid.—A. S.

Methyl Methylanthranilate; Preparation of ——. Schimmel and Co., Leipzig. Ger. Pat. 122,568, July 20, 1900. Zeits. angew. Chem. 1901, **14**, [34], 857.

CLAIM is made for a method of preparing methyl methylanthranilate, $C_6H_4(NHCH_3)(CO_2CH_3)$, by the action (1) of hydrochloric or sulphuric acid on a mixture of methylanthranilic acid and methyl alcohol, or (2) of a methyl haloid on a salt of methylanthranilic acid or on methyl anthranilate.—T. H. P.

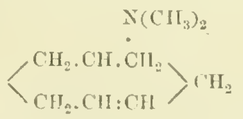
Morphine Salts; Impurity of ——. O. Rössler. Apoth. Zeit. 1901, **16**, 555. Chem.-Zeit. Rep. 1901, **25**, 247.

THE author has found that two samples of morphine hydrochloride, which satisfied the tests of the German Pharmacopœia IV., contained as impurities: the one, trimethylamine, or a compound of similar odour; the other, bacilli, consisting of small stout rods belonging to the group of *B. coli commune*.—A. C. W.

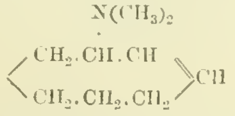
Tropine Group; Syntheses in the ——. R. Willstätter. Annalen, 1901, **317**, [3], 267—374.

THIS exhaustive communication is divided into two main parts:—

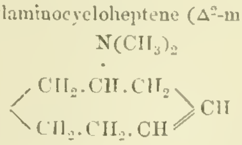
A. Synthesis of Monocyclic Tropine Bases.—Under this heading the author discusses the nomenclature of, and presence of a 7-carbon ring in the monocyclic tropine bases. He also describes, with details, the preparation of:—1. Bases with two double linkages: (*a*) dimethylaminocycloheptadiën (*a*-methyltropidine), $C_7H_9N(CH_3)_2$; (*b*) methylaminocycloheptadiën, $C_7H_9.NH(CH_3)$. 2. Bases with one double linkage: (*a*) Δ⁴-dimethylaminocycloheptene (Δ⁴-methyltropane),



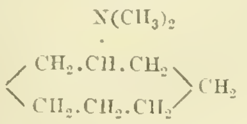
(*b*) Δ²-dimethylaminocycloheptene (Δ²-methyltropane),



(c) Δ³-dimethylaminocycloheptene (Δ²-methyltropane),



3. The saturated base dimethylaminocycloheptane,



B. Synthesis of Tropane and of Tropidine.—This portion of the paper deals with the conversion of halogen- and haloid acid addition products of the monocyclic tropine bases into bicyclictropane-methylammonium salts. It is arranged under the four headings:—(1) Synthesis of tropane; (2) Partial synthesis of tropidine by Merling's method; (3) Synthesis of tropidine; (4) Synthesis of isotropidine.—A. S.

Eschscholtzia Californica; Alkaloids of ——. R. Fischer. Archiv der Pharm. **239**, [6], 421—438.

THE alkaloids present in the flowering herb are, Protopine, β- and γ-homochelidonine, and probably small quantities of chelerythrine and sanguinarine. Morphine is not present. The protopine $C_{20}H_{19}NO_5$ is shown to be identical with that of *Sanguinaria* and *Glaucium*. The homochelidonine $C_{21}H_{25}NO_5$ is also identical with that from *Sanguinaria*; it occurs in the two isomeric forms β- and γ-homochelidonine, the greater portion occurring as the first-named modification. The chelerythrine of *eschscholtzia*, like that of *sanguinaria*, with which it is identical, separates from a mixture of alcohol and acetic ether, in colourless crystals melting at 203°—204° C., containing a molecule of alcohol, and corresponding to the formula $C_{20}H_{17}NO_4 + C_2H_5.OH$.

—J. O. B.

Glaucium Luteum; Alkaloids of ——. R. Fischer.

Archiv der Pharm. **239**, [6], 426—437.

No homochelidonine is present in the bases isolated from *Glaucium luteum*. The herb contains glaucine; the herb and root yield protopine, accompanied probably, in the latter, by traces of chelerythrine and sanguinarine.

Glaucine.—The glaucine of Probst was evidently very impure. The pure alkaloid, crystallised from ether, occurs in delicate, well-formed, tasteless, pale-yellow tablets and prisms, melting at 119°—120° C. Its salts give fairly permanent solutions, which do not rapidly develop a brown colour when the base is pure. It is a very weak base, and may be extracted from acid solutions by shaking out with chloroform—a fact which renders its separation from accompanying protopine easy. Its solutions are dextro-rotatory. It gives precipitates with the usual alkaloidal reagents, and gives analytical figures corresponding to the formula $C_{21}H_{25}NO_4$. The hydrochloride $C_{21}H_{25}NO_4HCl + 3H_2O$ recrystallised from hot alcohol by the addition of acetic ether, in which it is very sparingly soluble, occurs as silky, white, crystalline masses. The anhydrous salt melts at 232° C. The hydrobromide $C_{21}H_{25}NO_4HBr$, when pure, forms almost colourless crystals, which become coloured when heated to 200° C., and melt at about 235° C. With methyl iodide, glaucine yields glaucine-methyl iodide, $C_{21}H_{25}NO_4 + CH_3I$, in colourless crystals, which melt at 216° C., first becoming coloured at 210° C.; and from the behaviour of this compound it is evident that glaucine is a tertiary base. It is found to contain four methoxyl groups, being the tetramethyl ester of the compound $C_{17}H_{17}NO_4$, as shown by determinations by Zeissel's method, which gives results agreeing with the formula $C_{17}H_{13}(OCH_3)_4N$.

Protopine.—Pure glaucium-protopine is identical with the base isolated from other papaveraceous plants having the formula $C_{20}H_{19}NO_5$.—J. O. B.

Alkaloids and Saponins of the Cactaceæ. G. Heyl.

Archiv der Pharm. **239**, [6], 451—463.

Pilocereus Sargentianus.—From this cactus the author has isolated a new amorphous poisonous alkaloid, pilocereïne, $C_{30}H_{44}N_2O_4$, softening at 82°—83° C. and melting at 85°—86° C. It is obtained from the portion soluble in water, of the alcoholic extract of the dried plant, by extraction with ether from alkaline solutions in the usual manner, and subsequent purification. The alkaloid gives precipitates with all the usual alkaloidal reagents, with the exception of tannin. The free base is insoluble in water, but freely soluble in methyl alcohol, alcohol, ether, chloroform, benzene, and light petroleum spirit.

Cereus pecten aboriginum.—From this plant, a base, pectenine, was isolated, which has not yet been obtained in a crystalline condition, although its hydrochloride and its platinum double salt both occur in well-formed crystals. It differs from pilocereine in that its salts are soluble in ether, so that it cannot be shaken out from that solvent with acid solutions. It occurs as a yellowish syrupy liquid, with a peculiar narcotic odour, and markedly basic properties. Its colour reactions are very similar to those of the *Anhalonium* alkaloids, which, according to Heffter, it also resembles in physiological reaction, being markedly toxic.

Cereus gummosus.—No alkaloid was found in the alcoholic or aqueous extract of the dried plant, but a considerable amount of the saponin was isolated by Koberts' lead process. Neutral lead acetate afforded a compound from which the saponin, cereïnic acid, was liberated by treatment with H_2S, as a waxy, pale yellowish mass, which, when further purified by solution in absolute alcohol and precipitation with ether, formed a white flocculent quickly aggregating precipitate.

It gives all the colour reactions for saponin, and reduces Fehling's solution, both in the cold and on heating. Its glucosidal nature is further demonstrated by its hydrol on boiling with mineral acids. The filtrate from the neu lead acetate precipitate gave a further precipitate with b lead acetate, the lead compound containing a body sim to sapotoxin. The total saponin content of the drug shown by the baryta method of Christophson, was equ lent to about 24 per cent. of saponin on the dry drug.

—J. O. 1

Chelidonium Majus; Alkaloids of ——. M. Wintge

Archiv der Pharm. **239**, [6], 438—451.

The bases isolated from *Chelidonium majus* are, cheli nine, protopine, chelerythrine, β- and γ-homochelidonin

Chelidonine.—The formula for the base, which occur colourless, monoclinic prisms melting at 135°—136° C found to be $C_{20}H_{19}NO_5 + H_2O$, agreeing with the res obtained by A. Henschke, F. Selle, and A. J. Tyrer. Ch donine is noteworthy as being one of the few alkal which cannot be titrated by the alkalimetric method v Iodeosin, since it is precipitated by alkali before t indicator shows a final reaction. The bromine, benz. and acetyl derivatives are described, together with double gold and platinum salts of the last-named. W chelidonine is oxidised with H_2O_2 an atom of oxyge combined, the body obtained, $C_{20}H_{19}NO_6 + H_2O$, separat in the form of crystalline plates, which do not melt 250° C.

Protopine.—This base was found to be identical with protopine, $C_{20}H_{19}NO_5$, isolated from other papaverace plants.

Chelerythrine.—The base, similar to that obtained fr other plants of the same order, had the common form $C_{20}H_{17}NO_4$, and separated from a mixture of acetic et and alcohol in colourless crystals, melting at 203°—204° containing a molecule of alcohol in intimate combinati corresponding to the formula $C_{20}H_{17}NO_4 + C_2H_5OH$.

β-Homochelidonine.—As in the case of *Sanguinaria* *Eschscholtzia*, this base occurred in two physical isom β- and γ homochelidonine $C_{21}H_{23}NO_5$, the former melting 159°—160° C., the latter at 169° C., which give gold platinum salts of the same melting points.—J. O. B.

Sanguinaria Canadensis; Alkaloids of ——. R. Fisel

Archiv der Pharm. **239**, [6], 409—420.

The author agrees with previous investigators that chief bases of the rhizomes of *Sanguinaria canadensis* chelerythrine, sanguinarine, β-sanguinaria-homochelidoni γ-homochelidonine, and protopine.

Chelerythrine (see preceding abstract).—When seen mass, the pure alkaloid has a distinct pinkish tinge. It very sensitive to acids, yielding bright yellow salts; th of the mineral acids are but sparingly soluble in the prese of excess of acid. An attempt to obtain the base free fr alcohol by solution in benzene was partially successful, the base was with difficulty soluble in benzene free fr alcohol. It was found that, when liberated by means ammonia, the resulting base gave figures for nitrog greatly in excess of those obtained when a fixed alk was the precipitant.

The pure alkaloid free from alcohol was finally obtain by precipitating with soda, drying, re-solution in toluene, a recrystallisation. In this way, small colourless cryst which melted at 257° C., and lost 10·87 per weight at 100 giving off a strong odour of toluene, and therefore probal containing 1 mol. of toluene of crystallisation. The su stance dried at 100° C., gave figures agreeing with the form $(C_{21}H_{17}NO_4)_2H_2O$, but the manner in which the molec of water is combined is uncertain. In conclusion, it apparent that the composition and the melting point of base is markedly influenced by the menstruum from whi it is crystallised, and also by the alkali used to liberate it.

Sanguinarine.—The author agrees with Koenig that t base, separated from alcoholic menstrua, retains a porti of the alcohol in intimate combination, as shown by t formula $[(C_{20}H_{15}NO_4)_2 + C_2H_5OH]$. Tietz, on the oth hand, has given the constitution as being $C_{20}H_{15}NO_4 + H_2$ so that it is probable that the composition of the molec may vary with the medium from which it is crystallise Sanguinarine differs from chelerythrine in the colour lts, which are blood-red, in the shape of its crystals, are acicular when crystallised from acetic ether, and melting point, which is 211° C. (uncorr.); it is a less rful base than chelerythrine, and does not lose weight)° C.

guinaria homochelidonine.—As stated by Koenig, this occurs in two distinct forms, which are physically ric, and have the formula $C_{21}H_{23}NO_5$. When crystal- rom acetic ether, acicular crystals, fusing at 168° C., ggregating at 157° C., giving off the odour of acetic are formed These were found to correspond with ormula $(C_{21}H_{23}NO_5)_2C_2H_5C_2H_3O_2$. The dried base, tallised from absolute alcohol, gives a crop of crystals g at 169° C., the mother-liquor, a small crop with p. 159° C. The higher melting crystals, recrystal- rom hot alcohol, 96 per cent., gave short transparent t melting at 169° C., and having the formula $I_{23}NO_5)_2C_2H_5OH)]$. From the mother-liquor larger ls were deposited by slow evaporation, melting at . Another portion of homochelidonine, m.p. 158° C., well-formed crystals when recrystallised from acetic having the m.p. 169° C. These, redissolved and re- lised from dilute acetic ether, give a crop melting at . From these results it is therefore evident that d γ-homochelidonine are mutually convertible one he other by the solvents from which they are lised.

guinaria-protopine.—The identity of the protopine *guinaria* with that of *Escholtzia* is established, both the formula $C_{20}H_{19}NO_5$, and the m.p. 204°—205° C. r.).—J. O. B.

lkaloids; Micro-Chemical Detection of ——. E. Pozzi-Escot.

See under XXIII., *page* 1030.

e Bisulphate; Examination of ——. E. Carlinfanti.

See under XXIII., *page* 1031.

e Blossom Essence. E. Theulier. Bull. Soc. Chim. 1901, **25**, [15], 762—764.

sults of the 1901 harvest are given in a table showing igin, date of distillation, specific gravity, specific , percentage of esters and of methylanthranilate, e yield for the various daily batches of orange s from May 16 to June 2 at an essential oil at Grasse. The flowers are distilled with an equal of distilled water, the distillate being sold as orange water. A rainy day caused a fall in yield to 0·930 t. or 0·229 less than the average. The specific gravity between 0·869 and 0·872, the mean being 0·8709. ecific rotation (at 23° C., *t* = 100 mm.) varies from ′ to + 7° 20′, the average being 4° 48′. Hesse and el's method was employed for determining the nthranilate. This consists in precipitating the sulphate, which is only slightly soluble in ether, ng in water, and titrating. The average amount d was 0·7 per cent. The esters vary from 8·08 to er cent., with an average of 11·27 per cent., the limit being slightly lower than in previous years, e maximum has been 17—18 per cent. It is found e best yields of essence are obtained from flowers e Gulf of Jouan and from Vallauris. Moreover, soms in these localities are always earlier than in entres of production, such as Biot, le Bar, la Colle, es, &c. The essence from the flowers of sweet is quite different. Its characteristics are different at of neroli, and its odour is distinct from that of nce from Seville oranges.—T. A. L.

lwood Oil; East Indian ——. M. Potvliet. Brit. d Colonial Druggist, 1901, **40**, [8], 173—175.

Indian sandalwood oil is generally regarded as , if it fulfils the following requirements:—Sp. gr. C., 0·975—0·980; optical rotation in 100 mm. 17° to −20°; solubility in 70 per cent. alcohol at 1 in 5; santalol, at least 90 per cent. These tests, , cannot be considered adequate, as it is possible to a mixture of East and West Indian sandalwood oils and cedarwood oil, which will answer them. An addition of Macassar sandalwood oil also can only be detected with difficulty. As a result of numerous experiments, the author considers that East Indian sandalwood oil can only be regarded as unadulterated when it answers the following requirements:—Sp. gr at 15 C., 0·975—0·985; optical rotation in 100 mm. tube, −17 to −20°; solubility in 70 per cent. (by vol.) alcohol at 20 C., 1 in 1—4·5; santalol (by Parry's method, see this Journal, 1897, 568), at least 92·5 per cent.

Sandalwood oil from chips usually contains more santalol than that from billets and roots, but the latter has a finer aroma. Santalol contains from 35 to 50 per cent. of α-santalol, the proportion varying according as the santalol is prepared from billets or from chips. The author does not consider the formula, $C_{15}H_{25}OH$, to be correct for santalol. (See also this Journal, 1900, 272, 464, and 848; 1901, 64).—A. S.

Sandalwood Oil; Extraction of the Alcoholic Constituents of West India ——. Ger. Pat. 122,097, March 2, 1900, Heine and Co., Leipzig. From Zeits. angew. Chem. 1901, **14**, [32], 807—808.

Amyrol, as the sesquiterpene alcohol of West Indian sandalwood oil is called, may be readily separated in almost colourless and odourless condition by saponifying the oil and then fractionating *in vacuo* or by superheated steam. Amyrol is a thick viscous liquid, almost colourless, with a very slight aromatic odour and a somewhat bitter taste. It is soluble in 3—3·5 parts of spirit (70 per cent. by volume) at 20° C.; it boils at 299°—301° C. under 748 mm. and at 152°—153° C. under 10 mm. pressure. Amyrol is to be regarded as the medicinally active constituent of the oil; it should also be useful as a fixing agent in perfumery.—A. C. W.

Bergamot Oil; New Adulterant of ——, *and its Detection.* S. Gulli. Chem. and Druggist, 1901, **59**, [1127], 383.

The author draws attention to a new adulterant of bergamot oil, *viz.*, oil of turpentine which has been saturated with hydrochloric acid gas. Turpentine so treated can be added to bergamot oil in the proportion of 5—10 per cent., without materially altering the physical and chemical constants of the latter, whilst it does not lower the ester content more than, at the most, 1—2 per cent. The chloro-derivative formed by treating turpentine with hydrochloric acid gas is decomposed by alcoholic caustic potash, and consequently in the determination of the ester-content of an adulterated bergamot oil, would be reckoned as linalyl acetate, should proper precautions not be taken. The figures given in the following table refer to three samples of commercial bergamot oil, of which the first two were found to contain almost 5, and the third at least 10 per cent. of turpentine oil treated with hydrochloric acid.

Sample.	Specific Gravity at 15° C.	Optical Rotation at 20° C. in 200 mm. Tube.	Saponification.		Ester Content.
			Substance.	KOH consumed.	
		°			Per Cent.
1	0·882	+ 10·5	2·130	0·2213	36·05
2	0·8817	+ 8	2·315	0·2451	36·75
3	0·8810	+ 6	2·787	0·2910	36·40

Seeing that this new form of adulteration cannot be detected with certainty by means of chemical and physical constants, nor by saponification, the author recommends the following method:—Several grms. of the suspected oil are mixed with alcoholic caustic potash and evaporated to dryness in a platinum dish. The residue is ignited, treated with distilled water, filtered, and the solution tested for hydrochloric acid.—A. S.

Citroptene. E. Schmidt. Apoth.-Zeit. 1901, 619.

According to Crismer, the stearoptene of lemon oil melts at 143°—144° C., and corresponds to the formula, $C_{10}H_{10}O_4$. Van Soden obtained crystalline needles melting at 146°—

147° C., showing a blue fluorescence with alcohol and apparently identical with Crismer's compound and with the limettin, $C_{11}H_{10}O_4$, isolated by Tilden and Beck from lime oil (this Journal, 1892, 264). Burgess (this Journal, 1901, 745) claims to have discovered two new compounds, but the one melting at 145° C. appears to be identical with that isolated by Crismer and Van Soden. Theulier has stated that the distillation residue in the preparation of terpeneless oil of lemon contains the above-mentioned compound and also an amorphous body melting at 76° C. The author proposes the name *citroptene* for the chief high-melting compound: it melts at 147° C., contains two methoxy groups, and appears to have the character of a lactone or inner anhydride, corresponding to the formula $C_{11}H_{10}O_4$.
—A. S.

Ionone; Preparation of ——. German Pat. 122,466, addition to 73 089. April 25, 1893. Haarmau and Reimer, Holzminden. Zeits. angew. Chem., 1901, **14**, [34], 857.

The method of condensing citral with acetone to give pseudo-ionone, as described in the former patent, is altered as follows: the citral or the ethereal oil containing citral is shaken with a solution of alkali sulphite, an acid or an acid salt being meanwhile gradually added or carbon dioxide passed into the liquid. The faintly alkaline solution of the alkali salt of citralhydrosulphonic acid thus obtained is heated with acetone giving a salt of pseudoiononehydrosulphonic acid from which the pseudo-ionone is separated by heating with caustic alkali solution.—T. H. P.

Bark of Robinia Pseud-Acacia. F. B. Power. Brit. Pharm. Conference, Dublin. Pharm. J., 1901, **67**, [1625], 260; [1626], 275—279.

The principal constituents of the bark are:—

(1) The poisonous substance, *robin*, which possesses characters similar to those of a nucleo-proteid. Robin has an acid reaction, is soluble in water and in salt solution, and is precipitated from its solution by acids. It becomes coagulated by heating its aqueous solution, and also behaves like an albuminous body in regard to colour reactions, and precipitation by various reagents. Its toxic action is completely destroyed at the temperature of the water bath. Robin, when prepared by precipitating a cold concentrated aqueous infusion of the bark with strong alcohol, possesses the properties of an enzyme, or contains such a body associated with it. Like myrosin, it has the power of hydrolysing amygdalin and potassium myronate with the formation respectively of bitter almond oil (*i.e.*, benzaldehyde and hydrocyanic acid) and mustard oil, and like the rennet ferment, it is capable of coagulating the casein of milk.

(2) One or more substances of an alkaloidal nature which are easily decomposed with formation of ammonia and small quantities of an amine. These bodies are probably degradation products of the proteid, robin.

(3) The glucoside, *syringin*, $C_{17}H_{24}O_9$, or an oxidation product of the same, *gluco-syringic acid*, $C_{15}H_{20}O_{10}$.

(4) A small amount of tannin, an amorphous colouring matter, a sugar—probably *d*-glucose—and a considerable amount of fatty matter and resin.—A. S.

PATENTS.

Liquefied Gases; Filling Vessels with ——, and Apparatus therefor. A. Granaug, Bosnia. Eng. Pat. 18,703, Oct. 19, 1900.

The liquefied gas is pumped by a compressor into the vessel, through a tube extending to the bottom thereof, the gas which evaporates from the liquid in the vessel being conducted back to the intake of the compressor. The vessel is provided with a valve casing having two-valve controlled bores, which are connected respectively with the charging tube and with the intake of the compressor.
—R. A.

Air; Apparatus for the Manufacture of Liquid ——. E. Claude, Paris. Eng. Pat. 12,905, July 17, 1900.

The apparatus for the manufacture of liquid air, on the principle of the expansion of the air with the production of external and internal work, is constructed wholly or partially of nickel-steel, "of such composition that its coefficien f expansion is practically *nil* between the limits of temp ture obtained"; another advantage in the use of s nickel-steel is stated to be that it is a "very poor condu of heat." The invention, as to its essential features, rel to the lubrication of the machinery used. This, betw the time of starting the machine and the commencemen liquefaction, may be effected, either by talc or graphite by suitable liquids, and especially by a mixture of "val line" and light petroleum spirit, the proportion of latter being increased as the temperature falls. Or, this stage, according to the second claim, lubricatio dispensed with, by the "combined use of a high in pressure of 25 atmospheres at least, and a large admis [of air] greater than ⅛ but not much exceeding ⅓ of stroke." Another method consists in preliminary coo of the machine by the introduction of a portion of lique air so adjusted as, after evaporation, to leave suffic liquid to act itself as the lubricant. During the nor working of the machine the lubrication is effected by me of the liquid air produced during the process.—E. S.

Air; Apparatus for Liquefying and Separating Oxy from ——. E. C. Thrupp, Walton-on-Thames, Sur Eng. Pat. 18,913, Oct. 23, 1900.

The turbines used in the apparatus for effecting expans are of the construction described in Eng. Pat. 26,767, 1 (this Journal, 1900, 29). The apparatus generally described in the last claim, consists "in the combina with means for highly compressing air and cooling it i temperature interchanger and expanding it through a va orifice, engine, or turbine, of an auxiliary turbine actu by compressed air, to provide an augmented quantit cold exhaust gaseous air for cooling the compressed supply to the said valve, orifice, engine, or turbine, means for forcing a portion of the produced liquid air b into a pipe or receiver, at the cold end of the said in changer to mix with and further cool the compressed supply to the said valve, orifice, engine, or turbine, means for driving a blast of cold gaseous air through liquid air, to evaporate the nitrogen from the liquid condense oxygen from the blast, and means for for liquid oxygen at high pressure into an evaporating situated in the interchanger, to assist in cooling the fr air supplies; and a turbine in which the evaporated oxy is subsequently expanded to lower its temperature ag and further assist in cooling the fresh air supplies by pas through another coil situated in the said interchang The oxygen, after having thus afforded two cooling effe is conducted to a gasometer.—E. S.

Oxygen-Gas; Manufacture or Production of ——. F W. Timm, Hamburg, Germany. Eng. Pat. 10,0 May 22, 1901.

The process relates to obtaining oxygen from the air the use of oxides of metals or of "plumbic acid sal "arranged in several chambers provided with connecti capable of being shut off, with gaseous substances un the desired pressure until the reaction approaches the end of the one chamber, whereupon in the next phase the process a second chamber is put in action, in which corresponding reaction is continued, while the next follow reaction is effected in a chamber at the same time dise nected and situated in the rear of the direction of adva of the process." The apparatus comprises "a series retorts, chambers, or the like, adapted to contain the mas for absorbing and liberating oxygen gas, each cham being connected with the others, and provided with adm sion and discharge conduits for the gaseous substances."
—F. S

Ferric Saccharate; Production of ——. F. Stahlschm, Hagen, Westphalia. Eng. Pat. 17,953, Oct. 9, 1900.

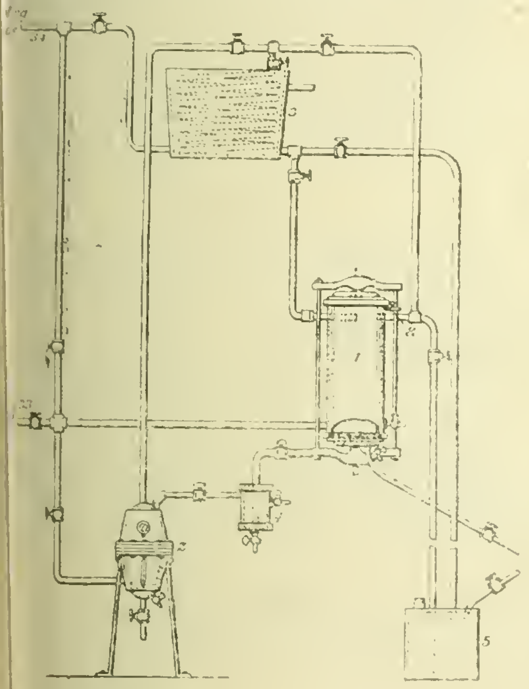
The patentee claims a process for producing ferric sacch rate, which consists in decomposing a hot solution of fe chloride containing cane sugar, by means of hot soda l under definite limits of concentration. The solubility of saccharate is stated to be undiminished when the solut is neutralised by mineral acid, or saturated with comm salt.—A. C. W.

aracymene-3-sulphonic Acid ; Manufacture of its Salts and of Thymol. M. Dinesmao, Paris, France. Eng. Pat. 13,745, July 5, 1901.

ue following processes are claimed :—2-bromo-*p*-cymene-sulphonic acid is digested at 170° C. with zinc dust and amonia, when *p*-cymene-3-sulphonic acid is produced. ie sulphonic acid is fused with caustic potash or soda at 0 C., producing a thymolate, from which sulphuric acid parates thymol.—A. C. W.

kaloids and Oils from Vegetable Substances ; Improved Process and Apparatus for Extracting ——. H. Froehling, Richmond, Virginia, U.S.A. Eng. Pat. 14,507, July 16, 1901.

E 11 claims constitute a description of the apparatus resented in the figure and the methods of using it for racting alkaloids and oils from finely divided vegetable stances which have been treated with alkalis. The top



bottom of the extractor 1 are held in position by clamps. trap 4 retains water and alkaline solutions, which are by prevented from entering the still 2. The condenser y be used as a reflux condenser, or, when the operation ished, may return the solvent to the tank 5. The ts of the extractor 1 and still 2 may be supplied with ng or cooling fluids from the pipes 33 and 34.

—A. C. W.

XXI.—PHOTOGRAPHY.

ography ; Practical Tricolor ——. H. Farmer and Symmons. Brit. J. Phot. **48**, 1901, [2152—2153] ; ppl. 62—64, 502—504.

methods described have special reference to the applia of photography to three-colour printing by means of graphic screen blocks. The colour filters used are ounded from the following stock solutions :—

Potassium chromate, 1,200 grains ; water to 10 oz.
Potassium bichromate, 300 grains ; water to 10 oz.
Eosine (blue shade), 120 grains ; water to 10 oz.
Methylene Blue, 5 grains ; water to 10 oz.

ese solutions are filtered, allowed to stand, and ted. The colour-filter solutions are used in $\frac{1}{4}$-inch n, and are made up as follows :—For the yellow ng negative, 180 minims of solution (3) are added to 20 oz. of water ; this filter is considered satisfactory for some subjects, but if it be desired to cut off the ultra-violet, 100 minims of solution (1) are added. For the crimson-printing negative, 300 minims of solution (1) and 110 minims of solution (4) are added to 20 oz. of water ; 250 minims of 0·880 ammonia and 250 minims of solution (3) are added to 20 oz. of solution (2), to form the filter for the blue-printing negatives.

A Mawson lantern plate is used for the yellow-printing negative, and Lumière plates, Series A and B, serve respectively for the crimson- and the blue-printing negatives.

For most subjects, with a screen of 133 lines to the inch, and a working aperture of F 45 (the stop being square and its side, the basis for the calculation of the F ratio, is set diagonally to the lines), the ruled surface may be $\frac{1}{8}$ in. from the sensitive film of the plate. Before using, the plates are dried on an electric heater for two minutes, dry heating them up to 220° F. The inclinations of the screen lines for the negatives are in the order given, 15° and 75°, 75° and 15°, and 45°.

Reduction with the iodine and cyanide reducer is carried on until the smallest shadow dots begin to disappear ; the opacity of the dots is then increased by a lead intensifier ; the negatives are placed in a bath of nitric acid, 1 oz. ; water, 60 oz., for one minute, and then immersed in a bath made up of equal parts of lead nitrate, 480 grains ; water, 20 oz. ; and potassium ferricyanide, 480 grains, water, 20 oz., until the films become yellow throughout. They are then washed, again immersed in the nitric acid bath, and blackened in a bath consisting of ammonium hydrosulphide, 1 oz. ; water, 3 oz. ; after washing, they are again treated with the dilute nitric acid solution, and finally washed and dried. Details of the block making are also given.—J. W. H.

Density ; Loss of ——, *during Fixing.* Lüppo-Cramer. Phot. Corr. 1901, **38**, 420. Chem.-Zeit. Rep. 1901, **25**, 228.

From experiments carried out with a large number of different rapid commercial plates, and with bromide plates specially prepared for dia-positives, the author finds that there is no difference in the amount of density which is lost during the fixation of the film in plates of varying qualities. The loss is not affected by alterations in the developer, nor in the speed of development. Luther has suggested that some sub-haloid as well as metal is formed during development, the former of which is converted in the fixing bath into the paler coloured metallic silver. There may be some compound of this character in the developed image, but as the kind of development does not influence the amount of such compound produced, its presence and ultimate destruction cannot altogether account for the loss of density when the plate is fixed in the ordinary way.—F. H. L.

Development ; Theory of ——. Lüppo-Cramer. Phot. Corr. 1901, **38**, 415. Chem.-Zeit. Rep. 1901, **25**, 228.

It has been shown by several investigators, including Precht and Strecker (this Journal, 1900, 1038) and the present author, that the old " Abney experiment " will not succeed except in the presence of soluble silver salts. In that experiment, an exposed plate was coated with a film of bromide emulsion (unexposed), and on development some image was found in both layers of gelatin. Thus the " silver germ " theory must be rejected. Eder (this Journal, 1900, 70) has also proved that contact action forms but an insignificant factor in the production of the negative picture, and so the only explanation of development left is an alteration in structure of the sensitive compound ; but at present it is impossible to say in what relationship the physical and the chemical modification of the bromide during exposure stand to one another as affecting the composition of the latent image. Fawcett's process (this Journal, 1900, 1143) indicates that the effect of light is not restricted to the immediate surface of the film.—F. H. L.

Developers ; Misunderstood ——. Lüppo-Cramer. Phot. Corr. 1901, **38**, 421. Chem.-Zeit. Rep. 1901, **25**, 252.

Gallic acid is not generally supposed to be a developer ; it has, however, this property. The alkaline solution should contain no sulphite, which enormously retards the action. An experiment with Farmer's toning solution showed that a negative developed in this manner consisted principally of metallic silver; in the case of collodion plates the negative appears to consist entirely of silver. The developing action appears to be due to the gallic acid itself and not to products of oxidation. Tannic acid is also capable of developing, but only to a small extent; sulphites do not hinder the action. Alkaline formaldehyde solution can also act as a developer.—A. C. W.

Intensification ; The Chemical Processes in Mercurial ——. F. Novak. Brit. Jour. Phot. **48**, 1901, [2156], 550. Eder's Jahrbuch.

M. F. Lefeur has carried out a series of experiments which confirm the conclusions of Chapman-Jones with regard to the constitution of the compounds formed during mercurial intensification. When ammonia is allowed to act on a mixture of mercurous chloride and a very little silver chloride, a large proportion of the latter remains in the black residue undissolved; the ratio of silver chloride left behind to the total weight of chloride used was ·213 : 1, a figure very near that calculated from Chapman-Jones' formula, $NHAgHg_2Cl$.—J. W. H.

Silver Bromide : A Hitherto Unknown Action of Developers upon ——. Lüppo-Cramer. Phot. Corr. 1901, **38**, 421. Chem.-Zeit. Rep. 1901, **25**, 252.

The sensitiveness of the unexposed silver bromide plate is considerably diminished by the action of developing solutions. This is especially true of metol and iron oxalate; hydroquinone is an exception. The diminution in sensitiveness is to be ascribed to the products of the oxidation of the developer. If the plate, before the developer is added, be kept in the shadow, or at some distance from the lamp, it may then be developed with confidence by the light of a candle filtered through yellow packing paper.—A. C. W.

Photographic Plates ; A Method of Making Ultra-Violet Sensitive ——. V. Schumann. Brit. Jour. Phot. **48**, 1901, [2152—2153], 484—486, 502—503.

By increasing the transparency of the gelatin of a dry plate, its range of sensitiveness in the ultra-violet may be extended. The author describes his method of producing such plates; a silver bromide gelatin emulsion is prepared, washed, dissolved in much water, poured on flat glass plates, and allowed to stand until a portion of the silver bromide is deposited, when the solution is poured off again, and the plate allowed to dry. To get the very best results, the coarser and heavier portions of silver bromide are removed from the emulsion by a similar process, before making the plate.—J. W. H.

Colour Filters for Photography. Brit. Jour. Phot. **48**, 1901, [2156], 552.

The following colour filter in a thickness of 1 cm. is recommended by Eder when using an Erythrosine sensitised plate :—Solution of Janus Green (1 : 1,000), 8 c.c.; Solution of Auramine (1 : 2,000), 14—16 c.c.; Water, 100 c.c. For the red filter he uses Tolane Red (1 : 4,000), or Naphthol Orange (1 : 500).—J. W. H.

Sensitiser : New Panchromatic ——. E. Valenta. Brit. Jour. Phot. **48**, 1901, [2156], 542.

A strong solution of Titan Scarlet S in water or alcohol, absorbs the whole of the spectrum from C ½ D to the ultra-violet, and is therefore a useful colour-filter dyestuff. Plates after being bathed in a solution of 1 : 40,000, with 2 per cent. ammonia solution, and with a good exposure, give an absolutely closed band from B to H; if to every 100 c.c. of solution 1 or 2 drops of a 1 : 40 solution of silver nitrate be added the action is much stronger; the dye is that best of those known to the author for making panchromatic plates.—J. W. H.

Silver Chloride : Reduction of ——, *with Calcium Ca*
Brit. Jour. Phot. **48**, 1901, [2156], 546.

A button of metallic silver is obtained on igniti
mixture of silver chloride with a quarter of its weig
calcium carbide. Other metallic compounds may be re
in a similar way, but in some cases the metal can on
obtained in a finely divided state.

On account of the possibility of explosion, a prelim
experiment with a small quantity is suggested.—J. W.

Ammonium Persulphate. Brit. Jour. Phot. **48**, 19
[2156], 552.

For plates, Namias recommends the following red
bath, in which alum is used to restrain the solvent acti
the persulphate :—Ammonium persulphate, 30 grms.;
50 grms.; water, 1,000 c.c.; for reducing prints a 0·5 pe
solution of persulphate with 1 or 2 per cent. ammonia,
be used before toning and fixing. He also affirms th
action of ammonium persulphate on silver nitrate doe
result in metallic silver but in silver "hyposulphate."
exposure in carbon printing may be easily correct
means of ammonium persulphate, which converts
chromic oxide into chromic acid—$Cr_2O_3 + 3(NH_4)_2S_2$
$3H_2O = 3(NH_4)_2SO_4 + 3H_2SO_4 + 2CrO_3$.

As an etching solution for zinc, copper, and alumin
solution of ammonium persulphate is very useful
copper, the solution should be made alkaline with amn
—J. W.

PATENTS.

Photographic Fabrics, and Process for Preparing
proved Photographic Fabrics. S. E. Page, Lo
From The Grenier Art Company, New York. Eng
10,524, May 21, 1901.

120 grms. of dried Irish moss (*chondrus crispus*
gradually heated in 32 litres of water until the mixture
Allow to stand for 5 minutes and then draw off 16 lit
the extract through a fine sieve into a vessel cont
160 grms. of citric acid. To this mixture 240 grm
ammonium chloride are added.

Silk is immersed flat in this solution for about 5 mi
and then dried. It can now be sensitised by immersio
suitable bath. When dry, it is ready to be printed
any negative. If tapestries are used, they need be pre
and sensitised on one side only.—C. M.

XXII.—EXPLOSIVES, MATCHES, Etc

Explosives ; Twenty-fifth Annual Report of H.
Inspector of ——, *for the year* 1900.

From this report it is seen that the only modification
law made during the past year has been an Order in C
stating that acetylene in admixture with oxygen or
deemed to be an explosive and is "prohibited from
manufactured, imported, kept, conveyed, or sold."

The growth of trade in explosives has continued
increased rate. Now there are employed 11,098 pers
factories under the Act against 7,484 in 1885, an
increase is almost entirely due to the more ext
engagement of persons employed in factories for prod
dynamite, guncotton, and small arm nitro-compounds.

There have been nine deaths from accidents d
manufacture, which is above the average for the d
viz. (4·5)

Two accidents with picric acid which occurred duri
year have convinced the Inspectors that not only is
acid far more liable to become ignited than had
supposed, but that when large quantities have b
ignited, an explosion is likely to follow. Alterations
consequently been made in regard to the regulation
picric acid factories, and in future this material w
subjected to practically the same restrictions as
explosives.

Two explosions caused by lightning occurred at fa
in Germany. The buildings concerned, were protect
the most modern arrangement of lightning conductor
the inspectors say "these two accidents have done m

confirm a feeling of distrust which has for some time been growing in our minds as to the absoluteness of the protection afforded by conductors erected in accordance with specifications laid down by the Lightning Rod Conference of 1882; they go far to confirm, on a large scale, the interesting and instructive laboratory experiments of Dr. Oliver Lodge. It would appear as if, for absolute protection, a complete metallic surface, inclusive of the under surface of the floor, were the only means available in the case of danger buildings, and that, where buildings are liable to evolve inflammable or explosive dust, even this means will not afford complete protection."

In regard to the use of explosives in coal mines, an order was issued on Sept. 24, which revoked the previous orders of April 7 and July 24, 1899.

It is seen that an explosive, even although it has passed the test at Woolwich, and is on the "Permitted List," is nly allowed to be used when certain conditions are observed. It has been conclusively shown, for instance, by xperiment that an alteration in the wrapper, or in the hysical form of an explosive, may materially alter its ehaviour in an inflammable atmosphere.

Captain Desborough, in his report of the working of the esting station at Woolwich, states that the Trauzl lead block est has been disregarded, and the relative strength of the arious explosives is now much more accurately measured y means of a ballistic test. The apparatus consists of a -ton mortar of 13 ins. calibre suspended in an iron framevork from an overhead beam. The strength of an explosive s tested by charging one of the guns with it and firing it rom a fixed distance from the muzzle of the mortar, and neasuring the swing of the mortar.

At the request of the Board of Trade model codes of arbour byelaws for the assistance of harbour authorities ave been prepared for petroleum and calcium carbide. committee of experts has been requested to advise the lepartment as to the conditions to which apparatus for enerating acetylene should conform in order to be free rom danger.

Dr. Dupré's report is given, as usual, *in extenso*. A rger number than usual of samples have been examined, nd a larger number classed as "rejected."

It is pointed out that in the case of gelignite and carbonite he samples were rejected, not because they were considered angerous, but on account of their not conforming to the mits of composition as laid down for "permitted explosives," the chief difficulty apparently being to keep the ood meal within the specified limits.

A sample of antimony sulphide contained an appreciable mount of free sulphuric acid, and it is pointed out that hen antimony sulphide is to be used in connection with otassium chlorate, notice should be taken of this possible ource of danger.

The chief feature in regard to the new explosives xamined is the number of chlorate mixtures which have assed the somewhat stringent tests and requirements.

In connection with an accident, it was observed "that oist picric acid forms with iron at first a ferrous picrate, hich though by no means violently explosive shows a emarkable tendency to take fire when struck, the fire preading readily to adjoining portions of the ferrous icrate. Fortunately, ferrous picrate soon passes to ferric icrate, particularly in moist air, and this does not show ny tendency of that kind, and is also a feeble explosive nly."—W. M.

Acetylene; Explosive Properties of Compressed and Liquefied ——. Engineer, Sept. 20. 1901, 308.

URING the year 1896, a set of seven cylinders were filled ith liquid acetylene which had been purified by the Pictet ocess (this Journal, 1897, 37). The bottles had capacies of about 12 litres, and weighed 20—22 kilos. each; the alls were 5 or 6 mm. thick. All the cylinders were first acuated, and then rinsed with acetylene, so that presence air was excluded. In 1900 it was noticed that the bottles ere rusty, and it was feared that the valves, which were of eel, might also be rusted up, and might produce a spark if tempts were made to loosen them. The cylinders were erefore destroyed. The first, containing about 4 kilos. of liquid acetylene, was laid in a sloping position with the valve at the top; at the upper part, where the still gaseous acetylene collected and where it was retained under a pressure of 50 atmospheres, a 1 kilo. cartridge of picric acid was laid and exploded electrically from a distance. The top of the bottle was blown away, the lower part was bent and torn into holes. No explosion of the acetylene occurred; the cylinder emptied itself by the escape of gaseous acetylene. With the next bottle, containing 3½ kilos. of liquid, a 200 grm. cartridge was laid at the bottom, where the liquid acetylene was. On passing the current, the liquid acetylene exploded, producing a black cloud of smoke 12 m. high; the cylinder was entirely destroyed. The third cylinder, containing about 400 grms. of liquid acetylene, was placed 25 cm. from a bottle containing 200 grms. of picric acid, and the latter exploded. The picric acid bottle was smashed; the acetylene cylinder was driven sideways for a distance of 2 m., but was not injured. Another cylinder, containing 500 grms. of liquid acetylene, was placed vertically and fired at from a distance of 85 m. with an infantry rifle. A clean hole was made in the front above the level of the liquid; the back of the bottle was only slightly bulged. There was no explosion of acetylene; the cylinder emptied itself with a whistling noise, and a column of bluish vapour extended upwards for 2½ m. The results appear to show that there is considerable difference in stability between highly compressed acetylene gas and actually liquefied acetylene. The gas was not exploded by the impact of the bullet, nor by the detonation of the picric acid; the liquid exploded every time. It also appears that a cylinder of liquid acetylene "will not explode by sympathy"; the detonator must be in close contact with it.—A. S.

Nitrocellulose; Researches on ——. G. Lunge. J. Amer. Chem. Soc. 1901, **23**, [8], 527—579.

1. *General Remarks on the Methods of Nitration.*—The material employed by the author was "chemically pure surgical wool," freed from the last traces of fat by boiling with sodium carbonate solution, and extraction with alcohol and ether. The wool was dried at 100° C., then cooled in an exsiccator, and immediately nitrated.

The nitration acid was made from "chemically pure" sulphuric acid of sp. gr. 1·84 (95·62 per cent. H_2SO_4) mixed with an equal weight of fuming nitric acid of sp. gr. 1·52 (93·76 per cent. HNO_3), from 1 to 2 per cent. of lower nitrogen oxides being removed from the nitric acid in the usual way.

The nitrations were carried out in the apparatus shown in Fig. 1, in which A represents a cylindrical jar closed with a ground-in glass cover, B, through which passed a dropping funnel, C, and the thermometer, E, which was fixed tightly by means of asbestos and sodium silicate solution. The cellulose was placed in the cylinder, the nitrating mixture introduced into the funnel, and the tube D connected with a Bunsen pump, by means of which nearly all the air was withdrawn. For nitrating cotton at temperatures higher than the ordinary temperature, the acid was heated to a slightly higher point and cooled in the funnel, whilst the temperature within the cylinder was regulated by keeping it in a water-bath.

The acid was separated from the nitrocellulose by decantation and then with the aid of a porcelain funnel, porcelain sieve, and vacuum pump, the mass being repeatedly washed, first with cold and subsequently with hot water. As a rule, from 2 to 3 days were required for the washing.

When washed, the nitrocellulose was dried, either in a vacuum exsiccator protected from the light, or in the special apparatus shown in Fig. 2. The nitrated product was placed in a cylindrical glass vessel, A, contracted at the bottom into the tube *a*, and provided with a porcelain sieve, *b*. The top was closed by the ground-in cover, *c*, which had a side tube, *d*, and a hole for the thermometer. Two of these vessels were used simultaneously, the inlet tubes, *a*, being connected with a T-piece through which passed dried air, and both were placed in an asbestos box, B, provided with glass observation windows, *g g*. This box was placed on an asbestos plate, beneath which was a small flame, regulated so that the temperature of the air in the apparatus was from 30° to 32° C. By means of this oven the nitrocellulose could be brought to constant weight in from 12 to 15 hours. It was found that a minute loss of nitrous vapours occurred, and therefore, in the more important cases, the slower method of drying in the exsiccator was preferred.

Fig. 1.

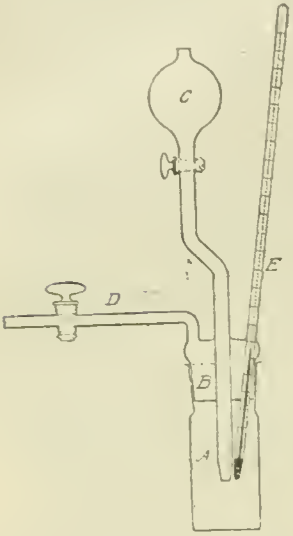
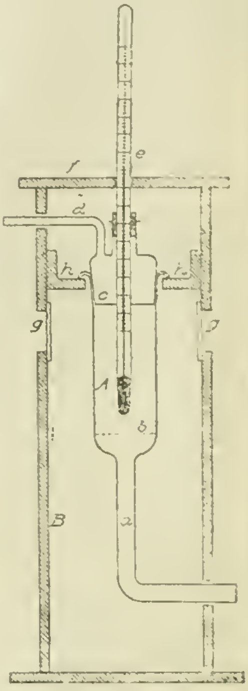


Fig. 2.



II. *Analytical Methods: Determination of Nitrogen.*—This was invariably made in the author's nitrometer, the difference in various determinations rarely exceeding 0·1 to 0·2 c.c. of NO, or about 0·01 per cent. of nitrogen.

The following table gives the percentage of nitrogen in various nitration products of cellulose, calculated on the basis of the atomic weights accepted by the German Chemical Society:—

Degrees of Nitration.	Formula.	Nitrogen.	NO per 1 Grm.
		Per Cent.	C.c.
Dodecanitrocellulose (= old trinitrocellulose).	$C_{24}H_{28}O_{20}(NO_2)_{12}$	14·16	225·53
Endecanitrocellulose.	$C_{24}H_{29}O_{20}(NO_2)_{11}$	13·50	215·32
Decanitrocellulose ...	$C_{24}H_{30}O_{20}(NO_2)_{10}$	12·78	203·87
Enneanitrocellulose..	$C_{24}H_{31}O_{20}(NO_2)_9$	11·98	191 08
Octonitrocellulose (= old dinitrocellulose).	$C_{24}H_{32}O_{20}(NO_2)_8$	11·13	177·52
Heptanitrocellulose..	$C_{24}H_{33}O_{20}(NO_2)_7$	10·19	162·53
Hexanitrocellulose...	$C_{24}H_{34}O_{20}(NO_2)_6$	9·17	146·26
Pentanitrocellulose ..	$C_{24}H_{35}O_{20}(NO_2)_5$	8·04	128·24
Tetranitrocellulose (= old mononitrocellulose).	$C_{24}H_{36}O_{20}(NO_2)_4$	6·77	108 01

Examination of the Nitrated Celluloses with Polarised Light.—Comparative observations and analyses have led the author to the following conclusions:—The most highly nitrated products appear blue in polarised light, but those containing between 13·9 and 13·0 per cent. of nitrogen cannot be distinguished from each other by polarisation. As the percentage of nitrogen rises, the blue colour becomes less intense, and here and there grey fibres can be observed, though not in proportion to the increase in the nitrogen. Below 12·4 per cent. of nitrogen, the fibres show a grey lustre, which usually appears yellow when the top light is cut off. Below 10 per cent. of nitrogen, the structure is
invariably partially destroyed and no certain observati
possible. It is only possible to distinguish with certain
firstly, any unchanged cellulose by its flashing up in va
gated (rainbow) colours; and secondly, highly nitra
products (from 12·75 per cent. of nitrogen upwards),
their flashing up less strongly in blue colours. The pur
transition stage in the fibres containing over 11·28
cent. of nitrogen (Chardonnet) was not observed.

Behaviour of Nitrocellulose towards Iodine.—Wh
treated with a solution of iodine in potassium iodide,
subsequently moistened with dilute sulphuric acid, g
cotton becomes yellow, whilst cotton becomes blue (Kind
The author has found that the brown or yellow colou
not due to the action of the iodine on the nitrated fib
since it is entirely removed by washing. When iod
solution alone is used, the most highly nitrated produ
(guncotton proper), lose their colour when washed w
water. The less highly nitrated products retain a bro
colour, the intensity of which increases with the decre
in nitration; but no sharp distinction can be based on t
In the author's opinion the phenomenon is probably due
the formation of oxycellulose.

*Determination of Unchanged Cellulose in Nit
celluloses.*—The author obtained unsatisfactory results w
the methods hitherto in use, but found the following n
method satisfactory in the case of the more highly nitra
products:—The reagent is an alcoholic solution of sodi
ethylate, prepared by dissolving 2—3 grms. of sodium
100 c.c. of 95 per cent. alcohol, and mixing the filte
solution with 100 c.c. of acetone. It has no effect u
cellulose, but decomposes nitrocellulose with the formati
of a reddish-brown compound, which is soluble in wat
In the determination, 5 grms. of guncotton are heated
40° or 50° C. on the water-bath with 150 c.c. of the reage
the liquid being shaken at intervals for 20 to 30 minute
or the mixture may be allowed to stand for a few hours
the ordinary temperature. The brown-red solution is
canted from the undissolved residue, and the latter was
with alcohol and with water, by decantation, and then
the filter with hot water, to which a little hydrochloric a
is added for the final washings. For ordinary work
cellulose is dried immediately and weighed, but in ex
determinations it is washed with alcohol, again treated w
50 c.c. of the reagent, and separated and washed as befo
The cellulose thus obtained, gives no trace of gas in
nitrometer, and duplicate determinations agree within 0
to 0·2 per cent. when the weight of unchanged cellul
amounts to about 0·2 grm. Guncotton which is complet
soluble in acetone contains only traces of cellulose, a
when as much as 0·85 per cent. is present it does
dissolve entirely. This method is not applicable to
determination of cellulose in lower nitrated products, a
the author attributes this to the fact that these bei
prepared with less concentrated acid, invariably cont
oxycellulose.

III. *Methods for Obtaining the Various Nitrocellulos*
—The lower nitrated celluloses, up to the deca compou
can be prepared with nitric acid alone, but as in act
practice mixtures of nitric and sulphuric acids are invaria
employed, the author has made his experiments exclusiv
with the mixed acids.

A. *The Highest Stage of Nitration obtainable fr
Cellulose.*—On treating 2·5 grms. of cellulose with 30 gr
of nitric acid (sp. gr. 1·52) and 90 grms. of sulphuric a
(sp. gr. 1·84), the author at first only obtained produ
containing a maximum of 13·456 per cent. of nitrogen.
subsequently, in conjunction with Bebie, he prepared
nitrated cellulose containing 13·92 per cent. of nitrog
which closely approximates to the theoretical percentag
pure dodecanitrocellulose. The acid mixture in this nit
tion consisted of sulphuric acid, 63·35; nitric acid, 25·3
and water, 11·34 per cent. This substance, which co
tained as much nitrogen as the product obtained on nitrat
the cellulose with a mixture of equal parts of nitrog
pentoxide and phosphorus pentoxide, was not stable, and
a few months showed only 13·5 per cent. of nitrogen,
which point it remained constant at apparently the high
stable degree of nitration. Attempts were made to ra
the percentage of nitrogen by not using hot water to wa
the products, but the product did not contain more th

53 per cent. of nitrogen, and exploded at 150° C. In a ther series of experiments it was proved that lowering percentage of water to the minimum by the addition of ning sulphuric acid did not lead to any increase in the centage of nitrogen in the product. Moreover, the ratio sulphuric acid to nitric acid could be varied from 3·2 : 1 :1 without making any difference in the results.

Various Conditions to be observed in the Nitrating cess.—The author has analysed hundreds of nitrated ducts in order to determine the influence of one factor the nitration whilst keeping the others as nearly uniform possible.

Influence of Water.—A series of experiments was le, in which the proportion of sulphuric and nitric acids kept as nearly as possible equal (the nitric acid being htly in excess). The temperature was kept at 16° to C., and the duration of the action was 24 hours. The owing results were obtained :—

Nitrogen.	Soluble in Ether-Alcohol.	Yield on Cotton.	Acid Mixture.		
			H_2SO_4	HNO_3	H_2O
13·65	1·50	177·5	45·31	49·07	5·62
13·21	5·40	176·2	42·61	46·01	11·38
12·76	22·00	..	41·03	41·45	14·52
12·58	61·00	167·0	40·66	43·85	15·49
12·31	99·14	159·0	40·14	43·25	16·61
12·05	99·84	153·0	39·45	42·73	17·82
11·59	100·02	156·5	38·95	42·15	18·90
10·93	99·82	144·2	38·43	41·31	20·26
9·76	74·22	146·0	37·20	40·30	22·50
9·31	1·15	138·9	33·72	39·78	23·50
8·49	0·61	131·2	35·87	38·83	25·30
6·50	1·73	..	31·41	37·17	28·42

plotting these results in a curve it is possible to ict the percentage of nitrogen in the product for the ing proportion of water in the acid mixture. With ence to these results, the author states that the amount itrogen in No. 1 was only increased to 13·67 per cent. xtraction with ether-alcohol. The insoluble portion of 2 contained 13·37 per cent. of nitrogen, and was, fore, regarded as practically equal to endecanitro-lose. No. 3 was not a chemical individual, but could eparated into 22 per cent. of octonitrocellulose with 0 per cent. of nitrogen and 78 per cent. of a substance aining 13·26 per cent. of nitrogen.

e author attributes the difference between the degree itration in the soluble and insoluble constituents of bove products to dilution of the acid mixture during itration, firstly by the formation of water, and secondly e abstraction of nitric acid. The variations must be, fore, less pronounced the greater the proportion of to the cotton.

e conclusion is also arrived at, that to obtain gun-n with a high percentage of nitrogen, it is quite cessary to use acid mixtures containing only a few per of water. When the acids are in the proportion of t is permissible to go up to 10 per cent. of water, and the ratio of 3 of sulphuric acid to 1 of nitric acid, to 12 per cent. It is thus possible to work with cheaper than is usually done. A further advantage of using ger proportion of water is that, as was shown by (this Journal, 1901, 612), the nitrocellulose is more .

re Octonitrocellulose.—No. 4 in the above series was termediate mixture, whilst with No. 5 the collodion ns were reached. It was calculated from the curve he typical collodion cotton, octonitrocellulose, should between Nos. 7 and 8, and that the corresponding nt of water in the acid mixture should be 19·5 per A nitration was therefore made under the above tions with a mixture containing 19·42 per cent. of , and the product was found to be practically pure itrocellulose.

uble Collodion Cotton for Artificial Silk.—With nce to Wyss-Naef's paper on the manufacture of ion cotton for artificial silk (this Journal, 1899, 364), the author has repeated the directions there given; he obtained products with 12·53 to 13·12 per cent. of nitrogen, but not soluble nitrocellulose, and he therefore regards the statements of Wyss-Naef as untrustworthy.

Lower Nitrated Products.—Below 10 per cent. of nitrogen, the solubility of the nitrocelluloses in the table rapidly decreases. As was found by Vieille, the products below hexanitrocellulose are insoluble. In the author's opinion, the soluble compounds obtained by Eder were nitric esters of other carbohydrates. When the percentage of water reaches 25 per cent. and over, the nitration is not complete after 24 hours.

In No. 12, unchanged cotton was left, even after three days' action. In the presence of still more water, the nitration becomes less and less complete, and eventually only oxycellulose is formed.

Morphological Structure of the Products.—With acid mixtures containing up to 15 per cent. of water the original structure of the fibre is preserved. At 18 per cent. there is some contraction, and the characteristic twist of the cotton disappears, whilst with more water the fibres are torn open and disintegrated, and finally formed into globular masses. This action reaches its maximum with 23 to 25 per cent. of water.

Resistance of the Guncotton to Boiling Water.—It was found by comparative experiments that guncotton made with the acid mixtures containing from 8 to 11 per cent. of water did not lose any more nitrogen on boiling with water than that made with more concentrated acids.

D. *Influence of Temperature.—Guncotton.*—The following conclusions were drawn by the author from the results of a series of experiments in which 2·5 grms. of cotton were nitrated at different temperatures (from 0° to 80° C.) with a mixture of 30 grms. of nitric acid (sp. gr. 1·52) and 90 grms. of sulphuric acid (sp. gr. 1·84). (1.) The speed of the process increases rapidly with the rise in temperature. Thus, the percentage of nitrogen in the product at 0° C. after 30 minutes was 10·71, whilst at 40° C. it was 13·07, and the same at 80° C. after 15 minutes. (2.) The percentage of nitrogen slightly falls (13·39 to 13·06) on passing from the ordinary temperatures (10° to 19° C.) to 40° C., but remains practically constant at 13·06 to 13·12 when nitrating at 60° to 80° C. (3.) The chief effect of the change of temperature is on the yield, which constantly falls on passing from the ordinary to higher temperatures. The author attributes this to the partial solution of the nitrocellulose. (4.) Nitration at higher temperatures changes the structure of the cellulose. That obtained at 60° to 80° C. is a fine fibrous powder when dried. If the proportion of sulphuric acid to nitric acid is greater than the usual 3 : 1, this loss on raising the nitration temperature is more pronounced.

As regards the influence of the temperature on the duration of the reaction, it was found that whereas at the ordinary temperature there was a considerable margin in this respect, at higher temperatures the percentage of nitrogen rose at first and then decreased. Thus, at a temperature of 32° C., the following percentages of nitrogen were observed in the products:—After 5 minutes, 13·27; 15 minutes, 13·44; 30 minutes, 13·47; 60 minutes, 13·50; and 120 minutes, 13·40.

The author concludes that the ordinary method of nitrating cotton at temperatures not exceeding 25° C. is correct, for the maximum percentage of nitrogen and the maximum yield of gun-cotton are obtained under those conditions.

Collodion Cotton.—The mixture of acids employed in these experiments contained 38·95 per cent. of sulphuric acid, 42·15 per cent. of nitric acid, and 18·90 per cent. of water. At 17° C. the nitration was practically complete in four hours. A larger yield (155·1 as against 148·1 per cent.) was obtained than at 40° C., but the product was somewhat less soluble in alcohol-ether. At 60° C. a product with the normal solubility and percentage of nitrogen was obtained in 15 minutes, but the structure of the fibres was destroyed to a greater extent, and such collodion cotton did not yield artificial silk suitable for spinning. The author, therefore, concludes that 40° C. is the most suitable temperature.

E. *Influence of Varying the Proportion of Sulphuric Acid to Nitric Acid.*—The following conclusions were arrived at in the case of gun-cotton :—(1.) The speed of the reaction rapidly diminishes with the increase in the quantity of sulphuric acid. (2.) The maximum percentage of nitrogen in the product is obtained when the ratio of sulphuric acid to nitric acid is not less than 0·25:1, and not more than 3:1. (3.) Above a certain ratio of sulphuric acid to nitric acid (apparently 8 : 1), unchanged cellulose is always present in the final product. (4.) An excess of sulphuric acid also affects the structure of the nitrocellulose. Beyond 7:1 the fibres are destroyed and on drying fall into a fine fibrous powder.

Collodion Cotton.—As regards the manufacture of collodion cotton, the effect of keeping the proportion of nitric acid to water perfectly constant, and only varying the sulphuric acid proper, is shown in the following series of experiments, in which the nitrations were made at the ordinary temperature, and lasted 24 hours.

No.	Acid Mixture.			Product.		
	H_2SO_4	HNO_3	H_2O	Nitrogen.	Solubility.	Yield.
	%	%	%	%	%	%
15	41·86	35·82	22·32	9·27	14·22	134
16	38·47	40·19	21·34	10·32	92·30	142
17	40·83	38·72	20·45	10·76	98·24	151
18	42·92	37·40	19·68	11·02	98·90	153
19	48·03	34·18	17·79	12·23	99·58	155
20	49·37	33·38	17·25	12·77	99·82	166
21	50·71	32·50	16·79	13·02	99·32	165
22	52·81	31·27	15·92	13·11	7·65	167
23	54·92	30·06	15·02	13·45	2·63	173

The portion of No. 15 insoluble in ether-alcohol was practically pure hexanitrocellulose. Nos. 16, 17, 18, and 19 were collodion cottons. No. 20 had nearly the theoretical composition of decanitrocellulose, and was yet completely soluble in ether-alcohol, and the author points to this as a proof of the existence of various forms of decanitrocellulose. These facts are important technically, since in the manufacture of blasting gelatin it is important to use soluble products containing a maximum of nitrogen (this Journal, 1900, 315). The last experiment (No. 23) yielded practically pure endecacellulose or gun-cotton.

The author's general conclusion is that in the manufacture of collodion cotton there is no reason for exceeding the proportion of equal parts of sulphuric and nitric acids with from 19 to 20 per cent. of water in the mixture.

F. *Formation of Oxycellulose in the Nitration.*—By colour tests with Methylene Blue the author found that the products obtained with dilute acids contained oxycellulose, but that those with concentrated acids did not. The results were confirmed by Schiff's test.

G. *Solubility of Nitro-Celluloses in Ether-Alcohol.*—The author finds that products soluble in ether-alcohol may be obtained almost down to heptanitrocellulose (10·19 per cent. of nitrogen) and up to decanitrocellulose (12·78 per cent. N.). The collodion cotton of commerce belongs rather to the medium class of the composition of octo- and enneanitrocellulose. Where complete solubility is the essential and the percentage of nitrogen less important, he recommends nitration with a mixture of equal parts of sulphuric and nitric acids containing from 19 to 20 per cent. of water.

A series of experiments showed that the usual proportion of alcohol to ether (*i.e.*, 1:3) could be varied within very wide limits.

H. *Influence of Lower Oxides of Nitrogen.*—As it is now generally assumed that the lower oxides in concentrated nitric acid consist essentially, if not exclusively, of nitrogen peroxide, the author made a series of experiments, using a mixture of 60·71 per cent. of sulphuric acid, 30·67 per cent. of nitric acid, and 8·52 per cent. of water, to which was added various percentages of nitrogen peroxide, with the following results :—

No.	N_2O_4	Nitrogen in Gun-cotton.	Yield.
	Per Cent.	Per Cent.	Per Ce
1	0·13	13·55	174·5
2	0·99	13·50	175·0
3	1·84	13·56	173·9
4	5·15	13·56	175·60

From these figures he concludes that, contrary to Pa assertions and the opinions of many practical men presence of "low oxides" in a proportion far excee that ever found in commercial acid has no influ whatever on the percentage of nitrogen or yield of cotton.

He has also tested the stability of such product Abel's, Guttmann's, and Thomas' tests, and has come t conclusion that they are as stable as those prepared acid free from nitrogen tetroxide.

As regards Guttmann's test (this Journal, 1897, 293), he states that he did not observe a *sudden* appea of the blue streak, but that he eventually succeed obtaining sufficiently concordant results with it. (See Journal, 1900, 642; 1901, 8.)

I. *Behaviour of Different Commercial Grades of C*—Different grades of cotton were mechanically clea washed, and nitrated under the same conditions a "chemically pure surgical wool" used in the prec experiments. The results showed that contrary t author's anticipation, there was no essential difference i quality of the collodion cotton obtained. All were pletely soluble, and the greatest difference in the nit from that of the pure cotton products, was only 0·2 cent. This can be accounted for by the difference in p the surgical cotton containing only 0·05 per cent. of whilst the commercial cottons contained on the av 0·5 per cent. In the author's opinion, therefore, the ing results obtained in the nitration of cellulose are attributed not to the quality of the cotton, but probal some inequality in the conditions, and in particular percentage of water in the acid mixture.—C. A. M.

Phosphorus-free Matches; Manufacture of ——, to S on any Surface. S. L. Fog and A. G. Kirsc Copenhagen. Ger. Pat. 122,804, Dec. 12, 1899. augew. Chem. 1901, **14**, [34], 858.

Claims are made for :—(1.) A process for prep matches which contain no phosphorus and which anywhere, by the use for igniting material of one or double chromates of a monovalent metal, together wit or several chlorates of di- or poly- valent metals. (2. impregnation of the sticks with chlorates of poly metals and the charging of the impregnated ends material containing the double chromate of a monov metal, together with suitable proportions of pota chlorate, sulphur, copper oxide, and a binding medium. The use of an ignition material composed of the chlorat polyvalent metals and the double chromates of monov metals together with the ordinary materials and the co of paraffined sticks with this material.—T. H. P.

Explosives; Analysis of ——. F. W. Smith.

See under XXIII., *page* 1032.

PATENT.

Explosive Substances; Manufacture of ——. J. Bo Paris. Eng. Pat. 21,068, Nov. 21, 1900. (Inte Conv., Sept. 22, 1900.)

Nitro-, azo-, picro-nitrated, or picro-azo derivatives, alone or mixed together, are dissolved by the aid of hea fatty acids alone or mixed, or with fatty substances, fatty esters with bases other than glycerin, or in mix of fatty acids with such esters, so as to produce expl substances which will soften but slightly at high tem tures. Various examples are given in illustration. O which a fatty acid is used is as follows :—Stearic parts; mononitronaphthalene, 12 parts; dinitrotoluene, parts; and $KClO_3$, 80 parts.

Both chlorates and perchlorates are proposed in these nixtures.—R. L. J.

XXIII.—ANALYTICAL CHEMISTRY.

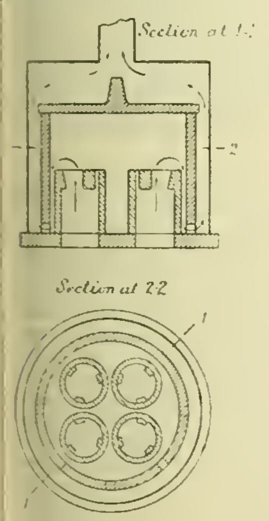
APPARATUS, ETC.

Pulverisation of Materials. W. Hempel. Zeits. angew. Chem. 1901, **14**, [34], 843—844.

HE author describes a series of experiments made to etermine the most suitable material for the construction f pestles and mortars. The substances examined were gate, bottle glass, hardened steel, and cast iron, 10 grms. f glass being powdered in each mortar until it all passed hrough a fine sieve; the weights of each pestle and ortar were determined before and after use. The esults show that the best material for mortars is ndoubtedly hardened steel, which was found to lose 005 grm. on an original weight of 295·049 grms.; an gate mortar weighing 371·741 grms. lost 0·041 grm., a sult due to the relatively greater brittleness of the agate. very good mortar is obtained by pressing a square steel late into the shape of a bowl, drilling holes in the four orners for counter-sunk screws and then hardening to as igh a degree as possible. The bowl is then screwed down a wooden block cut to fit it; any oxide on the surface an be removed in the lathe, but polishing is unnecessary. uch a mortar can be prevented from oxidising by keeping in a tightly-closed box containing a vessel in which is laced a little potassium carbonate.—T. H. P.

Iagnesium Ammonium Phosphate; Furnace for the Ignition of ——, in Porcelain Gooch Crucibles. Schaller. Zeits. angew. Chem. 1901, **14**, 800—801.

HE author describes a furnace in which porcelain Gooch rucibles can be gradually heated and slowly cooled, so hat breakage very rarely occurs. The furnace, which is esigned for four crucibles, consists of a circular fire-clay plate with four circular openings, above which stand four fire-clay cylinders provided with projections at the top for the reception of the crucibles. The four cylinders are surrounded by a large cylinder closed by a lid and with openings at the bottom; this cylinder is in turn surrounded by a sheet iron jacket which terminates in the chimney. Below the openings in the plate are four Bunsen burners, the flames of which enter the small cylinders and impinge on the crucibles.



The crucible containing the precipitate is heated with a very small flame until the moisture has evaporated, and then for 10 minutes with the full flame, and then allowed to cool the closed furnace to about 100° C., when it may safely removed. Porcelain crucibles have the advantage of eapness, so that a large number of precipitates may be tered without interruption one after the other. Also the ight of the crucible with its contents is generally the re for the next determination.—A. C. W.

PATENTS.

urnace Gases; Apparatus for Ascertaining and Recording the Composition of ——. M. Arndt, Aachen, Germany. Eng. Pat. 18,931, Oct. 23, 1900.

HE apparatus is worked through the chimney draught by eans of a receiver which is sealed in liquid, and is automatically put in communication alternately with the chimney and the open air. The chimney draught produces a partial vacuum in the receiver, which is thereby lowered, whilst the re-admission of air allows it to rise again. The movements of the receiver are transmitted by means of cords passing over pulleys to two small receivers, which in turn draw in gas from the flue and force it into a vessel, which is so sealed that it receives a given volume and allows the surplus to pass into the air. The volume of gas drawn from the flue which is thus enclosed each time one of the small receivers descends, is driven into an absorption vessel containing a liquid, such as solution of caustic potash, whereby one of the constituent gases, such as carbon dioxide, is absorbed. The percentage of the constituent thus absorbed is recorded on a paper strip by means of a marking stud on a lever, which is actuated by the pressure of the gas. The gas is driven through the various parts of the absorption apparatus by the raising and lowering of a reservoir containing the liquid, with which they are sealed and unsealed in definite order. The reservoir of sealing liquid is raised and lowered through a cord which passes over the pulley which actuates the small receivers. There are no cocks in the apparatus, which is designed to perform uninterrupted analyses of gas, such as flue gas, at regular intervals, as, for instance, once in every five minutes. (See this Journal, 1900, 930.)—J. A. B.

Sampling, Averaging, Mixing and Storing Material [Portland Cement, &c.] in bulk. T. A. Edison. Eng. Pat. 14,353, 1900.

See under IX., *page* 992.

INORGANIC CHEMISTRY.—QUANTITATIVE.

Gas Analysis by Electricity; Practical Methods of ——. Berthelot. Ann. Chim. Phys. **23**, [7], 433—447. Chem. Centr. 1901, **2**, [9], 599.

THE method used by the author consists in submitting the gas under examination to the action of "induction sparks" (of at most 10—12 mm. length). The behaviour of different gases is described, and methods of determining them qualitatively and, in many cases, also quantitatively. The gases dealt with are divided into six principal groups—free elements, elements in combination with oxygen, elements in combination with hydrogen, sulphur compounds, halogen compounds, and nitrogen compounds.

—A. S.

Gas Analysis by Spectroscopy; Practical Method of Rapid ——. Berthelot. Ann. Chim. Phys. **23**, [7], 447—482. Chem. Centr. 1901, **2**, [9], 600.

THE author gives the spectra (under normal pressure) of 41 gases—H, O, N, Argon, Helium, Air, NO, NO_2, N_2O, NH_3, Cl, HCl, Br, HBr, I, HI, H_2S, SO_2, H_2Se, H_3P, H_3As, H_2S_2, SiF_6, SOF_2, PF_5, SiF_4, BCl_3, BF_3, C_2H_2, C_2H_4, CH_4, CO_2, CO, $COCl_2$, COS, $CH_3.O.CH_3$, CH_3Cl, C_2N_2, HCN (mixed with H), CH_3NH_2, and CNCl—and collects the observed lines, arranged according to the wave-lengths, in a list.—A. S.

"Oxygen Consumed" in the Analysis of Water; The Influence of Chlorine as Chlorides in the Determination of ——. J. B. Weems and J. C. Brown. Proc. Iowa Academy of Sciences, 1901, Vol. 8.

THE methods in general use for the determination of the "oxygen consumed" are the following:—

1. *The Kubel Method.*—100 c.c. of the water, acidified with 5 c.c. of dilute sulphuric acid (1 : 3), are boiled for five minutes with an excess of centinormal permanganate solution. A slight excess of standard oxalic acid having been added, the liquid is titrated with standard permanganate until faintly pink.

2. *The Association Method* (recommended by the American Association for the Advancement of Science) is similar to the above, except that double the quantities of water and acid are taken, and the boiling is continued for 10 minutes.

3. *The English* (*Soc. of Public Analysts*) *Method* is conducted at 80° F. Two determinations are made, the permanganate being allowed to act on the acidified water in closed vessels for 15 minutes and 4 hours, respectively.

4. *The Schulze Method* is conducted in alkaline solution. 100 c.c. of water, mixed with 1—2 c.c. of caustic soda solution (1 part NaOH to 2 parts water), are boiled for 10 minutes with excess of centinormal permanganate, then cooled to 50°—60° F., mixed with 5 c.c. of dilute H_2SO_4 and titrated with standard oxalic acid.

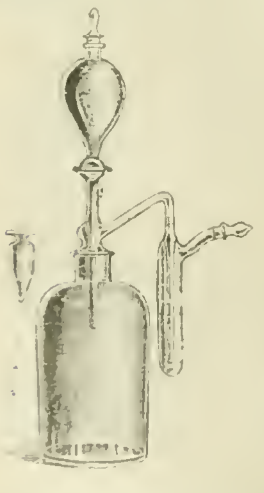
In the two first-named methods, the chlorides present in the water cause the reduction of a certain amount of permanganate. This the authors find to be the same for both methods, and they give in the following table the amount of permanganate destroyed in terms of "oxygen consumed." The two latter methods were not investigated, as it was expected that the action of chlorides would be very slight, if any, owing to the low temperature in No. 3 and the alkaline condition present in No 4.

Parts per Million of Chlorine as Sodium Chloride in Sample.	Oxygen Consumed in Parts per Million.	Parts per Million of Chlorine as Sodium Chloride in Sample.	Oxygen Consumed in Parts per Million.
5	0·03	600	0·63
10	0·08	700	0·72
15	0·10	800	0·80
20	0·13	900	0·83
25	0·15	1,000	0·98
50	0·18	1,100	1·08
100	0·23	1,200	1·24
200	0·28	1,400	1·44
300	0·33	1,600	1·56
400	0·38	1,800	1·63
500	0·48		

—L. A.

Chlorates; Determination of —— in Electrolytic Bleach-Liquors and in the Absorbing Vessels in the Potassium Chlorate Manufacture. H. Ditz. Chem.-Zeit. **25**, [69], 727—728.

A MODIFICATION of a former method of the author's. The apparatus is easily understood from the accompanying sketch. The containing vessel holds about 1½ litres, the dropping-funnel 300 c.c., the little absorption tube 20 c.c.



The chlorate solution (in quantity equivalent to approximately 0·1 grm. of $KClO_3$; or, if both chlorates and hypochlorites are present, so much that 40—50 c.c. of the N/10 sodium thiosulphate solution used in the analysis will be required) is placed in the containing vessel, along with 10 c.c. of 10 per cent. solution of potassium bromide, the absorption tube is about two-thirds filled with 5 per cent. potassium iodide solution, the apparatus is put together, and concentrated hydrochloric acid placed in the funnel (50 c.c., if the bulk of the chlorate solution does not exceed 25 c.c., proportionately more if it does). The acid is now allowed to flow into the chlorate solution, during which process the bromine evolved and passing out with the displaced air is caught in the absorbing tube, liberating an equivalent amount of iodine. The stopper is now placed in the exit-tube of the absorbing vessel, to prevent the iodide solution being prematurely driven back into the main vessel; and after five minutes' standing, 500—600 c.c. (proportionately more, if more than 50 c.c. of hydrochloric acid has been used) of distilled water is added through funnel, followed by about 20 c.c. of the 5 per cent. pot sium iodide solution. The whole is well shaken, the c tents of the absorption-vessel are blown into the m vessel, the absorption-vessel is washed into the m vessel, the whole of the attachment removed (after care rinsing) from the main vessel and replaced by the stop and the iodine in the liquid is finally treated by N sodium thiosulphate and starch.

In the case of mixtures of chlorate and hypochlorite total chlorine is given by this method, and the chlorine chlorate must be got by determining separately that hypochlorite.—J. T. D.

Calcium Oxalate; Occlusion of Magnesium Oxalate by— and Solubility of Calcium Oxalate. T. W. Richa C. F. McCaffrey, and H. Bisbee. Zeits. anorg. Che **28**, 71—89. Chem. Centr. 1901, **2**, [9], 601.

THE object of the authors was to ascertain the relat between the quantity of magnesium oxalate carried do by the calcium oxalate and the concentration of the und sociated magnesium oxalate in the solution. The results the experiments show that the conditions which cause increase of the concentration of the undissociated m nesium oxalate, also cause an increase in the quantity the magnesium oxalate precipitated, and consequently the error, when separating calcium and magnesium by t oxalate method.

The solubility of calcium oxalate in water is not inc siderable (1 litre of water dissolves at 95°, 50°, and 25 14, 10, and 6·8 mgrms. respectively), and would a cause error, but this can be avoided by washing the preci tate with ammonium oxalate solution.

The authors conclude with the following recommen tions:—The concentration of the magnesium should cor spond to about $\frac{1}{50}$ normal solution. To the dilute soluti is added ten times the equivalent quantity of ammoni chloride, and an amount of ammonium oxalate sufficient precipitate the calcium. The solution is boiled, treat with 3—4 times the equivalent quantity of hydrochlo acid, a little methyl orange added, and the liquid slow neutralised with ammonia (this operation should occu half an hour). A large excess of ammonium oxalate is n added, the solution allowed to stand for four hours, filter and the calcium oxalate washed with water containi ammonium oxalate. The results are correct to with 0·1—0·2 per cent.—A. S.

Leather; Analysis of Chrome-tanned ——. E. Stiasny Der Gerber, **27**, [649], 235.

THE author finds that Procter's method is convenient, a gives exact results in the estimation of chromium, but points out that, in common with other methods, it fai entirely to prevent the loss of acids during incineration. order, accurately, to estimate both the bases and t acids, the following method is proposed:—

4 to 5 grms. of the leather to be analysed are cut in th pieces, dried for the estimation of water, then extract with ether and afterwards with carbon bisulphide for t estimation of fat and sulphur. The leather is then dri for a considerable time at 110° C. to remove all traces carbon bisulphide. The leather is next introduced into flask with 50 c.c. of pure fuming nitric acid (sp. gr. 1·52 and allowed to stand from 12—24 hours. To the gree solution which is so produced, 400 c.c. of cold water a added. When cold, the total volume is made up to 500 c. 100 c.c. of this solution are used for the estimation hydrochloric acid by precipitation with silver nitrat 100 c.c. further, are evaporated to dryness, in order t expel the excess of nitric acid. Water is added, and th residue treated with barium chloride to precipitate th sulphuric acid as sulphates. 200 c.c. more of the origina solution are evaporated almost to dryness in a porcelai dish, the residual liquid being washed into a platinum basin and the solution evaporated to complete dryness and the residue gently incinerated. The latter is extracte with weak hydrochloric acid and filtered; ammonia is adde to the filtrate, and precipitates any small traces of chromium

squioxide; this is added to the residue, which is then ied and fused with sodium carbonate, to which a little gnesia is added, according to Procter's suggestion. The romate thus formed is then easily titrated with thiosulate in the presence of potassium iodide. The alkalis esent in the filtrate can be estimated as sulphates.

In the separation of the sulphur and fat after extracting h ether and carbon bisulphide, if it be desired to imate these separately, this is best done by oxidising the phur to sulphuric acid and estimating it as such.

—J. G. P.

lcium in High-Grade Ferro-Silicon; Presence of ——, Analysis of the latter. G. Watson Gray. Iron and Steel Inst., Autumn Meeting, 1901.

e author has found calcium in varying quantities in ro-silicon, doubtless obtained from the flux used in its nufacture. Aluminium and magnesium have been ected in ferro-chromes as a result of their existing in the ome ore, but not calcium, and the present discovery is bably the first notice of the presence of calcium in a o alloy. Its effect on the steel is at present unknown, it is pointed out that a high grade ferro-silicon taining very little calcium can be made in the electric nace. The analysis of six specimens show that the ium ranges from 0·79 to 14·40 per cent. The complete res are as follows:—

—	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
on........	31·90	44·05	56·70	62·90	68·65	78·80
....	61·30	45·28	28·35	24·40	9·91	12·64
ganese.....	3·92	3·51	2·40	1·10	0·20	0·30
minium....	0·22	0·47	3·52	1·52	2·40	4·76
ium	0·79	3·29	7·12	6·96	14·40	2·32
nesium	0·26	0·44	0·38	0·32	0·31	0·22
on	0·50	0·52	0·63	0·33	1·03	0·55
hur	0·055	0·045	0·025	0·033	0·014	0·008
sphorus....	0·027	0·013	0·024	0·015	0·034	0·051
mium.....	1·62	1·62	0·42	1·84	3·01	0·16
kel.........	..	Trace	Nil	Trace	Nil	Nil
per	0·01	Trace	0·01	0·02	0·01	0·04
num.......	Nil	Nil	Nil	Nil	Nil	Nil
gsten	0·25	0·42	0·20	0·30	0·18	Nil
[illegible]	..	..	Nil	..	..	..
[illegible]	..	..	Nil	..	..	..
	100·252	99·658	99·779	99·738	100·148	99·849
ific gravity	5·93	..	3·73	3·32	2·61	2·53

he chief points in the method of analysis are briefly ribed. To decompose the ferro-silicon without introng calcium and magnesium, the author makes use of reaction $K_2CO_3 + Si = K_2SiO_3 + C$. One grm. of finely ground sample is mixed with 4 grms. of fusion ture in a platinum crucible, covered, heated till a strong tion takes place, and afterwards strongly heated till n is complete. The mass is washed out with water the crucible cleaned as far as possible with hydroric acid, the solutions being mixed. The small quantity on remaining in the crucible is extracted by fused phate of potash, which is then dissolved out and either d to the other solutions in a porcelain dish, or rably precipitated with ammonia, and the precipitate iltrate added to their respective places. The contents e dish are boiled and, after the slow addition of 10 c.c. tric acid, evaporated to dryness. After extracting iron, s usual, the silica is weighed, vaporised with hydroc acid, and the residue weighed. The latter will contain any tungsten present, and the bulk of the chromium. It is either fused with the double carbonate and dissolved in hydrochloric acid, or preferably heated with bisulphate and dissolved in water, and hydrochloric acid if basic chromium sulphate is present. The residue now contains only the tungsten, which can be separated. The ammonia precipitates, three in number, are all burnt, dissolved in acid, and any further silica or tungsten therein recovered. The solution is then cleared of copper and any trace of platinum by sulphuretted hydrogen, and the separation of iron, manganese, aluminium, chromium, calcium, and magnesium conducted by the usual methods.

The sulphur and phosphorus are estimated in the same portion by fusing with Stead's tribasic mixture, &c., any impurities in the mixture being also determined. The total carbon is estimated by the same method as for ferro-chrome, viz., by mixing and grinding half a grm. with 5 grms. of ignited copper oxide, mixing the whole with 7 grms. of recently ignited fused chromate of lead, heating for 2½ hours in a current of oxygen and weighing the carbon dioxide in potash bulbs.—A. W.

Lead Peroxide in Red Lead; Volumetric Estimation of ——. M. Liebig, jun. Zeits. angew. Chem. 1901, **14**, [33], 828.

Half a grm. of the finely divided sample is rinsed with a little distilled water into a small Erlenmeyer flask, to which are introduced successively, 25 c.c. of a N/10 sodium thiosulphate solution, and 10 c.c. of a 30 per cent. solution of acetic acid. The mixture is shaken until the substance is dissolved, and then 10 c.c. of a 10 per cent. solution of potassium iodide and 2—3 c.c. of a zinc-iodide starch solution are added, after which the excess of thiosulphate is titrated back with N/10 iodine solution. The end-reaction is quite sharp, the lemon yellow of the lead iodide present being converted instantaneously into a readily detected dirty and dark yellow colour.—W. G. M.

Copper; Analysis of Commercial ——. P. Truchot. Ann. Chim. anal. appl. **6**, 286—288. Chem. Centr. 1901, **2**, [12], 743.

The author, in a previous communication (this Journal, 1901, 283), criticised Hollard's method for the analysis of commercial copper (this Journal, 1900, 563), pointing out that he had not taken into consideration the presence of manganese. Hollard replied (this Journal, 1901, 840) that the manganese is only present in any slag adhering to the copper. The author maintains that an analyst should not draw such a distinction. The sample must be analysed in the same condition as it is furnished, and the smaller sample actually taken must be as far as possible representative of the whole. Commercial "black copper" contains 0·08—0·10 per cent., slag, 8·50—9·50 per cent. of manganese.—A. S.

Mercury from Copper; Electrolytic Separation of ——. C. R. Spare and E. F. Smith. J. Amer. Chem. Soc. 1901, **23**, [8], 579—582.

E. Goecke stated in a thesis that from 16 to 18 hours were required to effect an electrolytic separation of these metals, and that in only three instances did he find the mercury free from copper. In reply to this criticism the authors give the following typical examples, among others, to illustrate their method of working.

In every instance the mercury was quite free from copper. The deposits were washed with cold water only. Some

ercury.	Copper.	KCN.	Dilution.	Current.	Voltage.	Temperature.	Time.	Mercury found.
Grm.	Grm.	Grms.	C.c.			° C.	Hours.	Grm.
·1211	0·1520	2·5	125	$N.D._{125} = 0{\cdot}03$ A	1·2	65	3¾	0·1211
·1211	0·3040	3·5	125	$N.D._{125} = 0{\cdot}03$	1·2	65	3½	0·1202
·0453	0·3040	3·5	125	$N.D._{125} = 0{\cdot}03$ 0·012	1·1 1·5	65	2⅓	0·0453
·0453	0·5115	6·0	135	$N.D._{125} = 0{\cdot}03$ 0·012	1·2 1·5	65	2⅔	0·0453
·1211	0·0483	2·5	125	$N.D._{125} = 0{\cdot}02$	1·5	60	2¾	0·1210

additional examples are also given to show that the method also gives satisfactory results in the presence of cadmium and zinc.—C. A. M.

Hydrogen Peroxide: Determination of the Value of Commercial ——. P. Sisley. Rev. Gén. des Mat. Col. 1901, **5**, [57], 209—210.

Commercial hydrogen peroxide may contain as impurities oxalic acid, iron, barium salts, alumina, chloride and sulphate of sodium, ammonium salts, silica, and magnesium chloride. The acidity should not exceed the equivalent of 1·5 grms of sulphuric acid per litre. Oxalic acid may be detected as calcium oxalate, iron by means of potassium thiocyanate, barium salts by sulphuric acid, and alumina by ammonia. Chloride and sulphate of sodium when present in large quantities render the hydrogen peroxide unstable. The magnesium chloride is added with the object of improving the bleaching action, but the author does not consider this advisable. For determining the hydrogen peroxide, the iodometric method and the titration with potassium permanganate are generally used. If different figures be obtained by the two methods, this points to the presence of oxalic acid or other substance capable of reducing permanganate.—A. S.

Arsenic, Antimony, Tin, and Bismuth in Fine Lead: Determination of ——. M. Liebschutz. Eng. and Mining J. 1901, **72**, [6], 168.

One hundred grms. of the lead in thin pieces are covered in a large beaker with 220 c.c. of boiling water, 100 c.c. of nitric acid (sp. gr. 1·42), and 10 c.c. of nitrate of iron solution (20 grms. Fe per litre). After vigorous action has ceased, the mixture is heated for about one hour, till complete solution is effected. If any lead nitrate is deposited, a little hot water is added. The solution is diluted with cold water to about one litre, a few drops of saturated salt solution added, and then caustic soda, drop by drop, till a light red precipitate appears, which darkens after vigorous stirring. After allowing to settle, the almost clear liquid is decanted off through a filter, and the residue washed twice by decantation with boiling water, the second time with the addition of a few drops of caustic soda, till the precipitate changes from light red to brick red. The washings each time are passed through the filter, which, itself, is subsequently washed three times by decantation with hot water. The combined filtrate and washings contain the main portion of the lead in the form of nitrate. The precipitate in the beaker and on the filter is dissolved in a mixture of hot dilute hydrochloric acid and 50 per cent. tartaric acid solution, and the filter is washed with hot water, moistening from time to time with dilute hydrochloric acid. The solution is made up to about one litre, and sulphuretted hydrogen passed in, the complete precipitation of the lead being insured by the addition of a little ammonium sulphate solution After settling and cooling, the precipitate is collected on a double filter, washed free from iron, and the sulphides washed into a small beaker in which the funnel also is placed. 20 c.c. of ammonium sulphide solution are then poured into the beaker through the funnel, followed by hot water, till most of the ammonium sulphide has been displaced from the paper. The whole is then digested on the water bath for about half-an-hour, the liquid filtered through the same filter, and the latter washed with hot water containing a little ammonium sulphide. The filtrate is acidulated with hydrochloric acid, boiled, and the precipitated sulphides of arsenic, antimony, and tin filtered off. If tin is not present, the arsenic sulphide may be dissolved out with ammonium carbonate solution, the liquid neutralised with acetic acid, and the arsenic determined by titration with "1/100th iodine" (1 c.c. = 0·00023 grm. As). The residual antimony sulphide is dissolved in 25 c.c. of cold hydrochloric acid, and the antimony determined by titration with iodine in presence of tartaric acid and sodium bicarbonate. If tin is present, it can be separated from the antimony by Clark's oxalic acid method or by the electrolytic process.

The sulphides of lead and bismuth left undissolved by the digestion with ammonium sulphide are dried on the filter and incinerated. The charred mass is moistened with a few c.c. of strong nitric acid, cautiously evaporated an calcined and then heated with 5 c.c. of sulphuric acid t white fumes are evolved. The sulphates of lead a bismuth are separated by dissolving out the soluble bismut salt, filtering and washing with dilute sulphuric acid. T the filtrate, 5 c.c. of hydrochloric acid are added, a spir of about 12 ins. of fine steel wire (soluble in acids withou residue), and the liquid boiled. In about an hour, th whole of the bismuth is deposited as a sponge or a blac powder, according to the amount present; it is necessar when the wire has become coated, to detach the adherer bismuth by rubbing gently with a glass rod. The ac solution is decanted, the bismuth covered with hot wate any remaining pieces of wire removed, the water decante off, the bismuth washed into a porcelain crucible with a j of alcohol, allowed to settle, the supernatant alcoh removed, and the bismuth dried on the water-bath an weighed. This process, which is a slight modification Clark's method (this Journal, 1900, 26), is rapid, giv good results, and has the advantage of giving the bismut readily in the metallic form.—A. S.

Tin: its Precipitation from Sulpho-salts, and i Separation from Antimony by Electrolysis. H. Ost an W. Klapproth. Zeits. angew. Chem. 1901, **14**, [33 817—827.

Experiments were made with a vessel containing a porou Pukall cell, in which the platinum anode was placed, th vessel itself, which was also of platinum, forming th cathode. This cell has been described as being used f antimony deposition (see this Journal, 1900, 911). modification consisting of a glass beaker containing cylindrical platinum cathode, surrounding a Pukall ce with a carbon anode, was also used. In each case, th anode cell contained 40—50 c.c., and the cathode compartment 80—100 c.c. of solution, the available cathod area was 1 sq. dm., and the level of liquid in the inne (anode) cell was ½—1 cm. higher than that in the oute vessel. Experiments with tin in sodium sulphide solutio (195 grms. Na_2S per litre) showed that precipitation wa very incomplete, and that, even with warm strong sodiu sulphide solution, using a high current density, a noteworthy proportion of tin is transported to, and deposite on, the anode, the tin solution being in the cathode cel

The complex ion $\overset{=}{\mathrm{SnS_3}}$ migrates towards the anode, with potential difference in the bath of 2 volts, whilst th corresponding antimony ion $\overset{\equiv}{\mathrm{SbS_4}}$ requires a higher pressur (over 4 volts). When ammonium sulphide solution i employed instead of sodium sulphide, and no porous ce is used, the formation of polysulphides interferes with th working of the cell, and with low current densities the ti is incompletely, or scarcely at all, deposited. Sudde alterations of the current, from greater intensity at lowe pressure, to less intensity at higher pressure, are noticeabl but these were not observed when carbon anodes wer used. These changes were commonly accompanied by a appreciable attack upon the platinum anode, and th formation of a deposit containing that metal. Whe porous cells were used, the character of the tin deposit which was always to a large extent spongy, was worse wit higher concentrations of ammonium sulphide. In the latte case also the weight of the deposit was higher than i should be owing to the co-deposition of sulphide. The ti can also be readily deposited in a mixture of sodium an ammonium sulphides, if the latter be present in sufficien quantity (much platinum may pass into solution, howeve during the current changes that take place), but an exces of the ammonium salt produces spongy deposits.

An account is given of the conditions under whic antimony and tin may be determined by the aid o electrolysis. As tin and antimony can be quantitativel co-precipitated in reguline condition from solutions containing sodium and ammonium sulphides and sodiu sulphate (0·4 grm. Sn + Sb is deposited in 2 hours by current of 0·3—0·5 amp. per sq. dm. at 70° C.) th following method is recommended :—

The two metals are obtained in the form of sulphides which are then dissolved with the aid of the smalles sible quantity of sodium sulphide, and transferred to a asured flask, which is subsequently filled to the duation mark. A fraction of this solution is used for determination of antimony alone, and another part for t of antimony and tin together. The presence of polyphides is of no moment. A portion of the measured ation containing not more than 0·25 grm. Sb is mixed h 8 grms. Na_2S, and after having been made up to –96 c.c., is placed in the cathode cell of the apparatus ady referred to; the anode cell contains 5—6 grms. S in 50 c.c. of solution. A current of 0·1—0·2 amp. the apparatus described [cathode area = 1 sq. dm.] ald deposit the whole of the Sb in about seven hours. nwhile, a portion of the original solution, containing more than 0·5 grm. Sb + Sn, is mixed in the iode-beaker with sufficient $(NH_4)_2SO_4$ to convert all Na_2S present into Na_2SO_4, 10 c.c. of $(NH_4)_2S$ tion (with 2 grms. $(NH_4)_2S$) are then added, together 40 grms. of crystallised Glauber's salt, and the me of the solution is made up to 80—90 c.c. and the id is heated to 70° C. The anode solution contains ms. $(NH_4)_2S$ and 30 grms. of Glauber's salt in 50 c.c. of d, the Na_2SO_4 being added in the form of a warm and ng solution. The temperature being maintained at –70° C., a current of 0·3—0·5 amp. is at first luced by a potential difference of 2 volts, which, ever, become somewhat reduced subsequently owing olarisation at the anode. Precipitation should be plete in about 2 hours. The deposit contains some hide, however, and the cathode is therefore transferred nother vessel containing 25 grms. of Glauber's salt in c.c. of solution, and electrolysis is continued for half our with a current of 0·5—1·0 amp. The following itions should be observed in both processes:—

ie porous vessel is not placed in the cathode liquid its pores are quite saturated with the anode solution, wise the resistance would be too high; the level of node solution is ½—1 cm. above that in the cathode- luring electrolysis; a platinum wire gauze with matt ce, in the form of a cylinder cut open, weighing, with supporting wire, 12 grms., is used as cathode; a n block serves as anode for weak currents, but for r current densities as used in desulphurising, the n becomes useless after a few experiments; toward the f the experiment, beaker, diaphragm, and cover-glass osed down with water; the washing of the deposit t still under current is unnecessary, as there are no ulphides present, the cathode is, therefore, at the end, ly removed and rinsed.

remove the Sb and Sn from the cathode, the latter is immersed in a beaker containing strong HCl until gen is no longer evolved; it is then removed, rinsed, plunged into a beaker containing strong nitric and ic acids. The latter solution remains serviceable for g time.—W. G. M.

ium; Quantitative Determination of ——. E. H. ler and R. W. Page. School of Mines Quarterly, 1, **22**, [4], 391—398.

An investigation of the comparative merits of the electrolytic, the carbonate, and the ammonium phosphate methods of determining cadmium has shown that the first named is very accurate provided that a large excess of potassium cyanide, and the presence of other salts, be avoided. The carbonate method is the most troublesome and the least accurate The third method is very accurate; it consists in precipitating the cadmium in neutral solution in the cold by a large excess of di-ammonium hydrogen phosphate, and either weighing the precipitate of $CdNH_4PO_4 . H_2O$ on tared filters (after drying at 100°—103° C), or dissolving it in dilute nitric acid and igniting to pyrophosphate. Incidentally it was found that Austin's method of precipitating cadmium with microcosmic salt in a nearly neutral solution containing ammonium chloride was unsatisfactory; also that asbestos filters should be avoided on account of the solvent action of either ammonium phosphate or nitric acid.—E. H. T.

Uranium; Electrolytic Determination of ——. L. G. Kollock and E. F. Smith. J. Amer. Chem. Soc. 1901, **23**, [8], 607—609.

The general method of determining uranium electrolytically and of separating it from cadmium was described in a previous communication (this Journal, 1898, 604).

Attempted Separation from Iron.—It was not found possible to separate iron from uranium in the acetate solution, since the basic iron salt invariably separated when the temperature of the solution reached 50 C., whilst, on the other hand, the deposition of the uranium was retarded. On adding chrome alum to a uranium acetate solution containing 2 cc. of free acetic acid and increasing the voltage to 20, there was no deposition of uranic hydroxide, but the chromic oxide was converted into chromic acid.

Electrolysis of Uranyl Nitrate Solutions.—The conditions are shown in the following examples:—

U_3O_8.	Dilution.	Temp.	Current.	Voltage.	Time.	U_3O_8 found.
Grm.	C.c.	° C.			Hours.	Grm.
0·1222	125	75	$N.D._{107} = 0·035$ A	4·6	5½	0·1225
0·1222	125	65	$N.D._{107} = 0·04$ A	2·25	7¼	0·1218

Electrolysis of Uranyl Sulphate.—Quantitative results were obtained by diluting the neutral salt solution to 125 cc., heating it to 75° C. and passing a current of 0·02 to 0·04 ampère for 107 sq. cm. with a voltage of 2·25.

Separation of Uranium from Barium, Calcium, Magnesium, and Zinc.—The chief precaution to be observed is to have the dish well covered during the precipitation of the urano-uranic hydroxide, since there is a risk, especially in the case of zinc, of other salts separating, if evaporation occurs.

The details of the process are shown by actual examples such as the following:—

In each case the metals were in the form of acetates. Attempts to separate uranium from nickel and cobalt in this way were unsuccessful.

$)_8$	Barium.	Calcium.	Magnesium.	Zinc.	29 % Acetic Acid (free).	Dilution.	Temperature.	Current, $N.D._{107}$	Voltage.	Time.	U_3O_8 found.
n.	Grm.	Grm.	Grm.	Grm.	C.c.	C.c.	° C.	A.		Hours.	Grm.
16	0·11	..	..	..	0·5	125	65	0·04	8	5½	0·1117
16	..	0·1	..	..	0·2	125	70	0·05	2·25	4¾	0·1113
02	..	..	0·1	..	0·1	125	70	0·05	2·25	5¼	0·1104
02	..	..	..	0·1	0·1	125	70	0·02	2·2	6	0·1100

—C. A. M.

GANIC CHEMISTRY.—QUALITATIVE.

ic Acid in Cotton dyed with Chrome Yellow; ection of ——, *by means of Diphenylcarbazide.* azeneuve. Bull. Soc. Chim. 1901, **25**, [15], 761—

ylcarbazide is a most sensitive reagent for c acid, one part per million and even less being readily detected. A solution of a chromate made acid with acetic or hydrochloric acid gives a deep violet coloration on adding powdered diphenylcarbazide. The test can also be applied for the detection of Chrome Yellow on the fibre as against Chrysophenine for example, and obviates the necessity of testing for lead. Two or three centimetres of the fibre are treated in a test tube with 1 c.c. of a one-tenth per cent. potash solution. The fibre is decolorised immeliately in the case of lead chromate or Chrome Yellow. The solution is then made strongly acid with acetic acid and a small quantity of diphenylcarbazide or its acetate is added in powder. On shaking in the cold, a violet coloration indicates the presence of chromium.—T. A. L.

Cocoanut Oil in Butter; Detection of ——. F. Ranwez. Ann. Pharm. 1901, **7**, 241; through Chem.-Zeit. Rep. **25**, [64], 240.

The method of Vandam is recommended and consists in ascertaining the amount of the fatty acids which are soluble in alcohol of 60° strength, expressing the result in c.c. of N/10 alkali, and calculating on 5 grms. of fat. Butter fat gives a figure of 10·3 to 11·1; cocoanut oil, 44·2, and margarine, 3·6. The difference in these figures is still larger if, in the fatty acids which are soluble in alcohol of 65°, the portion which is insoluble in water be estimated, the result being given in c.c. of N/10 alkali for 5 grms. of fat. In this case the number obtained for butter lies between 4·6 and 5·2; for cocoanut oil it is 42·0, and for margarine, 3·1.—W. P. S.

Methyl Alcohol, Detection of ——, in presence of Ethyl Alcohol. A. B. Prescott. Pharm. Arch. 1901, **4**, 86. Chem.-Zeit. Rep. 1901, **25**, 246.

The proposed method consists in the conversion of the alcohols into aldehydes by plunging a red-hot copper spiral into the dilute alcoholic solution, oxidising acetaldehyde by hydrogen peroxide, removing excess of the latter by sodium thiosulphate, and detecting the formaldehyde by Vanino's colour reaction with phloroglucinol (1 grm. of phloroglucinol and 20 grms. of caustic soda dissolved to 100 c.c. Compare this Journal, 1899, 403).—A. C. W.

Citric Acid in Wine; Detection of ——. M. Spica. Gaz. chim. ital. **31**, [2], 61—67. Chem. Centr. 1901, **2**, [12], 745.

The author's method is based on the fact that citric acid, but not tartaric, succinic, and malic acids, is decomposed on heating with strong sulphuric acid into acetone dicarbonic acid, or acetone and carbon dioxide. 100 c.c. of the wine are evaporated to a syrup, the residue repeatedly extracted with small quantities of absolute alcohol, the alcoholic solution filtered, made nearly neutral with alcoholic potash, and after a few minutes the separated potassium bitartrate filtered off. The filtrate is exactly neutralised with alcoholic potash. If citric acid be present, a white precipitate is formed, which can be filtered off, dried and weighed. It is then heated in a small tube with a little concentrated sulphuric acid, over a small flame till gas bubbles are evolved, when the liquid turns brown owing to the presence of calcium tartrate. The mixture is diluted with a little water, made alkaline with potash, avoiding any rise of temperature, and a few drops of sodium nitroprusside added. In presence of acetone (from citric acid) a blood red colour appears, changing on addition of acetic acid to a reddish violet which is more or less intense according to the amount of citric acid in the wine, and to the care taken to avoid loss of acetone. In the absence of citric acid, the alkaline solution gives with sodium nitroprusside, a greenish yellow coloration, which is ascribed to the presence of tartaric acid.

It is stated that by this method, 0·001 grm. of citric acid can be detected without difficulty.—A. S.

Oxydase, and Peroxydase Reaction. F. W. T. Hunger. Ber. deutsch. botan. Ges. **19**, 374—377. Chem. Centr. 1901, **2**, [10], 648.

The detection of oxidising enzymes by means of the guaiacum-hydrogen peroxide reaction fails, usually, because of the presence of certain substances, such as the tannins. In the investigation of the oxidising enzymes of cocoanut milk and of the sugar cane, the author found that the reaction is also prejudicially affected by other substances. Cocoanut milk contains a sugar (not saccharose) w acts in this manner; with the milk from young nuts reaction completely fails, with that from ripe fruits reaction takes place, but is not persistent. If the enz is precipitated by alcohol, filtered off and dissolved in w it gives a strong reaction, which, however, may be preve by the previous addition of glucose. The author has proved the reducing influence of glucose, in the case of oxydases of the sugar cane. Other reducing agents w injure the oxydase reaction are hydrogen sulphide, hy cyanic acid, pyrogallol, hæmatoxilin, and brasilin.

—A.

Sucramin; Detection of ——, in Foods and Dr Blarez and Tourrou. Répert. pharm. 1901, [3], **13**, through Zeits. Unters. Nahr. Genussm. 1901, **4**, [16],

For the detection of sucramin (this Journal, 1901, 497 alcoholic liquids, the alcohol is first driven off and concentrated residue boiled for a quarter of an hour w small excess of soda, by which means ammonia is evo and the sucramin converted into saccharin. The solt is made faintly acid with hydrochloric acid and saccharin extracted with ether and tested in the usual Solids are treated with water and the filtered extract te as above.—T. H. P.

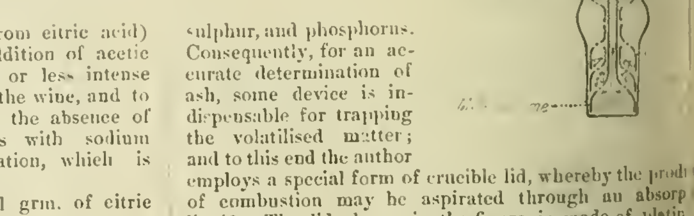
Alkaloids; Micro-Chemical Detection of ——. E. P Escot. Ann. Chim. anal. appl. **6**, 288. Chem. C 1901, **2**, [12], 744.

According to the author, picric acid is not suitable preliminary reagent for the detection of alkaloids m chemically. After a large number of experiments, he c to the conclusion, that owing to the widely diffe chemical nature of the substances known as alkaloi general reagent for all the compounds of this class is ou the question (see also this Journal, 1901, 605).—A. S.

ORGANIC CHEMISTRY.—QUANTITATI

Ash; Apparatus and method for the exact Determina of ——. H. Wislicenus. Zeits. anal. Chem. 1901, [7], 441—449.

During the ignition of organic substances, an al unavoidable loss occurs, by volatilisation, of various min constituents, such as alkalis, halogens (especially fluori sulphur, and phosphorus. Consequently, for an accurate determination of ash, some device is indispensable for trapping the volatilised matter; and to this end the author employs a special form of crucible lid, whereby the prod of combustion may be aspirated through an absorp liquid. The lid, shown in the figure, is made of platin slightly domed and stiffened by two annular rills, one which serves to retain the lid in place on the dish. F the other depends a cylinder, of which the lower edg turned outwards so as almost to touch the wall of the d The cylinder is closed below by a loose disc of platin resting on a projecting flange. At one point of the cumference, the upper lid is bent up, providing an apert for the insertion of a tube conveying oxygen. In using contrivance, the pipe of the cover is fitted over a taper hard-glass tube connected with (1) a small condenser,



orption bulbs charged with milk of lime, (3) an aspirator amp, the whole so disposed that the lid may be raised iout disconnecting the parts. The following procedure ecommended:—The organic substance, to be ashed, is rated with calcium acetate solution and milk of lime in dish, dried, and carefully carbonised in the open air, re placing the dish in position under the lid. Ignition ɔen continued at as low a temperature as possible, air g aspirated through the apparatus moderately rapidly, combustion promoted by stirring the ash frequently. ards the end, oxygen may be passed into the dish; or ash moistened with ammonium nitrate solution, or e hydrogen peroxide (this agent the author recommends) l and again ignited, in order to consume the remaining s of carbon. Finally, the lid is disconnected, inverted , and washed into the dish, and the contents of the s also added.—H. T. P.

nides and Cyanates; Determination of ——, in Admix- . E. Victor. Zeits. anal. Chem. 1901, **40**, [7], 462—465.

. method is based on the fact that silver nitrate pre- ates cyanide and cyanate completely in neutral solution, only cyanide in presence of nitric acid, silver cyanate g readily soluble in the acid.

approximately 10 per cent. solution of the sample is ared; and of this, two portions of 10 c.c. are measured 100 c.c. flasks, to each of which a known excess of ormal silver nitrate is added. One lot is then diluted e mark, filtered, and the excess of silver titrated in an ot portion of the liquid, after acidification with nitric by decinormal ammonium thiocyanate, using ferric as indicator. The total cyanide and cyanate is thus l. To the other portion, 10 c.c. of dilute nitric acid ded, the liquid diluted to 100 c.c., filtered, and the s of silver titrated as before. The silver consumed sponds to the cyanide in the sample. In making the nal 10 per cent. solution of the sample, soluble onate, if present, must be decomposed by addition of m nitrate, before proceeding as above. Reference is to the work of Feldtmann and Bettel (Proc. Chem. Met. Society of S. Africa, 1894—7, **1**, 274), according hom, (1) only isocyanate, and not normal cyanate, an insoluble silver salt; (2) an isocyanate in solution pidly transformed into normal cyanate at quite low eratures, (25° C.). For these reasons, they insist that olution of the sample, and the precipitation with silver e must be effected at a temperature near 0° C. in to avoid loss of isocyanate. The author has ex- d these statements experimentally, and finds that a on of alkaline isocyanate does not change sensibly at . in three hours. Only after 24 hours standing a ution of about 30 per cent. had taken place, the loss due, not to conversion of isocyanate into normal te, but to the well-known decomposition of the iso- nto ammonia and potassium carbonate. In any case, is no necessity to operate at such inconveniently low eratures.—H. T. P.

in; Determination of ——. G. Sesti. Staz. sperim. ar. ital. **34**, 346—358. Chem. Centr. 1901, **2**, [12], .

e filtering materials examined by the author, asbestos proved indifferent towards tannin. In determinations nic acid, filtering should as far as possible be avoided. following modification of the Löwenthal Macagno od for the determination of tannic acid is used in the mo Testing Station:—5 grms. of sumac powder are extracted in the warm with water, and after cooling, d with water to 500 c.c., or are digested for 48 hours 500 c.c. of water. 10 c.c. of the clear solution are rawn, diluted with water to about 400 c.c., 10 c.c. of sulphuric acid and 20 c.c. of Indigo carmine solution , and the whole titrated in the cold with N/20 per- anate. Another 20 c.c. of the solution which has, in eantime, been filtered, are precipitated with 10 c.c. of oniacal copper solution (22 grms. of $CuSO_4$ in 1 litre monia: 1 c.c. = 0·014 grm. of tannin), made up to .c., and 100 c.c. filtered off. This filtrate is diluted to c.c., and as before, treated with 10 c.c. of dilute sulphuric acid and 20 c.c. of Indigo Carmine solution and titrated with N/20 permanganate. The difference between the number of c.c. used in the two titrations, multiplied by 2·078 gives the percentage of tannin in the sample.

—A. S.

Formaldehyde; Determination of ——. Z. Peska. Chem.-Zeit. 1901, **25**, [71], 743.

The two most convenient methods for the determination of formaldehyde are: (1) A modification of Legler's method. This method depends on the fact that ammonia reacts with formaldehyde to form hexamethylenetetramine thus. $6\,CH_2O + 4\,NH_3 = N_4(CH_2)_6\,(CH_2)_6 + 6\,H_2O$. According to Legler, 5 grms. of formaldehyde solution are mixed with 50 c.c. of normal ammonia solution, and the liquid kept lukewarm for an hour, when it is acidified with normal acid, the excess of which is then determined by titration with ammonia. The author finds, however, that hexamethylenetetramine decomposes in presence of acid, so that instead of acidifying with excess of normal acid, the latter must be run into the liquid to which litmus or rosolic acid has been added, until the blue colour just vanishes. In this way accurate results may be obtained, but if the addition of acid be continued until the liquid assumes a neutral tint, low numbers will be arrived at, since hexamethylenetetramine does not react exactly neutral. (2.) Romijn's method, depending on the interaction of formaldehyde and iodine in alkaline solution, according to the equation—

$$CH_2O + I_2 + H_2O = CH_2O_2 + 2HI.$$

The alkali formate has no action on iodine or on methyl alcohol, which is sometimes present, but the method gives inaccurate results, when substances such as ethyl alcohol, acetone, or acetaldehyde, which give rise to iodoform, are present. 5 grms of the formaldehyde are weighed out and diluted to 500 c.c.; 5 c.c. of this solution are then mixed in a stoppered flask with 20 c.c. of decinormal iodine solution and 5 c.c. of normal alkali. After remaining for 15 minutes, 5 c.c. of normal acid are added, and the liquid titrated with decinormal sodium thiosulphate solution. 1 c.c. of decinormal iodine corresponds with 0·0015 grm. of formaldehyde, or, if the above quantities be used, the percentage of formaldehyde will be obtained by multiplying by three the number of c.c. of iodine solution used up. This method, which is especially recommended on account of its sharp end reaction, may also be used for determining the solid paraformaldehyde, which should be first dissolved in the normal alkali, and then oxidised with excess of the iodine solution.—T. H. P.

Quinine Bisulphate; Examination of ——. E. Carlinfanti. L'Orosi, **24**, 181—183. Chem. Centr. 1901, **2**, [10], 664.

Kerner's well known method is generally recommended for determining whether a neutral quinine sulphate contains the other quinine alkaloids, particularly cinchonine, quinidine &c. With the methods given for the conversion of the quinine bisulphate into normal sulphate, however, inorganic salts (sodium, potassium, and ammonium compounds) are also brought into solution, and these influence the results. The author recommends the following method of working:—A solution of 1·5 grms. of the crystalline salt in 15—22 c.c. of water. is treated with excess of 25 per cent. caustic soda and 100 c.c. of ether. The aqueous alkaline layer is separated, the ethereal solution washed three times with 2—3 c.c. of water, and the extraction with ether repeated with the ether distilled off from the first extract. The extracted alkaloid is dissolved in absolute alcohol, an aqueous solution of 1·49 grms. of the sample of quinine bisulphate added, and then so much alcohol that the warm solution remains clear. The whole is evaporated to dryness on the water bath, the residue washed with a little ether, dried at 40°—50° C., and examined as usual by Kerner's method.

—A. S.

Cocaine; Determination of ——. W. Garsed and J. N. Collie. Pharm. J. 1901, **67**, 222—227 and 254—258.

Of the various reagents which react with cocaine in solutions of 1 and 0·2 per cent. strength, only iodine, phosphomolybdic acid and Mayer's reagent give reactions with 0·1 per cent. solutions. These three reagents are still sensitive at concentrations of 1 in 50,000. The reaction with iodine was quantitatively examined. When the cocaine solution (hydrochloride or sulphate) is run into excess of N/10 or N/100 iodine solution, a black tarry mass is obtained; the liquid was filtered and titrated by thiosulphate. The results were variable. Ether removes a large quantity of iodine from the precipitate, leaving a brown crystalline residue of the composition $C_{17}H_{21}O_4NHI_3$. Only two of the atoms of iodine in this compound react with sodium thiosulphate, the third remains combined with the alkaloid as hydriodide.

When iodine is run into the alkaloid solution, drop by drop with constant agitation, a pale brown flocculent precipitate is obtained. The precipitate was filtered off and the excess of iodine titrated by thiosulphate; two atoms of iodine were used per mol. of cocaine. The precipitate had the same composition as the compound previously obtained. A solution of cocaine hydrochloride was made alkaline with ammonia, shaken with chloroform, the chloroform solutions extracted with dilute sulphuric acid, and the acid liquid titrated with N/10 iodine. The precipitate had a tendency to assume the tarry form; good results were, however, obtained when the alkaloid solutions were kept more concentrated, and N/100 iodine and thiosulphate used. Taken: 3·54 grms. of alkaloid in a large volume of solution. Found: 3·56 grms. It was not found to be advisable to add potassium iodide to the acid cocaine solutions before running in the iodine.

Ecgonine, at a dilution of 1 in 500, is not precipitated by N/100 iodine. Cocaine may be determined in the presence of ecgonine by this method with an error of 1—2 per cent. The ecgonine may also be kept in solution, when using stronger solutions, by means of potassium iodide, but under these conditions low results are obtained for the cocaine.

Benzoylecgonine in a solution of 1 in 100, gives a brick-red precipitate with N/100 iodine solution, soluble only on adding a large quantity of potassium iodide and diluting largely. A 0·2 per cent. solution also gives a precipitate with N/100 iodine, soluble in potassium iodide. If, however, the potassium iodide be added first and then iodine, no precipitate is formed. On adding an amount of potassium iodide, which prevents the precipitation of benzoylecgonine when alone, to a solution of all three bases, much too high results are obtained for the cocaine. The difficulty is overcome by shaking alkaline aqueous solutions with ether or light petroleum spirit, cocaine alone being extracted. From a solution containing 0·1 grm. of each base as hydrochloride, made alkaline by ammonia and twice shaken with ether, 0·1008 grm. was extracted. This residue when dissolved in hydrochloric acid and titrated by N/20 iodine gave 0·0965 grm. of cocaine.

Attention was then given to the estimation of cocaine in the presence of the other alkaloids which occur in coca leaves, and of its decomposition products. The most important of these are cinnamylcocaine and cocamine, which is better known as isatropylcocaine. Tropacocaine is said to occur only in very small quantity in any but Java coca, which is not official, and closely resembles cocaine in physiological action; hence its separation is not important. The substances to which the name of hygrine has been applied probably do not occur naturally in coca leaves, but are products of decomposition. The presence of cocaidine, homococamine, cocainidine, &c., requires confirmation; in any case these alkaloids are present in very small quantity.

An attempt was made to extract the alkaloid from purchased liquid extracts of coca. The chief difficulties are (1) the small amount of the alkaloid in the leaves, and therefore in coca preparations—rarely reaching 1 per cent.; (2) the instability of cocaine, which is readily decomposed by the action of heat or alkalis or acids: (3) the large amount of wax, resin, gum, &c., in the leaves, which substances interfere with the extraction of the alkaloid.

B.P. Extract.—The sample was deep brownish-green in colour, and contained alcohol; it gave precipitates both when mixed with water and alcohol. Light petroleum spirit dissolves less of the inert matter than either ether or el form. Similar results were obtained by repeatedly extr the alkaline solution with ether or light petroleum shaking the solvent with dilute sulphuric acid, a ammonia in slight excess, again extracting by ether or petroleum spirit and evaporating to dryness. The e ration of the original liquid to drive off alcohol, l extracting with ordinary ether, does not appear to affe result. Satisfactory results were obtained in working extracts to which weighed amounts of cocaine hydrochl had been added.

Miscible Preparation.—This was a clear brown e of aromatic odour. Alcohol was absent. It gave a solution with an equal volume of water. Concordant r were obtained by extracting with ether and light petr spirit. In the latter case, alcohol was added to preve formation of emulsions; in the former the brown preci produced on the addition of ammonia was filtered fro emulsion which appeared on shaking with the solvent.

Another miscible extract had an alcoholic odo brownish-green colour, and gave green extracts solvents. The preparations contained: B.P. extract, grm. of alkaloid in 100 c.c.; first miscible extract, 0·03 second miscible extract, 0·25 grm.

Attempts were made to separate pure cocaine fro alkaloids obtained from the extracts. Cocaine is readily oxidised by potassium permanganate; the au found that, if a great excess of free acid was av cocaine is not materially affected by the oxidising a Cinnamyl cocaine is instantly oxidised by permang whilst isatropylcocaine is stated by Liebermann to b like cocaine. The crude alkaloid from the extracts, gave an immediate opalescence and finally a slight s precipitate in Maclagan's test, was oxidised by permanganate; the recovered alkaloid did not answ test, it melted at 90°—95° C. A purchased sample of cocaine was then used. This was oxidised by norma manganate, the acid solution extracted by ether, then alkaline and extracted. The alkaloid obtained softe 77° C., and was quite clear at 87° C.; it gave not ev opalescence in Maclagan's test, however, after recry sation from alcohol, it melted at 95°—96° C, and thou failed to answer Maclagan's test at the dilution (1 in 1 required by the Pharmacopœia, gave a crystalline preci in two minutes at a dilution of 1 in 840. The au conclude that cocaine may probably be separated cinnamylcocaine by means of N/10 permanganate, that isatropylcocaine cannot be removed in this m except by using permanganate of a strength which wil partially decompose the cocaine.

The iodine compound of isatropylcocaine is precipi along with the cocaine compound.—A. C. W.

Explosives; Notes on the Analysis of ——. F. W. S J. Amer. Chem. Soc. 1901, **23**, [8], 585—589.

Determination of Sulphur.—The following metho recommended for the determination of sulphur in dyna gelatin. About 2 grms. are warmed in a 100 c.c. s crucible on the water bath with an alcoholic solutio sodium hydroxide, and when the nitroglycerin is de posed, the liquid is evaporated to dryness. The resid fused with 40 grms. of potassium hydroxide and 5 grn potassium nitrate, the mass dissolved in dilute acetic and filtered, and the sulphates precipitated in the usual

Indirect Method of Determining Nitroglycerin in Ge Dynamite, &c.—About 15 grms. of the sample are extra with chloroform in a Soxhlet apparatus and the los weight determined. In a second portion the moistu determined by desiccation over sulphuric acid for five A third portion of about 2 grms. is macerated with eth a small beaker, the ethereal extract filtered, and the pr of extraction repeated three or four times. The u filtrates are allowed to evaporate spontaneously, and residue warmed gently on the water bath with 5 c. ammonium sulphide solution and 10 c.c. of alcohol unti nitroglycerin is decomposed, after which about 250 c. water and sufficient hydrochloric acid to render the li strongly acid, are added, and the liquid filtered. The ate is washed free from acid and then washed through lter with strong alcohol and chloroform into a weighed num dish, which is dried to constant weight at 50° C. contents of the dish are now transferred to a silver ble and the sulphur determined by the method described . This amount of sulphur deducted from the weight e contents of the platinum dish gives the quantity of ances soluble in chloroform with the exception of the glycerin, moisture, and sulphur. The amount of the r substances *plus* the moisture and sulphur, deducted the total loss on extraction with chloroform, gives the ity of nitroglycerin.

ndardisation of Lunge's Nitrometer.—An empirical od of standardising the nitrometer consists in purifying rying a sample of potassium nitrate and measuring the oxide evolved from a known weight. The amount of the reduction tube is then ht approximately to the e of nitric oxide calculated the weight of nitrate taken. eduction tube is now sealed series of determinations made the potassium nitrate, using nt quantities, and in each finding a correction factor shows 100 per cent. in purity e case of the nitrate taken. this series of analyses a cor- factor applicable to all cases ulated. The chief objection s method is the difficulty of ing pure potassium nitrate, e author meets this by pre- specimens of the salt from nt sources, and also determin- e correction factor indepen- from a sample of purified sodium nitrate.—C. A. M.

V.—SCIENTIFIC & TECHNICAL NOTES.

Metallography; The Nomenclature of ——.

w of the fact that the nomenclature of metallography oming more and more involved, the council of the nd Steel Institute have appointed a representative ttee to consider the matter, and to ascertain whether it be possible to take steps to make the terminology nplicated and more precise. The Committee has not t, but a preliminary glossary of over 150 words en drawn up and printed, which may lead to the ication and unification of terms already in use, and elimination of some of them. As far as possible the quivalents in French and German will be added, and ped that the present effort will render some assistance production of the great International Technical Lexi- w being prepared under the direction and at the cost Society of German Engineers. In view of its analogy ography and to the study of meteoric iron, metallo- necessitates the use of similar technical terms, and sirable that, wherever possible, the same terms should l as are familiar to the mineralogists and geologists, ut the coining of new words should be avoided.

—A. W.

senic in Beer, and Peripheral Neuritis. Chem. Trade J. 1901, **29**, [712], 112.

recent conference of the British Medical Association ltenham, a discussion took place on "Peripheral s in Beer Drinkers."

. Reynolds was of the opinion that there was no ce between alcoholic and arsenical neuritis, but that acts much more virulently in an alcoholic subject. cases of alcoholic neuritis, the patient should be ed for symptoms of arsenical poisoning.

n Mann believed that the Manchester epidemic was arsenic, whilst alcohol played the part of a sub-cause. ards the elimination of arsenic from the body, he arge quantities in the hair, nails, and horny scales he skin, and this appears to indicate a special between the keratin tissues and arsenic.

A. P. Luff considered there was an alcoholic apart from an arsenical neuritis.

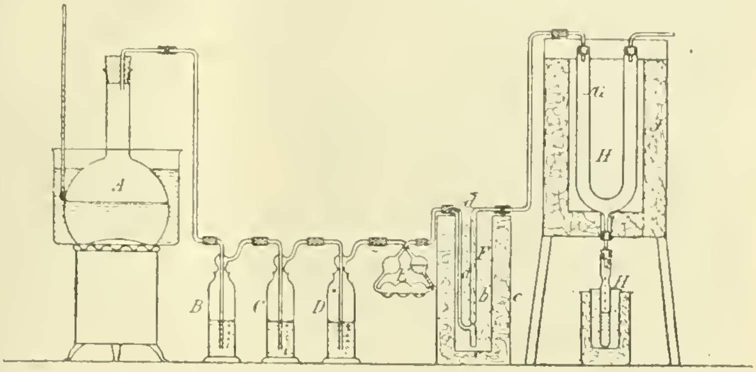
Kelynack stated that alcohol accentuated the effect of the arsenic.

Osler stated that alcoholic neuritis is a rare disease in America, where whisky is the drink of the majority of the working classes, although beer is also drunk in large quantities, particularly lager beer.

Nathan Raw stated that if arsenic be given in presence of alcohol, there is a greater liability to develop neuritis.

—A. S.

Carbon Oxysulphide. W. Hempel. Zeits. angew. Chem. 1901, **14**, [35], 865—868.

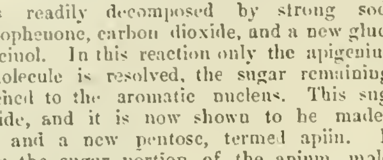


The author first describes Klason's method of preparing carbon oxysulphide, consisting in adding 200 c.c. of a saturated solution of ammonium sulphocyanide (containing 138 grms. of the salt) to a cooled mixture of 2,080 grms. of concentrated sulphuric acid with 1,000 c.c. of water, the liquid being then heated in a water-bath to 42° until gas evolution takes place, and then cooled to 20°; the gas is purified by passing it successively through caustic alkali solution, concentrated sulphuric acid, and finally triethylphosphine, and is collected over water. The gas thus obtained and stored soon decomposes, and to obviate this the author does not collect the gas over water, but passes it through a mixture of 1 part of triethylphosphine, 9 of pyridine, and 10 of nitrobenzene, the gas being then cooled to 10°—20° to remove vapours of these washing liquids, and finally liquefied to get rid of the impurities, which only condense with difficulty. The apparatus employed is shown in the figure, in which A represents a 5-litre flask containing the sulphuric acid and ammonium sulphocyanide, and heated in a water-bath; B, C, and D, wash bottles, the first two containing caustic alkali solution, and the last concentrated sulphuric acid; in the Liebig bulbs, E is the triethylphosphine, pyridine, and nitrobenzene mixture, and F, the condenser for removing vapours of these substances, consists of a tube, *a*, containing broken glass arranged in a metal vessel, *b*, filled with ice and salt, the whole being surrounded by a wooden box, *c*, packed with wool; the condenser, G, in which the carbon oxysulphide is liquefied, is a U tube cooled by ether and solid carbon dioxide contained in a zinc vessel packed with wool in a wooden box.

Pure carbon oxysulphide has a faint smell, but acts strongly on the nervous system, a rapid overpowering action following the inhalation of small quantities. The critical temperature of the gas is 105° C., and the critical pressure 63 kilos. per sq. cm. The boiling point at atmospheric pressure is —47·5°, while the pressure of the gas at 17·4° is 8 kilos. per sq. cm. 1 grm. of the gas, when burnt, evolves about 34,462 calories, and 0·8 c.c. is absorbed by 1 c.c. of water at 13·5° and under 756 mm. pressure. Mixtures with air containing 11·9 and 28·5 vols. of the gas per 100 of the mixture are non-explosive. When mixed with hydrogen sulphide and carbon dioxide, it can be determined by first absorbing the hydrogen sulphide in acid copper sulphate solution, then igniting to convert the carbon oxysulphide into sulphur and carbon monoxide, which last is absorbed by a hydrochloric acid solution of cuprous chloride; the carbon dioxide is finally determined by absorption in potash. The ignition can be carried out in a platinum capillary, care being taken that the ends do not become blocked with solidified sulphur; the volume of the carbon monoxide absorbed by the cuprous solution is equal to that of the carbon oxysulphide from which it is formed. The results obtained in this way are by no means exact, owing partly to the high solubilities of all the gases in question, and partly to the readiness with which carbon oxysulphide decomposes.—T. H. P.

Apiin and Apiose. E. Vongerichten. Annalen, 1901, **318**, [1], 121–136.

Apiin is readily decomposed by strong soda into *p*-oxyacetophenone, carbon dioxide, and a new glucoside of phloroglucinol. In this reaction only the apigenin portion of the molecule is resolved, the sugar remaining intact, still attached to the aromatic nucleus. This sugar is a disaccharide, and it is now shown to be made up of *d*-glucose and a new pentose, termed apiin. By acid hydrolysis the sugar portion of the apium molecule is attacked; strong acids (*e g.*, 14 per cent. HCl) split off the whole of the sugar after long boiling, apigenin being produced. Dilute acids (0·5–1 per cent. H_2SO_4), on the other hand, when boiled with apiin or with the glucoside mentioned above—apioseglucosephloroglucinol—split off only the pentose residue, leaving *d*-glucoseapigenin with the glucose still attached to the aromatic nucleus. Apiose prepared in this way is a syrup, the osazones of which are described. It gives none of the characteristic colour reactions of the other pentoses, and yields no furfural on distillation with hydrochloric acid; it may therefore possibly be a ketopentose. The disaccharide of apiin and apioseglucosephloroglucinol is not split off by emulsin or yeast invertase, but, after the apiose has been removed by means of dilute acid, the intermediate glucoside—*d*-glucoseapigenin—readily yields glucose under the hydrolysing action of emulsin. The amended formula of apiin is now expressed constitutionally as—



—J. F. B.

PATENT.

Diamonds; Process for the Artificial Production of ——. [*Metallic Electrodes.*] A. Ludwig, Bernburg, Germany. Eng. Pat. 17,119, Sept. 26, 1900.

Gas (preferably hydrogen gas) is brought to the required pressure in suitable high-pressure receptacles by means of compressors, force pumps, and screw presses, or the like, and in the gaseous atmosphere thus produced, carbon or graphite is heated or melted by an electric current, or by means of an electric resistance, to the temperature at which it becomes non-conductive, and is converted into diamond.—G. H. R.

Errata.—This Journal, 1901, 940, col. 1, table, col. 5, for "99·4" *read* "99·0"; col. 1, line 15 from bottom of table, for "Linseed III." *read* "Linseed II."; *ibid.* col. 1, line 16 from bottom, for "maize oil acid" *read* "maize oil acids"; *ibid.* col. 2, middle of column, for "strength of acids" *read* "strengths of acid."

Prizes.

Bonus for the Production of Mercury in New Zealand.

Bd. of Trade J., Sept. 26, 1901.

The following official notice was published in the *New Zealand Gazette* for 1st ult.:—

Notice is hereby given that a bonus of fourpence (4*d.*) per pound will be paid on the production of the first one hundred thousand pounds weight (100,000 lb.) of good, marketable, retorted mercury, free from all impuritie any mine in New Zealand, on the following conditior

1. That at least one-third of the quantity is produ or before the 31st March, 1903, and the remainiu thirds on or before the 31st March, 1904.

2. No bonus will be payable until the whole of t hundred thousand pounds (100,000 lb.) of mercu been produced as stipulated, to the satisfaction of an to be appointed by the Minister of Mines, and on certificate alone the bonus will be paid.

3. In the event of more than one person produci required quantities of mercury before the dates inquiry will be made by the officer above referred to, if it be found that each applicant is equally entitl bonus, the amount will be divided, in proportion quantities produced by each applicant, but in no ca any bonus be paid until at least one hundred th pounds (100,000 lb.) of mercury has been produced aggregate.

New Books.

The Chemistry of Illuminating Gas. By Nor Humphrys, Assoc. M. Inst. C.E., &c. Walter Ki Bolt Court, Fleet Street, London, E.C. 1901. P

This volume is a collective reprint of articles writ the author for the *Journal of Gas Lighting*, and published therein. The matter is subdivided as foll I. Relative Cost of Light from Gas, Oil, and C II. Products of Combustion. III. The Sulphur Q IV. Composition of Illuminating Gas. V. Wate VI. Various Gas-making Processes. VII. Oil Gas. Properties of Fluid Hydrocarbons. IX. Tar fo Making. X. Destructive Distillation. XI. Conde XII. Purification. The text fills 248 pages, succeeded by an alphabetical index.

The Gas Engineer's Pocket-Book. Comprising Notes, and Memoranda relating to the Manu Distribution, and Use of Coal Gas and the Cons of Gas Works. By Henry O'Connor, Past Pr of the Society of Engineers. 2nd Edition, R Crosby Lockwood and Son, 7, Stationers' Hall Ludgate Hill, London. 1901. Price 10*s.* 6*d.*

Small 8vo volume for the pocket. It contains dedi preface, table of contents, 428 pages of subject- with numerous illustrations and tables, and alpha index. The matter is subdivided into the fol groups:—I. General Constructing Memoranda. I loading Materials and Storage (Construction). III. House. IV. Condensers. V. Boilers, Engines, and Exhausters. VI. Scrubbers and Washers. Purifiers. VIII. Gasholder Tanks. IX. Workshop X. Manufacturing. Storing Materials. XI. Retort (Working). XII. Condensing Gas. XIII. Exh &c. XIV. Washing and Scrubbing. XV. Purif XVI. Gasholders (care of). XVII. Distributing XVIII. Testing. XIX. Enriching Processes. XX ducts Works. XXI. Supplementary.

Jahrbuch der Elektrochemie. Berichte über di schritte des Jahres 1900. Unter Mitwirkun Herren Prof. Dr. K. Elbs, Giessen; Prof. Dr. Küster, Clausthal; und Privatdoc. Dr. H. D Aachen. Herausgegeben von Dr. W. Nernst u W. Borchers. VI. Jahrgang. Verlag von W Knapp, Halle a S. 1901. Price M. 24.

8vo volume, containing preface, table of contents, 539 p subject-matter, with a list of works of reference recom and issued in 1900. I. Mathematics, Physics, Me and Electrotechnology. II. Theoretical and Te Chemistry. III. Theoretical and Technical E chemistry. IV. Protection of Rights and Patent tion, &c. V. Periodicals. List of journals and peri consulted in compilation of present Jahrbuch. betical index of authors and ditto of subject-matter. subject-matter is illustrated with 196 engravings, grouped as follows:—I. Scientific Part: (i.) App and Methods. (ii.) Theories. (iii.) Constitution Conductibility. (iv.) Measurements of Conduction. Electrical Energy. (vi.) Polarisation and Elect

.) Discharges, Magnetism, Gases, Radiant Energy and mical Energy. (viii.) Electro-analysis. II. APPLIED CTROCHEMISTRY.—(i.) Production of Electrical Energy. Inorganic Electrochemical Products. (iii.) Metals.) Inorganic Compounds. (v.) Various Salts. (vi.) ious Compounds. (vii.) Apparatus for Electrochemical hnology. (viii.) Electrothermic Appliances.

KELESS POWDER, NITROCELLULOSE, AND THEORY OF HE CELLULOSE MOLECULE. By JOHN B. BERNADOU, ieutenant, United States Navy. First Edition. First housand. John Wiley and Sons, New York. 1901. rice, 2·50 dols. Chapman and Hall, Ltd.

t 8vo volume, containing preface, table of contents, pages of subject-matter, and the alphabetical index. re are illustrative tables, and the matter is classified as ws:—I. Origin, Nomenclature, Definitions. II. Earlier rs as to Nitrocellulose Composition and Constitution. Conception of Progression in Relation to Composition Constitution. IV. Solutions of Nitrocellulose. Theory e Cellulose Molecule. V. Researches on the Nitration otton, by M. Vieille. VI. Pyrocollodion Smokeless ders, D. Mendeléef. VII. Nitration of Cotton, M. cy. VIII. Development of Smokeless Powders, Lieut. Bernadou.

CHEMISCHE INDUSTRIE AUF DER INTERNATIONALEN ELTAUSSTELLUNG ZU PARIS, 1900. By Dr. OTTO N. ITT, Professor an der königl. technischen Hochschule Berlin, &c. R. Gaertner's Verlagsbuchhandlung, Her- mn Heyfelder, Schönebergerstr. 26, Berlin, S.W. ice M. 5.

is a bound reprint of Dr. Otto N. Witt's recent riptive reports of the chemical industrial exhibits in International Exhibition of Paris for 1900, which rts appeared in a succession of numbers of "Die nische Industrie" in 1900 and 1901.

ORANDA OF THE ORIGIN, PLAN, AND RESULTS OF THE ELD AND OTHER EXPERIMENTS CONDUCTED ON THE RM AND IN THE LABORATORY OF THE LATE SIR JOHN, NNET LAWES, Bart., D.C.L., LL.D., D.Sc., F.R.S. ROTHAMSTED, HERTS. Being a report to the Lawes ricultural Trust Committee, by Sir J. HENRY GILBERT, R.S. Issued by the Committee. 58th Year of the periments. 1901.

ETHER with the foregoing there is also included a ate copy of the Rothamsted Experiments arranged in orm of plans and summary tables for reference in ields.

HOLIC BEVERAGES. Statement showing the Production d Consumption of Alcholic Beverages in various untries in each year from 1885 to 1899. 335. ice 10*d*.

return, which has been prepared in the Commercial rtment of the Board of Trade, contains statistical mation with regard to the production and consumption ine, beer, and spirits in the following countries and h Colonies:—The United Kingdom, Russia, Norway, len, Denmark, Germany, Holland, Belgium, France, erland, Italy, Austria-Hungary, Roumania, the United s, Australia, New Zealand, Natal, the Cape of Good , Canada, and Newfoundland. Certain statistics are ncluded with regard to Servia and Bulgaria.

Trade Report.

I.—GENERAL.

NEW CUSTOMS TARIFF OF NEWFOUNDLAND.

Bd. of Trade J., Oct. 1901.

th reference to the new Revenue Act, which came into on 1st July last, the Board of Trade have now ed a copy of the Act and its Schedules:—

specting the Labelling of Medicinal Preparations.

medicinal preparations, whether chemical or other, y imported with the name of the manufacturer, shall the true name of such manufacturer, and the place where they are prepared, and the word "alcoholic" or "non-alcoholic," permanently and legibly affixed to each parcel by stamp, label, or otherwise; and all medicinal preparations imported without such names and word so affixed may be forfeited.

[NOTE.—N.E.S. = Not elsewhere specified. Gall. = Imperial Gallon. Ton = 2,240 lb. Cwt. = 112 lb. Qtl. = 112 lb. The expression "proof" or "proof spirits," means spirits of a strength equal to that of pure ethyl alcohol compounded with distilled water, in such proportions, that the resultant mixture shall, at a temperature of 60° F., have a sp. gr. of 0·9198 as compared with that of distilled water at the same temperature.]

SCHEDULE A.

Goods Subject to Duty.

Tariff No.	Articles.	Rates of Duty.
1	Aerated waters, of all descriptions, and non-alcoholic drinks, not to include natural mineral waters.	40 % *ad val.*
2	Acids, hydrochloric and nitric, and all mixed or other acids, n.e.s.; sulphuric ether, chloroform, and solutions of peroxide of hydrogen; ceresene, chlorodinitrobenzol, and nitrate of ammonia.	35 "
8	Asbestos and all manufactures thereof	35 "
18	Brick, facing and fire.................	20 "
28	Candles	35 "
36	Cement, viz.: Portland, Roman, and hydraulic water lime, in bags, barrels, or casks.	25 "
38	Chemicals, when imported for manufacturing matches.	20 "
41	China, porcelain, and all earthenware, n.e.s.	40 "
57	Explosives..........................	35 "
61	Fireworks	40 "
67	Glassware:—	
	White window glass	30 "
	All other kinds, including silvered glass.	40 "
68	Gold, silver, and aluminium leaf, and gold paint.	35 "
80	India-rubber manufactures	40 "
86	Metal polish, blue, starch, blacking, soda, bicarbonate, washing soda, and caustic potash.	35 "
87	Lard, cottolene, and stearin...........	30 "
88	Leather:—	
	Sole and undressed, split	20 "
	Rough, undressed	10 "
	Calf, ox grain, and glove grain	30 "
	Patent and enamelled..............	20 "
	Harness and morocco...............	25 "
	Leather board and leatheroid	30 "
89	Lime	15 cts. per bushel.
90	Lime-juice and fruit juice:—	
	With not more than 25 per cent. of proof spirit.	60 cts. per gall.
	With more than 25 per cent. of proof spirit.	2 dols. "
91	Limestone...........................	50 cts. per ton.
96	Malt	10 % *ad val.*
100	Matches.............................	40 "
102	Medicinal, chemical, and pharmaceutical preparations, when composed of one or more than one substance, n.e.s.; patent and proprietary preparations, tinctures, ointments, essences, and oils, n.e.s.: cod-liver oil, paraffin wax, beeswax, Burgundy pitch, vaseline, and all similar preparations of petroleum.	30 "
103	Molasses, produced in the West India Islands in the process of the manufacture of sugar from the juice of the sugar cane.	4 cts. per gall.
112	Oils viz.:—	
	Coal oil, kerosine oil, naphtha, n.e.s.; gasoline, benzine, and all illuminating oils.	6 "
	Linseed or flaxseed oil (raw or boiled), n.e.s.; tallow and grease, n.e.s.; spirits of turpentine, and olein beef oil, neutral lard stock, cotton seed oil, sesame, and other oils to be used in manufacturing, n.e.s., and butter colouring.	15 % *ad val.*
	Essential oils, lubricating oil and axle grease, neat's foot oil, lard oil, sesame oil, n.e.s., and olive oil, n.e.s.	25 "
	Spermaceti whale, and other fish oils.	35 "

SCHEDULE A—*continued.*

Tariff No.	Articles.	Rates of Duty.
114	Paints and colours of all kinds, whiting, chalk, lamp black, ivory black, dyes of all kinds, putty, copper paint, varnishes, lacquers, japans, japan dryers, oil finish, British gum, dextrine, glue, sizing cream, and sizing of all kinds.	30 % *ad val.*
118	Perfumery, including toilet preparations (non-alcoholic), and pomades, French or flower odours, preserved in fat or oil.	40 „
121	Plaster of paris or gypsum, ground, manufactured, calcined, and paris green (dry).	20 „
130	Shoemakers' ink, harness and leather dressing, and harness soap.	20 „
132	Soaps and pearline, and other soap powders.	40 „
133	Spirits, viz. :—	
	Spirituous or alcoholic, distilled, or containing distilled spirits, and any mixture thereof with water, for every gallon thereof of the strength of proof, and when of a greater strength than that of proof, at the same rate on the increased quantity that there would be if the liquors were reduced to the strength of proof, as follows, viz. :—Alcohol, ethyl alcohol, spirits of wine, amyl alcohol or fusel oil, potato spirit, and spirits over 43 per cent. over proof, and so in proportion for any greater strength.	3·50 dols. per gall.
	Methyl alcohol, wood naphtha, or methylated spirits, ether, nitrous ether, sweet spirits of nitre and aromatic spirits of ammonia, alcoholic perfumes and perfumed spirits, cologne and lavender waters, and toilet preparations containing spirits of any kind, all medical preparations containing over 30 per cent. of alcohol.	50 % *ad val.*
	All medical preparations containing less than 30 per cent. of alcohol, tinctures, or medicines or medicinal wines (so-called), including medicated beef fluids, such as beef, iron, and wine, and etherial and spirituous fruit essence, n.e.s.	30 „
	In all other cases where the strength of any of the foregoing articles cannot be ascertained by the direct application of the hydrometer, it shall be ascertained by the distillation of a sample.	
134	Stationery, viz. :—	
	Albuminised papers and films for photographers, all manufactures of papers, n.e.s. : erasing rubbers, liquid gums, inks for writing, artists' paints and colours.	35 „
138	Sugars :—	
	Loaf, cut loaf, cube, and castor, or icing sugar.	4 cts. per lb.
	All other white and granulated sugars, n.e.s.	3 „
	Brown and yellow sugar, not granulated.	2 „
139	Tar, viz. :—	
	Stockholm, American, and coal tar ; pitch and resin or rosin ; tar mixtures, asphalt, and asphaltum, and like preparations.	15 % *ad val.*
148	Vinegar, viz. :—	
	When imported in casks, including the duty on package.	15 cts. per gall.
	In bottles	30 % *ad val.*
154	Zinc and manufactures of zinc........	35 „
155	Unenumerated goods :—	
	All goods not enumerated in this Act as subject to any other rate of duty, or declared free of duty by this Act, and not being goods the importation whereof is by this Act or any other Act prohibited, shall be subject to a duty of 40 per cent *ad valorem.*	

SCHEDULE B.

Table of Exemptions.

169. Bark, extract of bark, cutch, bichromate of potash, and logwood.

177. Copper, bitumen, naphtha, and iron oxide, used by manufacturers in the manufacture of paint.

180. Cotton-seed oil, olive oil, boracic acid, acetic preservaline, when imported by manufacturers to be u the preservation of fish or fish glue.

191. Manures and fertilizers of all kinds, and sul acid, when imported to be used in the manufactu manures.

194. Oil-cake, oil-cake meal, cotton-seed cake, c seed meal.

195. Ores, to be used as flux.

196. Parchment or wax paper, when imported sp for wrapping boneless fish, or for lining tins used i lobster-packing industry in this Colony.

207. Scientific instruments and apparatus, for u schools and scientific societies.

CUSTOMS DECISIONS IN VICTORIA.

Bd. of Trade J., Sept. 1901.

Tariff No.	Articles.	Rates of
1	Acids, acetic, Beaufoy's, is under 30 per cent. acidity.	3*d.* per
..	Barytes, white........................	Free
517	Dextrine maltose, to pay duty on total weight as sugar not the produce of cane.	12*s.* per
..	Fusel oil............................	Free
..	India-rubber substitute is a hydrocarbon compound.	„
..	Size, gold............................	.
285	Syrup, malt	25 % *ad*

FREE IMPORTS INTO YUCATAN.

Chem. and Druggist, Oct. 1901.

The Mexican Government has issued a decree, exem from the payment of Customs and additional duti well as from port dues and the 7 per cent. interior or tax, for one year, from July 1, 1901, the following chemicals, &c. imported through Chetumal, on the coast of the State of Yucatan :—Natural alkaloids specified) and their salts, liquid ammonia and amm carbonate, carbonate and bicarbonate of potash or photographic collodion, chloral, chloroform, medicinal chemicals, morphia, pastes and medicinal jellies, p permanganate of potash, medicinal compound po quinine and other alkaloids of cinchona, common salt and oxides of all substances not specified, iodine, iodo cod liver oil, olive oil, camphor, and starch.

TRADE OF CAPE COLONY.

Bd. of Trade J., Sept. 19, 1901.

Principal and other Articles.	Seven Months ended 31st July, 1900.	Seven M ende 31st July
IMPORTS.	£	£
Coal, coke, and patent fuel.......	214,000	220,0
Drugs and chemicals	106,000	179,0
Soap and candles	107,000	110,0
Oil, mineral	45,000	58,0
Dynamite and blasting compounds	27,000	59,0
Earthenware and crockery ware .	30,000	48,0
EXPORTS.		
Copper ore	250,000	350,0
Hides and skins	203,000	221,0

TRADE OF DANTZIG (GERMANY).

Foreign Office Annual Series, No. 2697.

Imports show a considerable decrease in goods arrivi transit ; in drugs, chemicals, and artificial manure ther falling-off of 6,300 tons as compared with 1899. Iron was 10,400 tons less.

Exports of beet sugar show an increase.

IMPORTS OF RIGA (RUSSIA).

Foreign Office Annual Series, No. 2698.

The following table shows the increase or decrease in the antities of the principal articles imported:—

Articles.	Increase.	Decrease.
	Tons.	Tons.
lk	..	6,332
y	5,073	..
l and coke	9,945	..
wood	16,393	..
	Barrels.	Barrels.
aure	..	1,225
	..	158
in	1,606	..
phate of soda	..	590
phur	..	57

EXPORTS OF CHILE.

ble showing the respective Quantities and Values of the Leading National Products Exported during 1899—1900.

Foreign Office Annual Series, No. 2700.

Articles.	1899.		1900.	
	Quantity.	Value.	Quantity.	Value.
	Kilos.	Dols.	Kilos.	Dols.
sclay	20,000	1,000	..	..
ate of lime	14,950,788	2,242,618	13,178,765	137,616
ax	14,428	7,214	26,628	13,314
ıe	1,414	42	320	10
per bars	17,311,133	14,928,273	20,340,000	17,899,200
iferous cop- r ore.	20,300	20,300	138,720	138,720
per regulus.	1,710,459	684,965	4,837,912	1,935,185
per and lver regulus.	1,093,762	546,880	1,918,060	1,150,836
per, gold, ıd silver gulus.	92,905	37,162	241,778	145,067
per and gold gulus.	32,978	24,771	..	..
per and lver regulus.	..	..	25,300	25,300
per, silver, ıd gold regu- s.	..	..	22,536	23,522
	8,298	4,979	170	102
no	23,482,000	929,280	34,435,005	1,377,400
per ores	35,854,439	3,585,443	20,212,676	2,021,267
per and ver ores.	183,996	36,799	238,551	40,722
per, silver, ıd gold ores.	11,970	2,633	360	90
alt ore	54,542	8,181	26,844	4,027
nganese ore.	40,930,738	1,227,923	25,715,200	761,406
kel ore	..	..	725	1,450
per and gold e.	58,141	8,720	48,057	27,008
l ore	12,102	6,651	128,936	57,468
l and silver e.	369,759	129,416	216,416	34,249
er ore	302,417	247,597	224,832	130,947
er and lead e.	32,292	4,844	1,457	218
d ore	..	..	4,300	645
erals for llection.	23	26,250	17	3,550
l in bars	1,625,329	2,461,234	1,871,133	2,806,698
r in bars d chased.	7,553,518	3,778,175	15,438,478	2,499,116
entiferous lena.	171,103	34,321	13,971	6,706
r precipi- e.	..	..	140	5,332
r and gold ecipitate.	..	..	235	7,494
ate	1,380,718,323	96,650,282	1,165,935,419	109,915,156
r sulphides	328,501	1,017,110	72,080	863,332
ne	304,328	4,198,427	318,360	4,043,172
ferous zinc	..	..	1,159	23,180
ferous and gentiferous ic.	13,442	413,500	13,628	408,840

NOTE.—1,000 kilos. = 1 ton.

BOLIVIAN EXPORTS THROUGH ANTOFAGASTA (CHILE).

Foreign Office Annual Series, No. 2700.

The exports of Bolivia by this port consist of silver, antimony, tin, copper, and other minerals and metals, borate of lime, hides, skins, bismuth, &c., the exports of which are evenly divided between Germany and the United Kingdom.

The following are the principal articles, received, in 1900, from Bolivia, at the port of Antofagasta, either for export or for consumption at Antofagasta :—

Exports.	Kilos.
Antimony ore	1,087,757
Tin, in bars	1,796,021
„ in ore	10,080,107
Copper, in ore	87,518
„ (old and worn-out castings)	520,575
Bismuth, in bars	84,663
Borate of lime	1,889,300
Vicuña skins	1,300
Bullocks' hides	288,065
Chinchilla skins	1,734
Rubber	1,164
Silver, in bars and sheets	2,377
„ in sulphides	63,912
„ in ore, silver, and lead	461,659
„ „ „ tin	120,971
„ „ „ copper	216,193
„ „ silver only	43,000,000
Peruvian bark or cascarilla	50,122

EXPORTS OF PERU.

Bd. of Trade J., Sept. 26, 1901.

This table shows the value of the exports of the following articles from Peru, in 1900, as compared with 1899 :—

Articles.	1899.	1900.
	Soles.	Soles.
Minerals	10,667,013	16,950,558
Sugar	10,103,519	14,558,426
Coca and cocaine	680,067	1,180,095
Skins	783,449	1,085,586

NOTE.—10 soles = 1*l.* sterling.

IMPORTS OF DAHOMEY.

Foreign Office Annual Series, No. 2706.

Imports comprise soap, perfumery, pottery, glass, and, for 1900, are much more than double what they were in 1898. In these articles, the United Kingdom, with Lagos, has by far the greatest trade, as, in 1898, they together had 53 per cent. of the total values ; in 1899, there was a slight drop to 51 per cent., but, in 1900, the proportion came back to 53 per cent. Germany had 19 per cent., in 1898, which rose to 25 per cent., in 1899, and, in 1900, remained at 24 per cent. France, in 1898, had 21 per cent.; in 1899, 24 per cent.; and in 1900, 23 per cent.

II.—FUEL, Etc.

BY-PRODUCT COKE OVENS AT BALTIMORE (UNITED STATES).

Eng. and Mining J., Sept. 7, 1901.

Work has begun on 200 by-product coke-ovens, for the Maryland Steel Company, at Sparrows Point, near Baltimore. The coke required for the blast-furnaces and steel works will be made there, and the works are well placed to secure raw coal at low prices. The by-products are to be saved, and the use to be made of the gas is under consideration. A portion of it could be used in the works, and in generating power. Negotiations are pending for its sale to the city of Baltimore.

CALCIUM CARBIDE SYNDICATE.

Chem. and Druggist, Oct. 12, 1901 (*see this Journal,* 1900, 1158).

The International Carbide of Calcium Syndicate has been dissolved. The syndicate, which was composed of German, Swiss, Austrian, Swedish and Norwegian carbide works, was constituted last December, in order to prevent overproduction of carbide, and improve prices. The capacity of the works last December represented an annual production of 50,000 tons, but the consumption was only one-fourth of that quantity, and the disproportion between output and sales was similar in France and Italy. When the syndicate was formed, it was decided to close most of the works, in order to dispose of stocks, but as the organisation has come to an end, the effort does not appear to have been successful. It is now proposed to form a fresh syndicate.

Coke Briquettes in Germany.

Eng. and Mining J., Sept. 7, 1901.

A new process has been patented in Germany, by which coke is reduced to particles, about 1 mm. in size, stirred to a paste in a resinous solution, and then run into briquette moulds. The briquettes are said to dry much more quickly, if manganese is added to the adhesive solution.

Benzine for Mine Lighting in Belgium.

Eng. and Mining J., Sept. 7, 1901.

Considering that a trial of benzine lamps with internal relighters might be made with advantage in collieries classed as but slightly fiery, the Belgian Goveroment has decreed that such trial be authorised, for overmen and officials only, in the Oigniez-Aiseau, Arsimont, Ans, and Glain Collieries, under the following conditions:—(1) The lamps must be of regulation type for slightly fiery mines, without chimney, but with double gauze. (2) The benzine must be rectified, and the oil-cup be filled in such a manner that the liquid cannot run out. (3) The friction igniter must not throw forward any incandescent substance on to the glass or gauze. (4) The place where the lamps are cleaned, and filled with benzine, must be isolated from other buildings. (5) This place must not be warmed nor lighted artificially, except by appliances of acknowledged safety, while being well ventilated, and no smoking must be allowed, nor access to any but those charged with cleaning and filling the lamps. (6) The quantity of benzine must not exceed 25 litres. (7) There must be no leakage of liquid while the benzine is being introduced into the lamp-house, or the lamps are being filled.

Patent Fuel at Civitavecchia (Italy).

Foreign Office Annual Series, No. 2703.

Patent fuel, manufactured here by an Italian company from Milan, is exclusively used by the railway company, and during 1900, and in the latter part of 1899, about 20,000 tons of fuel were turned out.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Asphalt and Manjak in Trinidad.

Bd. of Trade J., Sept. 19, 1901.

The principal deposit of asphalt is at La Brea. The Pitch Lake is 110 acres in extent, of unknown depth, and situated 130 feet above the level of the sea. The removal of 1.720,000 tons, during the past 34 years, has apparently made no impression on the lake. Of the present shipments of asphalt, 116,000 tons are made from the lake by a New York Company, and 33,000 by private shippers from lands outside the lake. The lake contains no liquid asphalt, but in other parts of the island this kind, from which illuminating and lubricating oils can be distilled, is found widely distributed. Glance pitch, also found in the island, is used for electric insulations and for black varnishes. Manjak, another variety, has recently been discovered in quantity, about 10 miles north of the pitch lake.

Asphalt Imports of Dantzig (Germany).

Foreign Office Annual Series, No. 2697.

A large trade, at good prices, was done in Trinidad asphalt for use in Poland. Limmer asphalt was little dealt in.

Carbolic Acid: New Zealand Customs Decisi

Bd. of Trade J., Sept. 19, 1901.

Carbolic acid or phenol, in bottles of less than ½ l
drugs, 15 per cent.; in bottles of ½ lb. and over, as ca
acid in bulk, free.

Petroleum Industry of Japan.

Bd. of Trade J., Oct. 10 *and* 17, 1901.

H.M. Minister at Tokio publishes a report or
petroleum industry of Japan, drawn up by Mr. J
Rentiers.

IV.—COLOURING MATTERS, Etc.

Indigo.

J. Soc. Arts, Oct. 18, 1901, 818.

Mr. M. E. F. Lavers has addressed a letter t
British Indian Commerce on the subject of artificial in
He asserts that this artificial product is inferior to na
indigo, and says that "some of the French printers
have been using the artificial dye are now again using
indigo, as they prefer it, especially at its present mod
price. The statement has so often been made that
German government, with the view of fostering a n
industry, has experimented with the new dye, but it
also been reported over and over again, that the resul
not satisfactory, but that further trials were to be mad

"We are told that a natural reduction in cultivatio
already been brought about, the truth being that, owi
the low prices ruling, it has not paid the planter to cult
his poorer lands, and to a comparatively small ex
experiments are being made with other produce in som
the better lands."

Mr. Lavers does not believe that any reliable fig
can be given to show that the artificial dye has inter
very materially with the consumption of the real article.

"In a late issue of the *Westminster Gazette* some fig
have been published to show what has taken plac
Germany and France that are so ludicrously incorrect
one is lost in astonishment as to how they can be
forward by the writer of the article. The figures hav
doubt been taken from Dr. Rose's report, wherein he s
that Germany has ceased to import indigo and has bec
an exporter. The statement that the imports into Gern
declined from 1,036 tons in 1886 to 118 in 1898,
ceased altogether in 1899, is simply without foundation

"The statistics of the Calcutta market show that Ger
took more indigo in 1898 and 1899 (when the Badische
was supposed to be successful) than she did in 1891, b
it was brought out, and she still continues to take her s
of the crop.

"France again took 2,720 chests last season in Calc
which, though less than she took in the previous seaso
more than she has taken in some years during the
decade. The imports into France in some years are m
larger than in others, depending on the fluctuations in
terminal market in Havre.

"A feeling of uneasiness has been caused and fostere
various means which has revolutionised the trade,
neither customers nor dealers will hold stock as
formerly did. The result is that pressure to sell the
has caused the serious decline in prices which has ta
place. The remedy required is a better mode of selling

"That the competition of, and the talk about, artifi
indigo has injuriously affected the markets for the real
there can be no doubt, and planters have been stimul
thereby to make additional efforts in reducing the cos
production. Economies of various kinds have been effec
and endeavours have been made, and are being made
increase the yield of the plant, and simultaneously to impr
the quality of the produce, but with what measure of suc
remains to be seen. Critics tell planters that they h
done nothing for years past to improve their methods, wh
others, perhaps with more knowledge, see that in reality
old-fashioned processes extracted from the plant nearly
that is worth having, and for the rest, the application
scientific methods to its growth and manufacture, gre

are and cleanliness, with some improvement in mechanical ppliances which have been adopted lately, will do nearly, not quite, all that is to be done. It is certain that former xperiments in the application of chemicals to assist fer- ientation, and so on, have not been the success anticipated. "Good may be done by manuring the crop, but will not duce the cost of production unless the results are very arvellous. These things are now, however, all having the ientific attention they deserve."

INDIGO IN INDIA.

Chem. and Druggist, Sept. 21, 1901.

The area sown this year is estimated at 86,200 acres, compared with 115,700 acres, in 1900. The decrease shared by all the reporting districts, and is attributed fall in prices and consequent closing of some of the digo factories last year. The deficient supply of water the inundation canals in Mooltan, Dera Ghazi Khan, and uzaffargarh, is the principal cause of the decrease.

INDIGO POWDER, U.S. CUSTOMS DECISION.

Bd. of Trade J., Oct. 3, 1901.

Powdered indigo, being specially provided for as ndigo," in paragraph 580 of the Tariff, is free of duty der that paragraph, and not dutiable under paragraph 20 as a drug "advanced in value or condition . . . *and not specially provided for.*"

V.—PREPARING, BLEACHING, Etc., TEXTILES, YARNS, AND FIBRES.

ALOE OR AGAVE PLANTING IN MADRAS.

Bd. of Trade J., Oct. 10, 1901.

A syndicate has been formed in the Madras Presidency, and has taken, for a period of years, all the aloe plants belonging to the Forest Department and the Local Fund Board, in the Anantapur district. It is now turning out fibre, stated to be equal to that produced by the Bahamas or Mexico. Aloe planting seems to be the coming planting industry in South India.

VII.—ACIDS, ALKALIS, AND SALTS.

BAUXITE IN NEW SOUTH WALES.

U.S. Cons. Reps., Oct 1901
(*see also this J., Sept.* 1901, 954).

Samples of the ore have been submitted for analysis, and the results are tabulated below. The proportions of alumina and iron are very variable, and phosphoric acid and titanic acid are always present.

Analyses of New South Wales Bauxite.

Locality.	Alumina.	Water.	Ferric Oxide.	Silica.	Lime.	Magnesia.	Soda and Potash.	Phosphoric Acid.	Titanic Acid.
e miles north of Inverall	31·43	20·38	27·03	15·01	..	0·4	..	0·34	4·98
ir Wingello	58·31	32·68	2·85	1·8	..	..	..	6·68	2·4
	35·28	17·81	12·9	29·8	..	..	..	0·19	2·65
	39·82	22·3	20·34	10·3	..	..	..	0·56	5·5
mavillle:									
ed ore	42·2	23·45	28·91	0·16	0·28	0·37	0·17	0·26	4·75
lottled ore	47·84	19·23	13·59	16·4	0·74	0·23	0·2	0·14	1·77
ellow ore	28·96	15·54	16·2	35·56	0·5	0·31	0·2	0·95	2·98

BORATE OF LIME FROM ANTOFAGASTA (CHILE).

Foreign Office Annual Series, No. 2700.

xports are confined to nitrate, silver, copper, and borate ime.

8,000 tons of borate of lime were shipped, during 1900, n Antofagasta, of which 12,000 to 13,000 tons have gone German, and 5,000 to 6 000 tons to British, ports.

he borate deposit of Ascotan, in the interior of Anto- asta, ranks amongst the largest and most productive in world.

he following is an approximate output of this deposit ing the year 1900, compared with that of 1899:—

hipments at Antofagasta from the Deposit of Ascotan.

To—	Quantity.	
	1899.	1900.
	Tons.	Tons.
rpool	2,000	1,900
iburg	4,900	9,020

he shipments from other deposits were as follows:—

To—	Quantity.	
	1899.	1900.
	Tons	Tons.
pool	3,000	800
burg	5,000	2,000

SULPHUR AND BORATE OF LIME AT TALTAL (CHILE).

Foreign Office Annual Series, No. 2700.

The deposits of native sulphur are actively worked, production has increased (60 workmen being at present employed), and profits are shown. The deposits cover a large area, and are worked by a syndicate formed on this coast.

The deposits of borate of lime are within a short distance of the sulphur deposits, and are of high grade, containing over 600,000 tons of borate of lime, producing 33 per cent. of boric acid.

SALT FOR INDUSTRIAL PURPOSES IN FRANCE.

Bd. of Trade J., Sept. 26, 1901.

A Presidential decree, dated Sept. 4th, 1901, fixes the conditions under which denatured salt, destined for industrial purposes, are to be exempted from payment of consumption duty.

The decree, in the original, may be consulted on application at the Commercial Intelligence Branch of the Board of Trade, 50, Parliament Street, S.W.

SULPHATE OF COPPER IN ALGERIA.

Bd. of Trade J., Oct. 10, 1901.

Sulphate of copper opens the prospect of good trade. The British product is preferred in the local market. During 1900, the import of sulphate of copper from the United Kingdom amounted to 118 tons, an increase of 20 tons on 1899.

DEMAND FOR SULPHATE OF COPPER IN GREECE.

U.S. Cons. Reps., Sept. 1901, 93.

In consequence of the increase of phylloxera in the currant-growing districts of Greece, the present yearly consumption of sulphate of copper is estimated at from 7,000 to 8,000 tons.

The currant trade of Greece is controlled by associations which have imported sulphate of copper, and sold it to the planters at cost price. Thus, the "Currant Bank of Greece," alone, imported over 2,000 tons of this commodity last year.

Great Britain, in 1900, furnished a satisfactory article at 22l. 10s. per ton, of from 98 to 99 per cent. purity, which was sold to the consumer at a margin of only 1l. 15s. per ton. The Greek Government, some years ago, placed this commodity on its free list.

The Consul thinks that the United States could secure a portion of this trade. Only a few years ago, Great Britain furnished nearly all the sulphate of copper consumed in Austria, owing to the superiority of the product. As the quality of the American article improved, it secured a larger share of the trade. Thus, while Great Britain, in 1898, supplied 61 per cent. of the sulphate of copper imported at Trieste, against 24 per cent. imported from the United States, her share of the total imports of 1899 fell to 18 per cent., whilst the latter rose to 43 per cent.

ELECTROLYTIC PRODUCTION OF SODA AND BLEACH.

Eng. and Mining J., Sept. 14, 1901.

The Hargreaves-Bird process for producing soda and bleach electrolytically is now in operation, on a commercial scale, at Middlewich, Cheshire, and the products are finding a ready market. Fifty cells are now at work, and the daily capacity is about 9 tons of bleach and 13 tons of soda crystals, though the soda output is not marketed solely as crystals. Another set of 50 cells is in course of erection, and further extensions will be proceeded with as the products become known.

The bleach obtained keeps absolutely dry. There is no hydrochloric acid present to form calcium chloride, which is always found in Leblanc bleach. The soda crystals average 99 per cent. purity, the remaining 1 per cent. consisting of sodium chloride, and sulphate and sulphite of soda. This small proportion of sulphate and sulphite is due to the presence of sulphur in the carbonating gases.

ALUM AT CIVITAVECCHIA (ITALY).

Foreign Office Annual Series, No. 2703.

The Société Générale des Alums Romains employs 95 hands at the mines in "Allumière," and returns a yearly output of about 6,000 tons of alum. In 1900, 6,155 tons of alum valued at about 5,000l., were exported. Alum is mostly exported in its natural state to Rouen, but a portion of it is refined in the Company's works at Civitavecchia. Here sulphuric acid is also produced. This article is now being exported for the manufacture of dynamite, but not as yet in considerable quantities. For the production of sulphuric acid, impure sulphur from Sicily is used. The output of alum could be considerably increased, and the alum trade would greatly benefit, if the serious drawback of transport from Allumière to Civitavecchia could be obviated.

SULPHUR ORE AT PERNAU (RUSSIA).

Foreign Office Annual Series, No. 2698.

In 1900, sulphur ore was imported for the first time, the quantity being 7,128 tons. This article is largely used by the wood-pulp mills.

SULPHUR IN BRITISH COLUMBIA.

Chem. and Druggist, Sept. 21, 1901.

A large deposit of sulphur has been found on the Skeena River, British Columbia. The Puget Sound country, and possibly the entire Pacific Coast, will eventually be supplied from this source. Control of the deposit has been secured, and arrangements are being perfected to ship the product to Victoria and other Sound ports.

VIII.—GLASS, POTTERY, AND ENAMELS.

GLASS, GLASSWARE, AND EARTHENWARE IN THE UNITED STATES.

Foreign Office Annual Series, No. 2704.

In glass and glassware there is an increase of 9 per cent. in the amounts exported. Earthenware was imported to the value of 9,467,418 dols., an increase of 9 per ce Germany sent 20 per cent. more, while the United Kingd sent 3 per cent. less.

IX.—CEMENTS, Etc.

CEMENT.

Egypt.

Imports of cement into Egypt, in 1900, were as follows:

Country.	Quantity.	Value.
	Barrels.	£ E.
United Kingdom	66,773	25,964
Austria-Hungary	3,381	927
Belgium	83,337	23,379
France	37,662	9,000
Italy	11,127	2,950
Russia	46	13
Total	202,326	£E. 62,233

Country.	Quantity.	Value.
	Sacks.	£ E.
United Kingdom	301,542	63,472
Belgium	1,717	200
France	67,164	4,989
Italy	312	26
Total	370,735	£E. 68,687

NOTE.—Barrel = 352 lb. (about). Sack = 91 lb. (about).

The total value of imports amounted to £E130,920, about 133,600l. sterling. Good Belgian cement is sold 11 frs. per barrel of 160 kilos., placed on the railway Alexandria, French cement at 13 frs. 50 c., and Engl cement at 13 frs. per barrel. The duties on cement i ported into Egypt amounted to 8½ per cent. *ad valor* including quay and paving dues, *plus* 6 frs. 48 c. per d for expenses of supervision and 50 c. for cartage.—(*Bd. Trade J., Sept.* 26.)

Bangkok (Siam).

The value of cement imported, in 1900, was 10,10 Denmark now takes the foremost place among the countr supplying cement.—(*For. Off. Ann. Series, No.* 2705.)

United States.

Of cement, 33 per cent. less was imported in 19 France sent 50 per cent. more than in 1899; the Uni Kingdom, 38 per cent. less; and Germany, 38 per ce less.—(*For. Off. Ann. Series, No.* 2704.)

Dahomey.

Lime and cement came almost entirely from France. (*For. Off. Ann. Series, No.* 2706.)

Civitavecchia (Italy).

Cement is produced by two Italian companies, and th joint output for 1900 is estimated at about 18,000 tons. (*For. Off. Ann. Series, No.* 2703.)

Rio Grande do Sul (Brazil).

Portland cement from the United Kingdom has to great extent given place to a German manufacture.—(*F Off. Ann. Series, No.* 2702.)

Santa Catharina (Brazil).

British cement was at one time the only cement importe but a foreign cement has lately appeared on the mark labelled Portland.—(*For. Off. Ann. Series, No.* 2702.)

Oran (Algeria).

Cement, hydraulic lime, and most materials for buildi are imported from France, but quarries have been open up in the neighbourhood of Oran, kilns established, and a large industry is likely to be established.—(*For. Off. Ann. Series, No.* 2710.)

Hong-Kong.

Hong-Kong is taking a front place in the cement trade, and it is satisfactory to see attempts on the part of British merchants to regain their position from Continental importers.—(*Comm. Intelligence, Oct.* 1901.)

X.—*METALLURGY.*

DUTCH METAL FREE OF DUTY IN UNITED STATES.

U.S. Treasury Circular.

Thin sheets of metal, 33½ ins. long and 8½ ins. wide, known as Dutch metal, an alloy consisting of copper and zinc, of which copper is chief value, are free of duty under Act of 1897, paragraph 533, as "composition metal of which copper is a component of chief value," instead of being assessed at 45 per cent. *ad val.*, as manufactures of metal, under paragraph 193.

PLATINUM PRICES IN UNITED STATES.

Eng. and Mining J., Sept. 28, 1901.

During the last two years, the price of platinum has been steadily advancing, and now exceeds that of fine gold, having reached as high as 21 dols. an ounce. This is more than double the price quoted in 1895, when it reached the lowest point in recent years, 10 dols., an ounce. At the opening of 1899, platinum was quoted at from 14·40 dols. to 15·50 dols. an ounce, advancing somewhat during the year, and was quoted at 17·75 dols., in December. This price was quoted until April 1900, when it advanced to 18·20 dols., and remained at that figure until the spring of this year, when it again advanced. The demand is somewhat in excess of supply, and it is believed that the price will continue to advance. There is also quite an active demand for the associated metals, osmium and iridium, for use in the manufacture of incandescent gas burners.

LEAD, COPPER, AND ZINC: PRICES SINCE 1885.

Broken Hill Prop. Co. Rep., 1901.

The following statement shows the highest and lowest prices ruling for the metals since 1885:—

Year ending 30th November.	Lead. Soft Spanish. Per Ton.		Copper. G. M. Bs. Per Ton.		Zinc. O. Bs. Per Ton.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
	£	£	£	£	£	£
1885	12¼	10½	48	40	21¼	19
1886	13¼	12¼	42	39	21¾	20
1887	14½	11½	67	38	25¼	20¼
1888	15¼	12¾	89	75	25¼	21¼
1889	14¾	12¼	78	38	25¼	21¾
1890	14¼	12½	60	47	28½	23¼
1891	13	11¾	55	45	26	22¼
1892	11¾	10	48	44	22¾	20½
1893	10¼	9¼	47	42	20½	17
1894	10	9	43	38	18¾	15¾
1895	11¾	9½	47	39	20	14¼
1896	11¾	11	49	41	19¾	16¾
1897	14½	11½	52	47	20¼	18¼
1898	14¼	12¼	57	48	25	18
1899	17½	13	78	58	28½	19¾
1900	17¾	16	79	68	22½	18⅝
1901 (6 months)	16⅝	12 1/16	73	67¾	19	16

TIN IN THE STRAITS SETTLEMENTS.

Bd. of Trade J., Sept. 19, 1901.

Perak.

The following table shows the quantity and value of the exports of metallic tin during each of the last five years.

Year.	Quantity.		Average Value per Picul.	Total Value.
	Tons.	Piculs.	Dols.	Dols.
1896	22,811	383,227	33·20	12,339,909
1897	20,949	351,915	36·09	12,701,695
1898	20,061	337,025	42·96	14 177,101
1899	18,960	318,526	72·52	23,099,506
1900	21,166	355,589	74·15	26,032,000

The duty paid was 3,570,631 dols., against 3,073,140 dols. in 1899. This is due to the high price of tin during the year, which enabled deserted fields, unpayable at previous prices, to be reopened, and to the increased mining population; in every part of the State, activity in the mining industry has increased. Any check in the mining industry is not due to exhaustion of the mines.

Selangor.

Tin commanded a high price during 1900, and the amount of metal exported was much larger than in 1899. The total weight in 1900 was 269,490 piculs (16,041 tons). This exceeds the output of 1899 by 14,791 piculs. 118,076 piculs went out in the form of smelted tin, and 151,414 piculs as tin ore, the former figures showing an increase, and the latter a decrease, upon the corresponding totals for 1899. On account of export duty, the sum of 2,695,828 dols. was received. In 1899, 2,481,701 dols. was collected, so that the advance in the past year was more than 214,000 dols. The amount of revenue derived from this source, in 1900, was more than double that which was received in 1898, when the sum collected was 1,317,258 dols. The market value of the exported tin was 19,434,562 dols., and the average rate of duty paid upon it was 30·02 dols. per bhara of three piculs. The increase in the output of metal is probably accounted for by the larger supply of labour which was available, as compared with 1899.

Negri Sembilan.

The average price of tin, which, in 1899, was 71·81 dols. per picul, rose, during 1900, to 74·19 dols., and attracted an increased population to the tin fields. The export duty collected amounted to 692,519 dols., or 135,586 dols. more than in 1899, the value of the metal exported being returned at 5,338,424 dols., as against 4,245,265 dols., in 1899.

Pahang.

The total weight of tin exported, during 1900, amounted to 15,728 piculs, as against 13,465, in 1899—an increase of nearly 17 per cent. The duty paid on it was 91,403·93 dols., as compared with 70,533 dols., in 1899—an increase of nearly 30 per cent. The disproportionate increase in duty paid is caused by a great increase in the tin won by ordinary miners, which pays 10 per cent. duty, and a decrease in the tin won by the Pahang Corporation, which pays 8 per cent. only.

MANGANESE ORE EXPORTS OF BAHIA (BRAZIL).

Foreign Office Annual Series, No. 2696.

Manganese ore was exported for a larger amount than in 1899, and the industry would have developed to a much greater extent but for the sudden rise in exchange.

The ore is obtained at Nazareth (some 50 miles to the west of Bahia), the mines being worked by four companies, *viz.*, one British, one American, and two Brazilian.

The deposits now worked lie close to the Nazareth tramway line, which is in direct communication with the sailing barges on the river.

The ore extracted from the deposits averages from 45 to 52 per cent.

MANGANESE TRADE OF RUSSIA.

Eng. and Mining J., Sept. 21, 1901, 356.

The shipments of manganese ore were very large, in 1900, and 426,179 long tons went abroad. This was due to the heavy demand from Europe, and also to the reduction at the beginning of 1899, by the Russian Government, of the rail freight rate from Tchiaturi to the main line of the Trans-Caucasian Railroad, at Sharopan, from 10 c. to 7 c. per pood of 36 lbs. avoir. The higher market value of the ore has enabled many of the smaller properties to continue active operations. Shipments to foreign countries from the ports of Batum and Poti, from 1885 to 1900, inclusive, amounted to the large total of 2,514,121 long tons. Of this, the United Kingdom received the greater part, 994,848 tons, or 30 per cent., the next largest importers being Holland, France, United States, and Belgium. The ore imported into Germany is shipped through Holland. The leading manganese producing centres are Mgrimevi, Shukruti, Zeda-Rgani, and Pervessi. The ore is frequently shipped as it comes from the mines, without sorting, and is often mixed with waste that has been lying on the ground for years. As Russia is the principal source of supply, furnishing nearly 50 per cent. of the world's exports, consumers make the best of the situation. When contracts call for a certain grade of ore, the Russian exporters are more careful.

Platinum Scrap: U.S. Customs Decision.

Bd. of Trade J., Sept. 1901.

Small scraps, clipped from wire and sheets of platinum, though in the nature of waste, are specially provided for under paragraph 642 of the Tariff as "platinum, unmanufactured," and are therefore free of duty under the said paragraph. They are held not to be dutiable as waste, at the rate of 10 per cent. *ad valorem*, under paragraph 463.

Copper Ores in South Australia.

Bd. of Trade J., Sept. 19, 1901.

The South Australian Government are prepared to purchase copper ores at Port Augusta, paying a deposit of 60 per cent. of the present value of the ore, the balance on realisation. Ores should be consigned to, and particulars may be obtained from, the Government ore-buyer, care of Messrs. Young and Gordon, Port Augusta, South Australia.

Cobalt Ores from Caldera (Chile).

Foreign Office Annual Series, No. 2700.

Trial shipments of cobalt ores have been made to the United Kingdom, and it is hoped that the results will enable this class of mine to work again.

Manganese Ore from Chile.

Foreign Office Annual Series, No. 2700.

The export of manganese from Carrizal Bajo was 9,73 tons, a decrease, from 1899, of 10,966 tons, the total expor for that year being 20,700 tons.

The manganese mines have produced as much ore as usual, and large stocks are awaiting shipment.

Chile.

Exports of Copper Produce from Chile and Bolivia to all parts of the World during the Years 1900–1899.

Bound to—	Quantity.			
	1900.	1899.	Increase.	Decrease
	Quintals.	Quintals.	Quintals.	Quintals
Bar Copper.				
United Kingdom	339,614	272,199	67,445	..
France	60,731	92,062	..	31,331
Germany	19,385	19,696	..	311
United States of America	3,913	2,217	1,676	..
Peru....................	220	396	..	176
Australia	..	..	..	..
For orders— United Kingdom or Continent...........	18,281	14,385	3,896	..
Total	442,174	400,955	73,037	31,818
Regulus.				
United Kingdom	35,903	70,213	..	34,310
France..................	..	..	..	..
Germany	696	..	696	..
United States of America	68,573	1,793	66,780	..
Peru....................	..	..	..	..
Australia	..	..	..	..
For orders— United Kingdom or Continent...........	..	..	..	..
Total	105,172	72,006	67,476	34,310
Ores.				
United Kingdom	393,539	594,885	..	201,346
France..................	598	977	..	379
Germany	718	1,195	..	477
United States of America	10,851	25,394	..	14,543
Peru....................	..	..	..	..
Australia	20,870	..	20,870	..
For orders— United Kingdom or Continent...........	12,830	23,577	..	10,717
Total	439,406	646,028	20,870	227,462

◆

Total Exports of Copper Produce from Chile and Bolivia to all parts of the World during the Years 1900–1899.

Bound to—	1900.		1899.		Increase.		Decrease.	
	Quantity.	Fine Copper.	Quantity.	Fine Copper.	Quantity.	Fine Copper.	Quantity.	Fine Copper.
	Quintals.	Quintals.	Quintals.	Quintals.	Quintals.	Quintals.	Quintals.	Quintals.
United Kingdom	769,086	424,154	987,297	410,520	..	13,634	168,211	..
France	61,329	60,826	93,039	92,257	..	..	31,710	31,431
Germany	20,799	19,883	20,891	19,994	..	..	92	111
United States of America	83,357	35,046	29,404	7,368	..	27,678	..	..
Peru..................................	220	220	396	396	..	..	176	176
Australia	20,870	3,130	..	..	20,870	3,130	..	..
For orders— United Kingdom or Continent	31,111	21,803	37,962	21,562	53,933	241	6,851	..
Total	986,752	565,062	1,118,989	552,097	74,803	44,683	207,010	31,718

Summary of Exports of Fine Copper from Chile and Bolivia during the Years 1900—1899.

	Quintals.
1900..	565,062
1899..	552,097
Increase	12,965

XII.—OILS, Etc.

Oils and Soap at Oran (Algeria).

Foreign Office Annual Series, No. 2710.

Olive oil was exported, in 1899 to the extent of about 104 tons, and in 1900, 413 tons. This is accounted for by the cheapness of American cotton-seed oil, which has been argely imported, thus setting free the more costly olive oil or exportation. These figures are all the more remarkable, nasmuch as, in 1899, there was a large crop of olives, and, in 1900, a very small one.

Seed oil, amounting to 4,611 tons, was imported during 1900, and promises to be more this year. This is wholly from America.

A soap factory has been established. Importations, in 1900, were 4,657 tons, and, in case this trial should be a success, other factories will follow.

Soap and Candles in the Crimea (Russia).

Foreign Office Annual Series, No. 2709.

Local manufacturing industries are in their infancy, the Crimea being dependent on other industrial centres for its upplies. There is a demand for soda, soap, candles, wrapping paper for fruit, &c.

Soap in the Seychelles.

Chem. and Druggist, Oct. 19, 1901.

There are five soap factories in operation in Seychelles, nd the value of soap exported, which was 56.923 r., in 1898, nd fell to 30,562 r., in 1899, rose last year to 36,010 r. here are also six mineral water factories.

Tea-seed Oil in India.

Chem. and Druggist, Sept. 21, 1901.

The scientific expert of the Indian Tea Association has ssued a report on tea-seed oil and cake. Investigations how that tea-seed oil is clear, light, and yellow, but as always a more or less acrid taste. It cannot safely e used as an edible oil, owing to the presence of saponin, hich is a constituent of the seed. For the same reason he tea-seed oil-cake is decidedly dangerous as a food r cattle. As a manure it is far behind the other oil-eed cakes of commerce. The oil could be used as a amp oil, and the cake might be useful as an insecticide. t was attempted, in 1885, to put tea-seed, as such, on the ondon market, under the name "tanne," but the seeds ound no buyer, and the price asked sank quickly to a evel far below the cost of importation.

Linseed and Rapeseed in India.

Chem. and Druggist, Oct. 19, 1901.

The North-West Provinces estimate an output of pure nseed of 75,780 tons, showing an increase of 2,513 tons ver the last year's estimate, in consequence of the increased acreage sown. The estimated output of pure apeseed amounts to 24,060 tons, as compared with 21,186 ns estimated last year.

Linseed Exports of Pernau (Russia).

Foreign Office Annual Series, No. 2698.

Owing to the good crop of crushing linseed, the quantity hipped, in 1900 shows a large increase, against 1899, and s slightly in excess of the 1898 quantity. The following omparison of values may be of interest :--

Year.	Quantity.	Value.	Average Price per Quarter.
	Quarters.	£	£ *s.* *d.*
1898	20,118	29,532	1 9 4
1899	12,439	26,120	2 2 0
1900	21,736	51,220	2 7 0

Oil-seeds and Oilcake Exports of Libau (Russia).

Foreign Office Annual Series, No. 2698.

The export of oil-seeds, for 1900, shows an increase over 99, notwithstanding that the crop of linseed in this district s a failure, owing to the heavy autumn rain. The principal ature of this trade was a great rise in prices from the ening to the close of the season.

The export of oilcake increased in quantity, from 46,641 tons in 1899 to 51,539 tons in 1900; sunflower seed-cake was considerably in excess of linseed-cake.

Oil-seeds and Oilcake Exports of Riga (Russia).

Foreign Office Annual Series, No. 2698.

Crushing linseed was much in request, and from the beginning to the end of the year, prices rose about 25 per cent. The crops in the interior proved almost an entire failure, and very little seed reached this market, most of it being consumed by the local oil mills. The quantity exported from Riga was 34,258 tons, against 29,292 tons, in 1899, an increase of 4,966 tons. Of sowing linseed, the shipments slightly fell-off.

There was a largely reduced export of oilcake in 1900.

Hemp-seed is gradually disappearing from the list, 280 tons only having been exported, in 1900, against 1,668 tons, in 1899.

Oil-seed Export of Chinde (Portuguese East Africa).

Foreign Office Annual Series, No. 2699.

The export of oil-seed has declined, as the Zambesi native is, from various causes, ceasing to cultivate produce for sale.

Tallow Imports of Bahia (Brazil).

Foreign Office Annual Series, No. 2696.

Among the chief imports is tallow, 5,817 casks, from Uruguay and the United States.

Ozokerit Deposits in Finland.

Bd. of Trade J., Sept. 26, 1901.

A Russian engineer has lately discovered rich deposits of ozokerit along the bank of the Kemioki, not far from Tornea. The ozokerit is remarkable for its large content of paraffin, besides 6 per cent. of resins.

Sesame-seed at Baghdad (Turkey in Asia).

Foreign Office Annual Series, No. 2707.

The sesame crop was fair, and considerable quantities of the seed were exported to London and Marseilles, where the market was good.

Oil and Seed Trade in Marseilles.

U.S. Cons. Reps., Sept. 1901, 86.

Marseilles is the greatest manufacturing and consuming point, for vegetable oils, in the world. The soap trade absorbs most of the oil, and, in recent years, has purchased from 112,000 to 287,000 barrels of cotton-seed oil as well. Imports, in 1900, of all oil seeds, other than copra and palm kernels, were about 10,000 tons in excess of 1899, whilst imports of copra and palm kernels alone showed an increase of 12,000 tons over 1899. Local mills crushed all of the 350,000 tons imported, which, in addition to the 44,990 tons of oil imported, gave about 180,000 tons of oil. Of this the soap industry consumed about 85,000 tons.

This trade requires about 50 per cent. of cocoanut oil and 50 per cent. of ground nut or cotton-seed oil. Two-thirds of the copra, from which the cocoanut oil is produced, comes from Manila, and both the sun-dried and kiln dried qualities are handled, preferably the latter. Shippers in the East, other than those in the Philippine Islands, prefer to send kiln-dried copra. An increasing quantity of copra is required in this market, and other markets are being developed in the commercial centres of Europe.

The failure of the ground nut crops in India, some years ago, gave the first impetus to the cotton-seed oil trade in this port, but the Indian farmers, who had been in the habit of replanting their land with the last year's seed, are now cultivating their land carefully, and using the best quality of African nuts for seed. Last year, 18,750 tons of Indian ground nuts were received at Marseilles, a considerable increase over 1899, and it is expected that this year's arrivals will amount to 45,500 tons. These receipts will naturally affect American cotton-seed oil sales, as the latter is always marketable at a good price, and buyers in the soap trade seek it only when they are unable to secure cheaper vegetable oils.

The demand for low-grade cocoanut oil for soap manufacture tends to keep the Marseilles mills from manufacturing other cocoa products. One firm manufactures not only the ordinary soap oils, but a refined product, known as "vegetaline," fusible at 26° C., and cocoa butter proper, known here as "cacaoline," fusible at 31° C. "Vegetaline" is an edible copra oil. It sold throughout last year at 15·44 dols. per 220 lb., f.o.b., and the "cacaoline," which has the consistency of butter, brought 28·95 dols. per 220 lb. The producing capacity of this concern is about 50 tons of cocoa butter per month.

Vegetable lard finds a ready sale. The requirements amount to 80 tons daily of tallow and palm-kernel oil. Vegetable tallow of foreign manufacture is received mainly from China, and the annual imports are estimated at 500 tons. There is also manufactured in this city about 600 tons annually from Illippi nuts. The product contains 55 per cent. of fatty acid, and competes on even terms with tallow containing 43 per cent. of fatty acid.

Cocoanut oil is growing dearer from month to month, prices having risen from 9·65 dols. per 220 lb. in January to 9·80 dols. in May, with every prospect of retaining the present level, and probably of going a little higher.

Imports of Oleaginous Seeds for 1900.

	Tons.*
Ground nut	105,231
Wild rape	579
Cotton seed	20,882
Linseed	10,242
Hemp	2,730
Sesame	67,470
Poppy	2,973
Colza	4,015
Turnip	1,508
Copra	104,207
Palm	8,294
Other	21,048
Total for 1900	350,179
Total for 1899	325,974
Total for 1898	309,197

* Of 1,000 kilos., or 2,204 lb.

Exports of Vegetable Oils for 1900.

	Tons.*
Palm	92
Cocoanut	9,096
Castor seed	4,530
Linseed	586
Wild rape seed (ravison)	57
Niger	13
Cotton seed	1,877
Sesame	10,469
Ground nut	1,911
Colza	280
Poppy seed	52
Turnip seed	2
Other	138
Total for 1900	32,083
Total for 1899	36,607
Total for 1898	34,995

* Of 1,000 kilos., or 2,204 lb.

Exports of oil-seed cake of all descriptions, for 1900, were 50,377 tons.

Imports of Vegetable Oils for 1900.

	Tons.*
Palm	20,286
Cocoanut	10
Castor seed	9
Linseed	2
Cotton seed (United States, 42,100)	44,990
Sesame	15
Colza	5
Other	4
Total for 1900	65,321
Total for 1899	78,430
Total for 1898	72,687

* Of 1,000 kilos., or 2,204 lb.

Arrivals of Oil Seeds at Marseilles from January 1 *to May* 31, 1901.

Description.	1901.	1900.
Ground nuts:	Tons.	Tons.
Shelled	22,578	16,728
Unshelled	51,818	52,717
Linseed	3,893	5,119
Rape seed and ravison	1,398	1,504
Poppy seed	451	466
Castor seed	11,954	6,700
Cotton seed	11,249	4,494
Sesame seed	32,331	54,139
Copra	38,485	43,269
Palm kernels	2,839	3,831
Mowrah seed and Illippi nuts	1,362	908
Total imports	178,158	189,864

PALM OIL EXPORTS OF DAHOMEY.

Foreign Office Annual Series, No. 2706.

Country.	1898.		1899.		1900.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£	Tons.	£
France and colonies.	2,885	52,864	4,470	95,582	6,240	152,47
United Kingdom	..	..	15	..	2	48
Lagos	2,527	46,326	3,904	83,472	1,623	39,657
Germany	539	9,882	1,088	23,269	896	21,9
Total	5,951	109,072	9,477	202,323	8,761	214,0

In 1898, the total amount of palm oil exported was 5,951 tons, which, in 1899, increased to 9,477 tons, but in 1900, it fell off to 8,761 tons, which, for the three years, gives a total increase of 2,810 tons.

France holds the leading position, and has largely increased her take. In 1898, 48 per cent. of the total amount was shipped to France, in 1899, 47 per cent., but in 1900, the proportion was 71 per cent. The shipments to Lagos, *i.e.*, the United Kingdom, have decreased from 43 per cent., in 1898, to 41 per cent., in 1899, and 19 per cent., for 1900. Germany, on the whole, has shown an increase.

COPRA, COCOANUT OIL, AND VEGETABLE TALLOW IN THE STRAITS SETTLEMENTS.

U.S. Cons. Reps., Oct. 1901.

Copra.—During 1900, there was imported into the Straits Settlements $93,074,933\frac{1}{3}$ lb. of copra, the import value of which was 4,455,489 dols., Mexican.* Of this, Bali Island sent about 24 per cent.; Natunas, 17 per cent.; Dutch Borneo, 16 per cent.; Celebes, 11 per cent.; the Netherlands Archipelago, 7 per cent.; Sulu, 7 per cent.; and Johore, 6 per cent.

During the same year, there was exported $91,160,025\frac{2}{3}$ lb. of copra, valued at 4,416,937 dols., Mexican. The following countries received the greater part:—Russia, 39 per cent.; France, 32 per cent.; Italy, 10 per cent.; Spain, 5 per cent.; Germany, 4 per cent.; Austria, 3 per cent; and Belgium, 2 per cent. About one-fourth of 1 per cent. went to the United States.

Cocoanut Oil.—There was imported, during 1900, $10,105,733\frac{1}{3}$ lb., valued at which was 1,011,673 dols., Mexican. About 97 per cent. of the oil came from Dutch Borneo, whilst 1 per cent. came from Java and 1 per cent from Ceylon. During 1900, cocoanut oil was exported to the amount of $14,740,553\frac{1}{3}$ lb., valued at 1,500,910 dols., Mexican. There went to Siam, 30 per cent.; to Sumatra, 15 per cent.; to Penang, 7 per cent.; to Selangor, 6 per cent.; to Dutch Borneo, 5 per cent.; to Perak, 4 per cent.; and to Java, 4 per cent.

Vegetable Tallow.—Imports, during 1900, amounted to $52,533\frac{1}{3}$ lb., valued at 7,034 dols., Mexican, whilst exports nounted to 91,900 lb., valued at 37,948 dols., Mexican. bout 60 per cent. of these imports came from Japan, and e remainder from Burma; all was exported to Great ritain.

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* 10 Mexican dols. = 1*l.* sterling.

XIII. A.—PIGMENTS, PAINTS, Etc.

Paints in the Crimea (Russia).

Foreign Office Annual Series, No. 2709.

Paint for ships is manufactured locally in large quantities t of inferior quality. A good non-corrosive paint could be roduced into the market, for the use of the Black Sea eet. At present, cargo ships are docked at Galatz, but ien the new large Russian docks are complete, painting d repairs to ships' hulls will be done in this country. is should lead to an increased demand for paint.

Aviavy: New Gum from Madagascar.

Moniteur Officiel du Commerce, 1901.

Aviavy seems to be the Malagasy name for the fig tree. avy (or aviavindrane) is abundant in the coast marshes m Tamatave to Mananjary.

Incisions made in the branches cause a milky fluid to w, which is used by the natives only for dressing wounds. is local use explains, no doubt, the cuts noticed on the nks of this fig tree. It coagulates easily by simple posure to the air; the action of sea-salt is little marked the coagulation, but this may easily be obtained by the ion of salt and heat combined. One may thus procure m the juice a coagulated mass, equivalent to two-thirds the juice treated. This product is soft, elastic, adheres to fingers like glue, and can be drawn out in long threads, ich do not harden in the air. The abundance of aviavy such, that in case the product of the coagulation should et with some industrial employment, an important source revenue for certain regions of Madagascar would arise m its exploitation.

XIII. B.—RESINS, VARNISHES, Etc.

Amber at Dantzig (Germany).

Foreign Office Annual Series, No. 2697.

The acquisition of the amber mines in the province of t Prussia by the State, and the cessation of the monopoly, e done good to the amber trade generally.

he demand for raw ambroid was brisk. Since ambroid been made, the sale of black amber goods has been ersely affected. Many people cannot tell the difference ween the real article and the pressed. Approximately, detailed statistics being available, 13 tons of raw amber, ie 10,000*l.*, reached Dantzig in 1900.

XIII. C.—INDIA-RUBBER, Etc.

Rubber Exports of Dahomey.

Foreign Office Annual Series, No. 2706.

Country.	1898.		1899.		1900.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£	Tons.	£
ice and lonies.	1¼	154	2	320	11	2,218
ed Kingdom	..	..	..	..	..	14
s..........	1¾	193	10½	1,712	8	1,546
nany	10	1,189	1½	257	1	196
Total	13	1,536	14	2,289	20	3,974

Rubber Exports of Bahia (Brazil).

Foreign Office Annual Series, No. 2696.

idia-rubber was shipped for a very small amount—5 casks. The only quality seen on this market is the gabeira, a low class rubber containing much moisture, only saleable at low prices. The United Kingdom and the United States receive most of the shipments, and efforts are being made to ensure greater care in the collection of the crop. The new rubber, now on the way down from the interior, is reported to be of superior quality.

XIV.—TANNING, LEATHER, GLUE.

Gambier in Sarawak.

Foreign Office Annual Series, No. 2711.

Gambier is doing better than for many years past, and extensive gardens are being opened, especially by the Borneo Company, Ltd., who have some 3,000 acres under cultivation; 2,290 tons were exported in 1900.

Hides and Skins at Libau (Russia).

Foreign Office Annual Series, No. 2698.

Hides and skins show an increase of 2,395 tons over 1899, 4,905 tons against 2,510 tons in 1899.

Hides at Bahia (Brazil).

Foreign Office Annual Series, No. 2696.

The export of hides was less, on account of the droughts which prevailed in 1899 and 1900, and caused the wholesale destruction of cattle by the peasants. The United States were the chief purchasers, Germany being next. The quality of the locally tanned leather is not high, but apparently suits the natives.

Goat skins are sold in bales of 300 skins, and all go to the United States. American and German firms control the whole of the trade.

Hides Exports of Bangkok (Siam).

Foreign Office Annual Series, No. 2705.

In 1900, hides decreased from 45,200*l.* to 38,585*l.*

Glyceretannate; or Tannate of Glycerin: U.S. Customs Decisions.

Bd. of Trade J., Oct. 10, 1901.

Tannate of glycerin, or "glyceretannate," is dutiable at the rate of 50 cents per lb. under section 7 and paragraph 1 of the Tariff Act, being assimilated to tannic acid or tannin.

Galls at Baghdad (Turkey in Asia).

Foreign Office Annual Series, No. 2707.

The gall crop was very full, the largest that has been known for many years, and was of very good quality. Prices opened at 18*l.* 10*s.* per cantar (about 640 lb.), but by the end of the year declined to 11*l.* 16*s.* 10*d.* per cantar.

XV.—MANURES, Etc.

Phosphate Production of United States.

Chem. Trade J., Oct. 12, 1901.

The annual report of the United States Geological Survey, showing the production of phosphate rock, during 1900, has been issued.

The report states that the decreased production in Florida and South Carolina was due to two causes—scarcity of transportation facilities, with consequent high ocean freight rates, and low prices for superphosphates, which discouraged manufacturers from buying crude rock at the general higher prices which prevailed during the year. In Florida, the decreased production was in the output of hard rock and river pebble, there being an increase of 44,000 tons in the production of land pebble, which was not sufficient, however, to overcome the decrease in the other two grades of rock. No production of soft rock has been reported from Florida since 1897. In South Carolina the production of land rock increased from 223,949 long tons, in 1899, to 266,186 long tons, in 1900, whilst the production of river rock fell off 50 per cent.—from 132,701 long tons, in 1899, to 62,987 long tons, in 1900. Tennessee's production increased from 430,192 long tons to 454,491 long tons. None was reported from North Carolina, in 1900, and the output in Pennsylvania decreased from 2,000 tons, in 1899, to 900 tons, in 1900. Two States, Alabama and

Arkansas, each reported a small production of phosphate rock, in 1900, the former having an output of 344 tons and the latter an output of 75 tons. These amounts are of interest only as indicating a possibility of further developments. The total amount of phosphate production reported to the survey, in 1900, was 1,491,216 long tons, against 1,515,702 long tons, in 1899, a decrease of 24,486 long tons. Notwithstanding this decrease in production, the total value of the product increased from 5,084,076 dols. to 5,359,248 dols., a gain of 275,172 dols.

The average price per ton for Florida hard rock advanced from 3·81 dols., in 1898, to 4·60 dols., in 1899, and 5·25 dols., in 1900. The increased production of land pebble was accompanied by a decrease in the average price per ton from 2·91 dols., in 1899, to 2·77 dols., in 1900. The latter price was considerably in excess of the price, in 1898, when the average price per ton was 1·89 dols. The decreased production of river pebble was, on the other hand, accompanied by an advance in price from 1·90 dols., in 1899, to 2·36 dols., in 1900. The price of South Carolina land rock, in 1900, was a fraction less than 3·30 dols. per ton, the price which ruled during 1899. In 1898, the average price for South Carolina land rock was 2·87 dols. South Carolina river rock showed an advance from 2·48 dols., in 1898, to 2·56 dols., in 1899, and 2·61 dols., in 1900. The price of Tennessee rock showed a noticeable improvement, in 1899, as compared with the preceding year, advancing from 1·62 dols. to 2·77. A further advance to 2·92 dols is shown in the returns for 1900. The principal reason for the advances in price of Tennessee rock, in 1899 and 1900, was the improvement in preparation of the material for market. The general advance in values in these years had also some effect upon the Tennessee market. The amalgamation of some of the more important concerns has eliminated to a considerable extent the competition for trade, which adversely affected prices during the three or four years immediately following the development of the phosphate rock deposits in this State. In 1897, the average price obtained for Tennessee rock was only 1·50 dols. per ton, in the majority of cases below the cost of production.

PHOSPHATES IN ALGERIA.

Foreign Office Annual Series, No. 2710.

The output of the phosphate mines in the department of Constantine continues to increase. The following table shows the yield since 1893, the year when the industry commenced:—

	Tons.
1893	5,042
1894	47,245
1895	111,372
1896	140,983
1897	217,346
1898	246,000
1899	281,816
1900 (first six months)	146,297

Philippeville.

Nothing further has been done in phosphates. The outcry against the leases granted by the Commune of Morsott to the British houses, in 1895, resulted in the decree of 1898, which has put an end to any extension.

It is feared that the Decree of 1898 will not be withdrawn. The powerful company now working the four beds (Tocqueville, Ain Kissa, Dyr, and Kouif), uses every means to prevent others from coming in.

Bone.

The quantities of phosphates exported, in 1900, are as follows:—

	Tons.
United Kingdom	71,638
France	63,108
Italy	37,800
Germany	34,172
Belgium	5,900
Spain	2,120
Austria-Hungary	2,312
Holland	4,520
Roumania	1,775
Japan	5,000
Total	231,645

SUPERPHOSPHATES AT ODESSA (RUSSIA).

Foreign Office Annual Series, No. 2709.

Small quantities of British superphosphates are bein imported. This has not been done before, and though the are being used in the vineyards of the Crimea, they wil hardly be able to compete with the Russian basic slag now being prepared at Marinpol.

MANURES IN THE CANARY ISLANDS.

Foreign Office Annual Series, No. 2605.

There is an increasing demand for artificial manure from the Canary Islands. England supplies the largest amount France, Spain, and Germany, however, share in this busines which is extending. Sulphate of ammonia, superphosphates, nitrate of soda, &c., are imported.

ARTIFICIAL MANURES IN SPAIN.

Bd. of Trade J., Sept. 19, 1901.

The development of beet production in Spain has create such a demand for artificial manures that Spanish dealer find it very difficult to fill contracts. Valencia alone imports from England 50,000 tons of sulphate of ammonia 8,000 tons of superphosphate, and 20,000 tons of dark gre saltpetre. Sulphates of ammonia are mostly in demand they usually contain from 24 to 25 per cent. of ammonia or 20 to 21 per cent. of nitrogenous matter.

GUANO IN CHILE.

Foreign Office Annual Series, No. 2700.

During the past year, 12,781 tons of guano were shippe from Punta Pichalo, in the Bay of Pisagua, to Valparais and Talcahuano. In the existing Government concession, stipulation exists, prohibiting the exportation of Pichal guano outside Chile, presumably with the object of givin the country the benefit of a cheap fertiliser, the principa fertilising ingredients of which are nitrogen and phosphori acid, 2 to 3 per cent. of the former, and an average of 25 pe cent. of the latter.

PHOSPHATE IMPORTS OF CIVITAVECCHIA (ITALY).

Foreign Office Annual Series, No. 2703.

Phosphate, now largely used as manure, begins to fo an important item in the import trade of this port.

XVI.—SUGAR, STARCH, Etc.

GLUCOSE AND INVERT SUGAR IN BEER.

London Gazette, Oct. 15, 1901.

Prohibition, under Section 5 of "The Customs an Inland Revenue Act, 1888," of the use in beer of certai substances.

Whereas it appears to the satisfaction of the Lord Commissioners of His Majesty's Treasury that glucos containing arsenic, and invert sugar containing arseni are substances which are capable of being used in th manufacture and preparation for sale of beer, and that th said substances are of a noxious and detrimental nature.

Now, the said Lords Commissioners, under the powe conferred upon them by Section 5 of "The Customs an Inland Revenue Act, 1888," do hereby prohibit the use i the manufacture and preparation for sale of beer of an glucose or invert sugar containing arsenic.

Dated this 10th day of October 1901.

N.B.—A penalty of 50*l.* is imposed by the said sectio for any breach of this prohibition.

W. H. FISHER.
H. T. ANSTRUTHER.

CANE SUGAR IN THE SOUDAN.

Bd. of Trade J., Oct. 10, 1901.

There is an opening for the cultivation of sugar cane i the Soudan on a large scale. Preliminary experiment would have to be made, but the sugar would find a read arket there, the people preferring the coarser, dirtier, and eeter but cheaper sugar to the white and expensive sugar f which Egypt sends up large quantities. A sugar refinery Khartoum or Wad Medani would probably recoup its vner.

SUGAR EXPORTS OF DANTZIG (GERMANY).

Foreign Office Annual Series, No. 2697.

Owing to the comparatively large stocks remaining over r shipment from the year before, the export of beet gar, in 1900, shows an increase of 72,800 tons as ainst 1899. The figures were 231,090 and 158,265 tons. ie United Kingdom was the largest purchaser, in 1900, king 102,251 tons, then came the United States of nerica, with 19,496 tons, the different ports in Africa, ,928 tons, and Holland, 13,863 tons.

SUGAR EXPORTS OF BAHIA (BRAZIL).

Foreign Office Annual Series, No. 2696.

Less sugar was exported than in 1899, owing to the rease in the local consumption. Formerly, sugar was ported from Pernambuco and refined in Bahia, but last ar, refiners used their own sugar instead of shipping it. e quality of the crop was average, and prices ruled very w.

The sugar trade is in a bad condition. Increased cost of duction, caused by dear labour, and the expense of fuel l transport paralyse this industry, and matters appear to from bad to worse.

SUGAR IN BRAZIL.

Bd. of Trade J., Sept. 26, 1901.

The cane-sugar industry in Brazil has not hitherto acted much attention from European or American italists. The total production is estimated at 250,000 s.

The export of sugar to foreign countries, in 1900, was ut 30,000 tons, and the remaining 220,000 tons were pped to different States of the Republic, or consumed on spot.

ompared with the large area under cultivation, the tories are but few, and in only one is the diffusion cess employed.

Vith a large production and consumption of sugar, there o regular refinery in Brazil. At present, the different ars, raw, crystals, whites, yellows, &c., &c., are worked by small refineries into more or less white powder, which s by the name of refined sugar in the country.

ne of the most successful of the central factories is eavouring to establish a refinery in Rio de Janeiro.

he sugar industry in Brazil, compared with the enor- is area fit for production, would appear to be yet in its infancy. What has still to be done is to complete the factories, improve the cultivation of the cane, and establish extensive refineries.

STARCH IN EGYPT.

Bd. of Trade J., Sept. 26, 1901.

Wheaten starch is used extensively in the preparation "rahat lakhoum." Rice starch, used only for laundry purposes, is much less in demand. A single factory at Cairo manufactures wheat starch. Imports are chiefly from Germany, England, France, Belgium, and Turkey.

Confectioners buy only lump starch of a bluish tinge. This variety is imported chiefly from England, in cases containing 50 lb. net, and is delivered, f.o.b. Alexandria, at about 12*s.* 6*d* per case. It has a large sale in the interior of Egypt, but is not entirely satisfactory to the local trade of Alexandria.

The article furnished by France and Belgium is practically of the same quality, and is not easily distinguished from the English product by the Egyptian buyer. The current price is about 34 francs (27*s.*) per 100 kilos (220·46 lb.), f.o.b. Alexandria. It comes packed in boxes of 25, 50, and 75 kilos, (55, 110, and 165 lb.) Tare is deducted, and, contrary to Eastern custom, no charges are made for packing. This starch is put up in packages, containing only 2 kilos. (4·4 lb.) each, and sold at an advance of 2 francs (1*s.* 7*d.*) per 100 kilos.

Syria also supplies large quantities of corn and wheat starch; but as the pieces are rather small in size, and of a yellowish colour, this article finds a market only on account of its low price.

Rice starch is imported from England, Germany, France, and Belgium; the products of the last three countries do not differ in quality. The starch is usually imported in cases containing 12 packages, each package weighing about 25 kilos. There are two grades, the first being sold at from 48 to 50 francs (1*l.* 18*s.* 6*d.* to 2*l.*), and the second at from 40 to 42 francs (1*l.* 12*s.* to 1*l.* 13*s.* 6*d*) per 100 kilos. (220·46 lb.), f.o.b. Alexandria. The German article, especially a Hamburg brand, is reported to have found a very ready sale in recent years.

English laundry starch also finds a good market in Egypt, and is shipped in boxes of from 50 to 55 lb. During last spring, it was sold at from 20*s.* to 25*s.* per cwt. (112 lb.), f.o.b. Liverpool.

The usual terms of payment for imported starch are cash within 30 days, with a discount of from 2 to 3 per cent.

SUGAR STATISTICS FOR 1900—1901.

Foreign Office Annual Series, No. 2709.

The following table gives the number of factories, their production, area under cultivation, yield of roots per acre, &c., for the "campaign" of 1900—1901 :—

Country.	Number of Factories.	Area under Cultivation.	Quantity of Roots Used.	Quantity of Sugar Produced.	Yield of Roots per Acre.	Yield of Sugar per Acre.	Percentage of Sugar to Weight of Beet.
		Acres.	Tons.	Tons.	Cwts.	Cwts.	
nany	395	1,111,401⅓	12,677,879	1,681,115	228	30	13·2
ice	334	698,513¾	8,306,331	939,410	238	26¾	11·3
a	274	1,322,191¼	6,340,348½	786,175	96	11¾	12·3
ria-Hungary	213	855,219¾	7,288,519	942,066	170	22	12·9
ium	106	173,384¾	2,422,290	283,709	277	32¾	11·7
and	32	115,038	1,204,921	148,340	209	25¾	12·3
len.	16	72,635¼	851,840½	98,211	234½	27	11·5
ark	7	35,255	393,548	44,274	223	25	11·2
Total	1,377	4,383,640¾	39,485,477	4,923,300	..	..	..
Total, 1899–1900	1,385	4,107,432	39,183,740	4,585,098	..	..	..

om the foregoing figures it will be seen that Russia, in ison to the other beetroot-producing countries of Europe, has the largest area under cultivation; (2) stands in number of factories; (3) stands fourth in the tity of roots used and of sugar produced; (4) stands st in the yield of roots and sugar; and (5) stands third e percentage of sugar to the weight of beet.

SUGAR PRODUCTION OF RUSSIA FOR 1900—1901.

Foreign Office Annual Series, No. 2709.

The "campaign" of 1900–1901, with 272 factories in operation, yielded approximately 48,742,849 poods (786,175 tons) of sugar, and to this must be added the "reserves" from the previous "campaign" of 5,230,704 poods

(84,366 tons), thus giving an approximate available total of 53,973,553 poods (870,541 tons). The disposal of this quantity will be as follows:—

——	Quantity.	
	Poods.	Tons.
Home consumption	38,000,000	612,903
Inviolable reserve	3,500,000	56,451
Voluntary reserve for export to Asia Finland, and Europe.	12,473,553	201,186
Total	53,973,553	870,540

XVII.—BREWING, Etc.

Glucose and Invert Sugar in Beer.

See under XVI., *page* 1046.

Beer at Oran (Algeria).

Foreign Office Annual Series. No. 2710.

Beer imports, in 1899, amounted to 1,161 tons. This, through the establishment of a brewery here, was reduced, in 1900, to 280 tons. This brewery is doing well, and its productions are excellent and cheap.

XVIII. A.—FOODS.

Oleomargarine in Mexico.

Bd. of Trade J., Sept. 1901.

Oleomargarine imported into Mexico will, in future, be dutiable, under No. 47 of the Mexican Tariff, at the rate of 20 cents (Mexican) per kilog., instead of, as formerly, at the rate of 75 cents per kilog.

XVIII. C.—DISINFECTANTS.

Sheep Dip Duty Free in United States.

U.S. Treasury Circular.

A yellow substance, with a pronounced sulphur odour, and about the consistency of ordinary butter, which is described in the invoice, and on the labels of the package, in which it is contained, as "Hayward's paste sheep dip" and as "Hayward's sulphur paste dip," which the chemist reports to be composed variously of sulphur, phenol acids, arsenious oxide, sodium arsenite and arseniate, arsenious sulphide and sodium chloride, and is expressly intended for use as a sheep dip, and is not fit for other commercial purposes, is exempt from duty, under the provisions of paragraph 657, Act of 1897.

XX.—FINE CHEMICALS, Etc.

Drug and Chemical Imports in Cape Colony.

Pharm. J., Sept. 14, 1901.

The quantities and values of the drugs and chemicals imported from the United Kingdom, during 1900, were as follows:—Acetic acid, 2,915 gals., 572*l.*; nitric acid, 3,832 lb., 12*l.*; sulphuric acid, 471,984 lb., 2,252*l.*; tannic acid, 1,233 lb., 139*l.*; borax, 57,453 lb., 1,372*l.*; cyanide of potassium, 420,052 lb., 20,113*l.*; potash, 63,692 lb., 933*l.*; soda (compounds of), 17,353 lb., 331*l.*; rock sulphur, 5,265 lb., 16*l.*; drugs and chemicals for medicinal purposes 116,321*l.*; gambier, 66,976 lb., 470*l.*; castor oil, 14,896 gals., 4,385*l.*; linseed oil, 105,850 gals., 14,917*l.*; palm oil, 1,678 gals., 208*l.*; perfumed oil, 122*l.*; ochre, 2,156,690 lb., 5,714*l.*; perfumery, 11,499*l.*; photographic materials, 26,344*l.*; food extracts and essences, 33,767*l.*; common salt, 9,101,473 lb., 4,218*l.*; rock salt, 286,998 lb, 173*l.*; saltpetre, 25,917 lb., 198*l.*; sheep-dip, 34,498*l.*; soap (common brown), 15,595,239 lb., 126,221*l.*; ditto (other kinds), 249,507 lb., 13,113*l.*; caustic soda, 5,669*l*; starch, 1,012,380 lb., 9,888*l.*; sulphur (flowers of), 7,479 cwt., 3,321*l.*

U.S. Customs Decision.

Bd. of Trade J., Oct. 10, 1901.

Creolin, Hydroquinone and Resorcin, purified. — 1. Creolin, or "Creolin, Pearson," produced from coal tar and other substances, is a chemical compound and medici proprietary preparation, dutiable at the rate of 25 per ce *ad valorem*, under paragraph 68 of the Tariff.

2. Hydroquinone (or hydrochinon) and resorcin, purifi are chemically diatomic phenols, prepared from coal-t products, in combination, perhaps, with other substanc and are intended, and used chiefly, if not exclusively, medicinal purposes, and are therefore dutiable at 25 p cent. *ad valorem* under paragraph 68.—Impure artic bearing the same name, however, which are prepared fr coal tar products, and are used chiefly in the manufact of dyes, such as fluorescin, eosine, and uranine, and f other purposes in the arts, are dutiable at the rate of 20 p cent. *ad valorem*, under the provision for coal-tar prepa tions, in paragraph 15.

Camphor and Camphor Oil in Formosa (Japan)

Japan Weekly Mail, Aug. 20.

Camphor.

The amount of camphor sold since the establishment the monopoly (July, 1900), to the end of March, 1901, w 3,685,500 kin,* valued at 3,233,455 yen † In March la two other grades began to be produced, one by the proce of drying, and the other by that of pressure, the outp being 145,669 kin, valued at 13,112 yen. The quantity crude camphor in stock, at the end of the year 19 amounted to 300,000 kin; thus the total output in t Island for the period extending from July, 1900, to the e of March last, amounted to 4,131,169 kin.

Camphor Oil.

The following is the value of the export of camphor for the four years from 1897 to 1900:—

Years.	To Japan.	To Foreign Countries.	Tota
	Yen.	Yen.	Yen.
1897	184,109	1,321,116	1,505,225
1898	304,830	1,661,945	1,966,775
1899	292,261	1,732,740	2,025,00
1900	1,000,938	1,385,645	2,386,58

Vanilla Planting in Seychelles.

Bd. of Trade J., Oct. 3, 1901.

Although, in 1900, the amount of vanilla exported w 17,569 kilogs., the actual crop of that year did not exce 12,000 kilogs., some of the vanilla of 1899 being includ in the shipments of 1900. The output for 1901 w probably be the largest on record.

The preparation of vanilla has improved of late ye Nearly all is cured in drying rooms, heated with hot a instead of being left to dry in the sun. Large prepar of vanilla are now building houses of two stories, in whi the whole process of preparation, from steaming the gre pods to packing the prepared vanilla, is carried out. 1900, prepared vanilla sold at Rs. 12 to Rs. 20 per lb. the Blue Book Report, for 1899, hints were given as vanilla cultivation. There is also an excellent treatise the subject by Mr. J. S. Galbraith, published by the Department of Agriculture.

Drugs and Medicines in Nicaragua

Chamber of Com. J., Oct. 1901.

The German Consul at Nicaragua states that drugs a medicines, which formerly came exclusively from Gr Britain and the United States of America (the latt supplied especially patent medicines) to Nicaragua, we also imported from Germany, in recent years. Althou the importation of these articles from Germany h considerably increased, there is yet a vast field open.

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* Kin = 1·32 lb. † Yen = 2s. 0½d.

Chemicals and Drugs at Varna (Bulgaria).

Chamber of Com. J., Oct. 1901.

ccording to a German Consular report from Varna, the ortations of chemical productions, drugs, and medicines very much diminished. Great Britain, Germany, ium, Austria Hungary, and France, which competed essfully in those articles, have now met with a new petitor—Italy. English, as well as Belgian and Turkish, s obtain the greatest sale; sundry salts and acids for ag purposes are supplied by Great Britain, Italy, and l quantities by Germany. As to drugs, Austria-gary and Germany dominated the market. Whilst aan and Austrian medicines diminished in demand, ch ones got into better favour.

Food and Drugs Act in Natal.

Chem. and Druggist, Oct. 12, 1901.

e Natal Government *Gazette* of September 10 contains ext of the Act to amend the law relating to the adultera- and fraudulent sale of food and drugs, Section 7 of ll. of which provides: "A drug shall be deemed to ld to the prejudice of the purchaser—(*c*) If being under the name given to a drug in the British Pharma- ia, it is not of the strength, quality, or purity of the ard prescribed by the British Pharmacopœia; (*f*) If professedly sold as being of any strength or purity, s strength or purity are not as represented."

XXI.—PHOTOGRAPHY.

otographic Chemicals and Apparatus at Rio Grande do Sul (Brazil).

Foreign Office Annual Series, No. 2702.

tographic apparatus is chiefly imported from the l Kingdom, but the films, plates, and chemicals from any, on account of their cheapness. These latter often issatisfaction, and are not to be compared with British actures.

XXII.—EXPLOSIVES, Etc.

ı Imports of Chinde (Portuguese East Africa).

Foreign Office Annual Series, No. 2699.

nese-made matches, introduced from Bombay, have unsuitable, as their composition cannot resist the limate, and they become useless.

Matches at Rio Grande do Sul (Brazil).

Foreign Office Annual Series, No. 2702.

ches are manufactured in Rio Grande and Porto , and fully supply local requirements.

Matches: Netherlands Prohibition.

Board of Trade J., Sept., 1901.

inisterial order prohibits the manufacture, sale, and ation of phosphorus matches to an amount exceeding . Transit is allowed. The law comes into effect 1901, as regards the manufacture, and on January 1, s regards the importation and sale.

BOARD OF TRADE RETURNS.

Summary of Imports.

Articles.	Month ending 30th Sept. 1900.	Month ending 30th Sept. 1901.
	£	£
....	2,870,902	2,539,188
s and dyestuffs	383,239	444,576
....	925,358	816,507
terials for non-textile in- s.	6,483,410	5,189,448
al value of all imports	10,662,909	8,989,719

Summary of Exports.

Articles.	Month ending 30th Sept. 1900.	Month ending 30th Sept. 1901.
	£	£
Metals (other than machinery)	3,376,608	3,012,641
Chemicals and medicines	627,217	680,399
Miscellaneous articles	2,853,870	3,012,479
Total value of all exports. . .	6,857,695	6,705,519

Imports of Metals for Month ending 30th Sept.

Articles		Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
Copper:—				£	£
Ore	Tons	6,883	9,811	117,676	118,574
Regulus	„	9,001	5,561	368,764	243,291
Unwrought.....	„	4,986	5,143	368,469	354,005
Lead, pig and sheet	„	15,022	20,028	260,337	238,840
Pyrites	„	65,201	46,362	110,285	78,275
Quicksilver	Lb.	4,060	37,724	411	4,412
Silver ore.......	Value £	..	..	61,855	94,970
Tin	Cwt.	66.131	77,693	470,821	453,215
Zinc..............	Tons	5,543	6,728	108,358	115,974

Imports of Chemicals and Dyestuffs for Month ending 30th Sept.

Articles.		Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
				£	£
Bleaching materials	Cwt.	23,611	20,017	11,126	6,909
Soda compounds...	„		21,993		7,237
Borax, &c.	„	24,467	22,435	12,565	9,949
Brimstone	„	85,501	53,272	22,672	11,055
Nitrate of potash..	„	24,808	16,705	21,563	14,505
Chemicals, other	Value £	..	..	107,703	135,684
Cutch and gambier.	Tons	1,593	1,792	28,860	42,819
Dyes:—					
Alizarin.......	Value £	..	..	11,680	11,018
Aniline and other	„	..	..	35,343	45,776
Indigo	Cwt.	326	564	3,907	8,528
Bark..............	„	15,131	41,879	5,231	17,547
Valonia...........	Tons	1,914	2,902	20,900	31,232

Imports of Raw Material for Non-Textile Industries for Month ending 30th Sept.

Articles.		Quantities. 1900.	Quantities. 1901.	Value. 1900.	Value. 1901.
				£	£
Bark, Peruvian ..	Cwt.	1,051	1,696	2,919	6,850
Caoutchouc	„	25,025	32.870	290,721	402,465
Gum:—					
Arabic	„	4,896	16,002	11,510	38,082
Lac, &c.	„	5,176	1,972	15,355	6,384
Gutta-percha	„	15,271	10,980	229.818	167,885
Hides, raw:—					
Dry............	„	44,386	26,409	103,297	69,466
Wet	„	44,329	69,375	106,087	169,956
Ivory	„	614	1,135	24,478	38,039
Manure:—					
Guano	Tons	5,183	1,807	25,358	6.750
Bones..........	„	4,588	5,903	19,090	22,940
Paraffin..........	Cwt.	61,065	54,170	89,810	63,062
Linen rags	Tons	836	1,117	8,993	9,759
Esparto	„	11,435	9,229	43,150	36,417
Pulp of wood.....	„	44,306	33,023	220,804	176,740
Rosin............	Cwt.	110 678	157.469	32,434	37,269
Tallow and stearin	„	127,755	129,222	159,985	168,186
Skins:—					
Goat	No.	995.953	2,212,356	93,617	190,220
Sheep..........	„	910,540	1,047,229	93,330	98,336
Nitrate of soda...	Tons	2,495	6,395	19,754	48,646
Phosphate of lime	„	23,875	32,880	39,677	54,096

IMPORTS OF OILS FOR MONTH ENDING 30TH SEPT.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Coco-nut Cwt.	30,309	30,666	36,398	37,063
Olive Tuns	447	1,286	17,980	47,921
Palm Cwt.	76,141	90,781	83,256	102,010
Petroleum :—				
Illuminating Gall	17,790,500	15,727,667	361,788	278,287
Lubricating „	2,466,697	2,425,270	85,828	77,059
Seed Tons	5,104	2,252	127,993	58,177
Train, &c. Tuns	2,321	2,812	40,367	48,486
Turpentine Cwt	63 371	72,439	88,333	92,534

IMPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 30TH SEPT.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Cement Tons	8,627	21,249	15,650	36,303
China and earthenware. Cwt.	30,604	34,437	79,182	86,357
Drugs Value £	..	..	101,513	84,246
Glass :—				
Sheet Cwt.	68,815	107,421	39,881	59,247
Plate „	11,262	29,116	13,703	32,162
Flint „	36,697	51,990	65,919	92,673
Bottles Gross	107,214	107,720	44,871	45,790
Other Cwt.	26,112	21,218	43,417	46,117
Glue and gelatin. .	13,901	16,045	30,067	32,644
Leather, unmanufactured. „	105,821	94,846	613,138	578,650
Oil-seed cake Tons	17,577	24,500	119,076	165,209
Paints and pigments. Value £	..	..	106,470	111,140
Paper, pasteboard Cwt.	497,913	471,656	337,124	327,213
Scientific instruments. Value £	..	..	45,656	64,578
Soap and soap powder. Cwt.	24,500	51,158	27,977	44,637
Zinc manufactures. „	30,487	38,109	38,504	43,455

EXPORTS OF METALS (OTHER THAN MACHINERY) FOR MONTH ENDING 30TH SEPT.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Brass Cwt.	10,068	8,862	51,573	42,038
Copper „	67,518	70,654	264,229	260,141
Lead Tons	2,835	2,629	54,450	37,412
Plated wares Value £	..	..	41,541	42,009
Tin Cwt.	12,457	11,426	88,194	70,503
Zinc „	13,455	13,157	14,038	19,155

EXPORTS OF DRUGS AND CHEMICALS FOR MONTH ENDING 30TH SEPT.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Alkali Cwt.	247,878	..	78,913	..
Bleaching materials „	76,235	95,736	22,635	31,835
Copper sulphate Tons	479	243	11,269	5,287
Chemical manures „	36,727	39,258	173,537	187,904
Medicines Value £	..	..	96,162	103,566
Soda compounds :—				
Ash Cwt.	..	126,853	..	27,214
Caustic „	..	101,741	..	51,422
Bicarbonate „	..	23,224	..	7,929
Crystals „	..	27,270	..	3,843
Sulphate „	..	46,718	..	3,719
Other sorts „	..	25,496	..	11,417

EXPORTS OF MISCELLANEOUS ARTICLES FOR MONT ENDING 30TH SEPT.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	19
			£	
Gunpowder. Lb.	793,300	Cwt.7,114	15,782	1
Candles „	1,413,800	1,841,100	25,501	3
Caoutchouc Value £	..	..	113,973	8
Cement Tons	20,300	22,801	38,806	4
Products of coal. Value £	..	..	124,896	7
Earthenware „	..	..	147,822	13
Stoneware „	..	.	15,152	1
Glass :—				
Plate Sq. Ft.	181,912	Cwt.5,144	11,879	
Flint Cwt.	8,758	8,739	20 011	9
Bottles „	69,657	67,156	35,505	3
Other kinds „	15,473	15,955	16,645	1
Leather :—				
Unwrought „	10,338	9,744	99,998	10
Wrought Value £	..	..	45,618	5
Seed oil Tons	2,270	3,439	69,290	9
Floorcloth Sq. Yds.	2,043,900	1,979,300	103,342	9
Painters' materials Val. £	..	..	167,740	15
Paper Cwt.	92,672	70,223	137,384	11
Rags Tons	4,110	4,989	24,722	3
Soap Cwt.	62,835	103,349	67,142	8

Monthly Patent List.

* The dates given are the dates of the Official Journ which acceptances of the Complete Specifications are adver Complete Specifications thus advertised as accepted are o inspection at the Patent Office immediately, and to oppo within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINER

APPLICATIONS.

23,044*a*. P. Naef. Apparatus for stirring or inje fluid into fuel in gas producers or into other solid mat Filed Sept. 17. Date claimed Dec. 17, 1900.

18,697. J. Hargreaves. Improvements in the evapor of liquids and the concentration of solutions. Sept. 1

19,071. W. F. Singer. Improvements in compre Complete Specification. Sept. 24.

19,147. J. F. Simmance and J. Abady. Improve in air-cooled condensers. Sept. 25.

19,237. E. Füllner. An improved process of separ mechanical admixtures from liquids, and apparatus the Complete Specification. Sept. 26.

19,300. W. H. Barker and J. Langcake. Improve in carburettors. Sept. 27.

19,349. T. H. Butt. Improvements in and relati collecting solids deposited in purifying apparatus. Se

19,633. H. Brier. Improvements in gas compre Complete Specification. Oct. 2.

19,823. F. E. Whitham. Improvements in apparat separating water or other liquid from solutions. Oct.

19,919. A. Lange. Improvements pertaining to recep for liquefied gases. Oct. 5.

20,389. F. Atherley and W. H. Buxton. Improved of carburettor. Oct. 11.

COMPLETE SPECIFICATIONS ACCEPTED *

1900.

17,739. W. H. F. Ohlsen. Gas compressing appa Sept. 25.

18,051. J. Radcliffe. Heaters and condensers. Oct

18,365. W. Foulis. Apparatus for charging retort for drawing the charge from retorts. Oct. 9.

19,081. F. W. Petrie and R. Cunliffe. Machine drying barm and other substances or materials. Oct.

20,353. M. Kasper. Apparatus for cooling or he liquids and for purifying gases. Sept. 25.

21,172. W. J. Bosley, W. G. Owen, and A. G. Filter cloth for sewage sludge, yeast, wine, or othe presses. Oct. 2.

21,571. J. B. Alliott and J. M. C. Paton. Apparatus for porating or concentrating *in vacuo*. Oct. 16.

2,137. J. Mecredy. Evaporating apparatus. Oct. 9.

23,574. E. H. Stein. Iron shaft-furnace for burning ent, lime, and the like. Oct. 2.

1901.

519. J. Wezel. Improvements in or connected with naces. Oct. 2.

0,303. O. Michael. Crucible furnace. Oct. 2.

4,513. C. Karfunkelstein. Construction of carburating aratus. Oct. 2.

6,390. W. J. Jones. Apparatus for carbonating liquids. . 2.

6.943. L. J. Bizet. Manufacture of receptacles for ids or gas under pressure. Oct. 2.

7.358. M. M. Waite and E. K. Storey. Apparatus for ing and stirring. Oct. 16.

7,726. M. M. Brophy. Apparatus for regulating the of, and separating mechanical impurities from water, m, and other fluids. Oct. 9.

II.—FUEL, GAS, AND LIGHT.

APPLICATIONS.

,513. O. Ruppert. Improvements in the manufacture luminating gas and coke, and in apparatus therefor. plete Specification. Sept. 16.

,558. The Firm of D. Migeot Bros. and J. Lepouse. rovements in apparatus for the manufacture or genera- of acetylene gas. Complete Specification. Sept. 17.

,152. W. J. Dibdin and H. C. Woltereck. Process of ucing oil gas. Sept. 25.

,161. J. Steiner.—From E. Steiner, Germany. Im- ed artificial fuel. Sept. 25.

,247. G. Ihle. Improvements in and relating to en burners for use in incandescent lighting. Complete ification. Sept. 26.

,373. G. Helps. The generation of water gas in coal etorts. Sept. 28.

,444. J. Laxton. Improvements to acetylene gas gene- s. Sept. 30.

548. T. Machin and A. Gregory. Improvements in lene generators. Oct. 1.

664. A. Duffek and H. Wien. Improvements in descent gas burners. Oct. 2.

688. V. A. Spence. Improvements in and relating to ghting systems. Oct. 2.

826. C. D. Abel.—From J. Saltar, jun., United States. d of and apparatus for purifying gases. Oct. 4.

857. V. Powers and The Bevois Patent Lighting Com- Ltd. Improvements in apparatus for the generation, e, and purification of acetylene and like gases. Com- Specification. Oct. 4.

898. W. P. Thompson.—From J. H. Darby, Wales. vements in the utilisation of gas for industrial ses. Oct. 5.

899. W. P. Thompson.—From J. H. Darby, Wales. vements in compressing fuel for coke ovens and other ses, and in apparatus therefor. Oct. 5.

916. J. P. Blake. Improvements in and relating to lescence gas burners. Oct. 5.

01. L. Stöckmann. An improved process for increas- e heating value of fuel. Complete Specification. .

50. C. Cory. Improvements relating to the manu- e of artificial or briquette fuel. Oct. 8.

63. C. W. Locke. Improvements in the construction -power oxy-hydrogen mixed gas jets. Oct. 8.

71. B. Haigh and The Invicta Acetylene Gas Gene- and Engineering Syndicate Ltd. Improvements in ing acetylene gas, and in apparatus for use therein.

20,116. F. H. Becker. A process for the utilisation of the ashes of lignite, brown coal, peat, and the like. Oct. 8.

20,225. C. Hayward. Improvements in machines or apparatus for generating acetylene and similarly manufactured gases. Oct. 10.

20,228. T. Glover. Improvements in apparatus for carburetting coal and other illuminating gas. Oct. 10.

20,282. C. D. Lépine. Improved acetylene gas generator. Complete Specification. Oct. 10.

20,302. W. T. Sugg. Improvements relating to burners for incandescent gas lighting. Oct. 10.

20,361. H. de Thiersant. Improvements in apparatus for generating acetylene gas. Oct. 11.

20,377. W. Thornton. An improved artificial fuel. Oct. 11.

20,389. F. Atherley and W. H. Buxton. *See* Class I.

20,472. W. E. Evans.—From G. de Velna, France. Improvements relating to the manufacture of coke. Oct. 12.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

16,409. J. F. Smyth. Apparatus for manufacturing acetylene gas. Aug. 14.

16,960. L. Thorne. Acetylene generators and apparatus connected therewith. Oct. 2.

17,383. L. Mette, née Zschiesche. Automatic gas igniters. Sept. 25.

17,734. W. J. Crossley and J. Atkinson. Apparatus for purifying the gas from gas producers and heating and moistening the air supplied to the producer. Oct. 9.

17,739. W. H. F. Ohlsen. *See* Class I.

17,993. W. J. Crossley and J. Atkinson. Apparatus for purifying heating gas from producers, blast furnaces, or coke ovens. Oct. 9.

18,035. A. J. Boult.—From A. Tissier, France. Manufacture of a mineral substance for use as a gas condenser, and for other purposes. Oct 9.

19,535. H. Winkler. Incandescent gas burners. Oct. 2.

19,760. E. C. Harvey. Gas heating and lighting appliances. Sept. 25.

20,073. G. G. Smith. Means of purifying acetylene and other gases. Oct. 9.

21,264. E. Taylor. Construction of grates and appliances for economising fuel and consuming smoke. Sept. 25.

22,470. O. A. Behrend.—From J. R. Schauer, Bohemia. Gas lighting. Oct. 16.

1901.

2766. K. Gossweiler. Acetylene generator, with automatic supply of carbide. Oct. 9.

2912. A. Kahn and M. Heberlein. Manufacture of artificial fuel. Oct. 9.

7286. J. Sharpe and R. G. Code. Acetylene gas apparatus. Sept. 25.

9664. F. Schmitt. Apparatus for generating and storing acetylene gas. Oct. 2.

10,183. C. Busch. Apparatus for generating acetylene gas. Oct. 16.

11,504. J. B. Leroux and P. J. Carmien. Apparatus for burning mixtures of air and inflammable vapour for heating and incandescent lighting. Oct. 2.

12,940. W. J. McClurg. Gas generators. Sept. 11.

12,956. C. L. J. Trocquenet. Incandescent gas burners. Oct. 9.

14,100. M. Taylor. Gas producers. Sept. 4.

14,183. M. Taylor. Gas producers. Sept. 4.

15,511. C. Joly and E. J. Richardson. System for the liquefaction of air and other aeriform fluids. Oct. 9.

15,730. M. Blake, R. H. Smart, and W. Ewing. Hot coke conveyors. Oct. 2.

17,566. G. Belin. Apparatus for generating acetylene. Oct. 16.

IV.—COLOURING MATTERS AND DYESTUFFS.

APPLICATIONS.

18,897. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture of black sulphur colouring matter. Sept. 21.

18,912. I. Levinstein, C. Mensching, and Levinstein, Ltd. Manufacture of black, sulphur-colouring matters, directly dyeing cotton. Sept. 23.

18,971. C. D. Abel.—From Actiengesellschaft für Anilin Fabrikation, Germany. Manufacture of nitrophenylenediamine. Sept. 23.

18,976. G. W. Johnson.—From C. F. Boehringer und Soehne, Germany. Improvements in the manufacture and production of thioxanthins. Complete Specification. Sept. 23.

19,010. I. Levinstein, C. Mensching, and Levinstein, Ltd. Manufacture of brown, sulphur colouring matters, directly dyeing cotton. Sept. 24.

19,267. R. J. Urquhart.—From The Chemische Fabriken vorm. Weiler ter Meer, Germany. Improvements in the manufacture of cotton dyes containing sulphur. Sept. 27.

19,332. G. W. Johnson.—From Kalle und Co., Germany. Improvements in the manufacture and production of colouring matters and material for use therein. Sept. 27.

19,486 R. B. Ransford.—From L. Cassella und Co., Germany. The manufacture of dyestuffs of the acridine group. Sept. 30.

19,587. O. Imray.—From American By-Products Company, United States. Manufacture of dyestuff from cotton seeds. Oct. 1.

19,663. O. Imray. — From Die Farbwerke vormals Meister, Lucius und Brüning, Germany. A process for purifying raw indigo. Oct. 2.

19,721. J. J. M. Ville. Improved manufacture of red colouring matters or dyes. Oct. 3.

19,798. E. A. Muskett and J. B. Scammell. Improvements in the production of gambier and other analogous materials. Oct. 4.

19,998. O. Imray. — From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of phenylamidoacetonitrile and homologues and substitution products thereof. Oct. 7.

20,200. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture and production of azo-colouring matters, and of intermediate products relating thereto. Oct. 9.

20,201. W. L. Wise.—From M. Iljinsky, Germany. Improvements in and relating to the manufacture of flavopurpurine. Oct. 9.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

17,508. J. Bolland. Bolland's dye prints. Oct. 9.

21,560. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of anhydrides of organic acids. Oct. 16.

22,456. C. D. Abel.—From Actiengesellschaft für Anilin Fabrikation, Germany. Manufacture of sulphonated colouring matters belonging to the diphenylnapthylmethane series. Oct. 9.

23,338. B. Willcox.—From The Badische Anilin und Soda Fabrik, Germany. Conversion of indigo leuco compounds into indigo, and the application thereof to colouring textile fibres. Oct. 16.

1901.

15,706. R. J. Urquhart.—From The Chemische Fabriken vorm. Weiler-ter Meer, Germany. Process for reducing nitroazoxy, azo, and hydrazo-compounds. Sept. 25.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES

APPLICATIONS.

18,561. H. Ryder. Manilla rope. Complete Specification. Sept. 17.

18,562. H. Ryder. Improvements in machines for mak manilla rope. Complete Specification. Sept. 17.

18,728. A. J. Boult.—From C. O. Reichenbach, Germa Improvements in or relating to the mercerising of cott Sept. 19.

18,792. O Imray.—From M. Beeke, Germany. process for mercerising vegetable material in a wound state. Sept. 23.

19,013. J. Williams, c o The Oriental Waterproof Sy cate, Ltd. An improved method of water proofing rot-proofing textile fabrics. Sept 24.

19,051. J. J. Anderson. Improvements in apparatus use in the treatment of vegetable fibres and other mater Sept. 24.

19,061. J. J. Anderson. Improvements in and rela to the extraction and preparation of fibres from cer plants of the Musa and like orders. Sept. 24.

19,089. T. Pratt. An improved method of merceri cotton fibres, in hanks, under variable and adjust tension. Sept. 25.

19,532. E. G. Ferreira. Improvements in and in nection with finishing plain, dyed, or printed cotton, li and other fabrics. Oct. 1.

19,555. A. Römer. Improvements in treating te fibre and in apparatus used therein. Complete Speci tion. Oct. 1.

19,585. O. Imray.—From American By-Products C pany, United States. Manufacture of pure cellulose cotton seeds. Oct. 1.

19,656. F. Rushworth. A new or improved meth and apparatus for waterproofing textile fabrics. Oct. 2

19,904. J. B. W. Maunder and A. Schauschieff. provements in drying, bleaching, or otherwise tre woollen and other fabrics, and in apparatus ther Oct. 5.

19,912. J. H. Ashwell. Improvements in the treat of yarn. Oct. 5.

20,267. W. A. E. Crombie and W. P. Dreaper. provements in the manufacture of fibreless threads cellulose. Oct. 10.

20,270. F. Mérelle. Improvements in means for ext ing straws and other foreign substances from wool or textile materials. Oct. 10.

20,401. A. Barraclough and H. Barraclough. Imp ments in the manufacture of textile fabrics. Oct. 12.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

17,759. E. Lehner. Process for making artificial h hair. Oct. 2.

18,026. L. Harmel. Yarn or textile fabric. Oct. 16.

20,498. J. W. Midgley. Warping and like mac used in the treatment of yarns or threads of fib substances. Oct. 16.

20,801. J. Imray.—From E. Bronnert, M. Frémery J. Urban, Germany. Manufacture of a solution of cellu Oct. 16.

VI.—COLOURING WOOD, PAPER, LEATHER,

APPLICATIONS.

19,312. A. W. Playne and L. W. Macdonald. Imp ments in and in the preparation of substances for vat dyeing. Sept. 27.

19,904. J. B. W. Maunder and A. Schauschieff. Class V.

20,181. A. W. Playne and L. W. Macdonald. Imp ments in and in the preparation of substances for vat dyeing. Oct. 9.

20,398. A. Fielding. A new or improved proce mordanting and dyeing textile fabrics or yarns. Oct.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

18,079. G. H. France. Method of and machin treating textile fabrics with liquids. Oct. 16.

20,158. C. Hartley. Apparatus for dyeing and other- ise treating yarn in cop and other similar compact form. et. 9.

20,159. C. Hartley. Apparatus for dyeing and other- ise treating yarn in cop and other similar compact form. ept. 25.

22,402. B. Willcox.—From The Badische Anilin und da Fabrik, Germany. Printing textile materials with digo. Oct. 2.

1901.

14,619. W. E. Heys.—From A. Masseron, J. Pivert, . Chaplet, E. J. Mueller, and J. Caquelin, France. pparatus for dyeing, sizing, and slashing warps. Oct. 9.

VII.—ACIDS, ALKALIS, AND SALTS.

Applications.

18,748. P. Naef. Improvements in and relating to the eatment of materials with liquids and gases or vapours. led Sept. 19. Date applied for April 18, 1901, being ite of application in United States.

18,749. P. Naef. Improvements in and relating to the atment of solids, liquids, and gaseous fluids. Filed Sept. . Date applied for May 1, 1901, being date of application United States.

18,875. G. E. Arnold. Improvements in nitric acid torts. Sept. 21.

19,035. H. A. Frasch. Improvements in and relating to ocess of producing nickel salt. Complete Specification. pt. 24.

19,036. H. A. Frasch. Improvements in and relating to ocess of producing caustic alkali. Complete Specification. pt. 24.

19,094. H. Spence and P. Spence and Sons, Ltd. Im- ovements in the manufacture of compounds of alumina. pt. 25.

19,234. S. Ingham. Improvements in the manufacture alkaline alginate. Sept. 26.

19,294. J. Wetter.—From The Chemische Fabrik, Dr. lolf Heinemann, Germany. Improvements in the treat- ent of certain raw materials or extracts containing tannin r obtaining ellagic acid. Sept. 27.

19,501. J. A. C. Walther. Process for obtaining organic ids, carbohydrates, and albuminoid substances from rbonic acid. Complete Specification. Sept. 30.

19,527. J. Hargreaves. Improvements in the manufac- re of borax. Oct. 1.

19,767. A. Gutensohn and E. Parr. New or improved ethod of profitably utilising the waste alkalis resulting om the manufacture of nitric and hydrochloric acid. t. 3.

19,902. E. Wenmaekers. Improvements in the manu- cture of sulphuric acid. Complete Specification. Oct. 5.

19,993. B. Talbot. Improvements in the production of mmonia. Oct. 7.

20,142. R. H. Winsloe and B. Hart. Improvements in paratus for the manufacture of sulphuric acid. Oct. 9.

20,143. R. H. Winsloe and B. Hart. Improvements in paratus for the manufacture of sulphuric acid and for covery of gaseous nitrous compounds. Oct. 9.

20,189. A. Heinemann. Improvements in the manufac- re of tannic acid. Oct. 9.

Complete Specifications Accepted.

1900.

16,973. P. Naef. Precipitation of bicarbonate of soda. pt. 25.

17,888. W. Marsh. Manufacture of carbonate of magnesia t. 2.

1901.

15,468. G. Wilton. Treatment or utilisation of sul- uretted hydrogen and other by-products from alkali and er works. Oct. 2.

15,527. O. Imray.—From The Basle Chemical Works, Switzerland. Manufacture of phthalic acid and benzoic acid. Oct. 2.

VIII.—GLASS, POTTERY, AND ENAMELS.

Complete Specifications Accepted.

1900.

17,132. R. Stanley. Manufacture of tiles, quarries, or other like pressed articles. Oct. 2.

17,685. W. Gaines. Means or apparatus for printing upon tiles, glass, metal plates, and other rigid surfaces. Oct. 7.

1901.

12,933. J. M. Garrison. Glass separators. Oct. 2.

17,161. P. M. Justice.—From The Mississippi Glass Company, United States. Machines for rolling configured wire glass. Oct. 16.

17,162. P. M. Justice.—From The Mississippi Glass Company, United States. Method of and apparatus for making corrugated sheet glass. Oct. 2.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Applications.

19,283. J. Horak. Manufacture of highly fireproof bricks. Sept. 27.

19,474. H. Croizier et Cie. Improvements in and in the compounding of artificial stone. Sept. 30.

20,459. J. E. Gillon. Improvements in the process of producing artificial stone. Oct. 12.

Complete Specifications Accepted.

1900.

15,344. W. F. Goreham. Apparatus for the separation of the flour or finer particles of cement and other materials. Oct. 9.

16,531. A. Jannetaz. Double-acting hydraulic press for pressing and moulding blocks of artificial stone for building purposes. Sept. 25.

22,105. A. C. W. Hobman. Sheet paving. Oct. 9.

23,574. E. H. Stein. *See* Class I.

1901.

13,136. E. Helbing. Method for producing artificial wood. Aug. 28.

15,214. E. Kreft. Digester for the manufacture of artificial stone. Oct. 9.

18,008. S. Höyer-Ellefsen. Fireproof floors. Oct. 16.

X.—METALLURGY.

Applications.

18,575. A. Clemang. Improvements in process of and apparatus for cleaning blast-furnace gases. Complete Specification. Sept. 17.

18,620. S. O. Cowper-Coles and The Cowper-Coles Metals Extraction Syndicate, Ltd. Improvements relating to the treatment of sulphide ores for the recovery of metals. Sept. 17.

18,655. J. H. S. Bradley and H. B. Burnell. Improvements in the manufacture of steel. Sept. 18.

18,716. F. E. Whitham. Improvements in machinery or apparatus for grinding or reducing lime, ashes, sandstone limestone, fireclay, quartz, and other minerals or materials, Sept. 19.

18,772. R. Brown. Improvements in utilising waste heat in connection with smelting furnaces. Sept. 20.

18,799. P. Auchinachie. The extraction of metallic vanadium from its ores or any compound containing vanadium, preferably an oxide thereof. Sept. 20.

18,949. M. Hirschmann and V. Heilmeier. Process and means for the restoration of burnt steel. Sept. 23.

18,965. D. I. Simpson. Process for the recovery of silver, gold, lead, and other metals from residue of sulphide ore after extraction of spelter. Sept. 23.

19,038. H. A. Frasch. Improvements in and relating to the separation of cobalt from nickel, copper, and other metals. Complete Specification. Sept. 24.

19,150. J. Mactear. Improved machine for treating alluvial deposits for the extraction of metals and minerals therefrom. Complete Specification. Sept. 25.

19,213. J. E. Clennell. Improvements in the treatment of solutions containing gold and silver. Sept. 26.

19,403. A. Manhardt. Process for producing an alluminium alloy. Complete Specification. Sept. 28.

19,741. R. W. Western. Improvements in the concentration of certain ores. Oct. 3.

19,766. A. Gutensohn and E. Parr. Improved method of treating refractory ore. Oct. 3.

19,818. C. S. Bailey. Improvements in the recovery of gold and other metals from sea-water. Oct. 4.

19,830. S. Cowper-Coles and Co., Ltd., and S. Cowper-Coles. Improvements in obtaining vanadium from ores containing it. Oct. 4.

19,897. W. P. Thompson.—From J. H. Darby, Wales. Improvements in apparatus for the recovery of small coke "breeze," and the treatment of the effluent water from blast furnace scrubbing apparatus. Oct. 5.

20,074. B. J. B. Mills.—From A. Lumière and L. Lumière, France. A process of manufacturing organo-metallic compounds of mercury. Oct. 8.

20,077. A. M. G. Sébillot. Process for the treatment of copper ores by recuperated sulphuric acid. Complete Specification. Oct. 8.

20,160. J. Tennett. An improvement in the casting of chill rolls. Complete Specification. Oct. 9.

20,166. W. A. Thoms. An improvement in coating metals. Oct. 9.

20,240. C. Göttig. Improvements in processes of gilding metals. Oct. 10.

20,353. W. H. Hyatt and F. C. Lingard. Process for the improvement of iron. Oct. 11.

20,410. W. E. Heys.—From E. Boyer, France. A new or improved process for the concentration or enrichment of ores. Oct. 12.

Complete Specifications Accepted.

1900.

16,484. J. W. Maddison and W. Rhodes. Process of melting iron and materials employed therein. Sept. 25.

17,569. S. Michaelowsky. Preparation of nickel. Oct. 9.

19,351. J. M. Hartman. Apparatus for continuous casting of pig metal. Oct. 9.

22,389. J. F. Duke. Extraction of gold from sea water or other solutions containing the same. Oct. 16.

22,408. P. M. Justice.—From B. Talbot, United States. Manufacture of iron. Oct. 9.

1901.

11,832. R. Dietrich. Process for the production of highly carburised steel. Oct. 9.

11,933. H. S. Blackmore. Reduction of metals and production of alloys of the same. Oct. 2.

12,349. E. Ferraris. Treatment of mixed ore for the separation of metals, such as lead, zinc, copper, iron, silver, and gold. Sept. 25.

12,831. T. V. Allis. Metal heating furnaces. Sept. 4.

13,379. G. Taddel. Process for obtaining aluminium and other metals. Sept. 18.

15,538. F. Maruhn and E. Uhthoff. Device for trimming soft metal castings. Sept. 25.

15,539. E. Maruhn and E. Uhthoff. Casting machines with swinging moulds. Sept. 25.

15,540. E. Maruhn and E. Uhthoff. Device for proj ing the casting out of the mould in metal casting machi Sept. 25.

16,864. C. P. Sörensen. Process for preparing alumia for soldering. Oct. 2.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

Applications.

18,483. C. T. J. Oppermann. Improvements in manufacture of electrical accumulators. Sept. 16.

19,068. W. S. Henneberg and E. C. H. Pape. An proved process for electrolytically precipitating and sir taneously amalgamating metals. Complete Specificat Sept. 24.

19,132. H. C. Harrison. Improvements in the elec deposition of metals. Sept. 25.

19,210. W. Strickland. An improved and replenish dry primary cell or battery. Sept. 26.

19,376. J. Hargreaves and J. W. Stubbs. Improvem in electrodes. Sept. 28.

19,404. C. F. Auer von Welsbach. Improvements accumulators. Sept. 28.

20,072. T. A. Edison. Improvements in accumulat Complete Specification. Oct. 8.

Complete Specifications Accepted.

1900.

16,801. A. J. de Brito e Cunha. Process and appar for the electrolytic decomposition of alkaline salt solutic Sept. 25.

17,490. B. Kuettner. Manufacture of secondary batt plates. Oct. 2.

18,397. J. D. Gilmour. Electrolytic decomposition metallic salts and apparatus employed therein. Oct. 16.

19,029. C. Schneider. Process for the electrol oxidation of solutions of chromium oxide salts. Oct. 1

19,393. R. J. Yarnold. Apparatus for electrically tr ing air, gases, and gaseous mixtures. Oct. 9.

20,200. J. H. Noble and A. Merry. Improvements i relating to electrolytic cells. Sept. 25.

21,233. T. Pescatoro and The Tudor Accumulator C pany, Ltd. Secondary batteries. Oct. 2.

22,406. J. Greenwood. Decomposition of alkaline s by electrolysis and apparatus therefor. Oct. 16.

1901.

12,954. W. Peto.—From P. Gouin, France. Electr secondary or storage batteries or accumulators. Sept. 4

13,300. A. Nodon. Manufacture of electrode plates secondary electric batteries. Oct. 9.

14,946. M. Haas. Electrolytic apparatus. Sept. 25.

15,909. R. W. James.—From J. J. Heilmann, Fra Electrodes of electrical accumulators. Oct. 9.

16,566. A. T. Davies. Storage battery plates. Sept.

16,874. J. Mactear. Electrolytic apparatus for prod tion of chlorine and alkali. Oct. 2.

XII.—FATS, OILS, AND SOAP.

Applications.

18,954. H. Lamplough, trading as the Albany Manuf turing Company, and F. Lamplough. Oil separat Sept. 23.

19,029. F. C. Thiele, J. M. Parker, and J. F. Fin Improvements in or relating to the refining of cr mineral oils and their distillates. Complete Specificati Sept. 24.

19,043. A. Kronstein. Improvements in rendering m tures of drying oils or resins respectively, with wood insoluble at high temperatures. Sept. 24.

19,079. G. B. Ellis.—From Chemische Fabrik von Hey-
n Actiengesellschaft, Germany. Improvements in soaps
d in the manufacture thereof. Sept. 24.

19,141. J. Koning. An improved process for washing
ols and other textile materials which enables the sub-
nces used for such washing to be recovered, and also for
nufacturing a homogeneous ammoniacal soap. Sept. 25.

9,186. J. Widmer. *See* Class XVII.

19,586. O. Imray.—From American By-Products Com-
ny, United States. Manufacture of oil adapted for
phonating from cotton seeds. Oct. 1.

9,750. E. Springborn and J. W. Woodthorpe. Improve-
nts in and relating to the process of and apparatus for
manufacture of soap. Oct. 3.

9,792. J. I. Mackenzie. Improvements in or relating to
ns or mechanism for filtering or extracting oils and the
. Oct. 4.

0,454. P. Karutz. Mixing apparatus for the manufac-
of soap. Oct. 12.

Complete Specifications Accepted.

1900.

7,413. J. C. W. Stanley and the Cotton Seed Oil
dicate, Ltd. Bleaching of oils and fats. Oct. 2.

1,810. A. des Cressonnières. Soap-kneading machines
the like. Oct. 2.

1901.

22. H. Herborn. Process of treating tar oils for the
luction of preservative oils for coating and impregnating.
9.

,964. W. F. Warden. Oil filters. Sept. 18.

,085. H. Sefton-Jones.—From Siegfried Feder and J.
de Bücken, Germany. Apparatus for making carpet-
ning soap. Oct. 2.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, Etc.

Applications.

,528. D. N. Bertram and S. Milne. Improvements in
nanufacture of gutta-percha. Sept. 17.

,621. S. O. Cowper-Coles and the Cowper-Coles Metals
action Syndicate, Ltd. Improvements in and relating
e manufacture of white lead. Sept. 17.

,964. A. C. Blossier. Improvements in the manufac-
or preparation of sheet india-rubber. Sept. 23.

,043. A. Kronstein. *See* Class XII.

,251. H. L. Godden. Improvements in the treatment
rtain minerals for the production of a pigment, and the
ratus therefor. Oct. 10.

Complete Specifications Accepted.

1900.

,378. A. Kronstein. Manufacture of varnishes and
icts resembling resins and balsams. Oct. 2.

427. F. Müller and G. Rossbach. Process for reducing
nelting point of resin. Oct. 9.

783. J. Stenverson. Pigments and dyes. Oct. 16.

044. C. F. Nafzger. Manufacture of insulating
rial. Sept. 25.

V.—TANNING, LEATHER, GLUE, and SIZE.

Applications.

249. G. Gautier. Improvements in the manufacture
ificial leather. Sept. 26.

263. J. W. Simmill and R. H. Helmich. Improved
m or size for use in mixing with pulp for making
paper for transferring printing, or for treating such
. Sept. 27.

19,310. W. Thornton. An improved compound to be used as a substitute for leather, and its application to boots and shoes. Sept. 27.

19,512. R. Cronsdale. A process for treating raw hide. Complete Specification. Oct. 1.

19,545. H. Royallmiuns. Improvements in currying leather. Oct. 1.

20,262. W. T. Forbes. Improvements in and relating to the treatment of hides. Oct. 10.

Complete Specifications Accepted.

1900.

14,727. H. R. Riches and The Wool, Skin, and Hide Syndicate, Ltd. Process for removing hair, wool, fur, and the like from hides and skins. Sept. 25.

17,783. J. Stenverson. *See* Class XIII.

19,831. F. Valentiner. Tanning or dressing of skins hides, and the like. Sept. 25.

1901.

12,372. P. Bez and E. Bez. Tanning hides and skins. Oct. 2.

XVI.—SUGAR, STARCH, and GUM, Etc.

Application.

19,720. A. Ashworth. A method of producing soluble products from amylaceous bodies. Oct. 3.

Complete Specifications Accepted.

1900.

18,040. R. Ostrejko. Obtaining charcoal having great decolourising properties. Oct. 16.

18,622. L. C. A. Calmette. Process and apparatus for the manufacture of glucose by saccharifying mucedines. Oct. 2.

1901.

11,442. C. B. Duryea. Method of manufacturing thin boiling or modified starch. Sept. 18.

12,588. A. Classen. Process for converting wood and other cellulose material into sugar. Aug. 28.

16,148. M. Cabidos and J. M. Abram. Manufacture of starch. Oct. 2.

XVII.—BREWING, WINES, SPIRITS, Etc.

Applications.

18,874. A. E. Berry and A. Boake, Roberts, and Co. Ltd. An improvement in finings. Sept. 21.

19,177. S. Dymond. An apparatus for drying yeast, hops, germ food, or brewers' and distillers' by-products and the like. Sept. 26.

19,186. J. Widmer. Improvements in the packing of solidified spirits, mineral oils, or their products of distillation. Complete Specification. Sept. 26.

Complete Specifications Accepted.

1900.

21,153. G. C. Marks.—From "Force" Société Anonyme, Belgium. Treatment of yeast. Sept. 25.

21,355. H. Debeil. Mash-tuns for use in the preparation of beer wort. Oct. 9.

21,779. J. Fletcher. Apparatus for carbonating liquids, and filling bottles under pressure. Oct. 9.

1901.

12,697. A. G. Bloxam.—From Gebrüder Sulzer-Winterthur. Manufacture of non-alcoholic beer. Sept. 4.

12,906. C. A. Allison.—From O. Selg, J. Bohnet, and C. F. Guntrum, United States. Converting wort into beer and other fermented liquids. Sept. 4.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

Applications.

A.—*Foods.*

18,818. S. W. Dod and C. Davies Improvements in the manufacture of food from blood. Sept. 20.

18,852. H. P. Geddes. Improvements in condensed foods by a special mode of evaporation for either liquids or solids. Sept. 21.

19,972. E. D. Bell. Improvements in alimentary preparations. Oct. 7.

B.—*Sanitation; Water Purification.*

18,525. F. T. Bond. An appliance for aerating and purifying organically polluted waters. Sept. 17.

18,800. W. P. Wrightson. Improved apparatus for and method of treating and utilising town refuse. Sept. 20.

19,125. C. J. Haines. Improvements in the process of and apparatus for softening waters and purifying waste liquors. Sept. 25.

19,399. The Brightside Foundry and Engineering Company, Ltd., and J. A. Lee. Improvements in refuse-consuming furnaces or destructors. Sept. 28.

Complete Specifications Accepted.

A.—*Foods.*

1900.

17,416. C. M. Aikman. Process of preparing concentrated foods. Oct. 9.

20,819. H. A. Hobson. Production of beer and other beverages and alimentary substances. Oct. 2.

21,626. J. H. G. Neisse and J. H. Boll. Process for the production of margarine. Oct. 16.

1901.

17,331. C. T. V. Bruun. Method of preserving eggs Oct. 9.

B.—*Sanitation; Water Purification.*

1901.

9982. L. Gathmann. Water-purifying apparatus. Sept. 25.

12,840. J. Bermond. Sterilising apparatus. Sept. 11.

17,649. A. Sorge, jun. Water-purifying apparatus. Oct. 9.

C.—*Disinfectants.*

1901.

10,549. C. Billing. New or improved antiseptic or detergent. Oct. 2.

XIX.—PAPER, PASTEBOARD, Etc.

Applications.

18,559. H. Herfs, *née* Baumeister. A supplementary process for the manufacture of waterproof and airtight paper, impervious to fat, and with glazed surface. Complete Specification. Sept. 17.

18,600. J. B. Tayler. Improvements in the treatment or manufacture of paper, applicable for use in electric insulation. Sept. 17.

19,585. O. Imray.—From American By-Products C pany, United States. *See* Class V.

20,396. A. Fielding. An improved manufacture viscous (cellulose sulpho-carbonate) for certain purp Oct. 12.

20,397. A. Fielding. Improvements in or relating to manufacture of viscose. Oct. 12.

Complete Specification Accepted.

1901.

536. L. Joseph. Supplementary process for the ma facture of waterproof and airtight paper, impervious to and with glazed surface. Oct. 16.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

Applications.

18,733. R. H. Page. Improvements relating to the duction of organic peroxides. Complete Specificat Sept. 19.

20,027. A. Zimmermann.—From The Chemische Fa auf Actien vorm. E. Schering, Germany. The manufac of dimethylene tartrate. Oct. 7.

20,028. A. Zimmermann.—From The Chemische Fa auf Actien vorm E. Schering, Germany. The manufac of methylene citric acid. Oct. 7.

20,188. J. Wetter.—From The Firm of F. Hoffmann Roche, Switzerland. Improvement in the manufactur salicylide or salicylic anhydride. Oct. 9.

Complete Specifications Accepted.

1900.

17,202. J. A. Besson. Process and apparatus for tinuously producing and rectifying chloral. Oct. 2.

1901.

8165. H. E. Newton.—From The Farbenfabriken vor F. Bayer and Co., Germany. Manufacture or produc of new pharmaceutical compounds. Oct. 2.

XXI.—PHOTOGRAPHY.

Application.

18,970. C. D. Abel.—From Actiengesellschaft für An fabrikation, Germany. An improvement in photogra roll-films. Sept. 23.

XXII.—EXPLOSIVES, MATCHES, Etc.

Application.

19,976. S. B. Earle. Improvements in or relating explosives or explosive compounds. Oct. 7.

Complete Specifications Accepted.

1900.

20,133. M. Bielefeld. Priming for detonating and cussion caps of various description. Oct. 16.

21,627. N. Ceipek. Explosive compounds. Oct. 16.

1901.

12,617. A. A. da Silva. Explosives. Oct. 16.

* * *

Printed and Published by Eyre and Spottiswoode, East Harding Street, London, E.C., for the Society of Chemical Industry.—

THE JOURNAL

OF THE

Society of Chemical Industry.

A MONTHLY RECORD

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SESSION 1901—1902.

Monday, Dec. 2nd, 1901:—
Messrs. Herbert E. Burgess and J. F. Child. "The Lemon Oil Industry."
Mr. J. W. Hinchley. "The Separation of Materials of Different Specific Gravity."

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SESSION 1901—1902.

Thursday, Feb. 27th, 1902:—
Mr. Wilton P. Rix. "Preparation and Behaviour of Insol e Frits for Pottery Glazes."

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NOTICES.

The Journal of the Society.

In order that members may be supplied with information at as early a date as possible, the Council has ordered that the Journal shall be issued twice a month, commencing January 1902, and that it shall contain abstracts of French and United States, as well as British patents.

Subscriptions for 1902.

Foreign and Colonial Members are reminded that the subscription of 25s. for 1902, payable on January 1st next should be sent in good time to the Hon. Treasurer (Mr. Samuel Hall), in order to ensure continuity in the receipt of he Society's Journal. Any changes of address to appear u the new List of Members now in course of preparation hould reach the General Secretary not later than January 5th, 1902.

Changes of Address.

When notifying new addresses, members are requested to rite them distinctly, and state whether they are temporary r permanent. Multiplication of addresses is also to be voided as tending to create confusion. When sending ubscriptions, the use of the form attached to the application elps in the verification of addresses, on which the safe elivery of the Journal depends.

Communications.

Authors of communications read before the Society, or y of its Local Sections, are requested to take notice that der Rule 43 of the Bye-laws the Society has the right of iority of publication for three months of all such papers. fringement of this Bye-law renders papers liable to be jected by the Publication Committee, or ordered to be stracted for the Journal, in which case no reprints can furnished to the author.

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rton, Alf., c/o Merchants' Dyeing and Finishing Co., Ltd., 42, Front Street West, Toronto, Canada, Dyer and Finisher.

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Lequin, E., l/o Rue Ste. Cécile; (Journals) Cie. St. Gobain, 1, Place des Saussaies, Paris (VIII^e); Subscription as before.

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Perkins, Prof. M., Union College, Schenectady, N.Y., U.S.

Newcastle Section.

Meeting held on Thursday, October 31st, 1901.

MR. W. L. RENNOLDSON IN THE CHAIR.

CHAIRMAN'S ADDRESS.

The Chairman's address consisted of an interesting revi or criticism of many popular beliefs, which he consider would not exist if a knowledge of chemistry, even sligl were more general.

Liverpool Section.

Meeting held on Wednesday, October 30th, 1901.

MR. C. LONGUET HIGGINS IN THE CHAIR.

THE SECOND HURTER MEMORIAL LECTURE

The Chairman, in opening the meeting, said no doubt th present would remember that in March 1898 the Secti lost its brightest ornament by the death of Dr. Ferdina Hurter. In response to the generally expressed wish t something should be done to keep his memory alive, it w after much thought and deliberation determined that memorial lecture should be instituted, to be delivered the opening meeting of the Liverpool Section every seco year.

Accordingly the first lecture was given in October 18 by one whose name had long been famous in connect with chemical industry, Prof. George Lunge; and now af a lapse of two years they were to hear the second. Hurter, as was well remembered, had devoted a large amou of time and energy to the study of one of the most charm of all subjects, photography, and some of the results of work were contained in the pages of the Society's Journ The present lecture was to be given by one who h studied deeply and successfully the science of photograp and who scarcely needed introduction. He then called Sir William Abney to deliver his lecture.

THE PHOTOGRAPHY OF COLOUR.

BY SIR WM. DE W. ABNEY, K.C.B., D.C.L., D.SC., F.R.S

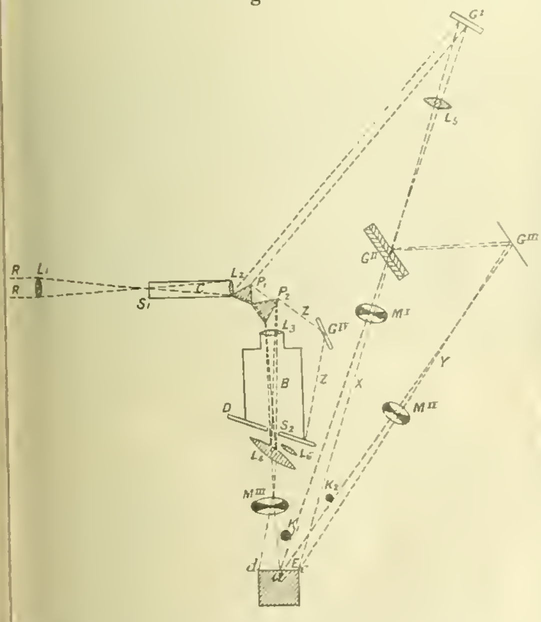
When I had the honour of an invitation to deliver Hurter Memorial Lecture, I hesitated to accept it, for althou I was an original member of your Society and one of first members of its Council, I have for so many ye ceased to belong to it that I could not convince mysel could find a suitable subject for it consistent with objects of the Society. I remembered, however, an epo making paper by Dr. Hurter and Mr. Driffield in the Journal of 1891, and it struck me that photography, with which it dealt, was not excluded as an appropriate subject for the Hurter Memorial Lecture. This being so, I accepted the invitation, and all the more readily, as I believe I am right in saying that it was owing to some remarks of mine made on public occasion at Widnes that Dr. Hurter was induced to urn his attention to certain scientific problems in photography then waiting solution. I cannot hope to give you a ecture at all of the same calibre as the first memorial ecture, but I shall endeavour to make clear to you the cientific principles which underlie the reproduction of oloured objects as coloured pictures by means of photography, r in short the photography of colour. I shall not touch on hotography in natural colours, that is, the production of a hotograph which by the direct action of light takes the ues of nature. At present any such photographs are ither evanescent by exposure to light, or have to be viewed n such a manner that they are rather of scientific than ndustrial value.

I propose to treat the methods of colour photography, ot historically, but from the scientific principles which nderlie it, and which must be followed to obtain success in orking it.

An instrument will be used in the lecture to-night which devised for studying colour, and this must be briefly xplained. Its object is to obtain pure monochromatic olours which will fill a fairly large space, and which space an also be filled by a mixture of any or all of the spectrum olours. The diagram shows the arrangement.

The rays R R, coming from the positive pole of the ectric light, are collected by a lens, L, and an image of the rater thrown on the slit S. After passing through the ollimator C, the rays emerged as parallel rays; part passed rough the prisms P_1 and P_2, were collected by a lens, L_3, nd a spectrum was formed on a slide, D (which will be ore fully described), in which slits could be placed, and image of the surface of the first prism was formed on e white surface of a cube, E, by means of the lens L_4, arranged that the image of one edge of the prism fell at the other edge falling outside *d*. The other beam which ssed through the collimator was reflected from the surface the first prism to a mirror, G_1, and passed through a lens, , then through a bundle of glass, G^{II}, placed at an angle the beam, and on to the surface *d* c of the cube, a rod, K_1, ing placed in its path, to secure that this white beam did t fall on *a d*, on which the colour mixture fell. The rtion of the beam which was reflected from G^{II} was again reflected by G^{III}, a silvered mirror, on to *a* c, a rod, K_2, being placed in its path to prevent it falling on *a d*. In all three beams, sectors, M^{I}, M^{II}, and M^{III}, were placed, to allow any or all to be reduced in intensity at pleasure. A small ray of light, Z, was allowed to pass beyond P_2, and fell on a small mirror, G^{IV}, which reflected it on to the back of D, casting a shadow of a needle, N, fixed to B, the camera, on S, a scale at the back of D. L_6 is a lens of short focus which could be moved into a fixed position behind L_4 to throw an enlarged image of the slit on a scale placed below *d c*. By the insertion of a supplementary lens the spectrum can be thrown on the screen instead of a white patch being formed by the recombination of all the spectrum rays.

Fig. 1.



I must remind you that in the spectrum we have the only pure colours, that each coloured ray has a different wave length, and that from the limit of the red to the limit of the violet, not an octave of vibrations is embraced. Even with this limitation it might well be conceived that the retina which receives shocks from waves of such varying lengths must be a very complex piece of apparatus to distinguish one hue from the other. It would be so if there was an apparatus in it for receiving and sorting out each series of vibrations, but Young emphatically showed that in order to receive the sensation of any colour, only three pieces of visual apparatus were necessary, each of the three being devoted to one single sensation. In other words, he announced that any colour in nature would be imitated by mixing in varying proportions a red, a green, and a blue light. In 1861 Clerk Maxwell followed up Young's hypothesis and published a paper in which he gave curves of necessary intensities of the three different standard spectrum colours, which he chose, to match each colour in the spectrum. His method consisted of choosing three rays, one in the red, another in the green, and a third in the blue as standards and placing two slits in the spectrum in position of two of those rays, say, in the red and blue. The third slit he primarily placed in the third standard ray, and by opening or closing the slits he obtained a match with a white light both in colour and in intensity. He then altered the position of the green slit, and again by similar methods matched the same white. After the positions in the green had been exhausted, he again placed his slits in the standard positions as a check, matched the white and then altered the position of the red slit, and so on, always forming white and noting the width of the three slits on each occasion. He really observed through the slit of the spectroscope and illuminated the three slits in the spectrum with white light, and made the matches with the colour seen on the prism face. The principle is obvious for a spectroscope is reversible. From these results he obtained equations in terms of the width of the slits such as are given below. The numbers in brackets denote the scale number which applied to known colours in the spectrum. The standard colours he chose were at scale numbers, (24), (44), and (68).

$$
\begin{aligned}
16{\cdot}1(28) + 25{\cdot}6(44) + 30{\cdot}6(68) &= \text{White}\\
22{\cdot}0(32) + 12{\cdot}1(44) + 30{\cdot}6(68) &= \quad ,,\\
21{\cdot}7(24) + 10{\cdot}4(44) + 61{\cdot}7(56) &= \quad ,,\\
18{\cdot}0(24) + 31{\cdot}2(44) + 32{\cdot}3(72) &= \quad ,,
\end{aligned}
$$

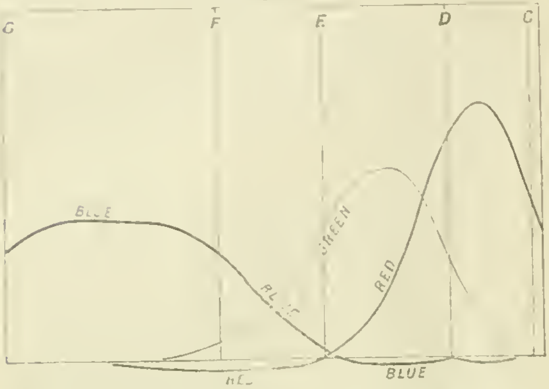
Eliminating the white from the equations he got the following results:—

$$
\begin{aligned}
44{\cdot}3(20) &= 18{\cdot}6(24) + 0{\cdot}4(44) + 2{\cdot}8(68)\\
16{\cdot}1(28) &= 18{\cdot}6(24) + 5{\cdot}8(44) - 0{\cdot}1(68)\\
22{\cdot}0(32) &= 18{\cdot}6(24) + 19{\cdot}3(44) - 0{\cdot}1(68)\\
25{\cdot}2(36) &= 12{\cdot}2(24) + 31{\cdot}4(44) - 0{\cdot}8(68)\\
41{\cdot}4(48) &= -2{\cdot}6(24) + 31{\cdot}4(44) + 3{\cdot}5(68)\\
62{\cdot}0(52) &= -3{\cdot}4(24) + 31{\cdot}4(44) + 17{\cdot}4(68)
\end{aligned}
$$

(It may be remarked that on his scale C. was about $21\frac{1}{2}$, D. $29\frac{1}{2}$, E. 44 (a standard colour) F. 56, and G. 80. The standard red was a little yellower than the red lithium line and the blue about the same as the blue lithium line.)

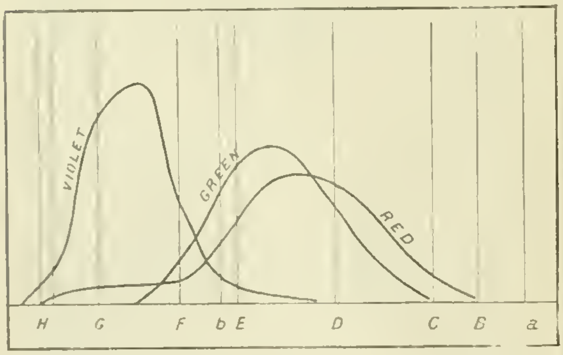
The annexed diagram shows the results graphically The equations which have in them *minus* quantities of standard colours are puzzling at first, but the difficulty will vanish after seeing a subsequent diagram. It should be remembered that Maxwell's curves are given in terms of the width of the slit, and have only individually, and not collectively, any physical meaning.

Fig. 2.



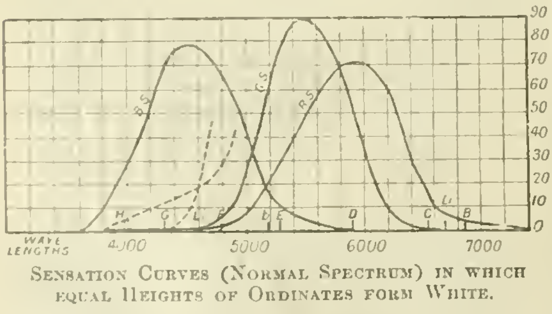
Koenig was the next observer to whom allusion need be made, and from his curves of the sensations we gather that the fundamental three sensations so overlapped that it was impossible to reproduce, with even pure spectrum colours, the intermediate colours except tinged with white.

Fig. 3.



Your lecturer was, I believe, the next investigator of the colour sensations, and whilst in details his results differ from Koenig's, in the main features they are identical. The curves which he obtained (given below) show the sensations when it is supposed that equal stimuli applied to each of the three make white light. Parenthetically it may be remarked that, on this supposition, the areas of the three curves must be equal, since the combination of the whole spectrum gives white light. It must be remembered that the curves show fundamental colour *sensations*, and are *not colours*.

Fig. 4.

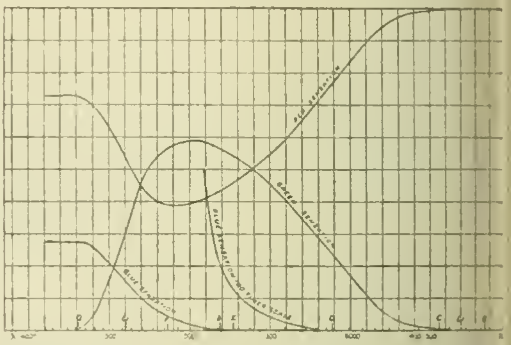


Sensation Curves (Normal Spectrum) in which equal Heights of Ordinates form White.

It will be noticed that the only rays which stimulate one sensation are in the red of the spectrum, and the red lithium line may be taken as typical of them. The colours most nearly approaching the colours that would be giv by stimulation of the green and blue sensations alone rays close to the green magnesium line *b* and the b lithium line of the spectrum. At these points they the sensation colours to which a little white light has b added. These positions in the spectrum are not far from th empyrically selected by Clerk Maxwell, and a study of figure will show that his *minus* quantities are fully account for. Broadly, it may be stated that, in order to match intermediate spectrum colour from the yellow to the b by a mixture of any three colours, white light must added to it. With the apparatus before you this can effected and a match made in the laboratory, but it beyond a lecture experiment possibility.

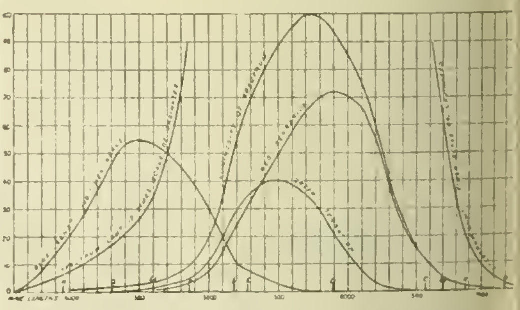
The next two diagrams show the percentage of sensatio in the different colours and the actual luminosity brightness) of the spectrum divided up into sensation lu nosities. It will be seen that the luminosities of the and green sensations are very large compared with that the blue.

Fig. 5.



Percentage Composition in Sensations of the Spectrum Colours, Normal Spectrum.

Fig. 6.



Normal Luminosity Curves in Wave-lengths (Electric Light) divided into Sensation Luminosities.

Table 1. shows the actual measures from which the Figs 5, and 6 were constructed.

Column I. shows the wave-lengths; Columns II., l and IV. the percentage luminosity of the sensatio Column V. the luminosity of the spectrum; Columns V VII., and VIII. the luminosity of the sensations in normal spectrum. The approximate areas of the th curves shown in Columns VI., VII., and VIII. are 747 344·3, and 5·3 for the red, green, and blue sensations spectively, and the equation for white is—

$$\begin{array}{cccc} \text{RS} & \text{GS} & \text{BS} & \text{W} \\ 68{\cdot}14 + & 31{\cdot}38 + & 0{\cdot}48 = & 100. \end{array}$$

Columns VII. and VIII. have to be multiplied by $\frac{6}{3.}$ and $\frac{68{\cdot}14}{0{\cdot}48}$, *i.e.*, by 2·17 and 142 respectively, to give eq areas with the red sensation curve in Column

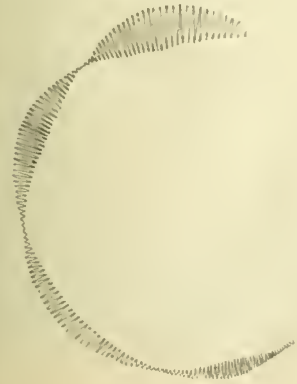
Table I.

I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.
λ.	Percentage Luminosity.			Luminosity of Spectrum.	Sub-Division of Spectrum Luminosity into Luminosities of			Equal Ordinates to give White.		
	RS.	GS.	BS.		RS.	GS.	BS.	RS.	GS.	BS.
7100	100	0	0	0·5	0·5	..	..	0·5	..	..
7000	100	0	0	0·9	0·9	..	..	0·9	..	..
6900	100	0	0	1·6	1·6	..	..	1·6	..	..
6800	100	0	0	3·2	3·2	..	..	3·2	..	..
6700	100	0	0	6·0	6·0	..	..	0·0	..	..
6600	99·8	0·2	0	10·0	9·9	0·1	..	9·9	0·22	..
6500	99	1·0	0	17·0	16·8	0·2	..	16·8	0·41	..
6400	98	2·0	0	26·0	25·48	0·52	..	25·48	1·13	..
6300	97	3·0	0	41	39·77	1·23	..	39·77	2·67	..
6200	94	6·0	0	59	55·46	3·54	..	55·46	7·68	..
6100	89·5	10·5	0	75	67·13	7·87	..	67·13	17·08	..
6000	83·3	16·7	0	85	70·81	14·19	..	70·81	30·79	..
5900	77·5	22·5	0	93	72·08	20·92	..	72·08	45·39	..
5800	71·3	28·7	0·005	99	70·58	28·42	0·005	70·38	61·67	0·7
5700	65·3	35·0	0·01	100	65·00	35·00	0·01	65·00	75·95	1·4
5600	59·3	40·5	0·023	95	56·52	38·46	0·02	56·52	83·45	2·9
5500	54·3	45·7	0·040	89	48·33	40·61	0·035	48·33	90·19	4·0
5400	49·7	50·2	0·065	80	39·76	40·16	0·052	39·76	87·15	7·38
5300	47·2	52·7	0·11	70	33·04	36·58	0·077	33·04	79·37	10·93
5200	53·5	56·2	0·18	56	24·00	29·90	0·099	24·00	64·88	14·10
5100	41·2	58·4	0·42	35	14·42	20·43	0·147	14·42	44·33	20·87
5000	39·3	59·0	1·6	18	7·09	10·61	0·300	7·09	23·02	40·89
4900	39·0	57·5	3·5	11	4·48	6·50	0·385	4·48	14·10	54·60
4800	40·0	54·0	6·0	7·5	3·00	4·05	0·456	3·00	8·79	64·75
4700	45·0	41·8	10·2	5·0	2·25	2·24	0·510	2·25	4·88	71·00
4600	54·5	30·0	15·5	3·5	1·90	1·06	0·542	1·90	2·30	76·0
4500	63·5	16·0	20·5	2·7	1·71	0·41	0·553	1·71	0·95	78·5
4400	69·8	4·5	25·7	2·1	1·47	0·09	0·540	1·47	0·20	76·68
4300	72·5	0	27·5	1·7	1·23	0	0·470	1·23	0	66·74
4200	72·5	0	27·5	1·3	0·94	0	0·357	0·94	0	50·69
4100	72·5	0	27·5	1·0	0·72	0	0·275	0·72	0	39·05
4000	72·5	0	27·5	0·75	0·54	0	0·206	0·54	0	29·25
3900	72·5	0	27·5	0·50	0·36	0	0·137	0·36	0	19·45
3800	72·5	0	27·5	0·25	0·18	0	0·068	0·18	0	9·22

lumns IX., X., and XI. shows the ordinates of these as, which will then be equal. As the areas, when equal, e white, the ordinates at any point where equal will give ite.

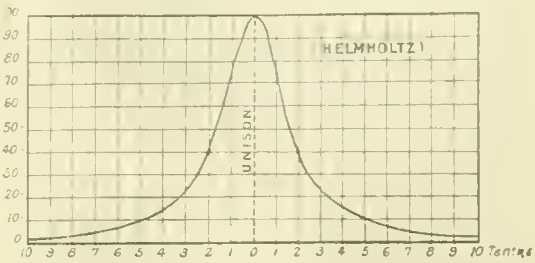
It is well that we should pause and consider how it ses that a variety of different vibrations can affect one ce of apparatus which can be set in oscillating motion. may connect two pendulums, or, rather, cause them to ct one upon another. We may have one of them vibrating h a set swing which remains unalterable in amplitude, ilst the other may be capable of increasing or diminishing length of swing. When the two pendulums are of erent length and both are vibrating, if that which has a d swing is so connected with the other that it gives it low during each swing, the blow will tend to increase swing, and gradually the phase of swing will alter, so t when one begins to descend the arc described the er will be ascending. The swing of the latter pendulum then diminish, and finally cease altogether, when it will in begin to move, and once more reach its maximum amplitude. Such a motion is to be seen in Fig. 7, which is one drawn by a modification of the apparatus used for Lissajou's figures. The increase and decrease of the swings of the second pendulum are well seen.

Fig. 7.



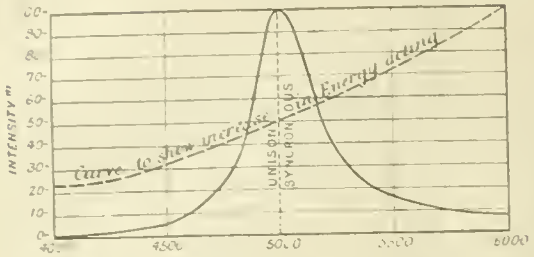
The same kind of motion is found in a resonator. Helmholtz calculated the loudness of a sound which would be given out from it when set in motion by notes in tune and out of tune with it, and he obtained a curve which is the same as that which would be got by lengthening or shortening the pendulum which was influenced by the oscillations of the pendulum having a fixed length and swing. The maximum ordinate is taken as 100, and represents the loudness of the note given out by the resonator when a note in tune with it was struck. The following table and figures give his results. They show that it is a symmetrical figure on each side of the maximum when the supposition is made that the notes struck were all equally loud. Where the notes struck are of gradually diminishing loudness the figure would be altered, and if for "sound" you read "light," and for "resonator" read "sensation apparatus," the curve would be altered as shown in Fig. 9, since the *energy* of the spectral rays increases from the violet to the red.

Fig. 8.



Intensity of Vibration of Resonator to Notes in Tune and out of Tune with the Membrane.

Fig. 9.



Amplitude of Vibration of an Atom acted upon by Waves of increasing Length and increasing Energy (calculated).

The following table applies to the curve shown in Fig. 8.

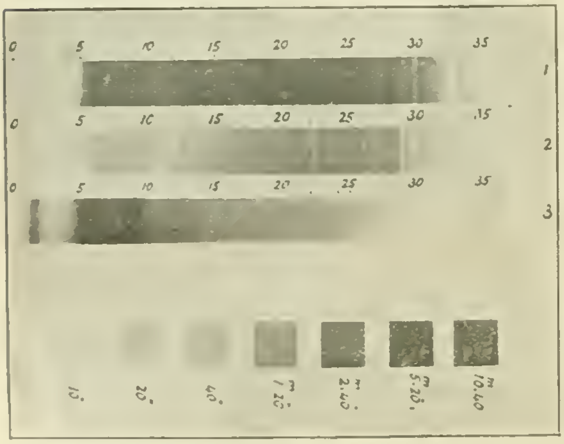
Table II.

Difference of Pitch.	Intensity of Vibration in Resonator.
0·0	100
0·1	74
0·2	41
0·3	24
0·4	15
0·5	10
0·6	7·2
0·7	5·4
0·8	4·2
0·9	3·3
1·0	2·7

Now I have been somewhat particular in bringing this bye-subject before you because what applies to the sound waves impinging on a resonator applies not only to light waves when they act on the visual apparatus, but also when they act on the atoms of the molecules of the silver salt which form the sensitive substance in a photographic film.

Adopting as unchallenged the chemical theory of the formation of the photographic image, we can show how the proportion of the number of molecules that are decomposed in a given time by the "swinging out" of the sphere of molecular influence of the halogen atoms varies through the different average amplitudes which are caused by the blows of the ether waves of different oscillation frequency.

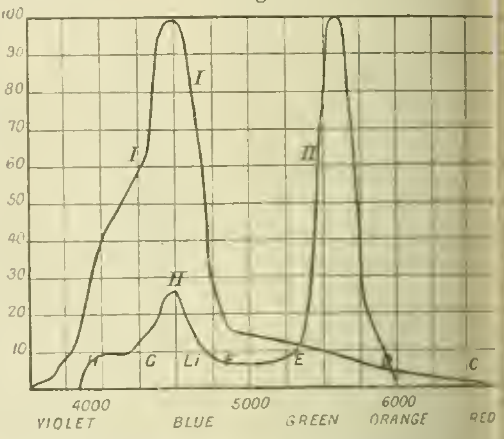
Fig. 10.



If we take pure bromide of silver as an example, and expose it on a photographic plate to the spectrum for a given time, each ray of a different wave length will decompose a different number of the molecules. The number of molecules so decomposed can be estimated by the amount of silver reduced on development, and the amount of silver in its turn can be estimated by the amount of obstruction which it offers to the passage of light through it, supp always that some known scale of obstruction can applied.

Such a scale of obstruction can be made by exp small portions of the same plate to a light of intensity for varying known times. Fig. 10 shows negative of the solar spectrum on a Cadett spectrum When the spectrum and this scale are developed toge and the obstruction to light measured in the latter, wa apply the obstruction offered by different parts of developed spectrum image to the obstruction curve by the scale, and obtain an estimate of the relative nu of molecules decomposed by each separate ray. Curve the diagram (Fig. 11), taken from a similarly exp bromide plate, shows that, allowing for the increas spectrum energy from the red to the blue, the c obtained is not unlike that which Helmholtz calculate the resonator.

Fig. 11.



We see from the figure that the maximum numb molecules is decomposed by the blue ray near the lithium and that it extends beyond the place where the blue v sensation starts near the green. If an exposure of a be made to a view through a cell of sulphate of qu (which cuts off the ultra violet rays) it may be taken tha print from the negative will closely represent what such would appear to a person possessed only of the blue co sensation, and it may be said that such persons do exist

Up to this point I have been endeavouring to clea ground for a further look into the question of the pl graphy of colour.

There are two methods of representing the pictur coloured objects to the eye. The first is of course as p and the second as images thrown from a lantern on screen. The second is the easier to deal with first, reasons which will be apparent as we proceed. method, again, is capable of subdivision (*a*) where colours are produced by *mixed lights*, and (*b*) where duced by absorption of colours in a film. I propose to with (*a*) first.

We have already seen that to produce any colours three sensations are necessary, and if we could have three pure colours stimulated by the three sensations t colours would be theoretically the perfect ones with w the mixed lights ought to be made. This is impossible with this limitation I propose first of all to consider wh the theoretically perfect plan of producing a colo picture on the screen by the superposition of three colo images.

We must choose the three spectrum colours w are theoretically best, and which, when combined, will tints which are as nearly as possible unmixed with w These three colours are the colours which nearest appr to the three sensations, and, as before said, are best re sented by the red lithium line, the green (*b*) magne line, and the blue lithium line of the spectrum. Ta these for our starting point, we have to consider what sh be the intensity of these three colours. It may be take anted that, if we have three transparencies whose images e to be combined on the screen, at one part they will ve to represent a white, and that the white will be represented in each transparency (positive) as bare glass. The tensity of the three colours must therefore be such as will ien mixed, without any obstruction to any of the three ys, give white light.

The colours and their intensities are thus fixed.

The next question to deal with is the theoretically perfect negative from which the positives are to be produced. Now for the purposes of this lecture I have taken the above-named three colours of the spectrum and matched the intermediate spectrum colours by their mixture and obtained the percentage composition of all the spectrum colours in the terms of these three colours, omitting the white added. The table and Figs. 12, 13, and 14 show the results.

Table III.

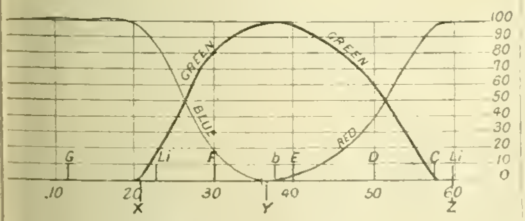
Table of Percentages and Luminosities of Colours in the Prismatic Spectrum.

cale No.	Wave Length.	Percentage Composition.			Spectrum Luminosity.	Luminosity.			Equal Amounts of Colours make White.		
		Red.	Green.	Blue.		Red.	Green.	Blue.	Red.	Green.	Blue.
64	7,217	100	..	..	0·5	0·5	..	..	1·05	..	..
62	6,957	100	..	..	2·0	2·0	..	..	4·2	..	..
60	6,728	100	..	..	7·0	7·0	..	..	14·7	..	..
58	6,520	100	..	..	21	21	0	..	48·2	0	..
56	6,330	85	15	..	50	42·5	7·5	..	99·2	7·5	..
54	6,152	69	31	..	80	55·2	24·8	..	116	24·8	..
52	5,996	50	50	..	96	48	48	..	101	48	..
50	5,850	36	64	..	100	36	64	..	75·5	64	..
48	5,720	25	75	..	97	24·2	72·8	..	50·8	72·8	..
46	5,596	17	83	..	87	14·8	72·2	..	31·1	72·2	..
44	5,481	11	89	..	75	8·25	66·75	..	17·3	66·75	..
42	5,373	6	94	..	62·5	3·75	58·8	..	7·9	58·8	..
40	5,270	2·5	97·5	..	50	1·25	48·6	..	2·6	48·6	..
38	5,172	0·5	99·5	..	36	0·2	35·8	..	0·5	35·8	0
36	5,085	..	99	1	24	..	23·76	0·24	..	23·76	10·4
34	5,002	..	96	4	14·2	..	13·63	0·57	..	13·63	21·7
32	4,924	..	91	9	8·5	..	7·735	0·765	..	7·735	33·1
30	4,848	..	82	18	5·7	..	4·674	1·26	..	4·674	44·4
28	4,776	.	68	32	4·0	..	2·72	1·28	..	2·72	55·4
26	4,707	..	45	55	2·9	..	1·26	1·54	..	1·26	66·1
24	4,639	..	25	75	1·9	..	0·48	1·42	..	0·48	61·4
22	4,578	..	11	89	1·4	..	0·15	1·25	..	0·15	54·1
20	4,517	..	0	100	1·1	..	0	1·10	..	0	47·3
18	4,459	..	..	100	0·86	..	..	0·86	..	..	37·3
16	4,404	..	..	100	0·70	..	..	0·70	..	..	30·3
14	4,349	..	..	100	0·56	..	..	0·56	..	..	24·2
12	4,296	..	..	100	0·45	..	..	0·45	..	..	19·5
10	4,245	..	..	100	0·34	..	..	0·34	..	..	14·7
8	4,197	..	..	100	0·26	..	..	0·26	..	..	11·3
6	4,151	..	..	100	0·18	..	..	0·18	..	..	7·8
4	4,106	..	..	100	0·14	..	..	0·14	..	..	6·1
2	4,060	..	..	100	0·10	..	..	0·10	..	..	4·3
0	4,018	..	..	100	0·6	..	..	0·6	..	.	3·8

f we were to translate the three colours into their ation equivalents, Fig. 5 and Fig. 12 would be identical.

Fig. 12.

RCENTAGE COMPOSITION OF SPECTRUM COLOURS IN LUMINOSITIES OF RED, GREEN, AND BLUE.



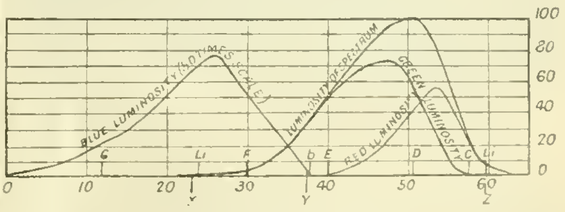
Scale of prismatic spectrum.

(X, Y, Z = position of slits.)

nowing the luminosity of the different rays, the luminosity e of the spectrum can be converted into the luminosity ie three colours (Fig. 13), and from these we can calculate the scale of ordinates to make the areas of the three nosity curves equal (Fig. 14), which is diagrammatically g that the three naked colours will make white. The of the areas of the colour luminosities into which the spectrum luminosity was divided, of course, would ually well found (and indeed was found) by measuring uminosity of the colours coming through the three slits e spectrum which formed white light. The ratio of the areas to one another was found to be identical with the ratio of the luminosities coming through the three slits.

Fig. 13.

LUMINOSITY OF SPECTRUM DIVIDED INTO RED, GREEN, AND BLUE LUMINOSITIES.



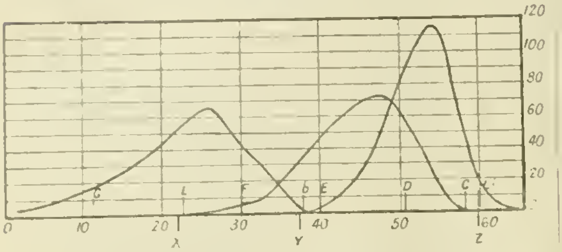
Scale of prismatic spectrum.

(X, Y, Z = position of slits.)

From the figure it will be seen that the spectrum is divided into two parts, the point of separation being the spot from which the green light is selected. One of the portions is occupied by the red luminosity and the other by the blue, whilst a curve of green luminosity overlaps both the others, finishing at the red and blue lithium lines, which are the colours selected to represent the red and blue lights. The opacities of the negatives at every point must be proportional to the luminosity of the three sensations, and from such negatives, positives should be taken in which the transparency of deposit is similarly proportional. In practice, it is here where Hurter and Driffield's work gives aid, and their researches have much simplified this problem.

Fig. 14.

Curves of Colours when equal Width of Slits forms White.

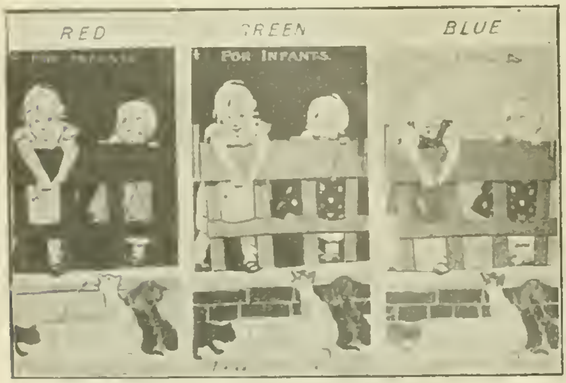


Scale of prismatic spectrum.

(X, Y, Z = place of slits in spectrum.)

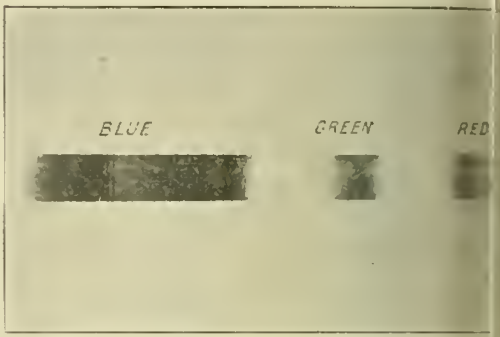
Now I will try and represent what I have so far endeavoured to explain in a simple manner, so that it may impress itself on you. First of all, the three slits are placed in the spectrum in the theoretical positions, and a patch of white light is made by their mixture. I then place in front of the slits three lenses of equal foci, instead of the single lens L_4 (Fig. 1), and form three patches of red, green, and blue. In contact with the face of the prism (see Fig. 1) I place a coloured transparency, and we have three images of the picture in different colours (Fig. 15). I withdraw the three lenses and substitute the one for them, and we see the coloured image. I withdraw the slits, and we have the image in white light, more brilliant than before, but still the same in colour. I repeat this with another coloured image, with the same results. Thus, for three-colour photography we have to see that the three unobstructed colours sent through the three positives make white, and then the three images formed of the same colours and superposed will give a correct representation, or nearly so, of the object.

Fig. 15.



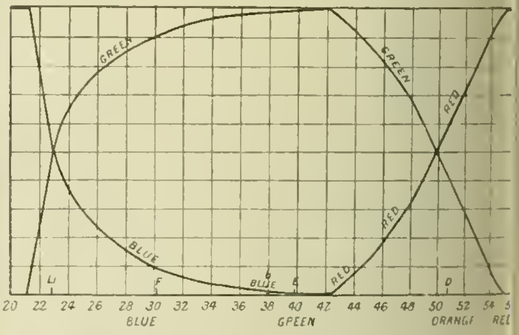
The subject, so far, has been treated from a theoretical standpoint, and not from a practical or practicable basis. The spectrum colours are not available for ordinary commercial work, and means have to be taken to get colours from other sources than that of the spectrum. Ives, by his intuitive genius, and by his study of Maxwell's curves, produced three colours for illuminating his three positives closely approximating to the colours which present theory indicates as correct. They are produced by transmitting white light through coloured screens or filters. The red is as pure a red as can be obtained—not quite as red, perhaps, as the lithium true red, but still not far His green is a green which matches a spectrum colo little nearer the red than that given by the study of colour sensations. By this choice the reds, oranges, yellows are less mixed with white than they would b been, but the blues and blue-greens suffer proportion His blue matches one close to the blue lithium line, allows no red to pass, which is most frequently a faul blue screens. Their spectra (Fig. 16) show that the

Fig. 16.



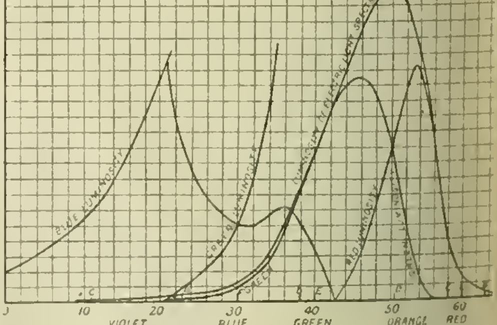
first occupy but small spaces in the spectrum. T luminosities are chosen so that when the light passes thro each, unobstructed, to the screen, the resulting mixtur white. The curves in Fig. 17 show the colour percen

Fig. 17.



Percentage Composition of Spectrum Colours Luminosities (Ives' Viewing Screens).

Fig. 18.



Luminosity of Spectrum in the Luminosities c Ives' Viewing Screens.

ach which goes to make up the different colours of the trum, and Fig. 18 shows the spectrum luminosity divided the luminosity of the three colours.

he following tables apply to Figs. 17 and 18 :—

TABLE IV.

lour at Scale.	Red. Green.	Luminosity of Spectrum.	Luminosity of Components. Red. Green.
matches	100·0 + 0·0	58·0	58·0 + 0·0
„	98·0 + 2·0	65·0	63·7 + 1·3
„	93·0 + 7·0	80·0	74·4 + 5·6
„	83·0 + 17·0	90·0	74·7 + 15·3
„	72·0 + 28·0	96·0	69·1 + 26·9
„	62·0 + 38·0	99·0	61·4 + 37·6
„	52·0 + 48·0	100·0	5·2 + 48·0
„	42·0 + 58·0	99·0	41·6 + 57·4
„	32·0 + 68·0	97·0	31·0 + 66·0
„	24·0 + 76·0	92·5	22·2 + 70·3
„	18·0 + 82·0	87·0	15·7 + 71·0
„	12·5 + 87·5	82·0	10·2 + 71·8
„	8·0 + 92·0	75·0	6·0 + 69·0
„	3·5 + 96·5	68·0	2·4 + 65·6
„	0·0 + 100·0	64·0	0·0 + 64·0

ur at cale.	Green. Blue.	Luminosity of Spectrum.	Luminosity of Components. Green. Blue.
atche	99·9 + 0·1	62·5	61·9 + 0·06
„	99·65 + 0·35	57·0	56·8 + 0·02
„	99·35 + 0·65	50·0	49·67 + 0·33
„	99·0 + 1·0	42·5	42·08 + 0·42
„	98·6 + 1·4	36·0	35·48 + 0·52
„	98·0 + 2·0	29·5	28·91 + 0·59
„	97·4 + 2·6	24·0	23· 8 + 0·62
„	96·7 + 3·3	18·2	17·60 + 0·60
„	95·9 + 4·1	14·2	13·62 + 0·58
„	95·0 + 5·0	10·5	9·97 + 0·53
„	94·0 + 6·0	8·5	7·89 + 0·51
„	92·5 + 7·5	7·0	6·47 + 0·53
„	90·3 + 9·7	5·6	5·05 + 0·54
„	88·5 + 11·5	4·8	4·25 + 0·55
„	85·5 + 14·5	4·0	3·42 + 0·58
„	81·5 + 18·5	3·5	2·85 + 0·65
„	77·0 + 23·0	3·0	2·31 + 0·69
„	71·5 + 28·5	2·6	1·86 + 0·74
„	64·5 + 35·5	2·3	1·48 + 0·82
„	50·0 + 50·0	1·9	0·95 + 0·95
„	25·0 + 75·0	1·65	0·42 + 1·23
„	0·0 + 100·0	1·55	0·00 + 1·55

following are the remaining luminosities of the um, which are represented by the red and blue of the edia :—

TABLE V.

e No.	Luminosities.	Scale No.	Luminosities.
	Red.		Blue.
64	0·00	14	0·80
63	1·00	13	0·70
62	2·00	12	0·60
61	4·00	11	0·55
60	7·00	10	0·52
59	12·50	9	0·50
58	21·00	8	0·48
57	33·00	7	0·45
56	50·00	6	0·40
	Blue.	5	0·37
21	1·50	4	0·35
20	1·40	3	0·27
19	1·35	2	0· 5
18	1·20	1	0·23
17	1·10	0	0·21
16	1·00		
15	0·90		

se luminosities (which are, of course, the luminosities spectrum itself) are shown in Fig. 18, as the continua- the red and blue curves respectively.

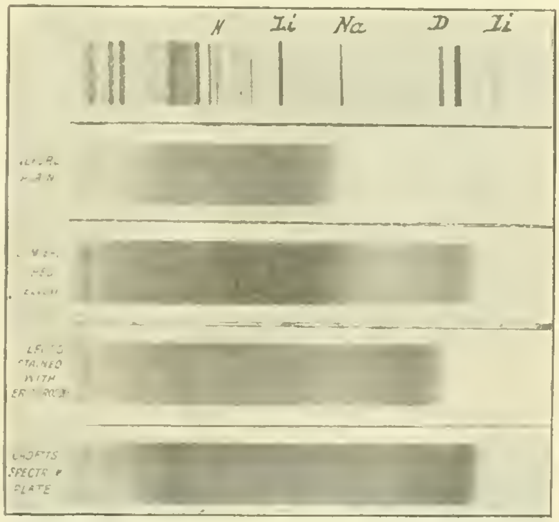
e VI. gives the wave-length values of the scale rs of the spectrum, and applies to diagrams 12, 13, 14, d 18.

TABLE VI.

Scale No.	Wave-Length.	Scale No.	Wave-Length.
64	7247	32	4924
62	6957	30	4848
60	6728	28	4776
58	6520	26	4707
56	6330	24	4639
54	6152	22	4578
52	5996	20	4517
50	5850	18	4459
48	5720	16	4404
46	5596	14	4349
44	5481	12	4296
42	5373	10	4245
40	5270	8	4197
38	5172	6	4151
36	5085	4	4106
34	5002		

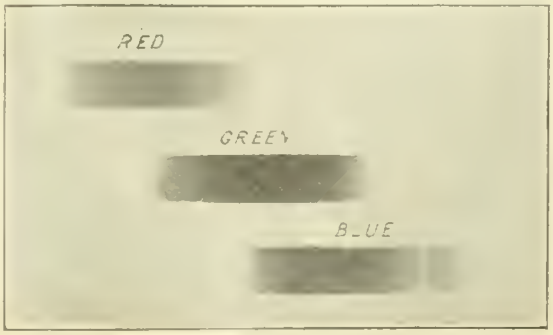
The practical question of obtaining the negative remains. Now I may at once state that except with the ordinary bromide plate, which with very prolonged exposure is sensitive into the red, no theoretically perfect negatives are possible so far. The photographic plates (Fig. 19) which can be impressed by the red through the use of dyes in the films have curves of sensitiveness so jagged that no absorbing screen has been found which can follow the jaggedness and cut off exactly the right proportions. See also curve II., Fig. 11, which is that of a bromide plate dyed with eosine.

Fig. 19.



With the ordinary bromide plates, in which the curve of sensitiveness shows no contraflexures (see curve I., Fig. 11),

Fig. 20.



proper absorbing screens can be found, but the exposure for the red negative is so prolonged that their use becomes impracticable. I have myself photographed a spectrum with such a plate with proper screens, which reproduced very accurately the spectrum (Fig. 20). The absorbing screen to cut off the different parts of the spectrum is the crux, and it is evident that even with plates sensitive to the red and yellow (see Fig. 19) a compromise with theoretical perfection has to be made, owing to the irregularity in the curves of sensitiveness alluded to.

Objects in nature are seen by reflected light, and all objects so seen not only show their own local colour and light and shade, but they also reflect a fair proportion of white light. The very small percentage of white light, therefore, which is found in the mixture of the colours coming through the screens becomes inappreciable; and if that local colour be rendered correctly, any small percentage of white light which is in excess becomes negligible.

Again, colours of objects are *not* pure spectrum colours, but if examined by the spectroscope are found to occupy a considerable space in the spectrum, and this enables a system of compensation, which the irregularity of the sensitiveness of the plate requires, to be brought into play, for it must be recollected that the colour *as a whole* has to be photographed For example, an orange colour will show on spectroscopic analysis that it is made up of a band of colours lying from the extreme red end of the spectrum up to the yellow. Now a plate may be very sensitive to the yellow and much less sensitive to the red. If, then, a screen be found which admits such a quantity of yellow that the deficiency of sensitiveness to the red is made up by the excess sensitiveness to the yellow, the integral result may be the same as if the plate were properly yellow and red sensitive. Bearing this in mind (I have here to allude to some work of my own), a colour apparatus can be made which will let us know when the compensation is effected without invoking the aid of the spectrum. If we take an intense red, an intense yellow, an intense green, an intense blue, and perhaps an intense purple pigment, and pure white paper, we can construct such a colour sensitometer as will be available for practically working out the suitable screens on the principle of compromise.

The luminosity of these six can be accurately measured by the plan which I originated, and we will suppose this to have been done and that they have to be reproduced by three-colour photography. If we match them severally by a mixture of the spectrum colours which most accurately represent the colour sensations or by the colours coming through such screens as Ives', knowing the luminosity of the three colours which make the mixture, we can lay down the luminosity, say of the yellow, is made up of so parts of red and so many parts of green luminosity the purple of red and blue luminosity. Suppose we to find the screen through which to take the "r negative, we first must calculate how much the lumin of the yellow must be reduced so that the red compo in it is equal to that in the purple. We must in reduce the luminosity of the red, yellow, and white ti the red components are of equal value. Thus, i luminosity of the yellow is 80, 40 of which are and 40 green, and of the purple, 2 red and 2 blue, we reduce the yellow to $\frac{2}{40}$ths of its luminosity, and the red in each will be the same, and so on. To effect the colours are placed as rings on a rotating disc, pa each ring or annulus is covered up by a dead black light reflected from it being taken into account). the disc rotates we see that the luminosities of the are very different; but, notwithstanding, the red compo in every ring are the same.

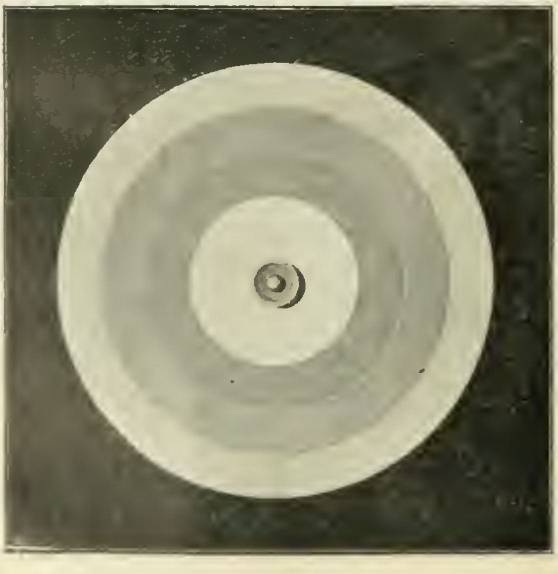


Fig. 21.

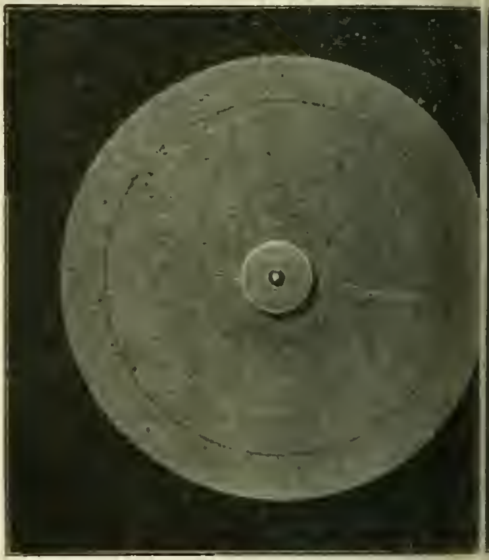


Fig. 22.

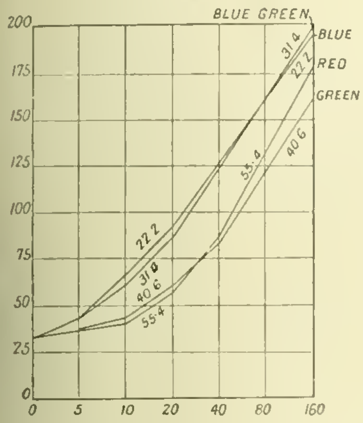
For the "red" negative to be correct it should sho the rings as equally dense. Without a screen we sha very different results from this (Fig. 21), but by pl an orange screen in front of the lens we shall see better, and by gradual alteration of the colour o using a parti-coloured diaphragm we shall at length c one which will effect what we require (Fig. 22). The method is gone through for a green and a blue sc The screens will vary according to the kind of plate w using.

I have here another form of colour sensitometer, but exactly on the same principles. Instead of pigment use glass, the luminosity being reduced by means of rot apertures placed in front or by neutral tint pigment. glass is very convenient, as there is no white reflect mix with the true colour as there is with pigments.

Having obtained these light filters we can photograp object with a knowledge that we shall get negatives are very nearly correct. From these negatives t parencies are made, and these have to be illuminated the light passing through the three colour screens an images superposed.

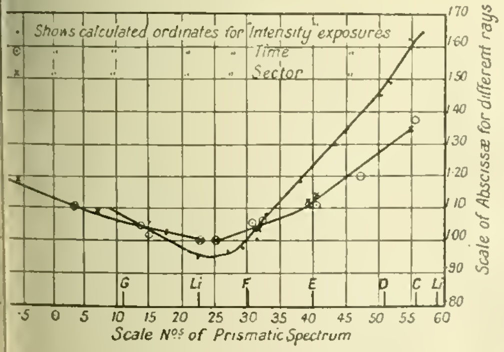
It might appear, after what has been said, that al difficulties in taking the negatives (and from them positives) are surmounted when we have got the light (screens) in the manner described, but that is not quit case, for I entered a "caveat" when I said "neg which are very nearly correct." Ives noticed the diff etting the red negatives of the same gradation as the two. Mr. Chapman Jones and your lecturer each endently investigated the action of light of different rs in producing gradation in a plate, and both came e conclusion that the gradation given by the red rays steeper than that given by the green or the blue. lecturer used the rays of the spectrum in his investigns, and, thanks to the method of graphically showing ation introduced by Hurter and Driffield, he was led to ascertain by a long series of experiments that gradation increased for rays on each side of that of the spectrum which had the maximum effect on simple salt of silver which was used in the plate.

Fig. 23.



23 will enable you to see the gradation given with ays of the spectrum, and Fig. 24 will show the general ion in gradation which is given throughout the whole um. It will be noticed that while the gradation for the blue and the green are not far different to nother, that given by the yellow to the red is much

Fig. 24.



r. The reason of this is not quite apparent at the it time, but I think it can be explained by the theory applies to the vibration of an atom when increased ocks of ether waves, as described previously. If, ially, it is found that such is indubitably the case, the menon observed will be one which may give us a r insight into, and a measure of, the viscosity of the and form a contribution to molecular physics of a ignificant character.

ractice the shades, say, of orange and yellow must be bit untrue, for if a certain depth of yellow is correctly ced, it is evident that in some cases the lighter shades a trifle either too red or too green.

Fig. 24 it will be noticed there are two curves, one concave than the other. The former represents the tion in gradation when the *intensity* of the light is l whilst the time of exposure remains the same. This is the curve which would apply to camera images, where the time of exposure of the image to the plate is, of course, the same. The other curve is that given by the measures where the *time* of exposure is altered and the intensity of the light remains the same.

[Some of Mr. Ives's slides were then projected by a triple lantern.]

This may be called the first important method of the photography of colour, and very beautiful it is.

There is a modification of Ives' process which must be mentioned, and it is a very remarkable proof of the practical use that a man of science may make of his theoretical knowledge in its application to an art. Ives requires three negatives, it will be remembered, to produce a triple projection, but Prof. Joly has compressed the three negatives into one. He rules on a glass three sets of fine lines of appropriate colours touching one another. One set is orange, another greenish-blue, and the third blue. Each line has a breadth of some $\frac{1}{200}$th of an inch, and they follow and touch one another in the order given. The colours are the same as those found for Ives' screens for taking the negatives when the same plate is used. When such a ruled surface is placed next a plate the camera image has to pass through the lines to the sensitive surface, and we have one-third of the whole negative formed by light of the colour passing through each of the three-line series respectively. If we back the transparency obtained from this negative with a plate covered with lines similarly spaced, but which are red, green, and blue, and cause the red line to coincide with the lines of the transparency which, in the negative, were taken through the orange lines, the green with the green-blue, and the blue with the blue, and then send a beam of white light through the transparency to form an image on a screen, we have the three transparencies of Ives in one, only shown in lines. The eye makes the small portions next one another blend together, and the effect is to see the object or view in colours. The brightness of the picture must, however, be inferior to that given by triple projection.

There are several difficulties to cope with in this process. The first is to get exact equality in the width and spacing of the lines in both the "taking" and the "viewing" screens, and the second is to make all the lines of the exact depth of colour which is required. These difficulties Prof. Joly overcame, and some of his lantern slides are shown on the screen.

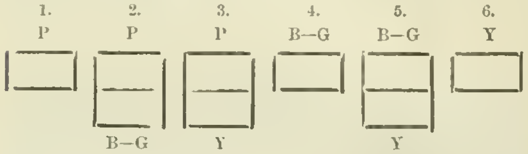
It should be noted that an American, Macdonough, claimed priority in the process; but I have no time or inclination to enter into the discussion of the rival claims.

Having shown how colour can be produced by triple projection, we can next proceed to see how projection can be made by the superposition of three coloured transparent films—a process which was explained by Mr. Ives and since worked out most successfully and on a commercial scale by Mr. Sanger Shepherd. The colour on a screen by mixing beams of white light passing through two or more coloured media is by no means the same as that obtained by sending one beam of white light through the same coloured media.

We have seen that the mixture of white light, after passing through a red, a green, and a blue medium respectively, can be made to give white. If the same coloured media, superposed one over the other, be interposed in the path of a beam of white light, they will cut off all light, or transmit only a dim light which has no dominant colour. In other words, for white we should get black. We have also seen that a mixture of green and red light gives yellow; if white light is transmitted through superposed media of these colours they would give a dark colour, tinged, perhaps, with one or other of the two colours red or green. Theoretical considerations show that the colours chosen must be totally different for superposition to those chosen for triple projection. What are these colours? is the question to be answered. (It may be stated once for all that the negatives which are suitable for giving triple projection transparencies are suitable for obtaining coloured transparencies by superposing three coloured prints from the negatives when suitable colours are chosen.) In the first place, the colours must evidently allow large overlapping bands of the spectrum to be transmitted. We shall find that in the three *negatives* where a spot of white is to be reproduced, the developed image of the spot in each is opaque. Again, if we have a black spot in the object, each of the three negatives employed will show that spot as transparent. If we take three prints (one from each negative) on a transparent colourless film, such as gelatin, sensitised with bichromate of potash, *the thickness of gelatin* left after development with hot water will *take the place of the silver opacity* found in the positives used for projection. These images we can dye with different dyes, and the *depth of colour* of every part will be *proportional to the thickness of gelatin* left at that part. Suppose we have photographed a bright yellow object, the "red" negative would show it as opaque, as also would the green negative, whilst the "blue" negative would show it as transparent. In the gelatin prints from the red and green negatives. all gelatin would be washed away where the image of the yellow object had been impressed, and it would be of maximum thickness in the print from the blue negative. This shows that the colouring matter used for the print from the blue negative must be a yellow. Hence we have an indication that the general colour of the print from the blue negative should be complementary to the blue used for the triple projection. By similar reasoning it will be found that a pink must be used to stain the print from the green negative, and a blue-green the print from the red negative. Now it is found by some that there is a difficulty in choosing the colours which will absolutely fit the negatives, such as we have described for the triple projection process, and the question of stability of the colour is one which it is necessary to consider. Thus, it may happen that some slight modifications of the screens for taking the negatives may be necessary; and I propose to show you the principles on which they may be obtained. Let us take strips of gelatin or glass plates which are stained with the three colours respectively which it is proposed to employ, and let us superpose pieces of them on one another and also have some alone.

First of all, these colours must be of such a depth that when all are superposed one over the other, the resulting light passing through must be a dark grey. If we superpose the green-blue and the pink, the light passing through must be a blue. If the pink be superposed over the yellow, a red must pass, and if we have a yellow over the green-blue, a green colour must pass. The colours available are then red, yellow, green, green-blue, blue, and pink. Now let us make a sensitometer of these colours in square patches. The diagram shows these in section.

Colours passing through 1, Pink; 2, Blue; 3, Red; 4, Blue-Green; 5, Green; 6, Yellow.



Let us consider (1), (2), and (3). In order to reproduce the pink (1), blue (2), and red (3), we must try to obtain some screen which will allow light of such a colour to pass through that the densities of 1.2.3 are almost *nil* (for the same pink is a component of each of the three) on the photographic plate, whilst the others should show opacity. It will be found to be a green screen, and so on with the others. It will be evident that only a close approximation can be obtained, since in (1) the pink itself is the only obstructing medium.

For the three negatives—

(I.) A green screen should make 1, 2, and 3, nearly transparent; 4, 5, and 6, nearly opaque.
(II.) A red screen should make 2, 4, and 5, nearly transparent; 1, 3, and 6, nearly opaque.
(III.) A blue screen should make 3, 5, and 6, nearly transparent; 1, 2, and 4, nearly opaque.
(I′.) A gelatin print from (I.) will, if stained *pink*, give 1, 2, and 3, *pink*; 4, 5, and 6, bare.
(II′.) A gelatin print from (II.) will, if stained *blue-green*, give 2, 4, and 5, *blue-green*; 1, 2, and 6, bare.
(III′.) A gelatin print from (III.) will, if stained *ye*
give 3, 5, and 6, *yellow*; 1, 2, and 4, bar

(I′.), (II′.), and (III′.), superposed will give the ori colours: *pink, blue, red, blue-green, green*, and *yellow.*

The sensitometer may be made still more delicat choosing half tints of each colour and superposing the whole tints of the other colours. The principle is sh however, in the figure.

[Some beautiful recent slides by Mr. Sanger Shep were thrown on the screen. They illustrated the ap ability of the process to various kinds of objects and vie

The results which have been obtained by Mr. Sa Shepherd in the beautiful colour positives which I shown you, ought to be equally well obtained by ca three-colour printing in transparent colours on a ground. Instead of superposing dyed gelatin prints same effect ought to be obtained by printing from collo surfaces, prepared from suitable negatives, in transp inks of the colours laid down above. (It may be rema that the ink used for the first printing may be opaque, the others must be quite transparent.) It is usual to the first printing a yellow, and the printing from "pink" and the "blue-green" surfaces in transp inks. Specimens of such a printing we have before work done by Messrs. Waterlow. The different stag the printings are shown, and also the finished picture. portrait in colours which I exhibit is a very fine pie chromatic printing, and is worthy of every study.

Now, it is not always convenient to use collotype sur from which to obtain prints, and the great desideratum obtain blocks which can be printed in the ordinary pri press. All of you are aware of the vast strides that been made in reproducing half-tone photographs in and white for illustrations in books. The means of this has not been by altering the depth of colour of printing ink used, but by introducing a grain in the neg from which the printing block is produced. The am of ink is the same wherever there is any ink, but half-tones are produced by an admixture of mor less white, given by the uncovered surface of the pap which the impression is made. In the same way pri blocks for each of the three colours can be prod which, if printed alone, would give every detail of light shade by the above method. The difficulty that must is the alteration of light, shade, and colour in diff prints when the three impressions are made on the surface, owing to difference in "register." Dr. Clay called attention to this fact in an admirable paper he tributed to the Royal Society, and there is no doubt something has to be done in improving the method b it will be competent to take rank as a real comm success.

The question of printing in opaque inks is another of picture-making which need be only briefly consid It is evident that each printing must give an image i form of dots more or less mixed by the eye with white. must be remembered that of all the colours used for t projection the green is the brightest, and that the bright of the yellow light is due to "the green brightness *plus* red brightness." When colours are placed side by and mixed by the eye, the brightness is only the mea the two brightnesses. Now, a green and a red pigm however bright, are always inferior in brightness to a br yellow pigment; hence, the yellow given by blending the eye will always be too small relatively to the green red unless the latter are toned down. As pictures mus bright, and not of a dull colouring, some means mus adopted for getting a yellow pigment into the schem printing, and this can best be done by producing a fo negative, intermediate between the green and the red. can readily be accomplished by splitting up the spectrum four parts, working out the curves, and finding a fourth sc for use with the fourth negative. This process has not worked to any extent except in the way of experiment.

Time has forced me to bring my lecture to a close. subject I have chosen was perhaps too large for a si hour (which has, I am sorry to see, been expanded nearly two). It is one, however, which is at present up most in the thoughts of many photographic workers, hom are not aware of all that is necessary to ensure ess. I have met some who are excellent manipulators, who are thoroughly innocent of a knowledge of the tific basis which underlies the process, but who have e or less succeeded by numerous trial and error ex- ments—experiments which might have been reduced in ber had they been guided by theory. My object has to help workers as far as I could by giving an outline ich theory, and I am grateful for the patience with which ve been heard.

r. **George Beilby** said that in the regrettable absence e President of the Society, it had been suggested that hould propose a vote of thanks to Sir William Abney is interesting lecture. He rded it as a great privilege lo so, and moreover he rded it as a privilege to been present. In bringing t such a gathering they indebted to Sir William y and to his great name nnection with this subject. e was something peculiarly actory to them in having them one of the great rities on this important . Sir William Abney had his own personality very in the background, but who had followed what ccurred during the last 20 in connection with this must feel that they were e presence of a great r. They were proud that William Abney had come sociate himself with the of the revered Dr. Hurter o give them the result of agnificent scientific work ad accomplished in con- n with photography. He o propose a very hearty of thanks to Sir William y for his address.

. E. K. **Muspratt** seconded te of thanks, and

William Abney briefly wledged.

London Section.

Meeting held on Monday, November 4th, 1901.

MR. OTTO HEHNER IN THE CHAIR.

LORIMETRIC METHOD FOR DETERMINING OXYGEN DISSOLVED IN WATER.

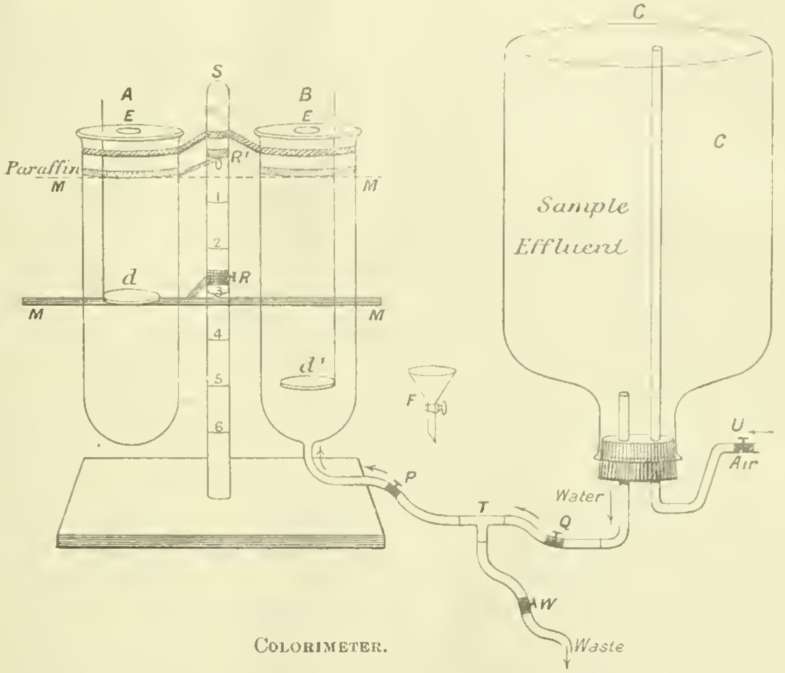
BY PROF. WILLIAM RAMSAY, F.R.S., AND

MISS IDA HOMFRAY.

estimation of dissolved oxygen in effluents from e farms, and in rivers and drinking waters, forms a le adjunct to the numerous chemical and bacterio- l tests for contamination which are at present applied, conjunction with a determination of nitrates and, s, incubation, may even supplant them. It occurred hat it would be advantageous if some quick and easy s could be devised for estimating the free oxygen er—some process which could be safely entrusted rsons who had received no training in chemical ulation.

ing out the gases, and their estimation by the usual s of gas analysis, are obviously unsuited for the e, and the method of which a description is now given appears likely to be one which may be generally available in the hands of the managers of sewage farms and of inspectors at testing stations. We have also devised a portable apparatus which can be taken to the effluent or brook, and which enables a rapid estimation to be carried out in a few minutes on the spot.

It is well known that an ammoniacal solution of cuprous chloride is colourless, but turns blue owing to oxidation immediately on exposure to air, with formation of cupric chloride. If the water in which the cuprous chloride is dissolved contains oxygen in solution, the same blue colour is produced; when atmospheric oxygen is effectually excluded, the amount of cupric chloride formed is found to be an accurate measure of the dissolved oxygen present; the estimation of cupric chloride lends itself especially to colorimetry, as, owing to the intensity and purity of the blue colour obtained in ammoniacal solution, very slight differences of tone are easily detected.



COLORIMETER.

The apparatus used resembles Mills' colorimeter, modified so that sample waters can be protected from aeration in transference from the collecting bottle, and during the experiment; this is effected by means of a layer of paraffin oil, as shown in the diagram. The necessity for displacing air from the whole apparatus by an inert gas, as shown in Thresh's process, is thus obviated.

The Apparatus.—A and B in the diagram are two glass comparison-tubes, each 12 ins. long and 2 ins. in diameter; they are closed with movable caps (E); (*d*) (*d'*) are opal glass discs supported by brass wires, which slide with friction through holes in the caps, and which hold the discs in any required position.

The tubes are supported on a stand with a vertical brass stem (S), which is graduated in inches and tenths. The levels of the discs and of the liquids in the tubes are read off against this scale with the help of the horizontal levelling rod (M M), which slides along (S) and can be fixed at any point by the clamp (R). The bottle (C) contains the sample water or effluent.

Just before the experiment, it is unstoppered and fitted with rubber corks and tubes as shown. Care must be taken that no air bubbles are included; the bottle is then inverted, supported on a tripod stand, and connected by thick rubber tubing through a T-piece with (B) as shown

To Fill (B) *from* (C).—The clamp (R) is set at 0·3 division on (S), reading by the bottom of (R). Open screw clips (Q), (W), and (U), and run off some water till all air is displaced from (C) to (W). Close (Q). Remove cap from (B) and pour in some paraffin. Replace cap and disc. Run off enough paraffin through (W) to displace air from tube (B) to T-piece, leaving a depth of 1—2 cm. in (B). Close (W) and open the other clips. Water is thus allowed to flow quietly into the colorimeter tube (B) until level with the rod (M M). The paraffin layer rises above the water, acting as a liquid stopper and preventing absorption of atmospheric oxygen for a considerable time.

To fill (A) with Standard for Comparison.—All corrections are eliminated by using as a standard, distilled water saturated with air, both being at the laboratory temperature, which must be noted. The water is shaken in an open flask till air bubbles are seen, and is allowed to stand until they have disappeared. It is poured quietly into a colorimeter tube (A) till its level reaches (M M). After making sure that no air bubbles are entrapped below the disc, a layer of paraffin is poured on to the water. The ratio of concentrations of oxygen in the waters in (A) and (B), can now be measured. The clamp (R) is moved to zero. (M M) is then the final level.

Addition of Reagents.—Cuprous chloride is found to keep from oxidation best in the form of a powder protected from light and damp in a stoppered black test-tube. It is made by warming a solution of cupric chloride with scraps of metallic copper, and then pouring into water. A white precipitate is filtered off, washed with boiling water, the water is displaced with alcohol, and the alcohol with ether; it may then be dried by help of a suction pump on the filter which retains it. It must not be used unless quite white, otherwise it may contain some cupric chloride. A little of the powder is poured into a small tap funnel (F) and covered with concentrated hydrochloric acid; a dark brown solution results. Some is then run into (A) and (B), avoiding air-bubbles. A white precipitate forms and aqueous ammonia is at once added from a pipette, till the liquid in both tubes reaches (M M); on stirring gently with the discs, solution takes place at once; the cuprous ammonium double salt is soluble and colourless, but some of it is oxidised to the cupric condition at the expense of all the oxygen dissolved in the water. A very small quantity of this powder suffices to ensure the removal of all the dissolved oxygen, but some excess does not interfere if sufficient ammonia is at once added. If any white precipitate remains, it turns yellow, for it is very sensitive to light, and interferes with the readings. The solutions (if coloured) should be of a pure greyish blue. A greenish colour indicates that an insufficient amount of ammonia has been added, unless the sample water itself was coloured or opalescent.

The colorimetric estimation consists in determining the ratio of the concentrations of the coloured cupric double salt in the two tubes.

The Determination.—As with Mills' colorimeter, the observer, looking through a hole in the cap of each tube, adjusts the levels of the opal glass discs (d, d'), so that, when seen from above through the liquids, the intensity of colour appears the same in both. The supports of the tubes are hinged to move in a horizontal plane, and their distance apart is regulated by the observer so that he can look down both tubes at once. (M M) is made to coincide with the level of each disc in succession, and readings are taken by (R) or (S), as shown in the figure. This gives the depth of (d) below the level of the liquid at the zero.

Let the readings be p and q in tubes A and B respectively.

Intensity of colour, *i.e.*, the total selective absorption of light in travelling through the lengths $2p$, $2q$, respectively, of the solutions is the same by adjustment.

But this absorption depends only on the number of molecules of solute encountered, the reflecting disc being white and the solvent colourless.

Hence, in the two solutions

$$p c = q c',$$

where c, c' are concentrations in A and B,

$$\therefore \quad \frac{c}{c'} = \frac{p}{q}.$$

Thus, $p/q \times 100$ expresses the percentage oxyg saturation compared to water saturated at known temper tures.

The final results are best expressed in c.c. per litre N.T.P. The numbers are accurately known for distill water at ordinary temperatures, and are given in Suttor Volumetric Analysis from 0° C. to 30° C.

In very many cases the water to be tested contains mu lime, which causes a turbidity on adding a solution ammonia. In this case, 2 or 3 c.c. of a hot saturated sol tion of ammonium chloride is added before the oth reagents to both tubes; dilution corrections are th eliminated.

The effluents to be tested are often rather yellow in colo The addition to the standard of a trace of an alkaline sol tion of paranitrophenol after the other reagents usua gives a colour similar to that of the effluent. The settin are thus somewhat facilitated, but the difficulty of deali with coloured effluents is much less than appears at first.

Numerous trials of the method have been made to t its accuracy and reliability.

(1) *Comparison of the Colours obtained by Differ Strengths of Cupric Chloride.*—The same volume of wa was poured into A and B. 6 c.c. of $CuCl_2$ solution w added to A, and successive quantities of the same soluti was dropped from a burette into B. Readings by the colo meter were taken after each addition of 0·3 c.c. to B. T readings were in all cases accurate to 1 or 2 per ce This shows that the readings obtained are proportional concentrations of cupric chloride.

(2) Negative results with ammoniacal cuprous chlori and *unaerated water* were repeatedly obtained. The wa used was boiled in a flask for some time under redu pressure, paraffin sucked into the vacuum after cooling, a the usual testing process applied. No trace of colour w produced.

(3) With varying quantities of oxygen in the wat aliquot portions of the unaerated water were run out a replaced by fully aerated water. Comparisons were ma with the undiluted standard and a very good agreement w found. This method is not a very convenient one, aeration gradually takes place through the paraffin wh absorbs gases very readily.

In order to obtain more satisfactory and independ check upon our experiments Thresh's iodometric meth was used side by side with the Cu_2Cl_2 method. For p ticulars of Thresh's method which, though rather lon and more complicated, is very convenient and reliable, Sutton's Volumetric Analysis.

It will be seen that the Cu_2Cl_2 method and Thres method are so entirely different, as are also the sources error, both chemical and personal, that they afford excellent mutual check. The concordance was alm always very good, the errors being well within the li required for practical purposes.

Portable Modification.—The cuprous chloride colour described above has been arranged in a portable form, necessary sample collecting apparatus, reagents and col standards being contained in a small wooden box. Exp ments can be carried out at the river side and the condit of the water tested in a few minutes at the required poi of its course. The apparatus has been tried on the Br near London with satisfactory results and also on Thames. The oxygen found varies from 5·5 c.c. to 1 per litre according to rapidity of flow, the entrance of effluents and the presence of aerating boards along course of the river.

The standards of colour in this apparatus consist of sealed tubes about six inches long containing vari strengths of ammoniacal cupric chloride. The experim is carried out in a similar shaped tube with ground gl stopper, under paraffin oil. The standards are suppo vertically in the box with a space between each into wh the test tube can be inserted for comparison. Ligh reflected up through the tubes by an opal glass plate se

It is thus easy to determine which of the standards is st nearly like the sample of the test tube in respect to nsity of blue colour.

o fill these standard tubes a stock solution (A) is made ollows: 3 grms. of pure copper wire are dissolved in ic acid and the solution is evaporated to dryness several s with hydrochloric acid; it is then heated till all the acid has been driven off. The residue of cupric oride is dissolved in distilled water, and ammonia and rochloric acid are added till a clear deep blue solution btained smelling strongly of ammonia. The solution is diluted until it occupies one litre. It can be kept for e time but gradually loses ammonia, becoming more or green in tint. Hence it is usually necessary to add onia in making up the diluted solutions for the dards from it.

is most essential to the permanence of the standard s that there should be a large excess of ammonia in the tions with which they are filled.

his stock solution is then diluted in definite proportions to correspond colorimetrically to definite concentrations ygen in the water to be tested.

of Standard.	No. of c.c. of A per Litre.	No. of c.c. of O_2 per Litre.
1	3·6	1
2	7·2	2
3	10·8	3
4	14·4	4
5	18·0	5
6	21·6	6

e quantity of ammonia added in diluting is immaterial ng as enough is present to ensure that all the copper is nt in the form of cuprammonium, and not of cupric It should smell strongly of the gas.

is easy to calculate the concentration of oxygen in r, which should correspond theoretically with a given gth of cupric chloride, say with Standard No. 6.

itre of A contains 3 grms. Cu = 6·4 grms. $CuCl_2$.

itre of No. 6 contains $\frac{6\cdot4 \times 21\cdot6}{1,000}$ 0·1382 grm. $CuCl_2$.

t 16 grms. O_2 are equivalent to 267·2 grms. $CuCl_2$ in eaction.

erefore 1 litre No. 6 is equivalent to $\frac{0\cdot1382 \times 16}{267\cdot2}$

28 mgrms. O_2.

·8 c.c. of O_2 at N.T.P.

erefore Standard No. 6 is theoretically equivalent to .c. of oxygen per litre. By the colorimeter it corresponds .c. per litre—an agreement as near as can be expected. esult was not worked out till long after the standards een empirically fixed, and is interesting as showing that olour estimated is really a measure of the reaction en the cuprous chloride and the dissolved oxygen.

e numbers for standards were obtained from numerous iments with varying concentrations of oxygen in water y comparing the standards with one another.

large number of actual effluent samples were procured the Beddington and Aldershot sewage farms. The en determination was carried out by the colorimeter. hresh's method, and in all the latter cases by the ble test tube method. The results obtained were com- with those obtained on duplicate samples at the testing n by the gas analysis method, on the same day. It ound, however, that the comparison with the duplicate le often gave a not very satisfactory agreement when ree other methods agreed very closely among them- . This was evidently due to aëration of the samples larly in the process of collecting, and also to partial ation of impure samples when kept for some days.

few compared results are given below. As the pro- mate accuracy obtainable with smaller quantities of en is less, and that required is also less, it is useless and ading to work out discrepancies of readings in per- ges. An accuracy of about 0·3 c.c. is as much as is red in estimations.

good many concordant negative results were obtained, re not quoted. The last effluents were very poorly

Cu_2Cl_2.	Thresh.	Test Tube.
1·90	2·26	2
5·12	5·16	..
0·70	0·53	..
6·92	7·07	..
2·87	2·92	..
6·40	6·65	..
2·44	2·70	2–3
1·00	1·27	1
1·86	1·80	2
0·82	0·86	1
3·06	3·08	3
0·60	0·45	0–1
7·70	7·50	7
4·35	4·17	4–5
0·00	0·15	0–1
0·00	0·00	0
Trace	0·35	0–1
5·20	5·80	5

aërated, and after saturating and incubating for three days no oxygen remained. These were examined microscopically and were found to abound in bacteria.

A number of experiments were made with a view to testing approximately the amount of aëration which takes place when boiled out water is allowed to stand undisturbed in a large beaker for varying lengths of time. The object of these experiments was to determine how rapidly aëration might be expected to take place in an effluent or impure brook water when standing at rest. Of course, running water would aërate more rapidly.

In all these experiments distilled water was boiled under reduced pressure for some time, and in a corked wash bottle provided with india-rubber tubes and clips. After it was cold, the end of the tube was opened under paraffin, which was sucked into the vacuum, and the aëration of the water was at once tested. The results were as follows:—

Time when taken.	Time of Standing.	Depth.	Method of Treating	No. of c.c. per Litre.
	Hours.	Cm.		
12.45 p.m.	0	10	Boiled out	0·0
3.10 p.m.	2·25	5	After standing	0·5
4.45 p.m.	4	1	„	1·5
5.30 p.m.	0	Boiled out	Taken from flask	0·3
11.45 a.m. Saturday	18	5	From beaker	5·3
12.30 p.m. Monday	0	Boiled out	Taken from flask	1·4
12.30 p.m.	48	10	From beaker	5·9
2.30 p.m.	50	1	.. ..	5·7

The slight difference in the last two experiments is probably due to a chance bubble of air in collecting. These experiments seem to show that the absorption of oxygen by still water is very slow, and that it does not proceed to complete saturation. But after 12 to 24 hours, about 5 or 6 c.c. per litre should be present in any water, unless active decomposition is going on.

The tests for aëration in the transference of water from one vessel to another, as in collecting samples, were as follows (Thresh's method for estimation was used):—

Method of Collecting.	No. of C.c. of O_2 per Litre.	Gained.
	C.c.	C.c.
(1) Partly boiled out, air admitted, collected under coal-gas.	4·3	..
Run into beaker poured into funnel....	4·4	0·1
Run into beaker poured into flask and back.	4·4	0·1
(2) Boiled out and collected from flask	2·0	..
Run into beaker and collected under gas	2·3	0·3
Run into beaker poured into funnel....	2·9	0·9
(3) Boiled out..............................	0·9	..
Run into beaker, poured into funnel ...	1·4	0·5
Run into beaker and collected in small flask by immersing, as in collecting river samples.	2·1	1·2
(4) Boiled out..............................	0·14	..
Run into beaker and collected as in last	1·26	1·12

For poorly aerated samples precautions seem necessary.

To avoid aeration in collecting samples, the can fitted to the testing box is open at one end and has a valve opening inwards at the other. The stream can thus be allowed to flow right through, displacing all air. The valve closes when the can is lifted out full of water.

A number of samples were sent in duplicate for incubation tests. In each case one sample was tested at once and the other keep tightly stoppered in a thermostat bath at about 20° C. for a day or two. It was then tested and the aeration of the sample before incubating was compared with that of the duplicate sample after incubation. This is apparently the crucial test for bacterial contamination. Some very poorly aerated samples were saturated with air by shaking, previous to incubation.

The following series may be quoted. All estimations were done by the three methods and the results agreed very well. For clearness the mean is given :—

Kind of Sample.	Before Incubation.	After Incubation.
Brook water..............	7·7	1·5
„ „ below effluent outfall.	5·2	0·3
„ „ lower down..	5·3	0·0
Effluent	0·0 (after saturation as explained).	0·0

Experiments were made using alkaline pyrogallol instead of cuprous chloride and ammonia, the facility of obtaining and preserving pyrogallol being an obvious advantage. The colour obtained is good and easily estimated by most people. The results seemed satisfactory so long as distilled water was used. When, however, tap water was used a deep colour was obtained, even with boiled out water. This appears to be due to the lime contained, for the excessive coloration was obtained always with distilled water to which had been added a small quantity of calcium chloride.

This was taken to be a fatal objection, and the use of pyrogallol was therefore abandoned. Small quantities of nitrates do not affect the cuprous chloride experiment, as the solution is necessarily alkaline.

DISCUSSION.

Dr. S. Rideal said that he was greatly interested in the subject of the paper, and quite agreed with the authors as to the extreme importance which attached to the determination of dissolved oxygen and nitrates in sewage effluents. He had recently had an opportunity of reviewing the various methods proposed for this purpose and the aëration test for effluents, and his papers had been published in the *Analyst* for June and August last. (Rideal and Stewart, *Analyst*, **26**, 141—148; Rideal, *loc. cit.* 196—202). When he heard of the paper on the subject before this Society, he hoped that Prof. Ramsay would have seen and would reply to his criticisms. Prof. Ramsay unfortunately had not seen the papers in the *Analyst*, and therefore he felt at some loss in making any remarks.

Prof. Ramsay: You had better go on.

Dr. Rideal, continuing, said that Prof. Ramsay had told him a year ago about the apparatus devised by him, and had suggested it to him for trial. He at once procured one and tried it, and the results were recorded in the papers referred to. At first he was very pleased with its working: the colours were sharp, the apparatus worked easily and gave good results with river waters. The first objection he had to make was that the standards did not go quite far enough. At the present time of year (November) the dissolved oxygen per litre of water would be about 7·4 c.c. per litre, but the highest standard provided with the apparatus before them was 6 c.c. per litre, and he therefore suggested that additional standards up to 8 c.c. per litre should be added. A minor point was as to the accuracy. The difference between the colours of two tubes represented 1 c.c. of dissolved oxygen per litre. There was a marked difference between any two tubes, and it was easy to read to half a c.c. His assistant, Mr. Stewart, claimed that he could read the tubes to one fifth of a c.c. For practica by the manager of a sewage farm, however, half a c.c. near enough; and, indeed, Prof. Ramsay only claimed the method was to be regarded as an approximate The next point was with regard to the cuprous chlo. He had found it difficult to get a colourless solution that salt. Prof. Ramsay had just demonstrated that test required a certain amount of time; and if it took as n time to dissolve at the waterside as it had that night, du that period they had a hydrochloric acid solution exp to the air and the cuprous chloride taking up oxy therefore all the precautions as to the layer of kerosen the surface of the water were of no avail. He had fo that a blank experiment with boiled water containing oxygen gave a blue coloration equal to 1 or 2 c.c. per l He therefore concluded that most of the readings were high by ½ to 1 c.c. by reason of the error thus descri He had also made some experiments with regard to action of the kerosene in this test; but he would no further into that matter at present, as kerosene was kn to be an absorber of oxygen to some extent, and after was a minor point under the circumstances. Experim on this point he had described in the paper referred which showed the rate of absorption of oxygen by the w when protected by the kerosene layer. Then with re to nitrites, although dissolved oxygen and nitrates were two most important bodies in this connection, it mus remembered that nitrites were always formed, and in in the bacterial method they were sometimes presen large amount—as much as 5 parts in 100,000. Their e must therefore be taken into account, and also tha organic matter. In dealing with an effluent containing 3 parts of nitrites and coloured organic matter, he found that the colour obtained was modified by these constituents. He had tested the influence of nitrites on colour, and, putting it roughly, the presence of 5 part nitrous nitrogen per 100,000 threw the colour up to extent equal to 2 c.c. per litre. He quite agreed with P Ramsay that a simple method giving approximate res was very desirable. One did not want refinement dow even 1 c.c. of oxygen; all that was necessary was to k if the effluent was more or less than half saturated. more, it was probably all right; if less, it was probabl wrong. The most serious criticism that had to be n was that the standards supplied were not constant. had not discovered this until quite recently. On se Prof. Ramsay's paper announced, he thought it desirabl repeat some of his experiments, and on doing so he fo that his tubes were much fainter than they were a year In view of this fact, he thought it quite possible that w he had attributed to nitrite interference might in part h been due to the gradual depreciation of the colour of tubes. Still the nitrite in the acid solution obviously n act as an oxygen carrier, and therefore during the contact one would get more colour than when nitrites w absent. On comparing his tubes, he found that at pre the 3 c.c. tube was of a darker blue than the 5 c.c., there were lesser variations in the others. With regard an alternative method, he had lately been using a modif tion of the Winkler process. Winkler originally sugges the use for this purpose of a manganous salt. Mangan chloride had the great advantage of being thoroughly sta The colour produced on the addition of caustic soda and iodide by the liberation of the iodine after acidulation as intense as the blue colour in the tubes under notice; it was quite possible to determine the relative amoun dissolved oxygen in water by guessing the brown colo which showed, without the use of standards, whether effluent was half or a quarter saturated. In order to co pare the colour of a sample, one had merely to take so of the same effluent, shake it for a minute, until it beca fully saturated, and add the reagents, when one ha standard for that particular temperature. This overca the difficulty met with in coloured effluents and that du nitrites if the reaction took place in an ordinary stoppe bottle, so that exposure of the acid solution to the air prevented.

Mr. W. T. Burgess asked for further information w regard to the amount of nitric acid found in what was s ure sulphuric acid. He had very seldom himself had to 't a sample owing to the quantity of nitric acid interfer- with the estimation of nitrates by Harrow's process, and 'as therefore rather surprised at the statement made by uthors.

r. E. J. **Bevan** suggested that pure sulphuric acid it be secured by simply passing through it a stream of urous acid gas and boiling off the excess.

of. **Ramsay** said that he had tried that method but out success.

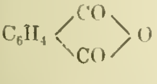
e **Chairman** said that Dr. Rideal had discovered so points in which the process overestimated the dis- d oxygen, that it was difficult to see how he had ever ged to find so low a proportion as 6 c.c. at any time. aking a sewage analysis, the chemist ought to distin- between methods which aimed at the highest accuracy nable and such as enabled him to form an opinion ient for practical purposes. And in the case before the chemist could probably judge without figures her a sewage was fairly aerated or not. In practice it no difference whether a sample of sewage contained or 2·7 of dissolved oxygen, especially as sewage ated rapidly in composition; and therefore it seemed u useless to attempt to get an exact estimate. While appreciating the value of Dr. Rideal's criticisms on the od, he took it that Prof. Ramsay had mainly in view a od and apparatus that would suit the foreman of the ge farm. He felt no doubt that for that purpose Prof. ay's method was more suitable than the most ingenious ccurate method worked out by Dr. Rideal. That od was admirably adapted for the hands of a skilled st; but at the riverside or sewage farm nothing could pler than Prof. Ramsay's process.

f. W. **Ramsay**, in reply, said that he was quite un- liced as to the method of working. What he and his gues on the Commission wanted to find was the st and most reliable method of working, and he should nly try Dr. Rideal's method. He thought that the us chloride difficulty might be dismissed, because one not run it all in. With regard to the kerosene, he agreed with Dr. Rideal that it took a long time for a to pass through; but it always did enter in the course ew hours. A much more serious matter was the ration of the standards, and in that case he feared ust say "peccavi." Much more ammonia should be t, and then they would not deteriorate. As to s, he admitted that, if present, they ought to be d as free oxygen, the same as nitrates. They were eckoned as "available oxygen," and that was all they l to know about them.

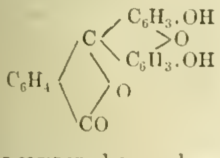
EW GLYCERIDE: GLYCEROL PHTHALATE.

BY WATSON SMITH.

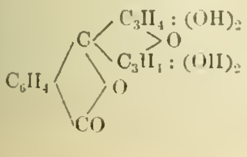
originally conceived the notion that as the diphenol, nol, $C_6H_4(OH)_2$, unites on heating with phthalic ride—



resorcinol-phthaleïn or fluoresceïn—

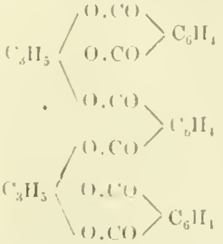


e similar compound or analogue might be formed, if orcinol, the tribydric alcohol, glycerol, were sub- l. The formula of the phthaleïn thus speculated, be—



and a chromogen containing aliphatic constituents would have possessed much interest.

On heating glycerin with phthalic anhydride alone, however, no such reaction occurred. On heating with zinc chloride, the product appeared to be substantially similar to that obtained by heating phthalic anhydride with glycerin alone. The idea now was that probably a glyceride was formed, especially as on heating with alkali hydrates, entire decomposition or saponification took place. Acting upon this idea, proportions of glycerin and phthalic anhydride were taken corresponding with the *Diglyceryl triphthalate*.



The mixture was heated for a long time nearly to boiling, and on cooling, a solid, resin-like, perfectly transparent and strongly refractive substance was obtained. This substance is insoluble in water, but soluble in an excess of glycerin on heating. From the solution in glycerin, white oily drops separate on addition of water, soluble in alcohol and ether. Whether zinc chloride were used or not, similar compounds were obtained, consisting of thick resin-like masses, which deliquesced and became sticky on exposure to air. As the substance evidently still contained free glycerin and was not uniform in composition, it was distilled *in vacuo*. This method answered the purpose, and it was found that when a certain point was attained in the distillation, at which apparently all excess of glycerin had come over, the mass in the retort began to froth up, and then on removing the vacuum the substance at once solidified to a mass resembling glass slag.

It was found that whether excess of glycerin or excess of phthalic anhydride were taken in the mixture employed, after distillation *in vacuo*, one and the same product was obtained, *viz.*, the hard glassy substance. This substance is easily decomposed or saponified with caustic soda solution, and hence the fact indicated the method which was adopted for determining the phthalic anhydride. Hot normal caustic soda was used and the excess was titrated back with decinormal acid. Thus figures were obtained pointing unmistakeably to the fact that under the conditions stated, the diglyceryl triphthalate is formed. But it is extremely difficult to get rid of the last traces of glycerin, for at this final stage, the mass heated *in vacuo* shows an extraordinary tendency to froth up.

Thus, when glycerin was in some excess in the mixture taken, the percentage of phthalic anhydride found was 71·00.

Adopting a slight excess of phthalic anhydride, the percentage was 75·34.

Adopting a further excess, it was 75·91.

The theoretical number for diglyceryl triphthalate, is 77·35, that for a possible diglyceryl diphthalate being 66·66.

The difficulty is that the phthalic anhydride is much more volatile than the glycerin, and at the high temperatures needed for the formation of the body, some of the former is lost, and the preparation never quite reaches absolute completion, though as the figures show, it very nearly does so. If the distillation process *in vacuo* be stopped at various stages before the glycerin is all expelled so as to reach the frothing-up stage, products of varying degrees of fusibility are obtained, containing varying amounts of glycerin, which continued distillation would have expelled. Some of these are of the fusibility of sealing wax, and may be drawn out in long silky filaments of extraordinary length. I show here some specimens of monographs stamped upon some of this material, used just as sealing wax is.

Just at the moment when the mass froths up in the retort at the final stage of the distillation *in vacuo*, it is noticed that a very distinct rise of temperature takes place. The maximum temperature reached was 235° C., but on removing the retort from the hot sand bath, at this point, the further rise was to about 242° C.

This glass like glyceride is characterised chiefly by its extraordinary insolubility in almost all solvents. It is practically insoluble in alcohol, ether, and benzene, also in petroleum and petroleum spirit. It does not dissolve appreciably in boiling water, but the water becomes slightly acid, probably through slight hydrolysis of the compound. It dissolves very slowly and slightly in cold or hot glycerin, and this also becomes slightly acid. It is quite tasteless, and softens on chewing. This glyceride is insoluble in hot olive oil, and also in other oils and fats. It simply softens in them and becomes plastic. Its best solvent appears to be cold acetone, but even in this it is but sparingly soluble. On pouring some of the solution on a watch-glass and letting it evaporate spontaneously, no sign of crystallisation was evident, but the clear transparent resin deposited in minute drops, solidifying to hard transparent masses of the tasteless resinoid body. I tried the experiment of taking a large excess of glycerin in preparing the triphthalic diglyceride, and obtained first the transparent refractive substance first described; this body I found was strongly acid. On distilling this product *in vacuo*, however, first water, then glycerin and acrolein vapours, then phthalic anhydride pass over, and finally the mass froths up as before, yielding the inert, glass-like glyceride. The fact is, reaction proceeds but slowly at these lower temperatures, or until, indeed, such high temperatures are attained, that under ordinary atmospheric pressure, decomposition of the whole would ensue. But under the reduced pressure, the necessary point of union is attained, excesses of glycerin and phthalic anhydride passing over. If instead of phthalic anhydride, phthalic acid be employed, a similar reaction occurs, the same glyceride being obtained.

Some of the glyceride was heated in a test-tube with thermometer, and connected with the vacuum pump. The compound proved very refractory to fusion, decomposition point and melting point lying very near together. Incipient fusion took place at 190° C., and then the mass began to decompose and finally to char, at about 220° C., and yet was not completely melted. Crystals of phthalic anhydride deposited on the sides of the tube. A bit of the glyceride ignited readily takes fire and burns with a bright flame, but does not melt, only softens. It will continue thus to burn till only a slight charred residue is left. The substance on charring emits an odour somewhat similar to that of burning fats. It can be moulded into forms like that of a taper, and will then ignite and burn with a bright flame without melting, but there is no advantage to offer over cheaper articles for the purpose. I have found that a very satisfactory cement for glass and earthenware can be made from this glyceride.

Since glycerin will not unite with phthalic anhydride to form a phthalein, but rather a phthalate, I thought it interesting to discover if resorcinol, which does so readily form the phthalein, fluorescein, would, on application of heat, displace the glycerin from combination with phthalic anhydride in this diglyceryl-triphthalate. I find that this reaction easily takes place, and thus an interesting test is obtained for the presence of the phthalic anhydride.

Sulphonated Products.—On treating the powdered substance with warm or hot concentrated sulphuric acid, sulphonation takes place, though by no means quickly. The substance shows no signs of charring in the process. With fuming sulphuric acid the action proceeds much more quickly, and no charring results. I have already observed two sulphonic acids, but have not as yet been able to examine them more closely. One is readily obtained when the sulphuric acid is used in excess, and on diluting the liquid and heating, and then allowing to cool, it readily separates in groups or aggregates of minute prisms, soluble in hot water, and quickly crystallising out. I am inclined to think this is the monosulphonic acid, but analysis must decide this later. Now, on treating a little fuming sulphuric acid with a large excess of the powdered glyceride, and heating gently, I was much surprised, after dilution with water and filtering, to observe an oil separating. evaporating and allowing to stand, quite a conside quantity of this oily body separated, and also a sm quantity of the crystalline sulphonic acid. The oil, w is heavier than water, and less soluble than the crysta acid, was separated from the latter and washed with w It then occurred to me that there might be some ana here with those sulphonated oils which form the basi the Turkey-red oils and oleines of commerce. The phonated oils, on treatment with ammonia, unite wit giving perfectly clear oils, quite soluble in water. neutralising with ammonia, my oil at once cleared, became perfectly soluble in water, and the amm compound obtained, possessed many of the prope characteristic of the sulphonated oleine oils mentioned.

Action of Nitric Acid.—Strong nitric acid has b means powerful action on this glyceride. To nitra freely, it was necessary first to treat with concent sulphuric acid, and then add nitric acid, and heat.

In conclusion, my best thanks are due to my friend H. Pauli, of the firm of Meister, Lucius und Brüning, supply of pure phthalic anhydride, and to my assis Mr. Albert Shonk, for considerable help in carrying ou experiments just recorded.

DISCUSSION.

Mr. **ARTHUR MARSHALL** considered the new subst described by the author a very interesting one. It evidently a true colloid, but unlike most other organic col it had a known and definite constitution, though i sembled them in being more soluble in a cold solvent in a hot one. The same was the case with nitrocellul most of which could be dissolved in ether or alcohol alo only the temperatures were reduced low enough. Cell itself was also more soluble in Schweitzer's reagent low temperature than at a high one.

MANUFACTURE OF VARNISH BY THE PRESSURE PROCESS.

BY ARTHUR J. SMITH.

On heating fossil gums in an open vessel the follo changes take place:—The gum softens, and first water, inflammable vapour, and later inflammable liquid of dou or unknown composition are driven off. The gum is verted finally into a black carbonaceous mass. The am of volatile matter, which can be driven off from gum this way, varies according to the gum. In the man ture of varnish 40—50 per cent. of the gum is very volatilised in the melting process.

The effects of this on the physical properties of the can easily be seen, by comparing some of the original with the residue left in the melting vessel, which, allowed to cool, is generally brittle and can be c powdered. Varnish made from a decomposition produ this description cannot have the wearing capacity, visc or light colour of a varnish made from the whole unde posed gum. It has been tried to make "whole g varnish, by dissolving the gum in spirit, mixing into and then distilling off and recovering the spirit. method does not seem to have been much used.

The majority of gums can be rendered miscible i without loss, by heating in a closed vessel under a pressure, and this observation has been applied to va manufacture on a commercial scale. There is no ris fire, and all noxious vapours are avoided. The 40—5 cent. of the gum, usually volatilised and thrown awa thus saved and becomes incorporated with the varnish appears to greatly increase its covering, wearing, and la capacities.

The result of saving this 40—50 per cent. is shown b fact that the usual formula, 1 part of gum, 2 of oil, and turpentine, will not hold good, the product being unworkable. 5—6 parts of turpentine is the amount us required to be added to make a workable varnish. being under pressure the gum mixes into the oil at a lower temperature, and as a result the varnish is very darker than the original oil, and, if properly refined oi been used, a very pale varnish is the result.

will be obvious to anyone familiar with varnish ınufacture what a great saving this will effect in the cost he varnish, by getting 8 or 9 parts instead of only 5, from ırt of gum, and at about the same cost of manufacture.

large number of quantitative experiments have been le in the laboratory, on nearly every variety of gum, to this process on a small scale, the operation being carried n a specially constructed "Jena" glass tube, fitted with ssure gauge and safety valve, the heat being furnished Bunsen or spirit lamp.

o take one experiment as an example, 100 grains of kauri, which had been exposed to the air in a dered condition for some days to get rid of the majority ts water, was melted into 200 grains of refined linseed under a pressure of two atmospheres. After cooling being open to the air for some time, 300 grains of entine were added, and the whole heated under pressure some 20 minutes. On cooling, the resulting mixture too thick for use with a brush, and it was found neces- to incorporate a further 230 grains of turpentine to g it to the consistency of ordinary varnish, thus making ırts of turpentine added.

was then placed in a jar in the sunshine, and became r in 10 days. It weighed 832 grains, and measured l. oz. The sediment weighed 3·0 grains. A further ease of weight was found to have taken place after the ish had been kept for a few weeks.

he phenomenon of gum melting into oil under pressure been observed before, but the observation does not to have been applied with any degree of success to manufacture of varnish on a commercial scale. I have essfully manufactured varnish in melters of up to all. capacity, and am now working on even a larger e.

Discussion.

r. J. Lewkowitsch thought the Society ought to be eful to the author for bringing forward a subject of ch one heard so little. The manufacture of varnish was resent only an art, its chemistry being practically ıown; and the men who understood the art held sway kept everybody out of it. One disadvantage chemists to contend with was that they did not know the con- tion of even the commonest gums, such as the copals. e course of reading the paper he interrupted the author sk what gum was referred to in the case given; but with the answer "kauri gum," very little information conveyed, as dealers were pliable in their practices, often named a gum to suit the wishes of their cus- ers. The copals covered such a variety of exudations different plants, that it was next to impossible to sify them, even if one knew the country or "coast" which they came; for little was known as to the ner in which copals were mixed for the market in the ing and sorting establishments. Gums were not like and oils, which could be discerned by chemical hods; and, in fact, they knew very little about them. y knew that in the varnish manufacture it was necessary nelt the gums; but so long as they did not know what nical processes occurred, and how the bodies decom- d and changed, and why they became soluble, very progress would be made from a scientific point of . He was afraid he could not take so sanguine a view he new process as the author did. Everybody who was ersant with the trade knew how difficult it was to oduce a new varnish. And that was quite natural; for ach-builder who turned out carriages worth several dred pounds each was not likely to risk spoiling his itation by using a new varnish of which he knew ing.

e would like to know whether experiments had been e with this process on a large scale. They were told it required more turpentine, and that seemed to agree some experiments published only last month by ert. This chemist had tried this process, and confirmed statement that some gums, when melted under pressure, olved in linseed oil. But he also stated that when run with entine, the gum separated out, and hence he condemned process. He himself could not say that he had practical rience with this process to endorse that view; he merely quoted what appeared in the experimenter's statement, and that was the experience of a practical varnish maker. The author appeared to have met with the same difficulty, and to have obviated it by adding more oil of turpentine; but he must remember that the turpentine would volatilise and so much less of a coat would be left for a given weight of varnish. Therefore, he would like to know whether the author had manufactured varnishes by his process on a large scale, and had tried his product by exposing varnished articles for a long time to the atmosphere, and what sort of coat the varnish gave under those circumstances; whether it was hard, brilliant, and possessed good lasting powers.

Mr. W. F. Reid agreed with the views expressed by Dr. Lewkowitsch. He thought it was probably owing to the lack of publication that the authors did not know that a similar process was carried out years ago and was still used on the large scale, though not in exactly the same way, in the manufacture of linoleum. Kauri gum and other resins or gums were put into a closed vessel provided with a safety-valve and warmed under pressure, and a varnish thus produced.

The Chairman: Under what pressure?

Mr. Reid, continuing, said the pressure might be anything desired; but if one went beyond a certain temperature the whole mass was charred. He thought that the reason why the oil would dissolve the fused gum and remain clear, whereas, as Dr. Lewkowitsch had pointed out, gum not first fused would dissolve in oil and precipitate out on dilution, was that those portions of the gum which were volatile were retained when fusion took place under pressure. He had made quantities of varnish under pressure, but had always found that a varnish made in that way would "bloom" in course of time. He would like to hear from the author what was the result of exposing this varnish to the weather. His experience had been that it did not remain bright. Moreover, the gain in weight referred to was altogether fictitious. In fusing the gum in the ordinary way, one only drove off the volatile part of it, and the decomposition that took place made the gum much harder. Working under pressure in the present process prevented that, and so what one gained in quantity was lost in quality The name of a gum was no guarantee of its composition. One might drive 10 per cent. of volatile matter from one sample and 20 per cent. from another. It was all a matter of experience, and no doubt the author would find that out when he came to work on the large scale.

Prof. W. Ramsay said that there was one point which was interesting to him from the physico-chemical point of view. How was the pressure produced? Was it air pressure, or was it produced by the gases evolved from the gums themselves on heating?

The Chairman observed that, *à propos* of Prof. Ramsay's question, it was obvious that something was kept in the background by the author of the paper. The small apparatus shown would not bear much pressure, be it due to decomposition and evolution of gas, or to mere expansion. A pressure of two atmospheres, which entirely disappeared on cooling, could not have much effect on the reaction. From one expression—"oxidised gum"—used by the reader of the paper in the course of the evening, he gathered that possibly the gum went through some preliminary process of preparation before it was applied to the manufacture of varnish, and he asked the author whether this was so or not.

Mr. Peter MacEwan said to his mind the chief point of the paper was the statement that the old-fashioned method of treating insoluble resins by "running," so as to render them soluble, need not necessarily be carried out. He judged from the sample of varnish passed round that the simple method of solution proposed by Mr. Smith was effective, but it was not generally known. They now had the fact published that the use of the process of solution under pressure would do away with the "running" method by which 40 per cent. of the resins was lost. But Mr. Smith did not appear to have carried his experiments far enough; he seemed to have used only kauri gum. The best varnishes were made from gum animi, a resin which could not be compared with kauri. Gum animi was an exceedingly hard and beautiful resin which no solvent would touch, and the new process should be tried on it as well as on copal and other varnish resins. He considered that a distinct service had been rendered to the varnish industry by this communication, for although much work had been done in it there was nothing quite conclusive. He recalled a paper which had been published in the Society's Journal some years ago. There the author showed that when the resins were so heated that the volatile products were passed over the resins, the latter were so altered as to become soluble. He could not help thinking that there was bound to be an immense difference between a varnish containing the whole of the constituents of the resin and one so altered in character by heating as to change from the insoluble to the soluble condition. Varnishes prepared from materials of widely different character were bound to give coatings equally different. He hoped the author would look into this thoroughly and also experiment with every kind of varnish resin of the "insoluble" class in the market.

Mr. A. J. Smith said in reply, that whether the gum decomposed or merely fused was an open question at present. If the vessel which he used were left to cool, it was found that a partial vacuum was produced. The evolved gas all condensed back into the mass. It was to that fact that he attributed the extreme viscosity of the product. He did not think the gum was decomposed during the melting under pressure, but it certainly was in the open pan. Whether oxidation did not take place for lack of oxygen, he could not say; but no acids were found above the surface after cooling; hence he assumed that there was no decomposition in the process. That appeared to him to be an important point in connection with the wearing power of the fossil gum itself.

Manchester Section.

Meeting held on Friday, November 1st, 1901.

CHAIRMAN'S ADDRESS.

NOVELTY IN PATENTS ACCORDING TO GERMAN PATENT LAW.

BY DR. J. GROSSMANN.

A patent is a monopoly which is granted to an inventor under certain conditions. These conditions under the statute of monopolies are that the applicant should be the true and first inventor, and that the invention shall not be contrary to law nor mischievous to the state by raising prices of commodities at home, by hurt of trade, or generally inconvenient. The original statute of monopolies has been extended, though not entirely superseded, by the Patent Act of 1883 and amended Acts passed after that date. Like other Acts of Parliament, these Acts have been consolidated by judicial decisions; their scope has been gradually extended; manufactures have been held to include processes, and inventors have been held to include importers.

It is clear that the granting of a patent which confers a monopoly on the inventor is meant to be a reward for the work which the inventor has done. It is now recognised that a man is entitled to the benefits arising out of any application of his mind. On the other hand he should only be entitled to such benefits if there is a certain amount of originality in the outcome of his mind, something which has not been done before; but whilst it is very easy to decide in ordinary literary productions whether an author has simply copied from another author, and whilst in literary productions the same thoughts put into different language by different men would still be original as far as form is concerned in each case; it is different in the case of industrial inventions. The form in that case has nothing to do with the question whether an invention is novel. It is here simply a question of fact. Now although the law recognises that an inventor should be recompensed by havi monopoly for his invention it does not in any way dis, nate between the relative importance of different invent the monopoly is given whether the invention be of importance or of very little importance; whether it a great amount of originality, or only very little; wh it is almost the natural outcome of previous improven or whether it is an entirely new departure. As a mat fact nearly every invention is only the outcome of pre observations and publications, and the last invento only gone a little step further than his predecessor; a may be safely assumed, in nearly every invention, t that invention had not been made by the person applied for the patent, it would not have been lo humanity, but sooner or later another person would found the same thing. The ordinary invention m readily compared to the worm which is caught by the bird: but if that bird had not got up so early, the would have been doomed just the same, as the next bird would have caught it. This is the reason why pa are limited to a comparatively short period, far shorter the rights and privileges which are granted to lit productions. It must also not be forgotten that in latter case little harm can be done by granting sp privileges and exclusive rights, whereas in the ca industrial processes, rights and privileges granted i wrong place may be of incalculable harm to the co which grants such privileges without careful investig It has been the custom in this country to grant pa indiscriminately to every one who applies, and alth there has been a nominal alteration by which the C troller-General may interfere in the case of most gl plagiarism, the fact is broadly as I have stated. The sequence of this is that there has been of late a fe growing, amongst those conversant with patents, th alteration in the English patent laws would be desi and as the outcome of that feeling a commission wa pointed by the Board of Trade to inquire into the wo of the Patent Acts on certain specified questions.

One of these questions was "whether, and if so, additional powers should be given to the Patent Offi impose conditions on or otherwise limit the issue of patents in respect to inventions which are obviously o which the information recorded in the Patent Office s to have been previously protected by Letters Patent in country."

One of the conclusions arrived at by the committee follows:—"That we are of opinion that the grant of in patents is a serious evil, inasmuch as it tends to the rest of trade and the embarrassment of honest traders inventors, and that this fact, coupled with the result o foregoing inquiry, is, in our opinion, a cogent argum favour of some inquiry as to anticipation by prior L Patent."

The "foregoing inquiry" referred to is one in whic committee endeavoured to ascertain approximately many patents which were applied for had not been a pated, and from which it appeared that only 57 out of 100 could be classed as such, and that 43 per cent. o patents applied for were simply repetitions of pre patents. The report continues: "We are therefo opinion that, in addition to the existing inquiries examination ought to be made at the Patent Office int question whether any invention claimed in a depo specification has been claimed or described in any what specifications of letters patent granted in the U Kingdom dated less than 50 years previous to the da the application. That this inquiry should not be exte to provisional specifications which have been publi but not followed by a complete specification, and consequent upon the limitations of this inquiry an e ment should be passed to the effect that a publicatio an invention in specifications of letters patent gra in the United Kingdom dated 50 years or more pre to the date of the application or in a provisional specific of any date of the kind before mentioned shall not of be deemed an anticipation of the invention." It be noticed that these recommendations as to search novelty only apply to such matter as has been publi in previous patent specifications, and leave out any m h may be common knowledge through other publica- s, so that a patent granted under the committee's mmendations might still be granted for an obsolete ntion or for no invention at all. This has been gnised by at least one very eminent member of the mittee, by Sir Edward Fry, who, in a note appended e report, expresses himself as follows :—"I regret the sion of the inquiry whether the invention claimed is ously old. I think that the inquiry, if made in con- tion with that into anticipation by previous specification, ld add very little trouble to the examiner, and I fear the omission of this inquiry may let through some of patents which we desire to check."

onsidering that there seems to be a general feeling in ur of alterations in the patent laws to the effect that ats should not indiscriminately be granted by the nt Office, but that they should be examined for novelty, ay be useful to study the conditions as to what titutes novelty in patents from the official examiner's t of view, and as the German Patent Office has been ling these questions in many thousands of cases for the 21 years, it may be of interest to put before you the t opinions as to what constitutes novelty in patents in nany.

though the German Government does not undertake guarantee that patents granted are necessarily valid, it ines the essential points of novelty in such a manner as tablish to a great extent the validity of a patent ; whilst, fore, the law in this country as to what constitutes lty in an invention has had to be established on the basis ecedents taken from decided law cases, ranging over the 60 or 70 years, and even further back, the German eption of novelty is supported by a much greater ber of cases, which outside of law courts have been led upon by the Patent Office before granting a patent. der to have a clearer understanding as to the German nt law, it is necessary to follow its history further than 1877, the time when it was passed. Before the co-German war, Germany consisted of a number of pendent states, each of which had a patent law of its which naturally was very ineffective, as would be the for instance if each county in this country had a patent of its own ; in that case if a person happened to have a nt in Lancashire but not in Cheshire, it might be used ly by anyone almost within a stone throw of its owner. Patent Law of 1877 was passed in order to consolidate hese different patent laws into one, and it became ssary to refer in some way to the different states and eir jurisdiction as regards patents in the former times. general principles of the new patent laws, and their ive position to former patent laws, were therefore d in special terms giving the motive of the act as ws :—

The law cannot determine under what suppositions an t or a process for which a patent has been applied nts as a matter of fact something new. The office h examines the application has to judge on this rding to the circumstances of each case."

e draft, however, in substantial accordance with the prevalent in Germany, denies the character of novelty ose inventions which, at the time of application, are r described in public print in such a manner, or are used in the land already so openly that their use by r experts appear possible. Whether the publication of printed matter is found in German or foreign publica- shall be immaterial. The former use of the invention however exclude its novelty only if carried on openly, within the realm.

e motives lay stress on this point, that the act is e drafted in essential accordance with the law as it is essed in Germany. With regard to that law, the first ideration at that time was the agreement with different governments respecting the granting of nts and privileges, dated 21st September 1842. That ement contains the principles which the different rnments should observe with regard to the regulations heir Patent departments, especially also the patent- ty, and in that direction it says in article 1 :—

"Patents shall only be granted for such objects as are in reality new and characteristic; a patent must therefore not be granted for objects which before the date of the application have been worked within the combined states or which were current or in any way known at that time ; patents should particularly not be granted for any matter which may already have appeared in publications, whether in German or any foreign language, and which is represented by description or drawing in such a manner that its working could be carried out by any expert. The decision as to novelty or individuality of the object to be patented remains within the judgment of the Government." The combined governments were accordingly bound to the foregoing conditions, but they were not prevented from taking even stricter views as to patentability or from restraining the granting of patents altogether.

A later Act of Parliament, that of 7th April 1891, enacts "that Patents are granted for new inventions which admit of industrial utilization, but the invention is not considered as new if, at the time of application, it has been described in public within the last 100 years, or has been used within the realm in such a manner, and so openly, that its use by other experts appears possible." This differs from the older enactment of the 25th May 1877 in this, that the words "within the last 100 years" have been added.

It will be noticed that the German law speaks of a "new invention," and this expression has caused a great amount of controversy ; it is assumed by many that an invention must necessarily be new, others contend that something can be new without being an invention, and that there may be an invention which is not new. Caro puts the matter very clearly: 1st. "Patents are granted for inventions" ; 2nd. "The invention must moreover be new" ; 3rd. "A new invention must be of industrial applicability," and the patent office is therefore bound to conduct the examination in a threefold direction.

Without going into metaphysical speculations as to whether there are new inventions and old inventions, it appears that there is a great difference of opinion as to whether the German patent law exemplifies or defines the cases in which there is no novelty. Some authorities refer to the motives which say, that novelty is barred only when the invention has been carried on openly and within the realm. Others found opposite opinions on the passage in the motives, that the Government may judge novelty according to the circumstances of each particular case. The fact is that it is impossible to determine by law what is new, for nearly every invention may be divided into a number of well-known elements which are simply combined, and it is left to a great extent to individual opinion to determine whether this combination is of such a character as to constitute novelty or not. One thing stands out clearly in following the decisions of the German Patent Office through the last 25 years, *viz.*, that the officials are adapting themselves to the requirements of the changes which have taken place in technology, and are justly taking broader views as to novelty.

A highly interesting article touching partially on this point has been published in the "Zeitschr. f. angew. Chem.," 1901, Nos. 36 and 37, by Dr. Julius Ephraim, and I have in the following taken the liberty of partially abstracting and partially translating this paper, as it gives us the latest views on points of interest in German law. The author commences by explaining that the natural development of the chemical industries and the natural evolution of patent law must necessarily lead to new points turning up, which in former days did not come into consideration. These questions will affect more or less every industry, and in discussing some of the questions which particularly apply to the chemical industry, he first considers previous publication as far as it affects chemical patents. It appears that for the last two years the examination of applications for patents in Germany has been carried on chiefly so as to ascertain whether the object of application has been completely published in literature ; whereas the examination as to whether the object constitutes an invention is now in most cases neglected, and takes place only in exceptional cases. This is no doubt a relaxation of the former strictness, and yet it appears that further relaxation is still desired by a certain class of technologists. As stated before, under the present law, an invention is not considered new if it has been published in print during the last 100 years in such a manner that it may be used by experts. Those who require further relaxation now claim that such publication shall only prohibit the granting of a patent if it describes the invention in a technically applicable form. But it would not always be an easy matter to determine this point, as the following instance will prove :—"When Buchner published his first investigations on zymase, there could be no doubt that the process, however minutely described, was a purely scientific one. No doubt an expert would be in a position to follow that description, and to get the same results. The question is, was that invention described in a technically applicable form? At the time C. Wehmer declared that he would not believe in Buchner's discoveries until the product could be obtained in commerce." Thus we see that an expert gave it as his opinion that the process did not represent a technically applicable process. If, therefore, the new relaxed forms of the German Patent Office were to be accepted, an application which contained nothing else but the description which Buchner himself had originally given would be patentable, as long as the applicant could show that this process, contrary to original views, was technically applicable. After Buchner's publication his discoveries were further followed out. Albert succeeded in finding a new and considerably simpler process for the preparation of zymase, and the inventor expressed the hope that soon Wehmer's requirements would be fulfilled. Without doubt Albert was of opinion that he had found a process which was technically practical, so that his publication could be looked upon as a prior publication with regard to future applications for patents. On the other hand, Albert was not quite certain, as he only expressed a hope on the point; so that it is clear that even if the Patent Office should relax its rules and extend the scope of prior publication, many doubtful cases would occur.

The further relaxation of the German patent law would particularly affect organic chemistry. Many products which at one time were considered far too expensive to ever enter into industrial application have become quite accessible through later fortunate discoveries. Take the case of two substances, one a substance of industrial importance, another the raw material for the preparation of that substance. Suppose the final product could not be commercially made because the known methods for the manufacture of the raw material were too expensive. Suppose a discovery is made by which the raw material can be cheaply prepared, should it then be possible to obtain a patent for the preparation of the final substances, which, since the new process for the raw material has been found, has become technically important? If scientific publications are not to be considered as prior publications, it might lead to very serious and unpleasant consequences.

The nature of chemical science is such that in many cases the scientific results can be at once transferred to technical work. This fact has been acknowledged in German patent law; in France, on the other hand, the laboratory experiment, even when it has been published, does not prevent the taking out of a patent for the same substance. The differences in the views which the law takes are particularly prominent in the case of Bullier's Calcium Carbide patent. The facts were the same in Germany as in France. The patent claimed by the German patent No. 77168 is as follows :—"Process for the preparation of carbon compounds of the metals of the alkaline earths consists in heating a mixture of the oxides, carbonates, &c. of the alkaline earths with carbon in an electric furnace." The question arose then whether this claim is anticipated by the previous publication of Moissan. "At the same temperature (3,000°) carbon quickly reduces calcium oxide. The metal is copiously produced, and combines easily with the carbon of the electrodes, forming a red hot fluid calcium carbide, which can be easily collected." In Germany this publication was considered as prior publication, in France however it was decided as follows :—"A communication made by a member of the Academy of Science, and which does not lead to an industrial result, but establishes simply a case
which has been observed in the course of labora
experiments, that is a scientific fact, cannot consti
a prior publication with regard to a patent which is ta
for a process and a new product." The consequence
adopting the French views are clearly seen in this exan
As long as on repeating a scientific work it appears
industrial results can be obtained, a patent could be ta
according to French law, which as a matter of fact w
not disclose more to an expert than the original scien
publication. Thus the conditions necessary to convert
laboratory experiment into a manufacturing process
be worked out in each case by the expert, no ma
whether the process is intended for technical or scien
purposes. As a matter of fact it appears that in Bull
carbide patent those conditions which were found t
necessary in order to get over the difficulties of ma
carbide on a large scale, and without which it would
been impossible to introduce the process as a manu
turing process, were neither mentioned in the German
the French patent application: so that what might
been unquestionably patentable remained unpatented,
was not disclosed to the public. The law thus prote
what experts already knew, whilst the further knowl
which was absolutely necessary was not published.
conception of an invention as constituted by the present
is particularly suitable to prevent such cases, and sh
therefore not be altered. The restriction to 100 yea
prior publications with regard to novelty is of some im
tance to chemical industry. In an action for novelty ag
the Lanoline patent, passages from Pliny and from Pha
copœa of the middle ages were quoted against this pa
which as a matter of fact has become the foundation o
entirely new industry. Still on reading these old pub
tions, any modern chemist would assume that statem
mentioned in them, and not confirmed by later obser
were likely to be incorrect. The conditions under w
experiments were carried out and observations mad
those days were so different from those prevailing at
present time that these old statements require confirma
by later investigation. On the other hand, by the ligh
present knowledge a great deal may be found in
publications which has some remote bearing on mo
problems. We need only draw attention to the fact
for instance Cavendish threw out hints with referenc
the existence of Argon, but that it was always assumed
there was an error in his observation. But although t
old publications, even when they describe a process c
pletely, are of no value to the modern technologist in
practical work, still they may be brought forward as
jections to new inventions. In Marggraf's Chymi
Schriffen it is stated that a rosin smelling like musk ma
obtained from Amber Oil and Nitric Acid. But Ambe
contains Butylxylol, from which, by nitrating, Baur obta
artificial musk. The use of liquefied air in mines migh
considered to have been anticipated by A. von Humb
proposal of using Oxygen. A description of the sa
explosives, Roburite and Hellhofit, may be traced a
back as the 16th century, that is, to a time when no
would have thought of safety explosives. Such publica
will not always interfere with the priority of a patent
they may cause the patentee considerable trouble. I
therefore, perfectly correct to leave out the question o
publications, particularly as they are often written in obs
language, and as we cannot examine them in the light o
present views. The question will, of course, arise, whe
the limit put down by the German law is the most sui
limit. The fundamental idea of a restricted period is no d
this, that only such literature should come into consi
tion which existed at the beginning of our modern indus
But as we are advancing in years, whilst the origin of
modern industry is practically a fixed point, it woul
better to fix the date, and assume the year 1800 as the
from which publications should be admissible.
question is of considerable importance, as in the cours
time the 100 years limit would bring us to a period w
industrial processes were fully discussed and publishe
such journals as Dingler's journal.

Dr. Ephraim proceeds to consider how far analy
processes should be admissible for patents, but this

estion which, after all, though of course important, is t of such general importance as the previous and the llowing subject, and as I am limited to time, I leave is part of his paper out, and proceed to the conclusion, iich treats of an extremely important subject, that the consideration of processes for the preparation of termediate products. It is on this point particularly that e difficulty of determining the novelty or the patentability a process is most marked. These intermediate products ve become of the greatest importance in the coal tar lustry. Take, for instance, the Azo colours, which owe eir development mainly to the naphthol sulphonic acids, xynaphtalinsulphonic acids, naphtylaminsulphonic acids, idonaphtolsulphonic acids, and so on. The importance these intermediate products is also particularly evident in e process for the manufacture of artificial indigo. As g as it was only a question of analogous processes, that of the application of methods which had been used for actically the same purpose with compounds of analogous nstitution, the views and decisions of the Patent Office with gard to new processes varied. For some time patents were anted for the preparation of new substances, even if only a rtain application of the compound would yield a colouring atter of new technical effect, and a patent was granted the preparation of an intermediate product. But the tent Office sometimes changed its position, and would at other time refuse a patent if by an analogous compound new chemical compound had been obtained by using uch the applicant produced a new available colour. In ch cases a patent only for the preparation of the new ailable colour would be granted.

The difference between the two views taken in judging se matters is as follows. When the process for the eparation of an intermediate product is generally pro- cted the use of the product by another party for the eparation of a colour depends entirely upon the permission en by the owner of the patent for the intermediate duct. If, however, the process for the manufacture of special colour is patented only in such a way that the eparation of the intermediate product forms but a link the preparation of the colour, the intermediate product y be made by anyone, so long as it is used for the paration of another colour or product. The patent for e preparation of the colour makes intermediate products d its preparation generally known without protecting the entor further than as far as its use for the preparation of articular colour is concerned. As in most cases, an inter- ediate product may be used, not only for a single colour, t for a further series of colours, it leaves it open to others use every intermediate product for experiments, which y lead to important results in other directions than those rsued by the original inventor. In that case, of course, e original inventor would receive no remuneration, ereas, otherwise, he would have a claim on any further entions, dependent upon the use of his intermediate duct.

It is indifferent as far as patentability is concerned ether the product is of technical importance, unless chnical importance is just the point on which the inventor ses his claim, and which can only occur when the product a new chemical compound. Thus, if the process for the oduction of phthalic acid, according to patent 91,202, had t been patentable for any other reasons, its patentability uld not have been justifiable on the ground that phthalic id was an article which was wanted, and of importance. t the circumstance that the presence of metallic salts, ring the action of sulphuric acid on naphthaline, produce ch an extraordinarily favourable yield in phthalic acid tifies the grant of the patent, assuming that it makes no ference in patent law, whether phthalic acid was at the ne of technical importance or not.

Up to quite lately both the German Patent Office and e German Courts of Justice agreed in their views that ere was no doubt as to the technical applicability of inter- ediate products. But in the latest decision of the High urt of Justice on the ionon patent, there is a passage ich denies the industrial applicability of intermediate educts.

The claim of the ionon patent, 73,089, is as follows :—"A process for the preparation of a new perfume, called ionon, from citral, and acetone, consisting in condensing the two compounds mentioned by alkaline agents, first into a new ketone, pseudo ionon, and in converting the latter or its condensation products with phenylhydrazin or other ammonia derivatives by acids into a ketone isomeric with ionon." The decision of the High Court was as follows :—"The invention, therefore, did not exist in this process, but only in the process, as far as it yielded a new substance, valuable in technology. The intermediate product was not an industrially applicable new substance."

The whole question, no doubt, is in close connection with the conditions of the German patent law, by which an invention is patentable, where it shows a new technical effect. What forms a technical effect is independent of scientific or theoretical considerations, but should be decided by those who are directly interested in the matter, that is, those who are engaged in chemical industries. If technologists can agree how a technical effect is to be interpreted in general cases, the law must follow the views which the technologists take, but in that case it would be necessary that all technologists should agree on the point, and not only those who have particular interests in a particular case. Here we come to a most important point, which does not only affect the German law, but the English law, that there are many clashing interests in connection with the patent question, and that the interest of the inventor, and the interest of those who may through that invention either gain or lose money are different points. As far as the German law is concerned, it is clear that if the views as regards patents of intermediate products undergo any alteration they will effect an alteration in the future as to the rescinding of patents. In section 11 of the Patent Law, No. 2, it is laid down that after the lapse of three years from the date of publication of the patent, the patent can be rescinded, if in the public interest the granting of licenses appearing necessary the patentee has refused to give licenses against adequate remuneration, and sufficient security; but so far, according to decided cases, "public interest" is not affected, if the later inventor without permission of the holder of the raw material patent may not use his own invention. If the question of patenting intermediate products is to be decided on a broader basis, this point will have to be altered and be decided in a broader sense. If the necessity for giving licenses is not increased, patents on intermediate products may prevent the carrying out of later inventions in a considerable degree.

I have gone particularly into the matter of intermediate products more fully as it is a development of patent law, which though particularly appertaining at present to organic chemistry, may be of far reaching effect in the course of time even in inorganic chemistry. It is a subject also which shows more clearly than any other the clashing interests which have to be considered in the formulation of patent laws, and in the present unsettled state of the English patent laws, I trust it may be useful to draw attention to the fact that even in the German patent law, which is generally and justly looked upon as a model of patent law, points have arisen on which those interested in the matter are evidently not satisfied. In any alteration of the patent laws in this country, it is to be hoped that not only will patent agents, lawyers, and manufacturers who work inventors' patents be consulted, but that the inventor also will have something to say in the matter. There is one particular lesson that we should learn from German experience, and that is that in searching for novelty it will be no use to go back only to published specifications of patents, but that it will be necessary to consult literature in general. But perhaps the most important point, and one that I have not been able to touch on this occasion is this, that in any alteration of the patent laws it should be clearly laid down that wherever anything has been mentioned in previous patent publications, which has evidently never been worked or even tried on a practical scale, and which has only been put into the specification for the purpose of extending its scope in an unlimited manner, and of preventing others from ever touching the subject, should not be considered as previous publication.

THE REPORT OF SIR EDWARD FRY'S COMMITTEE ON PATENT LAW.

BY IVAN LEVINSTEIN.

SEEING that we can no longer depend on the expansion of our staple trades for finding employment for our ever-increasing population, it is the duty of the Government to encourage the establishment of new manufactures and industries in this country. Patent laws were originally enacted for the very purpose of finding work for our people, by encouraging inventors and others to introduce new manufactures within this realm.

Our present laws, however, do the very opposite. The most important question, with regard to which amendment is wanted, is whether a foreign subject to whom we have granted a monopoly in this country should manufacture the patented article in our empire, or whether he need only produce it abroad and import it into this country. If we grant a monopoly to any person, foreign or otherwise, and allow him to produce the article abroad, our industrial interests are seriously injured, for the following reasons:—

1. We support foreign labour, and assist in the developments of foreign industries.

2. We throw out of employment a certain number of our own workpeople, as a newly introduced article generally replaces one already in use.

3. We stifle invention, and increase the cost of production by closing the door to our own inventors and manufacturers, whilst our foreign competitors are at liberty to make and vend the patented article without any restriction or royalty, since very often the foreign patentee has not succeeded in obtaining a patent in his own or other countries.

4. We grant the foreign patentee in many instances a practically permanent or continuous monopoly, since, at the expiration of the patent, there is no skilled labour in this country trained in this special manufacture.

If, however, the monopoly is worked in this country, the advantages to our trades and industries are:—

1. The monopolist finds employment for our workpeople.
2. He contributes to our local and Imperial taxation.
3. He greatly benefits other collateral industries.

As an illustration of the benefit derived from working a foreign patent here, take the case of the Otto gas engine. Messrs. Crossley succeeded in getting a license from Otto, an Austrian subject, who had obtained a patent for an improvement in the production of a gas engine. During the existence of this patent, Messrs. Crossley paid in wages and salaries to British workmen nearly two millions sterling, and they made for themselves a great fortune, much of which has been most generously devoted by them to British hospitals and charitable institutions. On the expiry of the patent some half-dozen other makers started to produce these engines, and to-day we are among the largest producers of gas engines. If this patent had not been worked in this country, the manufacture of gas engines would probably be to-day, and for years to come, a foreign monopoly, like many other articles. Take the case of Messrs. Brunner, Mond, and Co. Dr. Mond succeeded in getting a license from Solvay, a Belgian, to make in this country ammonia soda, and thus was this firm established in this country. They have paid in wages to British workmen more than four millions in money, besides largely benefiting, like Messrs. Crossley, other collateral industries. When the patent expired, other makers started the production of this article, and, but for the establishment of its manufacture in this country, a large portion of our chemical industries would have been ruined. There are probably ten times more foreign inventors than British—assuming the ingenuity of Americans, French, Germans, &c., to be equal to our own—simply because the population of the Continent and America is ten times that of Great Britain.

The Government appointed a Committee under Sir Edward Fry to consider, *inter alia*, the question of working patents, and the result of that Committee's enquiry is a recommendation that a patentee may work his patent abroad and give no license here so long as he supplies the requirements of the British public.

No more suicidal policy has ever been recommended l any Departmental Committee. The Committee in tl case consisted principally of lawyers, patent agents, a officials, with only two outside members, who knew ve little of patent law.

During the proceedings Mr. Bousfield, K.C., who w examined by Lord Alverstone, a member of the Committe stated that he was under the impression that it was mo desirable to have as many manufactures as possible work in this country. To which Lord Alverstone replied, "t economic question is not material to our present enquiry This reply requires no comment. After the publicati of Sir Edward Fry's Committee's report the Manchest Chamber called a conference of industrial chambers, whi met in Manchester in June last, when a number of resol tions were carried, among which was one disapproving Sir Edward Fry's Committee's recommendation on t question of working a patent. The author was delegated l the Manchester Chamber to bring these resolutions befo the autumnal meeting of the Associated Chambers of t United Kingdom, which met in September last at Nottin ham, and these resolutions were all confirmed with practi unanimity. An amendment was proposed by a member Sir Edward Fry's Committee approving of the report, b it was defeated by an overwhelming majority.

There is only one practical solution of this question, a this is, that, if a patentee will neither work his pate himself in this country nor let others work it, it may revoked, as is the law in France, Germany, Russ Austria, &c.

It is contemplated to organise a powerful deputation wait on Mr. Gerald Balfour, the President of the Board Trade, to put before him the resolutions of the Associat Chambers of Great Britain, and to urge him to take ste for the speedy amendment of the law.

New York Section.

Meeting held on November 24th, 1899.

MR. T. J. PARKER IN THE CHAIR.

THE DEATH OF MR. WALDRON SHAPLEIGH.

Before the business of the evening commenced, Pr C. F. CHANDLER said:—

I rise to perform the painful duty of announcing t death of our beloved friend and fellow member, Waldr Shapleigh, which took place at his summer home in W Lebanon, Maine, on August the 30th, 1901.

Mr. Shapleigh was the son of the late Marshall Spri Shapleigh, of an old Maine family. He was born at Phi delphia in 1848. He studied chemistry in Philadelp under the late Prof. Williams, and made such rapid progr that at the age of 19 he was appointed superintendent the zinc works in Blair County, Pennsylvania. A y later he accepted a position as instructor of chemistry Lehigh University at South Bethlehem, Pa. He remain there several years, and took charge of the chemi department *ad interim* on the death of Prof. Wetherill.

He then decided to devote his attention to the be sugar industry, and went to France, where he devot two years to the study of this subject. An article him on "The Cambrai Central Beet-Sugar Works, No France," appeared in the *American Chemist* for Febru 1874. On his return from France he was appointed chem to the King's County Sugar Refining Company of New Yo then engaged in the manufacture of glucose—a posit which he held for ten years, until the company was dissolv He was for a time at Peoria, Illinois, in charge of a gluc establishment.

When the inventions of Welsbach were introduced i the United States, Mr. Shapleigh was appointed ch chemist to the Welsbach Company, and he maintained connection with this company until his death.

In 1873, he was appointed by the Governor of Pennsylva a Commissioner to the Vienna Exposition, and in 1893, was appointed a Judge of the Chemical Section of t 'olumbian Fair at Chicago. He was a Fellow of the ,ondon Chemical Society, the American Chemical Society, he Society of Chemical Industry, and the Franklin Institute.

He is chiefly known by his work in connection with the are earths associated with thoria in the monazites and the arious other minerals in which it occurs. He showed istinguished ability in devising methods for separating hese earths, and from the foundation of the American Velsbach Company he was able to prepare all the materials equired by that company, so that the company was not bliged to purchase its mantle fluid from Vienna, as all the ther companies were. It is very unfortunate that the onfidential relations of Mr. Shapleigh to the Welsbach ompany made it impossible for him to publish the results f his investigations upon these earths. This fact will eprive him of the credit to which he is justly entitled of nravelling to a remarkable degree the intricate chemistry f these earths. He has received medals for the beautiful ollection which he prepared of the rare earths, especially r his salts of neodymium and praseodymium.

Mr. Shapleigh was a man of very unusual character. His ind was strong and clear and his temperament energetic, d he always gave the impression of possessing a great nount of reserve strength; at the same time he was very ntle in his disposition. He made a great many friends, d always very warm friends, by whom he was deeply ved, and his loss will be much lamented. He leaves a dow, a son, and a daughter.

PROPORTIONS OF LIQUID FATTY ACIDS IN SOME FATS AND OILS, AND THEIR IODINE VALUES.

BY N. J. LANE, B.SC.

a paper published some years ago (J. Amer. Chem. Soc. 93), I suggested, as a valuable improvement of Muter's thod in determining the amount of liquid fatty acids and their iodine values, boiling the lead salts with ether under a reflux condenser, and then allowing to cool slowly.

The method was also tried with petroleum ether, with very satisfactory results.

The following results were obtained with samples kindly furnished by Mr. Goulard, of Thomas Goulard and Co., the official inspectors for the New York Produce Exchange:—

——	Steam Lard.	Oleo-Stearin.	Cotton Oil.
Liquid acids by ether (per cent.).	60·03	28·02	71·98
Liquid acids by petroleum ether (per cent.).	57·51	25·86	72·31
Iodine absorption by ether method.	100·8	75·70	110·1
Iodine absorption by petroleum ether method.	101·1	80·58	112·2
Titre test (C.)............	..	50·2	34·3

A sample of artificial lard, prepared from the above fats in the following proportions—

	Per Cent.
Lard	70·00
Oleo-stearin......................	10·00
Cotton oil........................	20·00
	100·00

gave, by the petroleum ether method:—

——	Found.	Calculated.
	Per Cent.	Per Cent.
Liquid acids	56·84	57·31
„ iodine absorption	113·9	111·6
Cotton oil	20·22	20·00

The following tables contain a number of results obtained by the improved Muter method:—

Sample of	Liquid Acids.	Iodine Value of Liquid Acids.	Titre Test of Fatty Acids.	Iodine Value of original Fat: Found.	Iodine Value of original Fat: Calculated from Iodine Value of Liquid Fatty Acids.	Saponification Value.	Acidity as Oleic Acid.	——
	Per Cent.		° C.					
nmercial lard..........	60·80	95·94	38·1	..	..	..	0·15	Contained 4 per cent. of oleo stearin.
am lard................	65·76	97·18	36·9	..	..	..	0·48	Run with ether.
anut oil	30·21	18·58	23·0	..	..	..	4·08	
o-stearin	29·41	77·82	48·7	..	..	..	0·50	
ton-seed oil	75·51	157·8	32·4	..	..	..	..	
„	76·85	137·3	33·2	..	..	..	..	
ached cotton-seed oil ..	70·50	149·8	32·7	105·2	106·1	..	0·72	
ve oil	89·97	97·29	..	..	..	..	..	Solid acids, grav. 13·61.
l liver oil	69·90	167·9	..	..	..	199·0	..	
ame oil	78·05	139·9	21·4	..	..	189·2	..	
.nut oil	78·63	116·2	..	..	..	191·0	..	
„	77·25	112·9	..	..	..	190·1	..	
„	81·64	119·5	..	..	..	190·5	..	
„	78·89	111·0	..	..	..	185·5	..	
nese peanut oil	80·26	131·0	..	..	..	..	..	
anese wood oil.........	89·62	179·7	..	..	..	194·8	..	Fresh sample.
„ „ old sample	87·80	178·4	..	..	..	191·4	..	Old sample.

——	Liquid Acids, Volumetric Determination.	Liquid Acids, Gravimetric Determination.	Iodine Value of Liquid Acids, calculated on Volumetric Determination.	Iodine Value of original Fat found.	Iodine Value of original Fat calculated (I. val. L.A. × L.A. %).	Saponification Value.	——
tor oil.........................	90·28	91·28	96·27	..	..	..	Liquid acid as ricinoleic.
lnut oil, fresh	91·09	..	167·0	150·2	152·2	191·6	Petroleum ether and ethylic ether gave same result.
„ rancid	85·57	87·32	146·7	129·5	125·5	..	With petroleum ether.
oanut oil	44·22	..	17·86	7·71	7·90	257·4	Ethylic ether.
seed oil	93·22	..	99·61	90·49	92·85	190·1	„
„	88·06	..	104·4	90·49	91·95	190·1	With petroleum ether.

Nottingham Section.

Meeting held on Wednesday, October 30th, 1901.

MR. L. ARCHBUTT IN THE CHAIR.

THE HEAT PRODUCING POWER OF FUEL.

BY ARTHUR ADAMS.

(*This Journal, October* 1901, 972.)

Discussion.

Mr. Wm. Thomson wrote, stating that he had always used oxygen which had stood for 24 hours over water in a gasholder before use, and had made tests to find out whether carbon monoxide was produced during the combustion, but had failed to detect it. He had generally found the ash of the fuel left as grey-fused pellets, free from carbon. As the bubbles of gas were broken up four times by passing through the wire gauze surrounding the glass diving bell, he thought it might be taken that the gas left the apparatus at the same temperature as the water in it. In regard to the statement that an error of 1 mm. in reading the water level caused an error of 0·25 to 0·3 per cent., he never measured the water in the calorimeter itself, but either weighed it or measured from a litre flask delivering 1,000 grms. weight of water, and he took into consideration the radiation by taking half the fall of the thermometer during the period required to make the experiment, and adding it to the total rise of temperature. It had been suggested that the solution of the carbonic acid in the water would tend to raise the temperature of the water in the calorimeter, but he thought this not a serious error, because on burning pure carbon the results obtained were very close, if not identical, with those obtained by Favre and Silbermann.

Mr. R. M. Caven could well appreciate the importance of the two points dealt with in Mr. Adams's paper; the first, however, seemed to be met by Mr. Wm. Thomson's statement that he always employed oxygen saturated with aqueous vapour. With regard to the supposed incomplete combustion of the fuel, owing to the dryness of the oxygen, it seemed doubtful if the gas supplied direct from an ordinary cylinder would be "dry" in the sense of the term as used by Dixon and Baker. It was to be regretted that the author did not analyse the issuing gases so as to be able to state the actual amount of carbon monoxide present.

Mr. J. T. Wood said he understood that for all accurate estimation of calorific values, Mahler's Calorimetric Bomb was now used. This was not mentioned by the author of the paper.

The Chairman remarked that Mahler's calorimeter was largely used. It consisted of a strong steel shell, nickel plated on the outside and enamelled inside, in which the coal or other combustible substance was burnt in oxygen compressed to 25 atmospheres. The apparatus, though rather costly, was simple, and easily manipulated, and with a substance of known calorific value, such as pure naphthalene, it gave exact results. Mr. Reddrop, the late chemist of the L. & N.W. Railway, who had used this apparatus for several years, had obtained some very interesting comparative values by testing the same coals both in Mahler's and also in Lewis Thompson's calorimeters. The results given in the table, which he had Mr. Reddrop's permission to publish, were obtained with four samples of coal.

Description of Coal.	Calorific Value determined by		Sulphur. Per Cent.	Coke. Per Cent.	Ash Per Cent
	Mahler's Calorimeter.	Thompson's Calorimeter.			
Lancashire ...	7,552	7,370	0·62	67·4	7·5
Staffordshire.	7,968	..	1·33	..	..
	7,931	8,085	1·33	65·5	2·8
	7,977	..	1·25	..	..
Monmouthshire	8,327	7,865	0·74	82·5	6·1
Glamorganshire.	8,411	..	0·74	..	..
	8,425	..	0·74	..	..
	8,450	7,920	0·69	89·6	3·2
	8,448	..	..	..	..

These results show that Lewis Thompson's apparatus, though admittedly imperfect, gave results which would be sufficiently accurate for many practical purposes, the error ranging in the above coal from + 1·4 per cent. to − 5·5 per cent. The error was greatest with coals yielding high percentages (80 per cent. and upwards) of coke, probably owing to the carbon of such coal not being completely burnt in the Lewis Thompson calorimeter. Wm. Thomson's calorimeter was a much more perfect apparatus than Lewis Thompson's. The author's remarks were a little misleading, for in the original description of the apparatus (this Journal, 1886, 581) a gasholder of special constructio was described, in which the oxygen was stored over wate and was forced from the holder by admitting water at th bottom through a tube connected with the town mai As, however, the use of compressed oxygen direct fro cylinders was now so common in laboratories, the autho had done some service in calling attention to the necessit of saturating this oxygen with water before it was use He thought, with Mr. Caven, that it was a pity the autho had not made his paper more complete by giving som analyses of the products of combustion passing from th calorimeter when unsaturated and saturated oxygen wer used.

Mr. F. J. R. Carulla asked whether any calorimetri experiments had been made to show what difference ther was in heating power between small and large coal fron the same seam. Better results were obtained in practic from screened coal than from the screenings of the sam coal, and yet the calorimeter might give the same valu for both.

The Chairman said that the Lewis Thompson calori meter would be well adapted for such comparative tests, a it was very expeditious in use. He should think that th large coal would give the higher results in the calorimeter.

Mr. Ward said that small coal generally contained mo ash than the larger coal.

Mr. Arthur Adams said, in reply, that on reference t Mr. Wm. Thomson's original paper, it would be found tha although a special gas holder was suggested, the importan of the presence of water vapour was in no way indicate and in probably 99 cases out of 100, oxygen direct fro the bottle, unsaturated, would be used. The Berthelo Mahler calorimeter was more exact, as the products combustion did not come into contact with water, th preventing certain errors; it was far more expensive an less used than Mr. Wm. Thomson's form. The comparati results contributed by the chairman were of much intere particularly in the case of the Staffordshire coals, where t result in Lewis Thompson's calorimeter was higher tha in the Mahler calorimeter; this was probably due to t sulphur being burned with the formation of potassium su phate, in the former case, while it would be mainly burn to sulphur dioxide in the Mahler calorimeter. The resul seemed to prove that Lewis Thompson's form was not sati factory, as the results were not uniform. A series comparative experiments with the Thomson and Mahl calorimeters would be of considerable use and interest.

It was pointed out in the paper that compressed oxyge was not "dry" in the same sense as that of Dixon an Baker. It was saturated when compressed to 120 atmo pheres, that is, the expanded gas would contain less than milligrams per cubic foot, about 0·01 per cent., and it w sufficiently dry to cause incomplete combustion. There w a perceptible difference in the burning when moist oxyge was used; the combustion appeared to be slower. Want time prevented the analysis of the gases, and in the last thr months, since sending in the paper, it had not been possib to continue the experiments. Mr. Thomson's remar showed that there was complete combustion with moi oxygen, while Fischer's experiment, quoted in the paper, a all the classical experiments of Favre and Silberman Berthelot, &c., showed that there was incomplete combusti generally. As to the measurement of water, weighing w ndoubtedly the best, but was little practised. It was not ossible to make an error in measuring, of 1 mm. *i.e.* 0·25—·3 er cent. without carelessness, so that measurement by nting line on beaker was near enough in most cases. The olubility of the gases in water, more particularly the ulphur dioxide, which varied with the sulphur present in ie coal, was a possible source of error, which required examination. Screened coal gave higher values than screenings, nd contained less ash.

THE EFFECT OF TANNING EXTRACTS CONTAINING BISULPHITES ON LEATHER.

BY DRS. J. GORDON PARKER AND AUGUST GANSSER.

Contribution from the London Leather Industries Laboratory, Herold's Institute, Bermondsey.

he following research was commenced by us in order to ear up a question of great interest to tanners, and which i. as impossible to solve until Prof. Procter devised a rapid nd exact method for estimating mineral acids in leather.*

The questions to be solved were whether tanners were rrect in their view that leather, tanned with extracts hich have been treated with bisulphites, and which smell sulphurous acid, is brittle and liable to crack, and, if so, is e brittleness due to the presence of bisulphites, and to eir production of mineral acids in the leather ?

We have found no researches or published results on hich tanners could have based their theory that the sulurous acid oxidises into sulphuric acid, and so renders e leather liable to crack. It was therefore desirable to e whether leather, produced by the aid of this extract, es contain free mineral acids.

The extracts on the market, which have been treated ith bisulphites of soda, are patented,† and are rendered rfectly soluble in cold water or cold liquor. An analysis such an extract showed that sulphurous acid was present, rtly as neutral sodium sulphite, partly as bisulphite, and rtly in such a form that it was not liberated by the dition of strong mineral acids. This last was found to nearly proportional to the temperature which had been ed in making the extract, and appears to combine with d render soluble the phlobaphenes, which are difficultly luble tannin matters. The proportion which is so bound s not been estimated, but no free sulphuric acid is formed om it, nor can sulphurous acid be liberated from the mbined sodium sulphite.

The extracts referred to are known on the market as Mimosa D," Tanning Extract A.T., and Quebracho Exict S.F. (manufactured by A. Huillard and Co.); but sides these, there are also other extracts, which, although t decolourised by means of sodium bisulphite, contain to 2 per cent. of this material, which has been added to e extract subsequent to manufacture solely for the purpose preserving it, and, to a slight extent, of brightening the lour.

The extracts produced by the Lepetit, Dollfus and ansser patent, smell so strongly of sulphurous acid, that nners expect that the leather tanned with them will contain free mineral acid, especially when the leather dries ittle. Unfortunately, all the conditions which go to cause ather to become brittle are not known.

On investigating several samples of leather tanned in fferent tanneries, and samples tanned under our own pervision, we found every sample absolutely free from all ces of sulphuric or sulphurous acids. The brittleness the leather, therefore, could not be put down to the tion of acid. The question thus resolved itself into an vestigation whether brittleness was more prevalent in ther tanned with these extracts than in leather tanned herwise. One is often liable to use a highly clarified, rapid tanning extract in great strength in order to add weight to the leather, forgetting that these light-coloured extracts are in reality very strong solutions of tannin.

The brittleness can, in some cases, be put down to the use of extracts which have been improperly decolourised, and by a deposition of difficultly soluble tannins on and in the surfaces of the leather. Light-coloured extracts are used largely by sole leather tanners in the later stages to lighten the colour of the leather tanned in the earlier stages with cheaper and darker coloured materials, and where in such a case a brittle leather is produced, one is liable to put it down to the last extract used.

It is, therefore, of the highest importance to find out, if possible, the cause of leather drying brittle, and if this be not possible, then at least to ascertain which of the numerous theories put forward by tanners is correct.

Experimental Part: A. Trials with "Mimosa D."—Two pieces of calf grain, marked 1 and 2, were tanned with two different samples of commercial "Mimosa D," and the leather so tanned was afterwards tested for acid by Procter's method. At the same time, the alkalinity of the ash was estimated as follows :—

Three grms. of the leather were reduced to ash in a platinum dish. To this was added 10 c.c. of N/10 HCl. The soluble part was then titrated with N/10 Na_2CO_3, using methyl orange as indicator. In a similar manner a piece of goat skin, which had been tanned in a third sample of extract, was similarly treated. As the following results show, the three samples of leather, instead of containing any free mineral acids, were each in an alkaline condition.

The estimation of acid gave the following result :—

—	Sample 1.	Sample 2.	Sample 3.
	c.c.	c.c.	c.c.
Amount of added N/10 HCl	30·0	30·0	30·0
Amount of N/10 soda required..	26·6	27·1	26·7
Difference..........	3·4	2·9	3·3
Calculated in percentage of Na_2CO_3.	0·61	0·51	0·58
Calculated in percentage of $CaCO_3$.	0·57	0·48	0·54

The alkalinity of the leather ash gave the following results :—

—	Sample 1.	Sample 2.
Weight of ash in grms.	0·0436	0·0305
	c.c.	c.c.
Amount of N/10 HCl added	10·0	10·0
Amount of N/10 soda required ...	4·5	4·4
Difference.......	5·5	5·6
Calculated in percentage of Na_2CO_3	0·97	0·98
Calculated in percentage of $CaCO_3$	0·91	0·93

None of the samples of leather above tested showed the slightest signs of being brittle. The leathers were air-dried, and without the addition of any oil.

Each sample of extract which was used smelt strongly of sulphurous acid, yet the samples of leather were absolutely free from any trace of sulphurous or sulphuric acid, as the results above show.

To test the effect of light upon the samples of leather so produced, portions were exposed to strong sunlight for four weeks. The effect was very slight, the leather not being appreciably darkened.

B. *Trials with Chestnut Extract.*—A calf skin was divided into halves; one half, marked 1, was tanned with a decolorised chestnut extract, to which had been added 2 per cent. of free sodium bisulphite; the other half, marked 2, was tanned with the pure extract, to which no sodium bisulphite had been added.

"Leather Trades' Review," January 9th, 1901 (this Journal, rch 1901, 287).

Lepetit, Dollfus and Gansser, D.R.P. No. 91,603, 21, IV., 1896; stry patent No. 103,725, 30, VI., 1897; E.P. 8582 of 1896, 23, IV., 96, and 2603 of 1898, 21. II. (this Journal, 1897, 436) (*ibid.* 1899,), 1898.

The estimation of acid gave the following results :—

——	Sample 1.	Sample 2.
	c.c.	c.c.
Amount of N/10 HCl added......	30·0	30·0
Amount of N/10 Na_2CO_3 required	28·75	27·50
Difference	1·25	2·50
Calculated in percentage of Na_2CO_3	0·22	0·44
Calculated in percentage of $CaCO_3$	0·20	0·41

The alkalinity of the leather ash was as follows :—

——	Sample 1.	Sample 2.
Weight of ash in grms...........	0·0143	0·0197
	c.c.	c.c.
Amount of N/10 HCl added......	10·0	10·0
Amount of N/10 soda required ...	4·7	4·65
Difference	5·3	5·35
Calculated in percentage of Na_2CO_3	0·93	0·94
Calculated in percentage of $CaCO_3$	0·88	0·89

That the small addition of bisulphite would have no action on the composition of the leather was to be expected, although it may be noted that these samples of leather were absolutely free from any traces of mineral acids.

The same samples on exposure to four weeks' sunlight had not altered in colour or in firmness.

C. *Trials with Oakwood Extract.*—In the same manner, as with B, a skin was divided into two parts, and both tanned with the same quantity of oakwood extract. To one half, marked 1, 2 per cent. of bisulphite was added; the other half, marked 2, was tanned in the original extracts, without any additions. The following are the results of the tests for acids :—

——	Sample 1.	Sample 2.
	c.c.	c.c.
Quantity of N/10 HCl used	30·0	30·0
Quantity of N/10 Na_2CO_3.........	27·5	24·6
Difference	2·5	5·4
Calculated in percentage of Na_2CO_3	0·44	0·95
Calculated in percentage of $CaCO_3$	0·41	0·89

The alkalinity of the leather ash gave the following results :—

——	Sample 1.	Sample 2.
Weight of the ash in grms........	0·0260	0·0395
	c.c.	c.c.
Amount of N/10 HCl added	10·0	10·0
Amount of N/10 Na_2CO_3 used....	3·0	3·4
Difference	7·0	0·6
Calculated in percentage of Na_2CO_3	1·23	1·10
Calculated in percentage of $CaCO_3$	1·16	1·09

The above results show that the leather was not affected in the slightest degree by the addition of the sulphite.

D. *Trials with samples of sole leather of known tannage, from different tanyards.*—Sample 1: Sole leather, of light leather, good cut, firm but not brittle. The sample had been tanned with decolourised chestnut extract and "Mimosa D." Sample 2: Similar appearance and characteristics to sample 1, slightly darker in colour. The leather had been tanned with undecolourised chestnut extract, quebracho extract, and "Mimosa D." Sample 3: Heavily tanned sole leather, very brittle, dark colour, was of mixed tannage. A small proportion of "Mimosa D" had been used in the tannage.

Acid determination :—

——	Sample 1.	Sample 2.	Sample
	c.c.	c.c.	c.c.
Amount of N/10 HCl used	30·0	30·0	30·0
Amount of N/10 Na_2CO_3...........	26·8	25·5	27·5
Difference	3·2	4·5	2·5
Calculated in percentage of Na_2CO_3	0·56	0·80	0·41
Calculated in percentage of $CaCO_3$	0·53	0·74	0·41

Alkalinity of the leather ash :—

Weight of ash in grms.............	0·0736	0·1275	0·027
	c.c.	c.c.	c.c.
Amount of N/10 HCl added	10·0	10·0	10·0
Amount of N/10 Na_2CO_3 required ..	4·5	2·75	6·0
	5·5	7·25	4·0
Calculated in percentage of Na_2CO_3	0·97	1·28	0·70
Calculated in percentage of $CaCO_3$	0·91	1·20	0·60

As the results above show, samples 1 and 2, and also t brittle sample 3, are absolutely free from mineral aci and the brittleness of sample 3 is, therefore, not due to t presence of bisulphites, but is evidently due to ov tannage.

E. *Trials with a soluble, decolourised quebracho extra containing bisulphites.*—Leather, marked 1, was a sample calf leather heavily tanned by drumming. The leather w brittle and over-tanned, and parted with a lot of its tann by washing in water. Leather, marked 2, was a sample the same leather, which was treated for five hours in a 2 p cent. solution of bisulphite, and afterwards put for half hour in a drum with the solution of bisulphite; it was th taken out of this, allowed to drip, and dried. The leather produced had completely lost its brittleness, and dried o a good colour. Sample 1, previous to such treatment, w extremely brittle and harsh, and by treating it with bis phite it lost its harshness. From this result one c scarcely continue under the impression that bisulph produces brittleness, since, in this case, an opposite result obtained.

The determination of acids gave the following results :-

——	Sample 1.	Sample 2.
	c.c.	c.c.
Quantity of N/10 HCl used.......	30·0	30·0
Quantity of N/10 Na_2CO_3 required	25·8	25·9
	4·2	4·1
Calculated in percentage of Na_2CO	0·74	0·72
Calculated in percentage of Ca_2CO	0·69	0·68

Alkalinity of the leather ash :—

Weight of ash in grms............	0·0511	0·0687
	c.c.	c.c.
Amount of N/10 HCl added	10·0	10·0
Amount of N/10 Na_2CO_3 required	5·82	7·05
	4·18	2·93
Calculated in percentage of Na_2CO_3	1·05	1·24
Calculated in percentage of $CaCO_3$	0·99	1·17

In the above examples the analyses demonstrate th the fear of using extracts containing bisulphite is witho foundation.

Firstly, as the above results show, samples of leath tanned with these extracts, were in each case free from a trace of mineral acids; secondly, there was no indicati that even an excess of bisulphite had any injurious eff upon the leather. The weight of the ash from such leath and the alkalinity, were practically the same as from oth leathers. The bisulphite was not taken up by the leathe but appeared to assist in the penetration of the extract in the leather, and, as the extract diffused in, the bisulphi dissolved out.

In order to make perfectly sure, with regard to the orption of bisulphites by leather, the following experi- nts were undertaken :—

Two thick bellies, after the usual preliminary treatment liming, &c., to remove the hair, were put in a paddle and imed in a mixture of acetic and lactic acid. No. 1 piece s tanned in an extract containing bisulphites, "Mimosa ' being again selected. It was tanned slowly in a paddle, re extract being gradually added until the belly was roughly tanned. The other belly, No. 2, was treated in ther paddle in exactly the same way, but each time ract was added a quantity of bisulphite of soda was added, in the proportion of 1 part of bisulphite to every parts by weight of extract ; in other words, for every grms. of extract added to strengthen the liquor, grms. of bisulphite were added. The liquors were thus ngthened until they had a relative density of 1·045. tannage lasted 10 days. At the end of this period, the her was taken out, allowed to dry, and half of each e was dried right out, and the other half was oiled on surface and dried out slowly. Therefore, from the eriment, four separate samples were obtained, two oiled the other two unoiled. Neither the former nor the er, when dry, showed the slightest tendency to crack. y grms. of each of the unoiled samples were reduced ish in a platinum dish, with the following results :— 1 gave 0·3450 grm. ; No. 2 gave 1·7160 grm.

hese residues were now treated with a slight excess of huric acid, and strongly heated with the blow-pipe. monium carbonate was then added, and the ash again ed until the weighings were constant.

—	Sample 1.	Sample 2.
	Grms.	Grms.
ght of residue................	0·4222	1·7900
	Per Cent.	Per Cent.
alated as sodium sulphate...	0·84	3·58
alated as sodium bisulphite..	0·61	2·62

rom the remaining leather a further 50 grms. were n from 1 and 2. The leather was cut into thin slices, shaken gently in a shake machine for five or six hours a litre of distilled water, filtered, and filtrate from each orated to dryness. The remaining leather was then l and burnt to ash, as in the above.

—	Sample 1.	Sample 2.
	Grms.	Grms.
ht of ash from washed leather	0·1492	0·2460
ht as ash from filtrate	Lost	1·4813

the same manner as above, these four residues were ed with sulphuric acid, strongly heated, and weighed.

—	Sample 1.	Sample 2.
	Grms.	Grms.
ed leather (a)...............	0·2912	0·2863
r (b)........................	0·1361	1·5840
	Per Cent.	Per Cent.
lated as percentage of ium sulphate (a).	0·58	0·56
r (b)........................	0·26	3·16
lated as percentage of ium bisulphite (a).	0·42	0·40
r (b)........................	0·19	2·31

e other inorganic salts, which in the above were hed as sodium sulphate, were found to be so small antity that they might be neglected.

will be noticed, from the foregoing figures in experi- 1, that 0·42 per cent. of sodium bisulphite remains e leather after a thorough soaking, and that 0·19 per is found in the liquor, which gives a total of 0·61 per of sodium bisulphite. This amount corresponds to quantity of bisulphite which was found in the first riment when the leather was originally treated.

Further, it is peculiar, with the figures got by experiment No. 2, that about the same amount of bisulphite is retained in the leather as in experiment No. 1, *i.e.*, 0·40 per cent., which, together with the 2·31 per cent. which was found in the liquor, makes 2·71 per cent., thus corresponding within a tenth of a per cent. of the amount obtained by analysing the leather which was tanned with "Mimosa D" *plus* bisulphite.

We have endeavoured to show by the above simple experiments and analyses that sodium bisulphite does not appear to be absorbed by the leather ; in fact, it is easily removed, and when present it remains chiefly in the tan liquors. The small percentage of sodium bisulphite which is retained by the leather is in each of the above experiments almost exactly the same, in spite of the use of varying quantities.

Further, no sulphuric acid is formed either in the leather or in the liquors, when such extracts are used ; nor was there any indication of brittleness or cracking of the grain in any sample of leather which was tanned with tanning extracts treated with bisulphites.

Besides the above small experiments detailed, a much larger series of practical tests was carried out. Calf and sheep skins, and also hides, were tanned practically with varying quantities of tanning extract, to which, in one case, as much as 100 per cent. of bisulphite of soda was added (*i.e.*, equal quantities of sodium bisulphite and tanning extract). A good colour was obtained in each case, and the leather, although it was dried fairly rapidly and without being oiled, showed no signs of cracking. Samples were taken from each, and, on analysis, showed no trace of free acid, either sulphurous or sulphuric.

Discussion.

Mr. S. T. **Pentecost** thought that any acid remaining in the leather must be held by a lime soap, or a body of that nature. In bleaching cotton goods all traces of mineral oil might appear to have been removed, and yet after a time yellowish stains appeared. Might not the acid in the leather be imprisoned in a similar way? The intensity of the action of the bisulphite would depend upon the concentration of the tanning bath. Certainly, in the case of silk, treatment with bisulphite affected the fibre.

Mr. G. B. **Clemons** explained that the use of bisulphite was solely to render soluble in cold water certain tannins. He wished to know whether the tintometer could be taken as a reliable means of judging the colour of a tanning extract, and whether the tintometer results were always borne out in the tanpits.

Mr. J. T. **Wood** regretted the absence of the authors of a paper of such importance to tanners His firm had used extracts made according to the patents mentioned, and had experienced no difficulty. The patent stated that 300 kilos. of extract were heated with 100 kilos. of sodium bisulphite, in a closed vessel, to 115 C. for some hours. The product obtained from quebracho extract was perfectly soluble in cold water. (This Journal, 1897, p. 436.) As to the decay of bookbinding leathers, mentioned by the Chairman, a committee of the Society of Arts had recently published a report in which suggestions were made as to the prevention of this evil. The fumes of burnt gas were certainly fatal. The action of light was also of great importance. The amount of bisulphite in the strongest liquors would not be so strong as in the case Mr. Pentecost mentioned ; it would not amount to more than 2 grms. per litre, and this could scarcely affect the leather. In reply to Mr. Clemons, while the tintometer was most useful, he did not find it any guide as to the value of an extract. He knew of a case in which an extract with a worse tintometer reading than sample actually produced a better-coloured leather.

Mr. R. M. **Caven** asked what was the precise nature of the substance known technically as "bisulphite of soda." The question was of theoretical, if not of practical, interest, because of the doubt which has been thrown on the existence of $NaHSO_3$ (see discussion by Divers, this Journal, May 1899, p. 451). When SO_2 gas was passed into a solution of caustic soda until the liquid was neutral, sodium pyrosulphite,

$Na_2S_2O_3$, was contained in the solution. It would be of interest, therefore, to know whether the solution employed in leather dressing was acid in reaction, and, if so, what advantage it possessed over a solution of sulphurous acid.

Dr. J. Gordon Parker, in reply, wrote that the tintometer was a perfectly reliable means of judging the colour of a tanning extract, provided one only compared tanning extracts of the same make one against the other. One could compare different deliveries of oakwood, one against the other, and different deliveries of chestnut or quebracho, but not an oakwood against a quebracho, as there was a different colouring matter present in each.

Mr. Wood's remark about the extracts at the end of his reply was correct, if two different extracts made of different materials were being compared, but would not be correct were the two extracts made from identical raw materials.

In reply to Mr. Caven, the bisulphite of soda which was used was supposed to be $NaHSO_3$. It possessed a great advantage over SO_2 gas, as the sodium bisulphite appeared to form soluble compounds with the difficultly soluble tanning materials, whereas SO_2 gas appeared merely to bleach them slightly, without dissolving them.

Scottish Section.

Meeting held in Glasgow, on Tuesday,
October 29th, 1901.

DR WM. FREW IN THE CHAIR.

IMPROVEMENTS IN SUGAR-REFINING DURING THE LAST TWENTY-FIVE YEARS.

BY T. L. PATTERSON, F.I.C., F.C.S.

Sugar-refining is a physical and mechanical, rather than a chemical process. Briefly stated, it consists in the dissolution of raw sugar in water; filtration of the liquor through cloth to remove insoluble impurities, and through animal charcoal to remove colour; and finally, concentration of the decolorised liquor to obtain crystals. But it depends largely on chemical analysis for the determination of the composition and value of the raw material and for checking the various processes in the refinery. Hence the staff of no well organised refinery is complete without one or more chemists, although very few chemicals are used in the process itself.

On the Continent, chemical processes are wholly in use for the removal of colouring and nitrogenous matters from beetroot juice. These consist for the most part in the treatment of the juice with alkaline earthy bases, zinc, iron, and tin salts; carbonic, sulphurous, and hydrosulphurous acids. Electricity, too, is on its trial for the same purpose and for the partial removal of mineral salts. Some of these chemical processes have been adopted for the treatment of cane-juice in the Colonies, but none have been introduced into this country, except perhaps in a very modified way, because they are not applicable to British methods of refining. Sucrose undergoes inversion and decomposition so easily, and is so closely related in composition to some of the impurities to be removed, that treatment with strong chemicals is out of the question. For this reason animal charcoal still maintains its position as a decolorant in the production of the highest class products, as well on the Continent as in this country.

No revolutionary change has taken place in the refining industry during the last 25 years, but many improvements on the old physical and mechanical processes have been made and introduced. The first of these to which I am about to direct your attention consists in improved methods of washing raw sugar in the centrifugal, just introduced by Weinrich prior to this period, with steam, or with hot or cold water. The process was afterwards improved by Duncan and Newlands, Walker and Patterson, and others. Theoretically, raw sugar may be said to consist of pure sugar crystals and molasses. The object of the process is therefore to wash out the molasses, and raise the stand
of the raw material—chiefly beetroot sugar of low qualit
to that of the higher grades, and make them suitable
the production of the highest quality of refined sugar.
this purpose raw beetroot sugar of 75 per cent. to 80
cent. net analysis is filled dry into the centrifugal, or mi
with syrup or water, and transferred to a centrif
machine. After spinning out the syrup added or m
the sugar in the machine is washed with water or st
until most of the molasses is removed. The product wh
still contains all the insoluble impurity and some of
colouring matter has been raised in quality, though redu
in weight, to an analysis of 90 per cent. to 95 per cent.
The process separates the raw sugar into two produ
viz., (*a*) the partially purified or washed crystals, wh
are submitted to the ordinary process of refining for
production of white crystals, cubes, or granulated;
(*b*) the washings, containing the molasses which go
make yellows and syrups.

In the filtration of sugar liquors, filter-presses have b
introduced with marked advantage, but in most refine
the old Taylor filter, with in some cases trifling modificati
still holds its own. There is room, however, for a gre
use being made of the filter-press than has yet been do
Sometimes when filtration is difficult, a precipitate
phosphate of lime is brought about in the solution wh
coagulates gummy and gelatinous matters; or sa
kieselguhr, or other inert matter is added, to prevent th
from choking the pores of the filter cloth, and t
facilitate filtration.

Animal charcoal is still the chief or only decolorant u
in the refining industry. It is supplemented in m
refineries by the addition of sulphurous acid in the gase
state or in solution to the filtered liquid. The acid bleu
the yellowish liquors from the char to a considerable ext
and any excess is expelled in the after process of con
tration. With the exception of phosphoric acid soluti
carbonate of lime, lime, and sulphuric acid for sy
inversion, sulphurous acid is the only chemical now
use.

The process of concentrating and graining the su
solutions—technically called boiling—is always condu
in vacuum pans which boil at a low temperature.
improvement worthy of remark has taken place in
apparatus itself. But improved evaporators have b
introduced by Yaryan (1886) and Lillie (1888) in Ame
for the concentration of cane-juice, char, and other s
waters, which have found their way into the refi
industry of this country. They are built either vertica
horizontal, on the multiple effet system so largely use
the Continent and in the Colonies. They consist of on
more vessels divided into three compartments. The cen
or heating chamber is filled with pipes which connect
feeding chamber at one end with the collecting chamb
the other. Thin liquor is supplied in a regulated flo
the feeding chamber, where it is distributed in films
the inner surface of the pipes heated by low pressure st
and thence into the collecting chamber more or less
centrated. The vapour evaporated from the liquid is
veyed to the heating and the partially concentrated l
to the feeding chamber of the next vessel, and so on f
many vessels as are in series, usually three. A g
vacuum is maintained in the last vessel and the mani
tion is the same as that in use with the old triple effet.
advantage of these evaporators is attributed to the g
economy of heat, the small quantity of liquid submi
to heat at one time, and to the rapidity of evapora
The liquid is only in the apparatus a few minutes befo
is discharged concentrated to the desired density. Du
this time cane juice at 14° Brix can be raised to 5
and water, equal to 72 per cent. of the weight of the j
evaporated.

Whilst no great advancement has taken place in the
struction of the vacuum pans in which sugars are gra
improvements have been made on the condensers, so
now two or more pans are worked in connection with
condenser. And in order to economise water, the
densers are made counter-current, that is to say, the w
flows in the opposite direction to that of the vapour.

me progress has been made in the method of boiling als on the lines of a "seeding" process introduced by udy of Paris some time prior to the commencement e period under review (1865). This prodess has n in favour and been largely adopted in the refining stry. To make the advantage of this improvement , it will be necessary in as few words as possible to ibe the process of boiling. Large and well crystallised ts, other things being equal, bring a better price on the et than small badly crystallised goods. Hence in g white sugars, except where granulated and cubes equired, the object of the refiner is to produce as large als as possible. With this end in view, it used to be ssary to start the pan with nearly pure sugar solutions, when full of masse-cuite—that is a magma of sugar als and syrup or mother liquor—the pan was "cut" is technically called, that is half emptied, and the g process started again by feeding in more liquor. The als left in the pan grew larger with every increment of solution, the motion of the boiling mass, and rapid entration, until the pan was again full, when it was cut. This process of cutting had to be repeated several until the crystals attained the desired size, when the vas completely emptied. Practically it is not possible on cutting indefinitely, because the boiling requires to owed down as the crystals increase in size, and the ss would have to be greatly prolonged, making it very ult to prevent the formation of new small crystals h must be sifted out, and injuring the colour of the from which the after products are boiled. In this several lots of sugar are obtained, the crystals of which ase in size from the first cut to the last. As all are of ame quality, though differing in size of grain, the r's aim is to turn out each lot with large well formed als, which command the highest price.

obtain this result, reduce the cutting and shorten the of boiling, refiners now proceed as follows, *viz.*, they entrate some liquor in the pan to nearly the crystalising and add to it a proportion of the dried sugar from the or earlier cuts of a former boiling. The operation is ically called "seeding" the pan. The added crystals seed" grow as boiling proceeds, and attain full size sooner than they can do under normal conditions. A ement of this operation consists in using foreign sugar als as seed and growing the sugar in the liquor on . When the different pans from this method of work ixed, all the crystallised products can be turned out of and uniform quality.

ith the same object in view, when two pans stand her, it is a common practice to connect them with a closed with valves. One pan is boiled full of masse- which may be started from liquor alone or from liquor seed, the connection between them is opened and the d pan partially filled from the first. Boiling then eds until both are full and ready to cut, or be emptied, e size of the grain warrants. No improvement has place in the boiling of mediums and yellows.

e masse-cuites are dropped from the pans into mixers, ce they are delivered to the centrifugal machines in which yrup is separated from the sugar. The sugar is more ss washed, discharged into bins, air-dried, and filled bags for market. Hitherto the syrup and washings been collected together, and a second quality of sugar als boiled from the mixture. In the process of washing, red necessary to remove the mother syrup which es to the crystals, a considerable proportion of the is dissolved and lost to the first product. This has s been a difficulty which refiners try to obviate by as little water as possible, and carefully regulating ised to the class of sugar washed. But notwithstanding care, 6 per cent. to 15 per cent. of the first products vashed into the second products, for which a lower is obtained. A recent patent of my own (1897) has it possible to separate in the centrifugal itself the ings from the syrup or mother liquor, so that washing now be practised with impunity. The washings, g the same purity as the liquor from which the sugar boiled, are returned to the pan separately from the and boiled up with liquor to produce first product sugar. In this way the loss from washing has been avoided. Several large refiners are presently erecting machines to work this process and good results are anticipated.

In describing the process of boiling crystals we excluded "granulated" and "cubes." Both are practically products of the last 25 years. No seed is used for either of these sugars as only small crystals are required. The masse-cuite for granulated sugar is treated in the centrifugal to separate the syrup, after washing the moist sugar is completely dried in a Hersey, Newhall, or Gibb revolving cylinder through which a current of hot air passes. It is then cooled and packed for sale.

There are many patent processes for making cube sugar. Those which have been worked in this country are the Langen, Duncan and Newlands, Walker and Patterson, and the Adant. All are manipulated in much the same way. Masse-cuite boiled to a small grain is filled into moulds divided by partitions, so that the spaces between may form, when full, plates or prisms of sugar about five-eighths of an inch thick. The moulds are either a kind of centrifugal basket, or made to fit neatly into centrifugal baskets. The masse-cuite is allowed to set and cool in the mould, when the crystals become cemented together by a secondary crystallisation which takes place during the cooling process. The cooled moulds are then placed on a centrifugal spindle or in a centrifugal basket, and the syrup spun out. Whilst spinning the sugar plates are washed with clairce—a saturated solution of pure sugar in water—and when this too is spun out the moulds are removed and taken asunder. The plates are carefully separated and placed in a continuous mechanical or other stove, where they are dried in a current of hot air. The dry plates or prisms, now so hard that they have a metallic ring, are then transferred to a special cutting machine which chops them into cubes for market.

Besides the moulded masse-cuite processes just described, there are several others in which a kind of artificial masse-cuite is produced by mixing crystals, or crushed sugar, with a hot saturated solution of sugar. This mixture is then moulded into plates or prisms. Or again the sugar is moistened with water and pressed into moulds to form cubes or tablets, which are dried in the usual manner. None of these processes yield such a first-rate product as cubes made directly from masse-cuite, and need not be further referred to. The cube is such a convenient form of dry hard sugar, and its manufacture is now so perfect, that it has entirely supplanted the old form of loaf sugar in this country, the cutting of which was a most disagreeable household experience. Loaves are still made on the Continent, but their manufacture is rapidly dying out.

Passing to the residual products of the refinery we will consider an improved method of treating molasses, which in the beetroot sugar industry, because of the presence of a large percentage of lime and alkaline salts of organic acids, is the refuse of the process only suitable for cattle feeding and distilling. It is called "Crystallisation in Motion," many modifications of which are at work. The process was introduced on the Continent about 20 years ago, for granulating out the last available sugar that will crystallise. Patents were granted to Bock, Huck, and others, the latest improvement being perhaps that of Grossé. The apparatus consists of large cylinders or tanks, provided with a stirring arrangement kept in very slow motion, and in most cases surrounded by a jacket in which hot water circulates to control the cooling. It is often fitted with an air-tight door and connected to the vacuum pump and air pump by pipes, that it may work under reduced pressure and be emptied by increased pressure when finished.

The low syrups or molasses are put into this apparatus after they have been boiled to the granulating point, when they are in a supersaturated condition. Stirring then commences and is repeated at intervals during 50 or 60 hours, whilst the contents cool down very slowly to about 50° C. controlled by the hot water jacket. Under this treatment the small crystals of sugar at first formed grow in the viscous mother liquid or molasses, and become large enough to be easily separated from the exhausted molasses in the centrifugal machine.

The process of crystallisation in motion is an interesting one because it overcomes a practical difficulty in a very simple way. It may be explained by considering what takes place when partially exhausted, concentrated molasses is slowly cooled at rest. Such molasses is a thick viscous supersaturated liquid, in which the free sugar molecules are held apart by the large proportion of organic salts and other organic bodies present in solution, and in which that freedom of molecular movement favourable to the formation of large crystals is entirely absent. Practically crystallisation proceeds continuously as the solution cools, but theoretically, it is intermittent, and we can assume that several free molecules arrange themselves around another molecule in innumerable centres in the mass, to form small crystals. After withdrawing the free molecules in their immediate neighbourhood, crystallisation stops at these centres, and the crystals formed drop to the bottom of the cooler, or remain suspended out of the sphere of action. As cooling proceeds the solution again becomes supersaturated at the lower temperature, and new crystals form in new centres, to drop out of action as before. In this way supersaturation and crystallisation proceed together in different centres, and succeed each other, until the mass is cool, with the result that most of the sugar is crystallised in a very fine state of division, the greater part of which passes through the perforated linings of the centrifugals along with the molasses, and cannot be recovered. The motion of the mass under the influence of very slow cooling overcomes the difficulty of the formation of small crystals and prevents the mother syrup from reaching a supersaturated condition. The crystals first formed are transferred to new spheres of action, and the free molecules arrange themselves on the crystals already formed in preference to forming new ones. Thus the crystals grow as the mass cools and the final product is a crop of crystals large enough to be easily separated from the exhausted molasses in the centrifugal machine. When the molasses contain very little sugar, as they often do, to yield a fair crop in this way, the masse is seeded with a proportion of crystals from a previous boiling to form crystallising centres, and all the sugar that will crystallise is recovered. On the other hand, when the masse is too thick and viscous, a little thinner molasses is added to give that freedom of motion required. Usually the molasses from this process go to the distillery, or for cattle feeding. But as nearly all the syrups in this country are refined and go into consumption as golden syrup, the process has only been adopted by one or two refiners.

The manufacture of golden syrup has greatly increased during the last quarter of a century. The quality has been very much improved by the use of high class syrups and sugars as the raw material from which it is made. On the other hand it has been much impaired by the use in large quantity of liquid Indian corn glucose for diluting poor syrups, improving the colour and preventing granulation. Good well inverted syrups do not require this addition, nor is it practised by the best makers.

The syrups and sugars used for making golden syrup require to be partially inverted to prevent the granulation of cane sugar in the finished product. For this purpose they are heated with a little sulphuric acid, which is afterwards neutralised with carbonate of lime and the sulphate of lime filtered out. The liquor is then passed through charcoal and boiled to the required density. Some refiners use yeast instead of sulphuric acid, according to Tompson's 1884 patent more or less modified. The action is slower than with acid, but it enables them to work without chemicals. Yeast added to strong solutions of sugar and heated to 50°—70° C. does not set up alcoholic fermentation. An objection to yeast is the introduction of organic impurities into the syrup which are not removed by charcoal.

White sugar is made on the Continent direct from beetroot juice by the chemical agents already referred to, without the use of charcoal. Many of the refineries, too, work without charcoal, but the products are never so pure and white as they are when this decolorant is employed. The best results and finest products can only be obtained with charcoal. Consequently in this country, where the public demand the best of everything, all refiners use char. As large quantities are required, at least one ton for a ton of sugar, it may be taken for granted tha
char department is the largest and most expensive
refinery. Any useful improvement introduced into
department will therefore be of value. And pro
has to be recorded here as elsewhere in a refinery
is chiefly mechanical, and consists of improved me
of handling the char. Formerly the char, wet
the filters, was delivered by hand to kilns with
burning pipes, drawn by hand from the coolers belo
barrows and wheeled to elevators, often after having
spread on a cooling floor by hand, because the kiln c
were too short to do their work.

Now, the wet char is delivered mechanically o
kilns in which the reburning pipes do or do not re
In its passage down the pipes the char is raised
low red heat, which destroys the organic matter abs
from the sugar. Below the kilns it enters ample c
which are a continuation of the burning pipes, whe
is automatically discharged into receivers ready for
Then, as it is required, endless bands carry it from
receiver to the elevator. Thus the char is a
altogether mechanically handled, little or no labo
needed from the time it leaves the filter till it returns
except that required to control the machinery,
distribute the char on the kiln-heads and filters.

Char kilns have been greatly improved by pl
driers on the top heated by waste gases from the kiln
an adaptation introduced from American practice.
char passing through these is delivered into the
dry. Thus, the driers do outside what was formerly
inside the pipe, and make it possible for each kiln to re
the maximum amount of char.

Char is the great sugar refiner and much ca
bestowed on its manipulation. With repeated revivific
even in the best kilns, it gradually loses its decolo
power, and after a year or two's use has to be turned
The cost of renewing it is a serious item in the upke
a refinery Two causes are chiefly responsible fo
deterioration. One of these is the reduction of po
brought about by the shrinkage of the calcium phos
during successive reburnings. The other is due t
deposition of vegetable carbon, which has no decolo
power on its surface and in its pores, by the carbonis
of organic matter absorbed from the sugar. No re
has yet been found for the former evil; but it has long
recognised that, were it possible to remove the vege
carbon the latter would be taken away, the decolo
power would be greatly improved and the life of
char prolonged. This is the problem refiners are
trying to solve, and already two or three apparatus a
trial in which char is burned in a limited supply of
Chief amongst these is a cylinder with revolving pa
patented by Weinrich in 1896. It is in use in two or
refineries and good results are said to be got from
process. The patentee claims that impurities are oxi
at a temperature of 300° to 400° F. when this appara
used instead of ordinary kilns, but that a temperatu
600° F. is required when it is used as an auxiliary to
kilns. About the same time I was independently ex
menting on the oxidation of vegetable carbon in char,
found that it was not removed in any appreciable qua
below a low red heat. At this temperature, howeve
char is greatly improved by partial oxidation, and I
very hopeful that this process will prove of great val
the refiner.

Passing from improvements in the process itself, l
close this paper by a short reference to the comm
position of the industry during the last 25 years. W
there have been fluctuations, amounting to prosper
times, though oftener to failure and loss, the industry
whole, may be said to have been on the down g
throughout this period. The decline was not cause
any want of enterprise on the part of refiners. W
have said to-night is evidence that they are not sl
adopt new processes, or improvements on old ones, w
promise any chance of success. It has been almost w
brought about by the action of foreign States who
bounties to rival refiners, which enable the latter to u
sell home-made sugar in British markets. A few stat
will make this plain.

he consumption of sugar in this country, which was ,000 tons in 1875, equal to 60 lb. per head of population, r to 1,489,000 tons in 1900, equal to 81·2 lb. per l of population. During the same period, the sugar ted in this country fell from 760,000 to 610,000 . And the refined sugar imported — chiefly from many, Austria, and France—steadily increased from 000 tons in 1875 to 950,000 tons in 1900. In other ds, the consumption increased 81·5 per cent., whilst e refined sugar decreased 20 per cent., and foreign ned sugar increased 950 per cent.! In 1875, 88·5 per . of the sugar consumed in this country was refined in in and 11·5 per cent. abroad. Whilst in 1900 only er cent. was refined in Britain and 61 per cent. abroad. se figures speak for themselves, and show the enormous y done to this country by the imposition of foreign ties. But for them the growth of sugar-refining would st certainly have kept pace with the growth of consption, and many of the refineries closed during the last ter of a century would still be working profitably.

is worth noting in this connection the diminution of eries during the period under review. In 1875, 18 firms refining sugar in London, and two new refineries were ed a few years later, making in all 20 for London. e were 9 in Liverpool, 3 in Bristol, 2 in Manchester, ch in Earlestown, Plymouth, and Newcastle-under-, 13 in Greenock, 1 in Leith, and 1 in Dublin; total, 52. 900 only two were working in London, 3 in Liverpool, Earlestown, and 5 in Greenock; total, 11. Deducting atter total from the first we get 41 closed. To this has added another refinery, making 42 in all. For, some ago, a firm of Liverpool refiners courageously tried to the import of foreign refined sugar on the east coast of and by establishing a refinery at Rawcliff, near Goole, they worked on a continental model. But after a f two or three years at great loss, had to abandon the ct.

us we have seen that 42 refineries have been exished in Great Britain and Ireland during this aratively short period. Speculation and other causes in a measure accountable for the closing of some of . But the baneful influence of foreign bounties was able here too. For it caused great fluctuations in the ction of beet-root sugar on the Continent, with even er fluctuations in the price of the raw material. And rs here, who have to buy ahead to supply their wants, ne the victims of these unnatural movements. Although of them made heroic efforts to survive, we need not er that some refiners succumbed in the struggle for nce against such odds. The wonder rather is that are any left. The remnant struggle on, buoyed up the hope that in the near future our Government will brought to reason, and take some action which will bit the importation of bounty-fed sugar into this ry, or by some other means equally effective, put a o the unfair competition of foreign refiners, and save total extinction an old, honourable and legitimate try, which gives employment, even yet, to large capital considerable number of workmen.

en in spring last it became known that a duty was to be put on sugar, refiners were hopeful that the cellor of the Exchequer would make it differential, so recover the greatest duty from the sugars which ed the largest bounties, but when the duty was ed it was found to bear with equal incidence on sugars origin, leaving the position, so far as the refining try is concerned, practically where it was.

Discussion.

f. **Henderson** congratulated the Section on having ed so valuable an account of the present state of gar industry by an authority on the subject, like atterson, to whom he was also personally indebted for ation which had enabled him to compile a brief on the same subject for another purpose. He sted that Mr. Patterson might give the meeting some nt of the results of the experiments on the cultivation ar beet in Scotland.

Dr. W. C. **Anderson** remarked on the low temperature (300–400 F.) at which Weinrich claimed to be able to oxidise the organic matter contained in the char, and asked whether the author's experiments tended to confirm this statement.

Mr. A. **Macdonald** said that the paper seemed to cover every modification and improvement during the last 25 years. He was not sure if the lime process had been introduced within that period, possibly not; hence the omission of any reference to it. It was painful to mark the enormous curtailment which had taken place in the number of refineries of Great Britain, and though it was true that those remaining had increased in productive power, still the enormous increase in the imports of foreign-refined, coupled with the decline in the production of home-refined, was a clear indication of the disadvantages under which the home-refiners laboured, by reason of the bounties granted to foreign refiners. The margin between raw and refined beet sugar was now so small that a very trifling advantage one way or another was bound to determine the flow of business. For example, the price of raw beet sugar on the day of the meeting was 7*s.* 3*d.* per cwt., f.o.b., continental ports, on a basis of 88 per cent. The exact purity of 100 per cent. on this basis, apart from the arbitrary irritating increase adopted by the trade, was 8*s.* 2$\frac{3}{4}$*d.* per cwt. Now, as the price of foreign refined granulated sugar was then 8*s.* 3*d.* per cwt., f.o.b., it was clear that all the skill — all the scientific improvements in the world—could not effect economy enough to enable British refiners to compete against foreign refined sugar of the same character. It was only by variety, by greater skill, in enabling them to produce a better quality and an article of finer appearance, that the British refiners still existing had been able to hold their ground at all, in spite of the advantages of the differential rates between raw and continental refined sugar which enabled the refiner abroad to sell his refined product at practically the same price as raw.

Prof. Henderson had asked some questions about the cultivation of beetroot and the extraction of sugar therefrom in this country. The cultivation of beet and the extraction of sugar on a practical scale in this country had only taken place at Lavenham, under the initiation of Mr. James Duncan, and at a time when the higher price of sugar, as compared with the present price, should have made the enterprise a success. Mr. Duncan did not himself grow the roots, but relied upon the co-operation and hearty support of the farmer. He merely laid down a factory with all the necessary means of gathering in the roots, but while he had equipped his factory for working a large quantity of roots, he never could get more than about a quarter of the quantity which his factory was capable of overtaking. For this reason alone the venture proved unprofitable. Nevertheless he wrote in the most confident manner about the value of beet as a crop and as an industry, and said, "no one knows better than I do the value of beetroot to a country, for, not only does its cultivation mean fertile lands and rich after crops, but it means abundance of cattle, and a contented and happy peasantry, because of the profitable occupation it affords to many people." Besides this practical experiment—for after all it was only an experiment—many trials had been made in the cultivation of beet, and within 12 miles of Glasgow, viz., at Bishopton, beetroot had been grown indicating a yield of as much as three tons of sugar per acre. What this meant could only be realised by comparison, but when it was seen that the German crop averaged about 31 cwt. per acre, and that of France only about one ton, the possibilities of this country became plain. Indeed it might be laid down as a law that the moist climate of this country would enable a larger yield to be produced from our root crops than that of any other country. The question of ripening had yet to be answered by trial. This, our grievance against bounties, was as much because of the hindrance they had been to agricultural development and expansion, as it was because of the injury they had inflicted upon British refiners and growers of cane in the West Indies. For, had the Government fostered and guarded the cultivation of beet, at a time when every beet grower in

Germany was driving in his carriage to church while other farmers walked, the agricultural situation of this country would have been saved, the depopulation of the agrarian districts stemmed, and the enormous and alarming increase of the larger cities checked. Mr. Patterson's paper was a valuable resumé of the sugar trade, a kind of stocktaking for the last quarter of a century, and in a society connected with industry such as this was, it seemed desirable to take a look backwards in order to ascertain how far they had travelled and to take note of anything which had hindered their progress.

Mr. D. J. Playfair said that Mr. Patterson had made no reference to the strontia process for sugar refining, and asked if it were still in successful operation, or if it had been abandoned. With reference to the electrolytic process for refining sugar, Blount explained it to consist in using attackable anodes of either zinc or aluminium without a diaphragm, the resulting effect of which was to produce a hydrate of zinc or alumina, which on settling withdrew some of the impurities from the sugar solution. Some bleaching effect might also take place due to electrolysis of the soluble chlorides present, and perhaps Mr. Patterson could say if this happened, and if so, whether it had the effect of producing any inversion of the sugar.

Mr. T. L. Patterson said in reply to Prof. Henderson that the experiments on the growth of the sugar beet were conducted in Scotland for four or five years and were on the whole satisfactory. The roots grew well and yielded good crops, with a fair average percentage of sugar, especially in the small and medium sized roots. The yield of sugar per acre was high in some districts, higher even than Mr. McDonald had mentioned; whilst in others it was much below the average. The low yields were due more, perhaps, to inattention, or to ignorance of the culture of the beet on the part of the grower, than to any climatic or other cause; hence such yields might be disregarded. But field experiments such as these were were often misleading and generally showed better results than could be obtained on the large scale. This was the case in the United States, and it would doubtless be the case here; therefore too much reliance should not be placed on the results. One fact brought out very clearly in Scotland was the large proportion which leaves bore to roots. This was evidently due to the cold humid sunless weather generally experienced in October and November, just when the roots should ripen and mature. Instead, they kept on growing so that even in December the roots were not ripe. The experiments on the whole went to show that it might be possible, notwithstanding somewhat unfavourable climatic conditions, to grow beet on the lowlands of Scotland for the manufacture of sugar. But until the bounties given to foreign producers by their governments, referred to by several speakers, were withdrawn, there was no probability of this being done at a profit. In reply to Dr. Anderson, his own experiments showed that it required a low red heat to oxidise the carbon deposited in the char by the carbonisation of the organic matter absorbed from the sugar, and he did not think a temperature of 400° F. would be sufficient to oxidise the organic matter alone. He had not referred to the lime process, as it was introduced prior to the period under review. The process has been long in use in one refinery. In reply to Mr. Playfair, the strontia process was not used in sugar refining. It was introduced by Scheibler in Germany for recovering sugar from molasses in the beet industry, but was now almost wholly superseded by Steffen's lime process. In this country there were no molasses to treat, and as the syrups went into consumption the sugar was not extracted from them. He had no experience of the electrolytic process of treating sugar solutions, nor was it used in this country. Electricity was on its trial on the Continent for treating beet-root juice, and good results were said to have been obtained. Experiments just published, made on the large scale in a French factory, went to show that the purity of the juice was greatly improved by treating it with lime to alkalinity, and with powdered manganate of lime in small quantity, during the passage of an electric current of 7 to 10 volts. It was claimed that the sucrose in solution was not injured by the treatment, and that only the organic impurities were oxidised. But further experiments were required to confirm these statements, for well known that sucrose was as easily oxidised as m the organic impurities which accompanied it in the be

Yorkshire Section.

Meeting held on November 25th, 1901.

MR. O. WARD IN THE CHAIR.

THE SOLUTION THEORY OF DYEING.

BY R. B. BROWN AND J. McCRAE.

According to the theorem of Nernst (Theoretical Ch try, p. 412) when the value of the ratio of distributio dissolved substance between two solvents is consta independent of the concentration, the molecular wei the dissolved material must be the same in the two n If then a dyestuff distributes itself in a constant between liquid solvent and fibre, it follows that, pr we may assume that the fibre acts merely as a solve the dye, the molecular weight of this in the two media be the same.

Witt (Färber-Zeit. 1890–91, 1) has attempted to e the process of dyeing by the assumption of the forn of solid solution. Using this as a working basis, W and Appleyard (J. Chem. Soc. 1896, **69**, 1334) invest the distribution ratio of picric acid between water an and found that the distribution coefficient is not ind dent of the concentration, but that $s/\sqrt[2\cdot7]{w}$ = const., s is the concentration of picric acid in the silk and w concentration in the water. This would indicate that aqueous solution the molecular weight of the picric a 2·7 times that in the silk. It has, however, been p by cryoscopic and ebullioscopic determinations that, from ionic dissociation, picric acid in aqueous solution as simple molecules. Consequently, if Walker and A yard's result be interpreted from the solution point o we come to the absurd conclusion that in silk, picric present as 1/2·7 molecules.

Georgevics (Monatsheft, 1894, **15**, 707) does no that the distribution ratio of Indigo Carmine betwee and water is independent of the concentration, bu $\sqrt{w}/s$ = const., where w is the amount of the dyest 100 c.c. of the dye liquor after dyeing and s the amo colour taken up by 100 grms. of silk. From the solution point of view this indicates that if indigo ca exists as simple molecules in the silk, in aqueous so it is present as double molecules. There is n improbable in this and it may therefore be regard supporting, to a certain extent, the theory of Witt.

Schmidt (Zeit. physikal. Chem. 1894, **15**, 56) has s that Eosin and Malachite Green do not distribute selves in a constant ratio between water and silk at va concentrations, nor does picric acid between wate cellulose. This fact, namely, that Henry's law doe apply to those substances, leads Schmidt to conclud the taking up of dyestuff by fibre is "absorption" (p a surface action). It may be noticed that Schmidt' periments were carried out with solutions very much concentrated than those actually employed in d operations.

Sisley (Bull. Soc. Chim. 1900, [iii], **23**, 865; J. C Soc. 1901, **80**, i, 99) has also contributed results apparently support Witt's contention

Zacharias (Färber-Zeit. 1901, 149, 166) proposes a theory which may be said to embrace that of Witt. suggests that dyeing always takes place in two stages:

(1) The dyestuff is absorbed by the fibre;

(2) The dyestuff is fixed on the fibre as a dye.

This theory assumes then that in the first place th acts as an absorbent, and after the dyestuff has absorbed a change takes place; the nature of this s change may be polymerisation or it may be of a ch nature. From Fick's law of diffusion it is then de that c/c^n, = const. must apply to the absorption part

ss. The author believes that the constancy of the
s found by Walker and Appleyard and by Georgievics
to be read as meaning that the substance exists in
ent molecular species in the liquid and in the fibre,
hat the resistance to absorption increases with the
ntration and is dependent on the nature of the
uff.

a't Hoff (Vorlesungen, II., 65) has shown that solid
on is in no way connected with high molecular
ation. It is, therefore, *a priori*, not improbable that
dyed fibre the colour exists as simple molecules, and
an be shown that the distribution coefficient is constant
ndependent of the concentration, then we would be
ed in concluding that the fibre acts simply as a solid
nt and Witt's theory would receive experimental
mation.

ainst Witt's theory many authors have raised the
ion that the process is not reversible as it should be
is purely a case of solution. This assumption is
tous since it has not yet been proved that in any case
ich Witt's theory is applicable, liquid solvent cannot
t dyestuff from the dyed fibre and so establish the
equilibrium from the other side. In all probability in
cases the liquid solvent would partially extract the
uff if allowed sufficient time. The time required to
ish the equilibrium may be much longer than that
ary for the dyeing operation proper, as might be
ted from the opposite nature of the process. Sisley
cit.) has shown that silk dyed with Rosaniline on
g with (amyl ?) alcohol partially gives up the dye
liquid solvent. In this case, evidently, the equilibrium
kly reached from either side.

t assumes that all processes of substantive dyeing
be accounted for by his theory, and many have
ted his views because instances have been found
certainly appear to contradict it. The supporters of
theories seem to have endeavoured to construct a
theory to suit all cases. From the very varying
cal nature of the dyestuffs employed it is highly
ble that the laws regulating dyeing will vary in so far
chemical aspect is concerned. Zacharias's hypo-
has much to recommend it, and, as we see, it is an
sion of Witt's theory; he assumes that the absorption
ays accompanied by a secondary chemical change.
so far investigated would appear to support this
ption, but below are recorded some results in which
tio of the concentrations in the liquid and in the fibre
stant and independent of the concentration within the
examined. This may then be attributed purely to
tion unaccompanied by polymerisation or any
cal change, that is, the results clearly confirm for
cases the proposition suggested by Witt.

incline, therefore, to the view that in certain cases
eration of dyeing consists simply in the formation of
l solution, and that to this solution Henry's law is
y applicable, but at the same time we recognise that
es not hold good in general, for the non-reversibility
process in most cases speaks volumes in favour of
iew that a chemical or physical change takes place
the fixing.

EXPERIMENTAL.

endeavour was being made to dye a series of standard
ns on wool with known amounts of certain colouring
s in connection with an investigation into the relative
properties of wool and silk (R. B. Brown, this
l, 1901, **20**, 226). For this purpose, pieces of wool
t 0·6 grm.) were dyed, each in 120 c.c. of water
ifferent percentages of colouring matter. The amount
stuff remaining in solution was estimated at the end
dyeing operation by means of the Duboscq Colori-
and the actual amount on the wool calculated from
It was noticed that within wide limits of concentration
tant percentage of dyestuff is taken up by the wool
the relative amounts of wool and water, the tempe-
, and the duration of the experiment (sufficiently
or the establishment of the equilibrium) are constant.
eat accuracy has been aimed at in the experiments
ed below, but the values obtained for the distribution
re sufficiently constant.

It would be extremely useful from the point of view of the practical application of dyestuffs to be able to predict exactly how much colouring matter would be removed from the dyebath under given conditions of temperature, time, and concentration, and also to know the effect in this respect of additions of various substances to the dyebath.

Experiments having for their object the determination of these details, and the further elucidation of the solution theory are now in progress.

I.—Colouring matter: Acid Magenta (with addition of sulphuric acid). 0·6 grm. of wool in 120 c.c. of water. Dyed for 1 hour at 100°.

Original Concentration of Aqueous Solution. x Grm. per Litre.	Final Concentration of Aqueous Solution. c_1 Grm. per Litre.	Final Concentration of Colour in Wool. c_2 Grm. per 5 grm.	Distribution Coefficient. c_1/c_2
0·005	0·00068	0·00432	0·158
0·010	0·00137	0·00863	0·158
0·015	0·00229	0·01271	0·180
0·020	0·00260	0·01740	0·149
0·025	0·00327	0·02170	0·151
0·040	0·00516	0·03485	0·148
0·050	0·00720	0·04280	0·168
0·0625	0·00869	0·04850	0·158
0·075	0·00997	0·06500	0·150
0·0875	0·01059	0·07700	0·136

II.—Colouring matter: Chrysoidine F F. No addition to dye bath. 0·6 grm. of wool in 120 c.c. of water. Dyed for 1 hour at 60°.

x	c_1	c_2	c_1/c_2
0·015	0·00805	0·00695	1·158
0·02	0·01052	0·00948	1·110
0·025	0·01297	0·01203	1·078
0·03	0·01587	0·01413	1·123
0·04	0·02128	0·01872	1·137
0·05	0·02595	0·02405	1·078
0·0625	0·03281	0·02969	1·105
0·075	0·03907	0·03593	1·087
0·0875	0·04541	0·04209	1·079
0·1	0·05130	0·04870	1·053

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* Any of these specifications may be obtained by post by remitting 8*d*.—the price now fixed for all specifications postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

I.—PLANT, APPARATUS, AND MACHINERY.

PATENTS.

Condensed Steam and other Waters for Boiler Feed and other Purposes; Purification of ——. A. Harris, London. Eng. Pat. 18,266, Oct. 13, 1900.

The purification is effected by the addition of two reagents, such as the soluble salts of alumina and an alkali, which, as described in Eng. Pat. 19,621, 1899, react upon each other to form a precipitate, in which the oil or other impurities will adhere, so that they can be removed by decantation or filtration. According to the present invention, the reagents are added successively, so that the first may be evenly distributed throughout the bulk of the water before the second is added, thereby securing an even precipitation. The reagents may be admitted successively at different levels of the vessel in which the water is treated, or either or both may be added to the crude water in separate vessels, &c., before both are brought together in the treating vessel. Several arrangements of apparatus for carrying out the invention are described in the specification.—R. A.

Saturating Liquids with Gases; Apparatus for ——. F. Fischer and L. Kiefer, both of Carlsruhe, Baden, Germany. Eng. Pat. 21,494, Nov. 27, 1900.

The apparatus comprises a collecting reservoir and a mixing cylinder, the feed liquid being supplied by pumps or from a high-pressure feed-pipe. When pumps are used, the supply of liquid to the mixing cylinder is regulated by a float and a valve chest containing three passages. One of the passages is in connection with a feed-water tank, and can be closed by a return-stroke valve, whilst a second passage communicates with the mixing cylinder. The third passage communicates with the collecting reservoir, and can be closed by a valve actuated by a float. When the float is in its depressed position, communication is set up between the pump and the feed-water tank, but when the float is elevated communication is set up between the pump and the collecting reservoir. When a direct high-pressure feed is used, the supply is regulated by a float, which, when at its highest position, closes a valve in the feed-pipe. The mixing cylinder is provided with a blow-off valve, which can be raised by a lever operated by a disc fitted with tappets, the disc being rotated by the liquid supplied to the mixing chamber.—R. A.

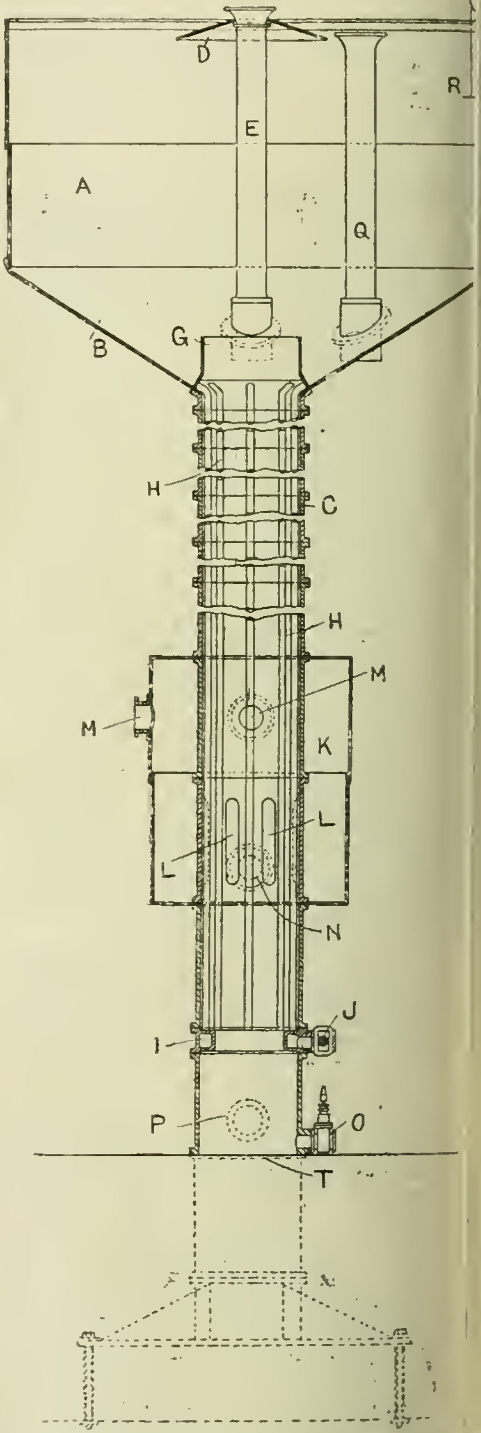
Cooling or Aerating Liquids, and for Purifying Gases; Apparatus for ——. M. Kasper, Düsseldorf, Germany. Eng. Pat. 20,353, Nov. 12, 1900.

This apparatus consists of a number of open frames or perforated supports, mounted one above the other, and provided with natural or artificial stones, over the upper layer of which the liquid to be treated or to be used for purifying gases is distributed. The liquid is finely divided by the stones in its downward passage through the apparatus, thus ensuring a good surface contact between it and the air, &c. One or more vertical or inclined flues are provided through the frame or supports, for the purpose of inducing a good draught.—R. A.

Solid Matters from Liquids; Apparatus for Separating ——. K. E. Markel and J. J. Crosfield, Warrington, Lancashire. Eng. Pat. 23,051, Dec. 17, 1900.

The figure shows a sectional elevation of the part of the apparatus above ground, with the foundations in dotted lines.

A is a comparatively shallow tank with conical bottom, resting on a column of any required height, C, which forms part of the tank. The water which it is desired to clarify enters the tank through the pipe E, being distributed by the cone D, so as to disturb the water in A as little as possible. In this tank the dirt gradually settles, collecting mostly in the conical hopper around the lip G, and falling thence down the pipes H to the ring I, whence it is let off from time to time by opening the mud-cock J. Some of the mud passes with the water down the central column, but being of greater specific gravity than the water, and coagulating to a certain extent, it falls with a slightly greater velocit that due to the flow of water, and use is made difference in velocity to separate it from the water by d the latter out through lips L, unitedly of greater are the pipe or columns C, into the chamber K, from whi clarified water passes away through openings M. Th



in C descends to the base of the column and is let off necessary, by opening the valve O. The found bedded in a mass of concrete.—L. A.

efaction of Air and other Aeriform Fluids. C. Joly l E. J. Richardson, London. Eng. Pat. 15,511, July , 1901.

patentees describe and claim a system and several gements of apparatus for "the continuous liquefaction r and other aeriform fluids the critical temperature of is below the ordinary temperature of the atmosphere at aratively low pressures, and any pressure which does xceed that which is required for the condensation at itical temperature." The liquefaction is effected by oling or expansion of the compressed gas in stages, pansion of a portion of the compressed gas at the of each stage being employed to effect the further g of another portion of the gas to the next stage, liquefaction is attained. The heat of compression in rst stage of the operation is absorbed by running , and thereafter liquid air, an alcoholic solution of m chloride, or other unfreezable liquid, or copper or lings, &c. is or are employed to aid in the transfer of rom the compressed portion to the expanding portion gas.—R. A.

g Fibrous and other Material [Pulp, Yarn, &c.], Apparatus therefor. H. H. Lake, London. From Hiorth, Christiania, Norway. Eng. Pat. 14,090, July 1901.

naterials are conveyed by a carrier through a drying el, through which a volume of air is circulated in the direction as the materials, the air being held in cons circulation through the drying channel and an airg apparatus, by means of a fan, &c. A small volume moist air is allowed to escape, and a corresponding e of fresh air is taken into the apparatus. Means e employed to utilise the heat in the escaping moist heating the fresh air taken in.—R. A.

from Liquids; Centrifugal Apparatus for Separat- ——. H. H. Lake, London. From J. J. Berrigan, York, U.S.A. Eng. Pat. 12,181, June 14, 1901.

EPTACLE for the combined constituents to be sepa- is constructed to rotate on an eccentric axis passing h it, so that, by the centrifugal force due to the o, the constituents are projected and deposited t a portion of the inner periphery of the receptacle. ed conduit is arranged to direct the materials entere receptacle against a definite portion of the inner ery, and scrapers are provided for conveying the solid ial from its place of deposit to an escape outlet. The ale is balanced during its rotation by liquid con- in an external vessel, in liquid communication with eceptacle, means being provided for preventing the ce of solid material into the communicating opening.
—R. A.

t and other Materials; Apparatus for the Separa- of the Flour or Finer Particles of ——. W. F. eham. Eng. Pat. 15,344, 1900.

See under IX., *page* 1115.

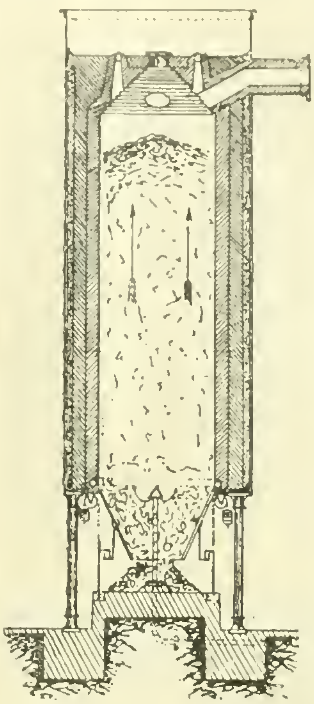
II.—FUEL, GAS, AND LIGHT.

Peat Briquettes. Engineer, Aug. 30, 1901, 228.

kind of peat briquette called "press-coal," due to ing, has been introduced into Sweden; in 4 mins., temperature of 300°—500° F., and by immense re, peat-coal briquettes are produced, containing 66 nt. of carbon and only 3·7 per cent. of moisture, and r cent. of ash. The briquettes are lustrous, solid and ct, and have a specific gravity of 1·2, and a calorific of 6,500 calories. Trials of the fuel are to be made on wedish State railways and at the naval station of rona.—J. W. H.

ducer; Gobbe's "Quenching" ——. F. Bruyère. J. Gas Lighting, 1901, **78**, [2002], 778—779.

oke is drawn from gas retorts or coke ovens into ggons, which are emptied into the producer, shown in the annexed illustration, through the door in its top. Steam or a fine spray of water is introduced at the bottom of the producer, and is heated by and cools the coke in the latter as it passes through it. The coke is gradually quenched by the ascending steam, and is removed from the bottom of the apparatus, while the steam is gradually heated until, in the upper part of the producer, it attains the temperature (600° C.) at which the reaction $H_2O + C = H_2 + CO$ occurs. The gas thus produced is stated actually to be purer than ordinary water-gas, and to contain only traces of nitrogen and carbon dioxide. It is said to be peculiarly well adapted for heating gas retorts.



The following calculation of the amount of gas obtained in the quenching of coke in this apparatus is given:—70 kilos. of red-hot coke (the residue from the carbonisation of 100 kilos. of coal) will bring into the apparatus 70 × 350 = 24,500 calories. The decomposition of 1 kilo. of steam will require 3,222 calories for the formation of hydrogen, while the carbonic oxide produced will yield 1,648 calories, making the net heat required = 3,222 − 1,648 = 1,574 calories. The gases liberated by the decomposition will carry off at 600° = $\left(\frac{3\cdot409}{9} + \frac{14 \times 0\cdot245}{9}\right) \times 600 = 456$ calories. Hence the 70 kilos. of coke will decompose $\frac{24,500}{1574 + 456} = \frac{24,500}{2,030} = 12\cdot06$ kilos. of steam.

The decomposition of 12·06 kilos. of steam will require 8·04 kilos. of coke (? carbon), and as the weight of the gas made will be 0·67 kilo. per cubic metre, the volume of gas will be $\frac{12\cdot06 + 8\cdot04}{0\cdot67} = \frac{20\cdot10}{0\cdot67} = 30$ cb.m. This is equivalent to 3·730 cb. m. per kilo. of coke (? carbon) consumed. The gas thus produced is stated to be cheaper than either Siemens' producer-gas or ordinary water-gas, because no coke is consumed in raising the heat of the bed of fuel.
—J. A. B.

Water-Gas in the Destructive Distillation of Coal; Utilisation of ——. V. B. Lewes. J. Gas Lighting, 1901, **78**, [2000], 623—627.

The author refers to an earlier paper (this Journal, 1900, 647), in which it was stated that less benzol was required, to enrich to a given extent, a mixture of coal-gas and water-gas in fixed proportions, when the water-gas was mixed with the coal-gas in the foul main than when it was mixed with clean coal-gas. It was also suggested that if a stream of water-gas were passed through the crown of a retort during the carbonisation of coal, the consequent dilution and quickening of the rate of flow of the gas evolved would prevent the secondary reactions which commonly occur in the retort and result in many hydrocarbons valuable as illuminants being broken down into methane, hydrogen, and carbon. A considerable gain in candle-feet per ton of coal seemed likely to result, and the author now reports the results of two sets of trials made at the Crystal Palace District Gas Company's works with a view to ascertain the extent of the gain, if any. To compare the value of the varying volumes of gas of different candle-power, these values are reduced to "candle-feet," obtained by multiplying the make by the candle-power and dividing by 5. Thus, in the case given below,—

$$\frac{10,468 \times 15\cdot88}{5} = 33,246 \text{ candle-feet.}$$

The first set of trials was made in six (later, 12) beds of seven through horizontal retorts, 22 ins. by 16 ins. in cross section, with Derbyshire coal, which under ordinary conditions of carbonisation yielded 10,468 cb. ft. of 15·88 candle-power gas (= 33,246 candle-feet) per ton. Arrangements were made for admitting water-gas at the top of the ascension-pipes on one side of the bench, and by blocking up the dip-pipes on that side, compelling the water-gas to pass down to and through the retorts, and to escape with the coal gas through the ascension pipes on the other side of the bench. A trial showed that the closing of the dip-pipes on one side, *cæteris paribus*, resulted in the coal yielding 8,615 cb. ft. of 18·58 candle-power gas (= 32,013 candle feet) per ton, instead of the normal result quoted above. Hence it was clear that the normal working conditions had been altered, and that the results obtained in this set of trials, when water-gas was introduced into the retorts, should be taken with some reservation. After trials in which the proportion of water-gas introduced to coal-gas made, was varied, it was found that the highest return in candle-feet per ton of coal carbonised was 40,833, which was obtained with a mixture containing 29·1 per cent. of water-gas. Actually there were obtained 13,730 cb. ft. of gas of 14·87 candle-power. This represented a gain in candle-feet of 22·6 per cent. on the normal results of carbonising such coal.

The second set of trials was made with a bench of 70 inclined retorts, into each of which cold water-gas was admitted through a pipe in the upper mouthpiece, while the gas escaped through the ordinary ascension pipe at the lower mouthpiece. The following are details of trials of the coal (Derbyshire) used, both without the use of water-gas, and with the proportions of water-gas which gave the most favourable results:—

—	Without Water-Gas.	Water-Gas added for 3 hours from time of charging the Retorts.	Water-Gas added for 3 hours from ½-hour after time of charging the Retorts.
Cubic feet of gas obtained per ton of coal	9,907	14,715	14,925
Illuminating power of gas (candles)	16·55	14·85	14·40
Candle-feet per ton of coal	32,792	43,703	42,984
Percentage increase in candle-feet over normal carbonising results....	..	33·2	31·0
Percentage of water-gas in mixture............	Nil.	28·6	29·5
Percentage of carbonic oxide in mixture......	7·19	..	14·0
Gallons of tar in hydraulic main per ton of coal	8·3	7·4	8·07
Gross calorific value of gas (calories per cubic foot)	152·6	125·8	127·2
Net calorific value of gas (calories per cubic foot)	138·8	118·7	116·8

The economy of admitting water-gas to coal-gas retorts in this manner is dependent on the relative costs of water-gas and coal-gas, and of purification of coal-gas and of the mixed gas. Figures furnished by C. Dellwik of the cost of crude water-gas made by his process with generator fuel at 12*s*. 6*d*. per ton, make it 3·12*d*. per 1,000 cb. ft. for a production of 500,000 cb. ft. per diem and 2·98*d*. for a production of 1,000,000 cb. ft. per diem. The gas should contain only 4 per cent. of carbon dioxide, and if it were passed while hot into the retorts, the author believes the carbon dioxide would be partially reduced by contact with the carbon in the retort, though such reductio not observed when the cold water-gas was used. The of purifying the mixed gas therefore might not gr exceed the cost of purifying coal-gas. Taking the c coal-gas of 16·5 candle-power in the gasholder at 1s 1,000 cb. ft., and that of water-gas at 3⅓*d*., 1,000 cl of the mixed gas of 14·4 candle-power could be prod for 9·57*d*. Though the calorific value of the mixe would be considerably lower than that of the coal-gas temperature of its flame would be as high, and he would be equally efficient with coal-gas for lightin means of incandescent mantles.

The illuminating power tests were made throug according to the instructions of the Gas Referees, the being burnt in the Argand burner at such a rate that it a 16 candle-power flame. Had the gas been burnt a fixed rate of 5 cub. feet per hour, the coal-gas record of 16·55 candle-power would have been returned 16·22 candle-power, and the mixed gas containing per cent. of water-gas would have been returned 12·79 instead of 14·87 candle-power. On the other burning the gas at such a rate that it gave constan flame 3 ins. high, would have had the effect of retu the 16·55 candle-power coal-gas as of 17·90 candle-p and the 14·87 candle-power mixed gas as of 16·78 ca power.—J. A. B.

Illuminating Gas from Coke-Ovens, Production of - F. Schniewind. J. Gas Lighting, 1901, **78**, [2 691—703.

The author refers to the large number of by-product ovens recently erected in the United States, some of w as for instance an installation of 400 ovens at Ev Mass., are designed to supply coke for locomotives domestic use, and gas for illuminating as well as he purposes. The following is an outline of the schem which the author thinks that the plant may be maint in full operation throughout the year, while meeting fluctuations in the demand for illuminating gas. The evolved during the first 15 hours of carbonisatio collected for illuminating purposes, and the gas subseq evolved is used for heating the ovens, after benzol been extracted from it. The plant is of such capacity the first or illuminating fraction, amounting, with Domi coal from Cape Breton, N.S., to 44·5 per cent. of the t and having an illuminating power after purificatio 18·5 candles, suffices to meet the minimum consum per diem. The increased consumption during the w months is met by adding to the first fraction a suffi volume of the second or heating fraction, and then brin up the illuminating power of the mixed gas to the req standard by carburetting it with benzol. The benzol covered from the heating gas would suffice to keep up illuminating power of the gas distributed, to 20 ca throughout the year, and leave a considerable balanc benzol for sale.

An auxiliary producer or water-gas plant serves supply heating gas to the ovens when sufficient of second fraction of the gas evolved from the coal is available for the purpose. The calorific power of the distributed, would vary only to a very small extent, between 670 and 690 B.T.U. per cubic foot.

The author considers that this scheme would lead to c oven plant becoming a central station for the supply of li heat, and power. Thus for lighting, the gas is of high can power, and of high calorific power, and would therefor serviceable either for open-flame or incandescent bur For heating, the high calorific power renders the gas best artificial fuel gas available for domestic and manufacturing purposes, while the coke would be a smokeless solid fuel, and the tar might also be used liquid fuel. For the supply of power, the gas could used in gas engines, or producer gas could be made f the coke, and similarly used. Even where boilers retained, the coke would form a good fuel.

The operating results of a plant of 100 coke ovens gas plant are given as follows:—

Annual Expenditure.

	Net Tons per Annum.
1) *Coal.*—800 net tons average coking coal carbonised per diem	292,000
2) *Wages, Materials, and Maintenance.*—Estimated at 30 to 50 cents per net ton of coal carbonised, inclusive of unloading coal, loading coke, delivering tar to storage tank, making concentrated gas liquor or sulphate of ammonia, and delivering illuminating gas into holder.	
3) *Gas Auxiliary Expenses.*—Producer plant for use in winter months, consuming coke........ Operating expenses, wages, and materials for producers will be 25 to 40 cents per ton of coke gasified.	6,363
4) *General Expenses.*	
5) *Interest and Depreciation.*—Cost of plant depends greatly on the location.	

Annual Receipts.

6) *Coke* (= 75 per cent. of coal).—600 net tons per diem.. The value of the coke will depend on the demand, but usually metallurgical and foundry coke obtain better prices than domestic fuel.	219,000
7) *Tar* (= 5 per cent.) .... At present worth 14*s.* 6*d.* to 17*s.* 6*d.* in London.	14,600
8) *Ammonia* (= 1 per cent.) equivalent to sulphate Sulphate at present quoted 10*l.* 12*s.* 6*d.* in Liverpool, but cost of sulphuric acid must be deducted. The weight of 60° B. acid required is about equal to the weight of sulphate obtained.	2,920
9) *Additional By-Products,* such as cyanides, light hydrocarbons, and sulphur, may be recovered. Their market prices are very variable.	
0) *Gas.*—The gas sold, after allowing for leakage, &c., will amount to .... The value in the holder will depend on local conditions.	Cu. Ft. 1,250,000,000

—J. A. B.

s-*Pipes; Destruction of ——, by means of Electricity.* W. Leybold. J. Gas Lighting, 1901, **78**, [2000], 630—631.

ST and wrought iron gas-pipes ordinarily are serviceable ·25 to 50 years, cast being more durable than wrought n ones. In recent years electrolysis has caused rapid struction of gas-pipes in places where electric tramways ist. A current of about 500 volts passes into the overad wire from one or more generating stations, and after nning into the motor beneath each tramcar, returns by eans of the rails to the stations. Each rail is jointed by ck copper wires soldered to the ends of the lengths of il, but nevertheless the rails offer a certain resistance to e current, some of which passes on a favourable opporrity into the earth and underlying gas and water-pipes, ich offer less resistance to it. Current flows from the ls to the pipes at spots remote from the electricity works, d, in the vicinity of the works, flows back from the pipes the rails. The difference of tension between pipe and l varied; in Hamburg at a time when the current was pplied from only one works it ranged from 0·2 to 1 volt most places, but was as much as 4·65 volts near the rks. The soil in Hamburg contains 0·006 to 0·004 per nt. of sodium chloride, and the tramway authorities ploy salt or refuse sodium nitrate to melt ice and snow the rails. Sodium chloride is split up into sodium and lorine, the sodium forming with water sodium hydroxide l hydrogen. The hydrogen is liberated at the negative le, while the chlorine forms ferrous chloride at the positive le, and the sodium hydroxide precipitates therefrom rrous oxide. The process continues until the positive le is completely dissolved.

Efforts should be made to reduce the currents passing to the gas-pipes by laying rails of sufficient transverse ction, well connected by soldered copper wire, or with the nts welded by means of thermite (this Journal, 1900, S, and 1901, 253). The tension in the rails should also reduced by fixing in many places insulated return transssion cables to carry the current back from the rails to e works.

Destruction of the drums of gas meters and the bells of station governors is observed sometimes, when saline water or glycerin is used in the meter or governor. Currents circulate in such a medium between the different metals used for the component parts of the apparatus.—J. A. B.

Incandescent Gas Lighting: Discovery of ——. Auer von Welsbach. J. für Gasbeleucht. **44**, [36], 661—664.

WHILE engaged in the spectroscopic examination of the light emitted by erbia and other rare earths, when placed in a gas flame, Auer found that small fragments of the earths, held on platinum wire, did not give sufficiently bright spectra. To increase the available illuminating surface, he adopted the plan of impregnating pieces of cotton fabric with the salts of the earths, and on subsequently burning out the cotton the residual oxides were found to be sufficiently coherent for his purpose. Lanthanum oxide treated in this way glowed so brilliantly as to suggest the possibility of applying it to practical illuminating purposes, and thus the idea of the "incandescent mantle" originated. A mantle of lanthanum oxide, however, soon disintegrated and fell to dust when left in the air, owing to the absorption of moisture and carbon dioxide; and this fact led to the use of other oxides, notably zirconia and thoria, in admixture with the lanthana for the purpose of imparting stability to the mantle. Auer's view was that such oxides must be so intimately mixed as to form a "molecular mixture," such as is obtained when the salts are first brought into solution together and then converted into the oxides. Haitinger, who was assisting Auer, now discovered the value of small proportions of ceria in improving the illuminating power of the mantles.

Up to this stage in the development of the invention it had been commercially unsuccessful, and the fortunes of the companies concerned reached a very low ebb. Auer again turned his attention to the use of thoria, then a very rare and costly substance. As mentioned above, it had been used in the earlier mixtures and was found to give a brilliant light for a time; but after 50 or 60 hours the light fell till it was no better than that of mantles made without thoria. This led to an investigation into the nature of thoria, and crystallisation methods were devised whereby it could be prepared in a pure state quickly and in considerable quantities. The surprising discovery was then made that the purer these thoria preparations were, the lower was the illuminating power of mantles made from them, and finally a point was reached at which the mantles had very little illuminating power at all. An investigation of the purified thoria and of the mother-liquors showed that the light-exciting substance accumulated in the latter, and eventually it was identified as ceria, which clings persistently to thoria and can be separated completely from it only with difficulty. Cerium solution was now added gradually to a purified thorium solution, and at last the well-known thoria-ceria mixture, giving the brilliant results of the present day, was arrived at. This discovery at once brought success to the incandescent gas-light industry.

Nothing very definite is known as to the cause of the luminosity of the thoria-ceria combination. Auer's views are as follows:—Bodies capable of glowing brightly in a flame are produced when certain refractory oxides are brought into "molecular mixture" with each other. The main component, or refractory carrier, must remain unaltered in the flame, whilst the lesser component must be both readily reducible and readily oxidisable in it. The proportion in which the two components should be present appears to depend upon the pressure: for atmospheric pressure, in the case of thoria and ceria, 1 per cent. of the latter is the correct amount; but for 100 atmospheres it would probably be greater. In that part of the flame-sheath where the mantle must be arranged, oxidising and reducing actions alternate with extreme rapidity. The oxides, which are extremely finely divided, are thus bathed in gases which are now mainly oxidising and now mainly reducing. The principal component of the mantle is neither oxidised nor reduced under these conditions, but the lesser component assumes alternately the higher and lower degrees of oxidation. If, therefore, the two components are capable of combining when the lesser is in either one of its degrees of oxidation, the combination will be destroyed when the other degree of oxidation is assumed. This combination and separation of the components will alternate as rapidly as the changes in the character of the flame gases, possibly many million times per second, and the molecular disturbances thus set up will lead to the excitation of light waves.

All incandescence bodies which are of this general character give a more or less useful light, and when examined in the form of salts are found to present certain peculiarities. The salts corresponding to the two components are in each case physically, though not chemically, similar: they crystallise together and form characteristic double salts, as in the case of thorium-cerium salts. In the alumina-chromium oxide combination, which gives a brilliant light, the alumina is the oxidisable and reducible member: chromium and aluminium salts form isomorphous double salts—the alums. Other combinations are those of uranium oxide with thoria, lime, or strontia, in which a small percentage of uranium oxide produces a brilliant light. Here it is the uranium oxide which assumes two degrees of oxidation. Their salts present the peculiarities referred to above; for example, uranium and calcium occur regularly together in certain compounds, as in uranochalcite. Their oxides, like the salts, can combine, and they separate whenever the uranium passes into the state of higher oxidation.—H. B.

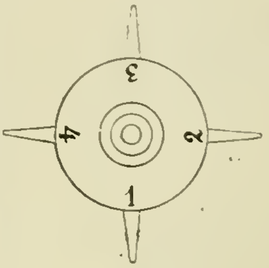
Incandescent Mantles; Photometric Examination of ——. Report of the Photometry Committee to the "Deutscher Verein von Gas- und Wasserfachmännern," Vienna, 1901. J. für Gasbeleucht. **44**, [38], 697—699.

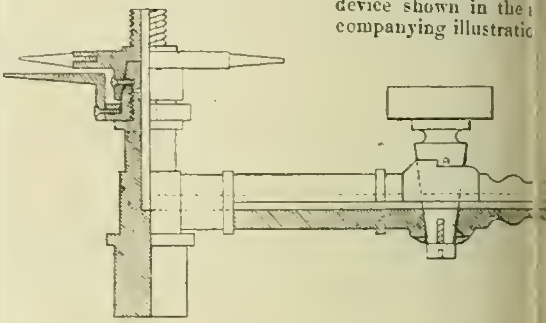
In Germany mantles are obtainable in two forms, these which have been burned-off and collodionised, and those which have not been burned-off. In preparing the former for testing, they should be hung from a hook and set fire to at the top, to burn away the stiffening material. In preparing the latter (which should be kept as dry as possible), they are carefully stretched upon a vertical wooden model, so that the meshes and the upper edge are as nearly horizontal as possible; any folds at the top are smoothed out; and the asbestos loop is adjusted evenly in the notch at the top of the model. The mantle is taken off the model by means of a hooked wire, and is burned off by playing a Bunsen flame round about its top and allowing the material to burn gradually downwards. It is recommended to suspend the mantle over a glass pyramid, to prevent the lower portions from coming together on burning. When the glow of the carbonaceous matter at the top has entirely ceased, the mantle should be shaped and hardened over a press-gas flame, the mantle being repeatedly raised and lowered, while the pressure is gradually increased. The pressure of gas to be used depends upon the kind of mantle. The burner consists of a special form of Bunsen burner, covered with wire gauze at its upper end and provided with a flame-spreader, which directs the flame out sideways. To give proper photometrical results the mantle should be so shaped as to fit the head of the testing burner closely.

The Testing Burner.—As burners of different forms may give different results with the same mantle, the testing burners must always be of the same construction. They are first tested without mantles, to see that they burn uniformly and that the greenish-blue zones are of the standard form, and before each test they are blown through to clean them. The mantle supports must be so high that the distance between the burner rim and the upper edge of the mantle is at least 70 mm. The glass chimney should be a smooth unperforated cylinder, 25 cm. long.

Regulating the Gas-nipple.—The gas-nipple of the burner should be so regulated, that with a gas pressure of 35—40 mm. (1·4—1·6 ins.) the consumption will be 115—130 litres (4·0—4·6 cb. ft.) of gas per hour. Before regulating the nipple, the mantle is maintained at incandescence for at least half an hour on a burner with a consumption of about 130 litres per hour. The nipple is then adjusted by gradually increasing the apertures until, at a uniform pressure between 35 and 40 mm., the highest illuminating power is reached. To check this point the gas pressure should be reduced by about 5 mm., by means of the micrometer screw of the gas-meter, when a diminut in the luminosity should be perceived; the proper press is then restored.

Testing the Mantles.—To determine the illuminati power of any make of mantle, at least four mantles m be tested, the gas pressure and consumption being adjust to those for which the nipple of the burner has be regulated. The man must be burnt for least five minutes bef making the test, so t the burner may be hea up, and tests must th be made in at least thi different horizontal rections. In rotating t mantle into each n position, not only t burner top, but also t gas-nipple must tu round with it; to faci tate this operation, device shown in the companying illustratic is recommended. It consists of a fixed cone, provid with a fixed arm or pointer, and a rotatable upper pa which is numbered and carries four pointers; its meth of application is obvious.





The Standard of Light.—Experienced observers c obtain satisfactory results with the standard Hefner flam but beginners find great difficulty owing to the mark difference in the colour of the two lights. Moreover, wi mantles of 70—100 candle-power, the photometer scre comes so close to the Hefner standard, that very slig movements of the screen produce large differences in t reading. The use of an intermediate light standard therefore recommended, consisting of either a small electr incandescent lamp, actuated by accumulators, or a "Liliput incandescent gas lamp, provided with a pressure regulato The "Liliput" lamp must have burned for at least 50 hou before it is used for photometric purposes. The value the intermediate light standard is determined at t beginning and the end of the test by means of a Hefn lamp, the results being calculated to Hefner units.

Durability Tests.—It is sufficient to determine the illu minating power of the mantles at the outset, and after 2 100, and 300 hours' burning respectively, a clean chimne being used during each photometric test. The gas mu burn throughout at the rate and pressure prescribed abov the pressure of 35—40 mm. being particularly attended t and with this object the burner stand should be provide with an efficient governor.—H. B.

Luminescence Spectra of the Rare Earths. E. Baur and R. Marc. Ber. **34**, [12], 2460—2466.

Muthmann and Baur, on examining the luminescenc spectra emitted by Yt, Gd, &c., when subjected to th action of cathode rays, obtained results (this Journal, 190 785) agreeing with those of former observers. The author find, however, that Yt, Gd, and La, *when in pure conditio* have *no* discontinuous spectra, the spectra hitherto observe being really due to the presence of minute amounts of E Nd, and Pr. They have proved that coloured earths ar necessary for the production of the supposed characteristi pectra of Yt, Gd, and La, by adding Er_2O_3, Nd_2O_3, and r_2O_3, to the purest Yt_2O_3, CaO, and other suitable earths, nd thus producing artificially the spectra in question, from aterials which did not by themselves show them. These ixtures, when in proportions suitable for the production f spectra, may be regarded as "solid solutions" of the oloured body in the colourless one. Whilst spectra are mitted by very minute proportions of the coloured earths, ney are developed most brightly when from 0·1 to 1·0 per ent. is present in the mixture; with 5 per cent. they are uch weaker, and with 10 per cent. mostly disappear. he spectrum of the coloured earth varies, to some extent, ccording to the nature of the "solvent" (*i.e.*, the colourss body) employed; moreover, the coloured earths, when resent together in the same "solvent," influence each ther remarkably, even preventing entirely the emission of iscontinuous spectra.

It was observed that when a specimen of yttria, giving e supposed typical Yt spectrum, was further fractionated remove the last traces of Er, the whole spectrum iminished in brightness, whilst the so-called gadolinium pectrum made its appearance. It was then found that actions which contained Nd always gave the "gadolinium" pectrum. The two spectra, therefore, appeared to be onnected with the presence of Er and Nd. Using calcium lphate as a neutral "solvent," and adding 1 per cent. of rbium sulphate, the entire spectrum hitherto ascribed to ttrium was obtained. Similarly, with 1 per cent. of eodymium sulphate the "gadolinium" spectrum was roduced exactly. To make sure that these results could ot have been due to the presence of Yt and Gd in the oloured earths, a specimen of the purest yttria (giving nly a weak spectrum), and the Er_2O_3 and Nd_2O_3 used, ere progressively diluted with CaO. Yt_2O_3, even at a ilution of only 1 : 100, barely showed the yellow line, hilst at 1 : 1000 no spectrum was visible. On the other and, Nd_2O_3 at 1 : 10,000,000, and Er_2O_3 at 1 : 1,000,000, ave distinctly visible spectra. The spectrum exhibited by pecimens of yttria is therefore due to the presence of r and Nd, in traces not otherwise recognisable.

Praseodymium sulphate was diluted similarly with $CaSO_4$ 1 : 100), when the spectrum ascribed to *lanthanum* Muthmann and Baur, *loc. cit.*) was reproduced. The uminescence of lanthanum sulphate is therefore due to aces of Pr. The spectra of La_2O_3 and of CaO + Pr_2O_3 1 per cent.) show considerable differences at first sight; ut the lines coincide in position, and the differences are ue to the difference of the "solvent." If the same solvent e used [comparing, for instance, Pr_2O_3 in Yt_2O_3 (1 : 1000) ith La_2O_3 in Yt_2O_3 (1 : 100)], the spectra become identical. o prove that the spectrum of the Pr_2O_3 was not due to its ontaining La_2O_3, dilutions with CaO were made as above. t a dilution of 1 : 1000, La_2O_3 gave no longer a line pectrum; whereas the Pr_2O_3 showed its characteristic lines ven at 1 : 1,000,000.

In view of Crookes' experiments and conclusions as to he decomposibility of Yt and Gd, it is interesting to note he effect of Nd and Er upon each other. If dissolved in ulphate of calcium or yttrium in the proportion $1Nd_2O_3$: Er_2O_3, both spectra appear, complete and of equal ntensity. When the Nd_2O_3 is increased in proportion, the wo red, the orange, and finally the typical yellow lines f erbia gradually disappear; whereas, if the Er_2O_3 is ncreased, spectra are ultimately obtained in which all four ines of neodymia are absent, the first to go being the range, then the yellowish-green, and finally the red, lthough in mixtures containing Nd, the orange bands are sually the most intense, and the yellowish-green band the eakest.

The presence of even 0·1 per cent. of iron reduces the uminescence very much, larger proportions preventing it ntirely.—H. B.

PATENTS.

Peat and other ***Moist Substances; Mode of Drying*** ——. T. A. Dillon, Kingstown, co. Dublin. Eng. Pat. 18,561. Oct. 18, 1900.

The moist peat or other substance is placed in a chamber hrough which a steam coil or pipe passes. Air enters the chamber through several holes at the end at which the steam enters the coil, and leaves it through the annular space between the widened open mouth of the coil, and the sides of an aperture at the other end of the chamber. The steam rushing from the widened mouth of the coil is said to create a vacuum in the chamber, and so maintain a steady continuous flow of hot dry air through it. Waste steam is employed for choice.—J. A. B.

Peat or other Materials; Pulping, Mashing, and Moulding ——. G. T. Zohrab, Glasgow. Eng. Pat. 18,680, Oct. 19, 1900.

The apparatus consists of a vertical cylindrical vessel, mounted upon wheels so as to be movable, and provided with an upper bell-feeding mouth for the peat or other like material. It has a central axis on which is a screw, which forces the peat downwards towards a horizontal perforated plate, above and against which rotate suitable knives. The material is forced through the plate to a lower compartment, where it meets other rotating knives serving to thoroughly knead and mix the material. At the bottom of the cylinder are a number of parallel horizontal archimedean screws, which force the pulp out through moulds of any desired shape.—R. S.

Peat; Method and Apparatus for Treating ——. P. Jensen, London. From G. Heine, Högsfjord, Norway. Eng. Pat. 3215, Feb. 14, 1901.

Peat is obtained from the bog by first mixing it with water to make a pulp, and then withdrawing the pulp formed, by suction and conveying it to the factory. The pulp is next carried over cylinder machines, such as are used in papermaking, until it is sufficiently dry to be taken to a press for making briquettes.—R. S.

Artificial Fuel. A. Kahn, Helmstedt, and M. Heberlein, Eisenach, both in Germany. Eng. Pat. 2912, Feb. 11, 1901.

About 75 per cent. of gypsum is mixed with about 15 per cent. of carbonaceous substances, such as peat or peat refuse, leaves, sawdust, coal slime, &c., and the mixture is saturated with 10 per cent. of resin or oils. The mass is pressed and made into blocks.—R. S.

Smoke-consuming Furnaces. J. A. Crawford, Allegheny, U.S.A. Eng. Pat. 17,041, Sept. 25, 1900.

The side walls and the bridge wall are provided with intercommunicating horizontal channels arranged above the grate. Vertical channels pass both upwards and downwards from this channel. The lower channels lead from air inlet openings below the grate, while the upper ones lead to downwardly-inclined openings in the walls of the upper part of the combustion chamber. Other short channels lead directly from the horizontal channels to the furnace. The air inlets below the grate bars are formed of open ended metal boxes, having regulating air inlet slides. Two tubes may lead to the stack, namely, a cold air pipe opening from the ash pit, and a hot air pipe, the exit of which is above the end of the cold air pipe, opening from the fire chamber.—R. S.

Consuming Smoke and Gaseous Products of Combustion in Furnaces. G. S. Gallagher, Manhattan, U.S.A. Eng. Pat. 15,811, Aug. 6, 1901.

This invention consists in forming the furnaces of steam boilers with special flues in the side walls, the bridge wall, the bridge wall extension, the front wall, and, when a central wall is employed, in that also. These flues are constructed of hollow tiles, fitting closely one against the other. In the side, front, and central wall they have two horizontal rows of perforations, allowing the air heated therein to enter the combustion chamber above the fuel. Those employed for the bridge wall have each two openings, one above the other, the lower an inlet for smoke and gases from the surface of the fuel, the upper an outlet for these gases mixed with air, into the combustion chamber. The inlet and outlet openings lead to a flue bringing heated air. The tiles for the bridge wall extensions are of tapering form, and are provided with openings communicating from the interior of the hollow tiles to the outside or combustion chamber of the furnace.—R. S.

Hydrocarbon Oils, and Rendering them Non-Explosive; Improved Process for Purifying ——. J. W. Mason, Manchester. Eng. Pat. 16,134, Aug. 10, 1901.

Each 100 galls. of the oil is treated with 4 oz. of salt and 4 oz. of slaked lime in a cylindrical boiler provided with a blow-pipe, by means of which air can be forced through the oil. After blowing for about 10 minutes, 8 oz. of borax and the same quantity of "borax dry soap" are added to the oil, when the air is again blown through for about one hour. After settling 15 minutes, the oil is run through a charcoal filter into a storage tank. The sludge remaining in the boiler may be used for cleansing purposes, 1 lb. mixed with 5 galls. of hot water being said to form a good soft soap. —T. A. L.

Coke Oven. E. Stauber, Berlin. Eng. Pat. 19,143, Oct. 25, 1900.

The coking oven consists of a vertical chamber having a feeding hopper, and communicating by a number of short passages, at different levels, with a concentric heating chamber, in which is situated a perforated coiled pipe, through which liquid fuel passes from an upper reservoir. The coal is first dried by means of a solid fuel box which is slid beneath the oven. The vapours then given off pass to the chimney. When vapours cease to be given off, the liquid fuel is turned on, and burns in the heating chamber, escaping from the coiled pipe through a number of openings, the necessary air being admitted through tubes passing through the walls of the oven. The gases given off during this period—the coking period—are drawn through a condenser by an exhauster. On the completion of the process the fire-box is withdrawn, allowing the coke to fall into a lower chamber, where it is allowed to cool out of contact with air. It is subsequently discharged by means of a door into trucks.—R. S.

Gas from Gas-Producers, and Heating and Moistening the Air supplied to the Producers; Apparatus for Purifying ——. W. J. Crossley, Manchester, and J. Atkinson, Marple. Eng. Pat. 17,734, Oct. 6, 1900.

The inventors claim, in combination with other gas-producing plant, the use of a tower constructed of superimposed sections, each alternate section being a gas section through which the gas from the producer passes, and in which it is cooled and more or less cleansed, whilst the intermediate sections are air sections, in which air is heated and moistened by a downward current of water which traverses both the gas and air sections, and is conveyed from the one set to the other by means of siphons. The gas takes a downward course, whilst the air moves in the opposite direction.—C. S.

Heating-Gas from Gas Producers, Blast Furnaces, or Coke Ovens; Apparatus for Purifying ——. W. J. Crossley, Manchester, and J. Atkinson, Marple. Eng. Pat. 17,993, Oct. 10, 1900.

The inventors claim the use and construction of a rapidly revolving body, consisting of more or less bi-conical surfaces, provided with ribs, and enclosed in a corresponding bi-conical outer case, so that the tips of the ribs closely approach the inner surface of the casing. A central inlet is provided for the admission of gas at the one side, and a central gas outlet on the other, the gas passing round the edges of the larger diameter of the revolving body at a very high circumferential velocity, so as to throw impurities outwards into a slot and passage formed for this purpose, and thus separate them from the gas under treatment. The construction of the revolving body and ribs is such that, whilst considerable power is required to impart the high velocity to the gas in passing from the central inlet to the circumference, a large proportion of this power is returned as the gas is slowing down during its approach to the central outlet.—C. S.

Oil-vaporising Apparatus. A. Kitson, London. Eng. Pat. 19,848, Nov. 5, 1900.

The apparatus comprises the combination of an externall heated vaporising tube, nearly or quite horizontal, which preferably charged with coke or similar material, a narro perforated tube placed in the vaporising tube, and chambers containing respectively water and oil, which su stances are forced, under equal pressures, into the vaporis tube and the perforated tube respectively. Two modific tions are given.—C. S.

Catalytic Substance for Use as a Gas Condenser, and f other Purposes; Manufacture of a Mineral ——. A. Boult, London. From A. Tissier, Paris. Eng. Pa 18,035, Oct. 10, 1900.

A natural quartz mineral, quarried at Autogny le Till par les Ormes, France, and composed approximately 78·8 per cent. of silica, 1·44 per cent. of iron oxid 6·96 per cent. of alumina, and 4·32 per cent. of magnesi is powdered, made into a paste, moulded into suitab blocks, &c., and baked at about 2,000° C. The blocks, & are made into linings or rings in the smoke passages or flu of boilers, &c. Thus arranged, they are said to absorb "i completely burnt and waste gases and the gases of com bustion, and to combine them so as to ensure comple combustion." The blocks, if caused to absorb petroleu or other liquid hydrocarbon, and then placed on a furna grate, are said to effect the complete combustion of t hydrocarbon without the emission of smoke.—J. A. B.

Mineral Oil Gas for Heating Purposes; Apparatus f Generating and Burning ——. W. H. Bennett, Londo Eng. Pat. 17,004, Sept. 25, 1900.

The oil is supplied, under pressure, to a central tube clos at the top by a cap, from which the oil passes to a tubul ring, which is heated by the flame of the burning gas, o at starting, by oil lighted in a cup for the purpose. Th oil is thus vaporised in the heated ring, and the vapo passes down to a larger tubular ring placed below, an having outlets at top, through which the vapour issues an burns. A cylindrical shell encompasses the burner, and a inner truncated inverted cone constitutes with the shell, a annular outlet for the flame.—J. A. B.

Carburetting Apparatus; Construction of ——. C. Ka funkelstein, Berlin. Eng. Pat. 14,513, July 16, 1901.

The principal feature in this apparatus is that the com pressed air, in flowing through the porous material impreg nated with the hydrocarbon to be vaporised, is claimed uniformly distribute the fluid in the upper layers of the sai material, and to automatically replace the evaporated liqui from a reservoir in the lower part of the apparatus, so as t bring the ascending air well into contact throughout i whole course with finely-divided hydrocarbon, thus increasin the carburetting effect. The vessel used for this purpose i divided, by perforated partitions, into three superimpose compartments, the upper one for collecting the carburette air, and furnished with outlet taps; the central compart ment containing the porous material; whilst the air-suppl pipe opens into the lower compartment (serving as reservoir) —C. S.

Spirit and the like for Lighting, Heating, and Motiv Power Purposes; Process and Apparatus for Vapo ising ——. K. Gossweiler, Ulm, Germany. Eng. Pat 22,129, Dec. 5, 1900.

The invention relates to a system for the preliminar heating of gas generators, the heat being produced "in directly without direct ignition of a combustible connect with the gasification tube," namely, by blowing air throug a portion of the spirit to be vaporised and igniting th vapour for the purpose of heating the gasification tube. I one modification of the apparatus a separate reservoir i provided for this portion of the spirit; in another, mean are provided for raising the spirit to be vaporised into th hottest zone of the heating flame, in order to accelera gasification; and in another, the wick for the combustibl is separated from the remainder in the reservoir by mean of a casing, "for the purpose of limiting the cooling of the gas produced by the still ungasified combustible to the amount given out through the casing." Acetylene, or coal gas, can also be used for the preliminary heating.—C. S.

Gas for Lighting, Heating, and other Purposes, and Apparatus for Use in connection therewith; Manufacture of ——. H. Lane, Manchester. Eng. Pat. 17,762, Oct. 6, 1900.

The process claimed consists of the following stages:—(1) Combustion of fuel in a generator; (2) forcing the gaseous products of combustion downwards by means of a air-blast introduced beneath the raw fuel; (3) compdeting the combustion by a supplementary supply of air ntroduced preferably between the generator and the regenerator; (4) the upward flow of the gaseous products hrough the regenerator, which has internal chequer-work composed of firebrick below and preferably of metal above; (5) the spraying of water on the highly heated upper chequer-work of the regenerator, and the downward flow of he resulting steam; (6) the scouring out the remnant of he gaseous products of combustion by the steam aforesaid; (7) the flow of superheated steam from the regenerator nto and up the coked and raw fuel in the generator; (8) decomposition of the superheated steam into its constituent gases; (9) destructive distillation (into vapour) of he raw fuel by the upward flowing gases; and (10) formaion of new gaseous products by the admixture of the esulting vapour with the said gases.

The apparatus includes a generator, furnished with a firegrate and water seal near the bottom, and a feed aperture and gas outlet, as well as a series of air-inlet pipes (automatically controlled) and passages at intermediate points; passage communicating with a regenerator; an air-inlet ipe and passage for a supplementary air supply, introduced preferably into the passage between the generator and regenerator, also an arrangement of chequer-work within the regenerator, &c.—C. S.

Gas; Apparatus for Purifying ——. J. E. Prégardien, Kalk, near Cologne. Eng. Pat. 13,788, July 6, 1901.

Purifying vessels, with vertical inlet and outlet pipes onnected in series, have a bye-pass between the inlet and outlet pipe of each vessel. The bye-pass is closed or opened by alteration of the position of plugs in the inlet and outlet connections. These plugs provide a hydraulic seal for he ends of the pipes which are shut out for the time being. —J. A. B.

Naphthalene contained in Illuminating and Heating Gases; Apparatus for Extracting the ——. L. Breittmayer, Bordeaux, France. Eng. Pat. 10,024, May 14, 1901.

The gas to be freed from naphthalene passes through a closed vessel containing a suitable naphthalene solvent, the pipe or pipes by which the gas enters being very close to he surface of the liquid, so that the inrush of the entering gas agitates the solvent, continually exposing a fresh urface. The vessel is also provided with a gas exit and openings for charging and emptying.—T. A. L.

Gas Igniters; Automatic ——. L. Mette, Berlin. Eng. Pat. 17,383, Oct. 1, 1900.

A fabric, preferably conical or bell-shaped, is impregnated with a solution of salts of aluminium, cerium, and platinum, n such proportions as to leave a residue, after burning, consisting of about 98·7 per cent. of alumina, 1 per cent. of ceria, and 0·3 per cent. of platinum. In the upper part of he conical fabric is fixed an igniting-ball of platinum black, and outside the conical body is arranged another conical body "of the toughest possible material, such as alumina, clay, asbestos, or similar substance." The device is fixed nside the upper end of the lamp chimney. The object of he strong outer conical body is to protect the inner fabric from injury by the explosion which accompanies ignition. The inner fabric may be replaced by a brush-shaped bundle of threads impregnated with rare earths and with platinum. —H. B.

[Incandescent] Gas or other Burners; Apparatus [Caloric Engine] for Supplying Air, or other Combustion Supporter, to ——. A. J. Boult, London. From The New Process Lighting Co. of Cleveland, Ohio. Eng. Pat. 21,622, Nov. 29, 1900.

This relates to an incandescent gas lamp supplied with air under pressure, the air-compressor consisting of a blower-fan driven by a caloric engine, which is situated in the upper part of the lamp and actuated by the waste heat from the burner. The caloric engine is of the type in which air is expanded and contracted, for furnishing the motive power, by being alternately shifted from one end to the other of a cylinder the ends of which are maintained at widely different temperatures.—H. B.

Incandescent Lighting; Apparatus for Burning Mixtures of Air and Inflammable Vapour for Heating and ——. J. B. Leroux and P. J. Carmien, Nantes. Eng. Pat. 11,504, June 5, 1901.

Alcohol or mineral oil, contained in a bottle or other convenient receptacle, is conveyed by means of a capillary siphon tube to a distributor, which is provided with a chamber containing a filter, for removing impurities from the liquid, and with a valve for regulating the supply of liquid. A Bunsen mixing tube, which may be provided with a mantle at the top, is superimposed upon the distributor. To start the burner, the base of the mixing tube, into which the volatile liquid issues, is heated by the application of a spirit torch.—H. B.

Bunsen Gas Burners. M. S. Walker, Chicago. Eng. Pat. 15,139, July 25, 1901.

At the lower end of the usual Bunsen mixing-tube is arranged a "primary mixer," consisting of a chamber provided with a gas-inlet nozzle of small diameter, and having air inlets at the sides as usual. Above the gas nozzle, and in line with it, is a second discharge orifice, through which the mixture of gas and air issues into the ordinary Bunsen tube, where a further admission of air may be made if desired. The second discharge orifice may have several forms; as, for example, simply a central perforation in a diaphragm which extends across the tube, or a vertical tubular piece fixed centrally in such a diaphragm. The burner may be used in incandescent gas lighting.—H. B.

Incandescent Gas Burners. H. Winkler, Berlin. Eng. Pat. 19,535, Oct. 31, 1900.

In an incandescence burner having a rate of gas consumption at least twice that of the ordinary Welsbach burner, there is arranged, between the burner head and the mixing tube, a shallow intermediate chamber, into which the top of the mixing tube projects. This chamber is of greater diameter than the mixing tube, but narrows quickly, in the upward and downward directions, to the diameters of the burner head and the mixing tube respectively. The burner is supplied entirely or mainly with air drawn through the mixing tube, the burner head and mantle being surrounded by a globe, surmounted by a chimney for creating a strong draught.—H. B.

Incandescent Bodies for Lighting Purposes. G. Meyer, Prague. Eng. Pat. 19,859, Nov. 5, 1900.

A process of making incandescent bodies more resistant, consisting in knitting, sewing, or netting on the impregnated, and not yet incinerated, incandescent body or mantle, threads forming a rib or framework, which threads are impregnated with suitable chemicals with the object of vitrifying or stiffening and thoroughly attaching them to the mantle . . . For example, the stiffening threads may consist of cotton threads impregnated with silicic acid preparations.—H. B.

Acetylene Generators, and Apparatus connected therewith. L. Thorne, London. Eng. Pat. 16,960, Sept. 24, 1900.

Water passes from the tank of a bell gasholder to one or more adjacent generators containing carbide, and the gas evolved, passes into the gasholder until the rising bell lifts a weight, and thereby closes a tap on the gas connexion between the generator and holder. Gas subsequently evolved, forces back the water from the generator to the gasholder tank, and thus leaves the carbide dry until, by the descent of the bell, the gas connexion is re-opened, and the pressure in the generator thereby relieved.—J. A. B.

Acetylene and other Gases; Purifying ——. G. G. Smith, Florence, Italy. Eng. Pat. 20,073, Nov. 8, 1900.

The gas is passed through pipes which dip beneath the surface of liquid vaseline, which is stated to remove impurities, in addition to water, as already claimed under Eng. Pat. 12,240 of 1900 (this Journal, 1900, 1001).
—J. A. B.

Acetylene Generator with Automatic Supply of Carbide. K. Gossweiler, Ulm, Germany. Eng. Pat. 2766, Feb. 8, 1901.

Carbide is contained in a receptacle, the position of which is varied through the movements of a bell or float, so that, when the bell contains little gas, carbide is discharged into water, and gas is thereby generated, and, when the bell is nearly filled with gas, the discharge of carbide is completely arrested.—J. A. B.

Acetylene Gas Apparatus. J. Sharpe and R. G. Code, both of Ottawa, Canada. Eng. Pat. 7286, April 9, 1901.

The movements of a gas bell, into which the acetylene passes, operate, by levers and ratchet and pawl mechanism, a rotary water distributor, by which water passes through a movable intake to generating chambers placed below.
—J. A. B.

Acetylene-Gas; Apparatus for Generating and Storing ——. F. Schmitt, Mannheim, Germany. Eng. Pat. 9664, May 9, 1901.

Water passes from a receptacle into one or more generating chambers, containing carbide, placed within the receptacle. The gas evolved passes to a gasometer and thence to an intermediate storage chamber, from which it expels water. The water so expelled is independent of the water which is used for supplying the generating chambers, and the gas is therefore said to be stored in the storage chamber under uniform pressure.—J. A. B.

Acetylene Generators for Lanterns, Lamps, and other Purposes. L. Blériot, Paris. Eng. Pat. 13,790, July 6, 1901.

A reservoir of water, formed as a truncated pyramid or cone, in order to fit without play in a socket of corresponding form, contains a tubular box, with double bottom, in which is a basket containing carbide or acetylithe. A screw, with winged head accessible from outside, opens or closes an orifice at the base of the box, by raising or lowering a conically shaped elastic plug. When the orifice is closed, the elasticity of the plug still admits of the escape of gas in the event of the pressure within the box becoming high. A purifier and cap with elastic ring joint are provided at the top of the box.—J. A. B.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Petroleum; Filtering ——, *through Fuller's Earth.* C. Engler and E. Albrecht. Zeits. angew. Chem. 1901, [36], 889.

Experiments were carried out to ascertain the nature of the processes taking place during the filtration of petroleum through Florida earth (see this Journal, 1900, 890, 1005). The results obtained are shown in the table.

Dimensions of filtering layer: 86 cm. high, 4 cm. diameter. Sp. gr. 0·7929 at 15° C.; and appearance of the crude oil: translucent, brown, with greenish fluorescence.

In order to preclude the possibility of chemical action during the filtration, a mixture of the oils which had already been once filtered through Florida earth, was filtered; this would consequently be free from any substances likely to be affected chemically by the filtering material. Similar results were obtained, thus showing that the separation is effected mechanically. In a further experiment the filter oil was drawn off at different levels from the tube containi the Florida earth. The results show that the lighter ascends through the filtering layer more quickly, whilst t heavier portions remain behind and are found in the low part of the filtering tube, whence they are forced slow upward by the fresh oil entering from below. The separ tion of petroleum into fractions of different specific gravi by means of Florida earth, appears to be due solely capillary attraction. Experiments with other filteri media, as infusorial earth, either alone or mixed with san &c., did not give satisfactory results.

Fraction.	Sp. Gr. at 15° C.	Volume.	Appearance.
		c.c.	
1	0·7812	About 70	Water-white.
2	0·7870	„ 65	Water-white, with fa fluorescence.
3	0·7897	„ 120	
4	0·7905	„ 70	
5	0·7913	„ 50	
6	0·7919	„ 110	Faint yellow; greeni fluorescence.
7	0·7920	„ 100	Rather more yellowish.
8	0·7965	„ 400	Yellow, with greeni fluorescence.
9	0·8020	„ 50	
10	0·8032	„ 100	
11	0·7976	„ 300	Orange, with greeni fluorescence.
12	0·7962	„ 500	

There is only agreement to a limited extent with the co clusion drawn by Day (this Journal, 1900, 890), that t differences in natural petroleums arise from their havi undergone a similar process of capillary filtration throu porous strata. But there is agreement that in individu instances a separation and transference of the light fractions from the place of formation to a centre of depo tion at a distance, may have occurred, and also that if t communication was subsequently cut off or considerab obstructed, a permanent local separation of the light oi from the heavy ones may have been effected; but it pointed out that if the original communication were mai tained, the separation effected by capillarity would gradually counteracted by diffusion. Further, the chemic nature of the oils from various adjoining districts is often divergent as to prevent a common origin being ascribed them.—A. S.

Petroleum Inclusions in the Muschelkalk Formation Roth-Malsch, Baden. C. Engler and E. Albrec Zeits. angew. Chem. 1901, [37], 913—916.

The samples of oil examined were collected from the ca ties of certain fossil Gryphaeæ and Ammonites, occurrin in the Muschelkalk (Lias *a*) at Roth-Malsch (Baden). the following specimens, No. 1 had lost its lighter fractio through exposure to the air, No. 2 was a thin brown taken from freshly broken rock, and No. 3 a thin yello transparent oil from a mussel cavity containing crystals calc-spar. The chemical composition was found to be—

—	I.			II.	III.
	%	%	%	%	%
Carbon	87·22	87·66	87·20	86·73	86·59
Hydrogen ...	12·65	12·33	12·45	12·95	12·92
Total	99·87	99·99	99·65	99·68	99·51

with traces of sulphur and nitrogen. The oil is therefo mainly a hydrocarbon oil similar to that found in Bak crude by Markownikow und Oglobin.

To examine the properties of the oil and isolate an asphaltum, pitch, and paraffin, the sample was treated wi petroleum spirit (ligroïn) boiling below 50° C., and left stand for several hours, the deposited asphaltum being co lected on a filter, washed with the same spirit, dissolved i benzene, filtered, and evaporated to drive off the solvent The first filtrate was distilled, the residue dissolved in ethe cooled in a refrigerating mixture, and treated with coole cohol, the deposited sticky flakes being washed with ether-cohol (1 : 1). The alcohol-ether solution on being re-oled also deposited a pitchy substance, which was united th the other, the paraffin being extracted with alcohol ider a reflux condenser, and the pitch left behind. The l recovered from the filtrates was thick and dark brown, . gr. 0·9453 at 17° C.

The original assumption that this oil was formed from e fatty matter of the fossil fauna, was disproved by the antity being too great for such an origin, and also the presence of similar oil in accidental cavities in the ck. The assumption is, therefore, that the oil was forced to the fossil and other cavities, by pressure, from the rrounding bituminous rock ; and the same process is con-lered by the authors to have probably occurred in the se of petroleum deposits found in sandstones and other rous rocks.—C. S.

Benzol ; Detection of Carbon Bisulphide in ——. E. Votoček and R. Potměšil.

See under XXIII., *page* 1147.

PATENT.

eservative Oils for Coating and Impregnating ; Process of Treating Tar Oils for the Production of ——. H. Herborn, Wiesbaden, Germany. Eng. Pat. 3922, Feb. 23, 1901.

E heavy tar oils, after having been freed from their dily volatile constituents, are thoroughly agitated in cold with 3 per cent. of concentrated hydrochloric acid 1 2 per cent. of a saturated solution of zinc chloride or phate or aluminium chloride. The oil is then allowed stand for several hours, when the clear portion is anted. It contains about 2 per cent. of chlorine, and of a characteristic reddish-brown colour ; its specific vity and viscosity have increased, and it has lost its leasant odour. On distillation, hydrochloric acid is en off at 200° C., and the distillate shows a characteristic coloration. As an example of the method, a tar oil ing a sp. gr. 1·097 and viscosity 2·93, took up 2·25 cent. of chlorine, and then had a sp. gr. 1·122 and osity 6·00.—T. A. L.

IV.—COLOURING MATTERS AND DYESTUFFS.

low Dyestuff obtained from Sulphocyanide Salts ; Sulphocyanogen, so-called Pseudosulphocyanogen, and the ——. A. Goldberg. J. prakt. Chem. 1901, **64**, [15, 6, 17, 18], 166—181. (See also this Journal, 1901, 13, 238, 798.)

ESCRIPTION is given of the production of pseudosulpho-nogen by the action of hydrogen peroxide and potassium ammonium persulphate on potassium or ammonium hocyanide. The yield is much lower than by the cesses given in the former papers. The analyses the products show them to be mixtures of at least substances, from one of which the small quantities Canarin are derived. The product obtained by the on of one equivalent of bromine can be freed from gen by dissolving in pure sulphuric acid, filtering, and ring into water ; persulphocyanic acid, $H_2C_2N_2S_3$, is formed. The alkaline solution of the anhydrous stance has the same tinctorial properties as the alkaline tion of the original pseudosulphocyanogen.

he dyestuff, Canarin, is always formed in much smaller ntity than the yellow compound ; its empirical formula $H_6C_5N_8S_7O$. Experiments showed that a favourable d of Canarin could be obtained in the dry way by the on of halogen on sulphocyanides, if care were taken that halogen acted uniformly and at a high temperature. ice the process of Ger. Pat. 101,804. 8 kilos. of um sulphocyanide are heated in a ball-mill to 150°— C., whilst 3·5 kilos. (one equivalent) of dry chlorine led in, the mill being in motion during the whole ation. The resultant brownish-red powder is washed water, the residue heated to 60° C. with a solution of 5 kilos. of caustic soda in 40—50 litres of water, allowed to cool, filtered, and the residue treated with 1—2 per cent. caustic soda solution. A pale yellow substance then dissolves. The residue is chiefly composed of the sodium compound of the dyestuff, which is separated by acids as a brownish-yellow voluminous precipitate. The sodium salt is soluble with difficulty, especially in solutions of salts of caustic soda. The potassium salt is much more soluble. Both salts are substantive cotton dyestuffs of similar properties. The finest and greenest shade is obtained with an addition of about 10 per cent. of soda to 2 per cent. of the sodium salt. Somewhat redder shades are given by sodium chloride, sulphate, and phosphate. The dyeing power approaches that of Chloramine Yellow or the chlorinated Primuline Yellow, to which latter the shade is most similar. The fastness to acids, soap, and fulling is very considerable ; the shades also resist cold or hot strong alkalis. Canarin and its sodium salt appear to be non-poisonous.—A. C. W.

Indigo ; The Electrolytic Reduction of ——. F. Haber. J. prakt. Chem. 1901, **64**, [15, 16, 17, 18], 289—293. (See also this Journal, 1899, 757, 1132.)

BINZ, in his account of the electrolytic reduction of indigo, makes no mention of the efficiency, which, however, appears to be low. The theoretical conclusions thus cannot be regarded as proved. The author does not consider that the reduction of indigo in such an unfavourable electrolyte as a paste of zinc oxide and caustic soda by means of a prodigal consumption of current can be regarded as a "solution of the problem" of the electrolytic reduction of indigo.—A. C. W.

Anthragallol ; Nitro-Compounds of ——. II. M. Bamberger and F. Böck. Monatsh. für Chem. 1901, **22**, [7], 717—731.

As a further result of work on these compounds, the authors find that α-nitro-anthragallol, obtained pure by recrystallising the product of the reaction of water on pseudonitro-anthragallol, from alcoholic benzene, gives on acetylation a derivative of the composition $C_{14}H_4O_2.NO_2(O.C_2H_3O)_3$. Further, pseudonitro-anthragallol gives the following reactions :—By the action of methyl alcohol, it yields a derivative of a pseudo nature ; aqueous hydrochloric acid converts it into β-nitro-anthragallol, $C_{14}H_7O_5.NO_2$, whilst the alcoholic acid gives monochloro-anthragallol, $C_{14}H_7O_5Cl$; formic acid has the same action as water, yielding α-nitro-anthragallol ; with pyridine, pseudonitro-anthragallol forms a salt, $C_{14}H_8O_5$, HNO_3, C_5H_5N ; whilst acetyl chloride gives a compound of the formula $C_{16}H_{10}O_8NCl$.—T. H. P.

Anthragallol ; Nitro-Compounds of ——. III. M. Bamberger and F. Böck. Monatsh. für Chem. 1901, **22**, [7], 732—736.

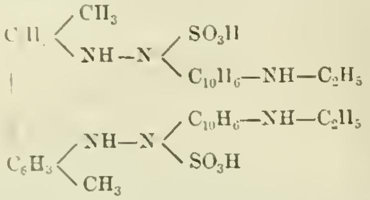
THE anthragallolamide obtained by Georgievics by the action of ammonia on anthragallol, does not give the expected nitro-anthragallolamide on nitration. Dimethyl-anthragallol, $C_{14}H_5O_2.OH(OCH_3)_2$, is obtained by the action of dimethyl sulphate.—T. H. P.

Diazo-Sulphonates and Phenols or Amines ; Action of Light upon Compounds of ——. Seyewetz and Blanc. Rev. Gén. des Mat. Col. 1901, **5**, [56], 203—205.

IT is known that sodium sulphite gives, with di- and tetrazo compounds, bodies which, when mixed with amines and phenols, do not furnish dyestuffs. The latter are produced, however, as Feer has shown (this Journal, 1890, 1002), when such mixtures are exposed to light.

The authors find that the sodium sulphite compounds in question react with amines and phenols, forming compounds which are decomposable into sulphur dioxide and dyestuffs. The precise conditions of this action and the subsequent formation of dyestuff, have been investigated in the case of the compound formed from sodium tetrazoditolyldisulphonate and β-naphthylamine ether.

Sodium tetrazoditolyldisulphonate is obtained by acting upon tetrazotised tolidine with sodium sulphite. Three times the proportion of the latter theoretically necessary is required to give the best yield. The product is purified be recrystallisation from a 10 per cent. solution of sodium sulphite. It was combined with β-napthylamine ether by mixing it with a dilute solution of the latter at a temperature of 12° C., an oily precipitate being obtained, which crystallises after standing for a few hours. This was recrystallised from 30 per cent. alcohol, being dissolved in the latter at a temperature of about 80° C. Above this temperature it undergoes partial decomposition into sulphur dioxide and a red dyestuff. The same change is brought about by the action of light. The crystals, which have an orange-yellow colour, decompose at about 160° C. without melting. They are insoluble in cold, and sparingly soluble in hot alcohol and insoluble in ether, benzene, and chloroform. Alkalis in alcoholic solution give a precipitate which is slightly soluble in alcohol and water. Dilute acids on boiling, and concentrated acids in the cold, decompose the compound, liberating sulphur dioxide. Its formula is—



The dyestuff, as obtained by boiling this compound with alcohol and cooling, is a red powder, decomposing at 150° C., insoluble in cold and very slightly soluble in hot water, moderately soluble in alcohol, acetone, and acetic acid, and sparingly soluble in ether. It is insoluble in dilute but dissolves in concentrated acids with a blue or violet colour. Its identity was proved with the dyestuff produced by direct combination of β-naphthylamine ether and tetrazotised tolidine.—E. B.

Fluorescein; Sensitiveness to Light of ——, its Substitution Derivatives and Leuco Bases. O. Gros. Zeits. phys. Chem. **37**, 156. Zeits. angew. Chem. 1901, [37], 924.

The sensitiveness to light was tested by soaking earthen plates with ethereal solutions of the substances under examination, and then exposing them to light, one-half of each plate being covered with black paper to serve as a check test. It was found that the influence of light on the colours was independent of any elevation of temperature due to the light itself, inasmuch as the concealed halves of the plates became warmer than the exposed portions.

The effect of different parts of the spectrum was also examined, by the interposition of coloured glasses. The coloration of the leuco bases was most extensive under rose-red; furthermore, in most of the leuco bases, a second maximum of coloration was recorded under the corresponding complementary colour of the colouring matter. The addition of salts was found, with few exceptions, to modify the velocity of the reaction; copper salts, barium chloride, and mercury chloride retarding, whilst salts of cadmium, manganese, lead, molybdenum, tungsten, uranium, &c., produced acceleration. The nitro compounds appear to possess a special affinity for oxidation, being the only members of the leuco bases that oxidise in the dark.

The sensitiveness of the colouring matters themselves to light is based on a process of oxidation, and not of reduction, as is sometimes assumed. This was proved by the direct measurement of the oxygen consumed in the course of the exposure to light, by means of a special apparatus.

The influence of the resulting colouring matter on the oxidation of the leuco bases is at first accelerative; and the sensitiveness to light is heightened by the presence of extraneous pigments. This catalytic action is probably stimulated by absorption of light; hence the sensitiveness of the leuco base extends not only to the rays absorbed by itself, but also to those absorbed by the resulting colouring matter.—C. S.

Diphenylamine; Two New Nitro-amino Derivatives of——. F. Kehrmann and G. Steiner. Ber. **34**, [12], 3089—3092.

2-*Nitro-3'-Aminodiphenylamine.*—A mixture of o-nitrochlorobenzene (25 grms.) and anhydrous sodium acetate (25 grms.) is brought into a wide-necked flask and hea in an oil bath to 170°—180°. Metaphenylenediamine gradually added and the heating is continued for 6—7 hou whilo a slow stream of carbon dioxide is sent through flask. The substance crystallises from alcohol in long needles melting at 112° C., which are nearly insoluble boiling water, but dissolve readily in benzene, alcohol, eth and glacial acetic acid. The average yield, calculated the nitrochlorobenzene used, was 40 per cent. of theoretical.

The sulphate (thick browns prisms or fine yellow needl is easily soluble in boiling water and alcohol.

On reduction the hydrochloride of 2.3'-*Diaminodipher amine* is obtained in long snow-white clustering need This salt is stable, when dry, in the absence of light, becomes pink when exposed to light or to the atmosphe

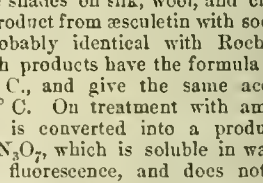
2-*Nitro-2'-Aminodiphenylamine* was obtained by heat together o-phenylenediamine, sodium acetate, and o-nit chlorobenzene in an atmosphere of carbon dioxide. yield was extremely poor. The substance crystallises fr a large amount of boiling water in yellow-red nee melting at 103°.—H. L.

Dyestuffs of the Æsculetin Series. C. Liebermann F. Wiedermann. Ber. 1901, **34**, [12], 2608—2617.

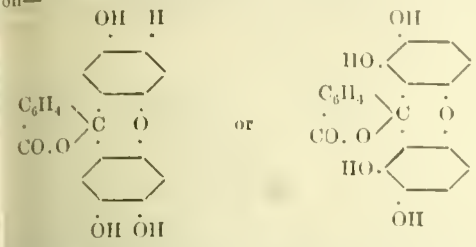
By treating the bisulphite compound of æsculetin w ammonia, Rochleder, in 1867, obtained a remarka fluorescent dyestuff, which he termed Æscorceïn. bisulphite compound has the formula $C_9H_6O_4NaHSO_3$, is not an ordinary double compound. When treated w dilute mineral acids, no sulphur dioxide is given off; residue consists of an organic compound containing sulp and is, in fact, dihydro-æsculetin sulphonic acid. treatment of the sodium salt with ammonia or ethylam vapour, it is converted into æscorceïn sodium sulphon which dissolves in alkalis with a blue colour and a brilli blood-red fluorescence. The product gives a dibrom which dyes blue shades on silk, wool, and chromed cott The reduction product from æsculetin with sodium amalg æscorcin, is probably identical with Rochleder's hy æsculetin. Both products have the formula $C_{18}H_{14}O_8$, at about 300° C., and give the same acetyl compo melting at 274° C. On treatment with ammonia vap hydro-æsculetin is converted into a product having formula $C_{18}H_{13}N_3O_7$, which is soluble in water with a b colour, but no fluorescence, and does not dye wool mordants. On investigating other æsculetin compou like methyl-æsculetin, æsculetin-β-carboxylic acid, and este s, the authors find that like æsculetin itself, no dyes is formed by the action of ammonia. This reaction o takes place with the hydro-derivatives of these compou obtained by the action of bisulphite or of nascent hydro as in the case of the dihydre-æsculetin sulphonic acid o dihydro-æsculetin.—T. A. L.

Dihydroxyfluoresceïn. C. Liebermann. Ber. 1901, 3 [11], 2299—2303.

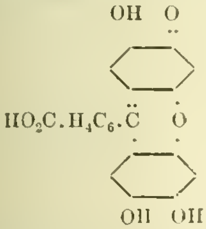
Some years ago the author, with the object of obtain fluoresceïns containing o-hydroxyl groups, and with a v of examining their behaviour towards mordants, prepa fluoresceïns from hemipic and norhemipic acids. T from the latter acid has the formula—



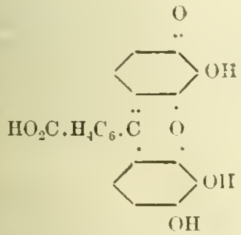
and gives golden-yellow shades on alumina and dark br on iron mordants, the corresponding eosine dyeing alum mordants pink. The shades, however, were of no partic value, and as norhemipic acid was not obtainable in appreciable quantity, the research was abandoned. M recently Thiele (Ber. **31**, 1247) has prepared oxyhy ione, and this product on condensation with phthalic ydride, gives a dihydroxyfluoresceïn having the constiion—



he corresponding quinonoid formula. The condensation . phthalic anhydride takes place readily, as in the case rdinary fluoresceïn, a good yield being obtained. The ss of phthalic anhydride is removed by boiling with r, and the product is recrystallised from dilute alcohol, ning microscopic greenish-golden shining plates. It olves in alcohol with a strong yellowish green fluornce and in alkalis with a cherry-red non-fluorescent colour. solution in concentrated sulphuric acid is pure canaryow. This reaction and the fluorescent alcoholic solution r that the product obtained is not purpurin. On treatt with acetic anhydride and sodium acetate, the tance readily yields the tetra-acetate having the formula $I_x(OC_2H_3O)_4O_3$. which crystallises in small faintlyowish prisms, melting with decomposition at 264° C. droxyfluoresceïn can also be produced from oxyoquinone triacetate (Thiele, *loc. cit.*) by heating 10 by weight of the triacetate, 7 parts of phthalic dride, and 4 parts of concentrated sulphuric acid for a minutes to 145° C., but is somewhat difficult to purify obtained by this process. The product dyes unmored wool and silk orange shades. On an alumina lant it gives a bright orange, on iron a bright violet, on chrome a rose-red shade. All these shades are fast ap and do not fluoresce. The affinity of dihydroxyesceïn for mordants is very marked, the fabric being even in the cold, but preferably at about 50°—60° C. same is the case with Galleïn, and it therefore appears ble that dihydroxyfluoresceïn is represented by the onoid formula—



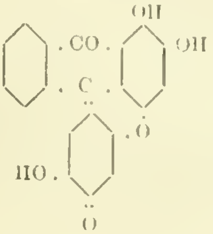
t that of Galleïn is—



latter gives reddish-violet shades on alumina and bluish-violet on iron mordants, due probably to the ent arrangement of the hydroxyl groups, which may ccount for the lack of fluorescence in this compound. e action of bromine on dihydroxyfluoresceïn yields a roxyeosin, which, however, according to analysis rs to be a dibromodihydroxyfluoresceïn. It crystalrom acetic acid in small greenish-golden prisms, whilst olour of its solution in alkalis is not very different that of dihydroxyfluoresceïn. The shades on morare redder, but the difference is not so great as might been expected.—T. A. L.

Dihydroxyfluoresceïn. J. Thiele and C. Jaeger. Ber. 1901, **34**, [12], 2617—2620.

The authors refer to Liebermann's publication (see preceding abstract) on this subject. They obtain dihydroxyfluoresceïn in the same way, but purify it by extracting the crude melt with 30 per cent. sulphuric acid and washing with water. When suspended in four times its weight of glacial acetic acid and treated with four atomic proportions of bromine, it is converted into a dibromide, which dissolves in sodium acetate to a faintly-green fluorescing eosine solution, becoming rose-coloured, and non-fluorescent, on treatment with alkalis. On heating dihydroxyfluoresceïn with 7—8 times its weight of concentrated sulphuric acid for two hours to 120° C. and precipitation with water, a product is obtained to which the name Violeïn has been given. The substance dissolves with a violet colour to a certain extent in nitrobenzene, glacial acetic acid, and aniline, and gives indigo-blue salts with alkalis. It probably has the following constitution :—

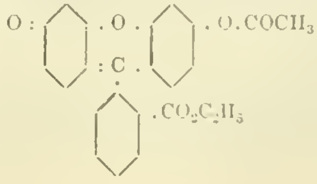


and is thus an anthraquinone derivative similar to Cœruleïn. The tetra-acetate forms a dark brownish-violet powder, easily soluble, with a reddish-violet colour, in glacial acetic acid, acetone, acetic ester, and chloroform, but very slightly soluble in water.—T. A. L.

Oxyhydroquinonephthaleïn ; Fluoresceïn Esters. W. Feuerstein, M. Dutoit and J. Wallach. Ber. 1901, **34**, [12], 2637—2642.

Since oxyhydroquinone by Thiele's researches has become a tolerably readily obtainable substance, and in view of Kostanecki's mordant theory, according to which the introduction of two *o*-hydroxyl groups into any chromophore, confers mordant dyeing properties upon the substance, it appeared of interest to examine the action of phthalic anhydride on oxyhydroquinone. The authors confirm Liebermann's results (see preceding abstracts), and his conclusions as to the formula of the substance which they support by some new facts. They find that the dyestuff contains a carboxyl group, since by heating with alcohol and sulphuric acid it is converted into the ester which crystallises from alcohol in green plates melting at 326° C. The product differs from the original one in being quite insoluble, even in boiling water. By treatment with acetic anhydride and fused sodium acetate, the ester yields the tetracetyl compound which forms orange-yellow crystals melting at 239° C. The tetracetyloxyhydroquinone phthaleïn they find similar to Liebermann, crystallises from acetone, and melts at 264° C., whilst the tetrabenzoyl derivative separates from a mixture of benzene and light petroleum spirit in large crystals.

Fluoresceïn Ester.—Contrary to what has generally been assumed, it is found that fluoresceïn, when heated with twice its weight of absolute alcohol and one and a half times its weight of concentrated sulphuric acid, is converted into its ethyl ester. This product melts at 242° C., is insoluble in sodium bicarbonate, and when boiled with dilute soda lye yields ethyl alcohol and fluoresceïn. On boiling with acetic anhydride and sodium acetate, it yields acetylfluoresceïn ethyl ester having the formula—



and crystallising from acetone in orange-coloured needles melting at 191° C. Fluorescein methyl ester melts at 253° C., and forms shining green crystals with a reddish reflex, very sparingly soluble in the usual solvents.—T. A. L.

Malachite Green; Hydroxy-Derivatives of ——.

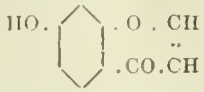
F. Votoček and J. Jelinek. Chem.-Zeit. Rep. 1901, **25**, [76], 274.

The authors find that in the condensation of carbinols, the phenol hydroxyl does not always enter the para position as would be expected, but also the *m*- and *o*-positions. They have condensed tetramethyldiaminodiphenylcarbinol with β-naphthol, phenetol, anisol, guaiacol, and resorcinol methyl ether and dimethylaniline with anisaldehyde *p*-ethoxybenzaldehyde, protocatechualdehyde, piperonal, β-resorcylaldehyde, and β-naphthaldehyde. The introduction of more than one hydroxyl can change the colour of the parent substance Malachite Green to violet. This effect depends upon two factors, the mutual position of the hydroxyls and their position with regard to the methane carbon, and does not therefore follow any simple law. The substitution of the hydroxyl hydrogen by acetyl produces a regular change in the shade of the dyestuff from violet towards the green portion of the spectrum, whilst the replacement of the hydroxyl hydrogens by alkyl groups has scarcely any effect on the shade of the dyestuff. The thiophenols react with tetramethyldiaminodiphenylcarbinol in a different manner from the phenols, and in presence of phosphorus oxychloride, no triphenylmethane dyestuff is formed, but a substance containing sulphur which belongs probably to the aromatic pinacones.—T. A. L.

3-*Hydroxychromone; Synthesis of* ——.

St. v. Kostanecki, L. Paul and J. Tambor. Ber. 1901, **34**, [12], 2475—2479.

It having been shown that the oxidation product of brasilin is 3-hydroxychromonol, the authors propose to continue their investigations in the chromone group with a view of subsequently synthesising brasilin and hæmatoxylin. The chromone derivatives hitherto synthesised have all contained alkyl groups in the β-position of the γ-pyrone ring, whereas the brasilin oxidation product is a derivative of chromone itself. The authors have succeeded in obtaining 3-hydroxychromone—



synthetically as follows:—The Resacetophenone ethyl ether condenses in presence of metallic sodium with oxalic diethyl ester to form 4-ethoxy-2-hydroxybenzoylpyruvic ethyl ester—

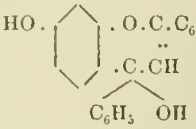
$$4.2.1.C_6H_3.C_2H_5O.OH.CO.CH_2.CO.CO_2C_2H_5$$

which crystallises from alcohol in well-formed white prisms, melting at 100° C. On cohobating the alcoholic solution with hydrochloric acid (sp. gr. 1·19) a voluminous precipitate is formed after some time, consisting of 3-ethoxychromone-β-carboxylic acid. This product separates from alcohol in groups of prismatic needles, melting at 234° C., giving off carbon dioxide and yielding 3-ethoxychromone, which crystallises from dilute alcohol in long needles, melting at 121° C. This differs from the foregoing compound in its behaviour to concentrated sulphuric acid, in which it dissolves to a colorless solution with a violet-blue fluorescence, whereas the carboxylic acid gives a yellow non-fluorescent solution. On boiling the product with hydriodic acid (sp. gr. 1·9) for some time, the alkyl group is removed, and 3-hydroxychromone is formed. This substance crystallises from water in tufts of white needles, melting at 218° C. It dissolves in soda lye to a colorless non-fluorescent solution, and behaves to sulphuric acid like its ethyl ether.—T. A. L.

1.4-*Benzopyranol; Derivatives of* ——. *III.*

C. Bülow and W. von Sicherer. Ber. 1901, **34**, [11], 2368—2385.

In continuation of previous work (see Bülow and Wagner, this Journal, 1901, 704 and 799), and with a view of investigating the stability of the hydroxyl group of the pyranol ring, the authors have condensed dibenzoylmeth the aromatic "homologue" of acetylacetone, with resorci in glacial acetic acid by means of gaseous hydrochloric a and have obtained 2.4-diphenyl-7-hydroxy-[1.4-ben pyranol] having the formula—



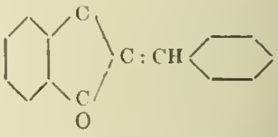
The hydroxyl, attached to the carbon atom 4 has carbin rather than phenolic properties, and on heating the prod with hydrochloric acid under pressure, this hydroxyl replaced by chlorine, which can be split off by suit treatment with water. Moreover, a diacetyl or dibenz compound can be readily obtained, or an acetylbenz derivative. A dimethyl ether has also been prepared. I the previously prepared pyranol derivatives, the new prod gives a hydrochloric acid addition product, and the sulpl and picrate have also been obtained, together with the pla and aurichloride salts. By the action of 15—20 cent. caustic potash at a high temperature, 2.4-diphe 7-hydroxy-[1.4-benzopyranol] is decomposed quant tively into acetophenone and benzoresorcinol. Bromin acetic acid solution gives a crystalline scarlet precipit dissolving to a non-fluorescent solution in concentr sulphuric acid. Reducing agents convert 2.4-diphe 7-hydroxy-[1.4-benzopyranol] into 2.4-diphenyl-7 droxy [1.4-benzodihydropyran), which also gives a fluorescent solution in concentrated sulphuric acid. pyranol derivative only contains the phenolic hydr which is readily identified by its behaviour to alkalis capability of yielding an acetyl compound. The pyr derivative gives, with sodium nitrite, a crystalline nit compound, in which the nitroso group enters the positio This product shows Liebermann's nitroso reaction.

—T. A.

Indandion [Diketohydrindene]; Derivatives of –

E. Noelting and H. Blum. Ber. **34**, [12], 2467—24

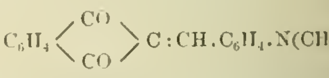
Indandion [diketohydrindene] reacts readily with ben dehyde (Kötzle and Wislicenus, Annalen, **252**, 72) form benzal-indandion—



This substance has the properties of a chromogen accor to Kostanecki (Ber. 1897, **30**, 1183), who showed th dihydroxy derivative (with the hydroxy groups in o position to each other) was a mordant dyestuff.

The authors have prepared amino derivatives of ben indandion, which prove to be weakly basic dyestuff accordance with Kostanecki's view of the parent subst

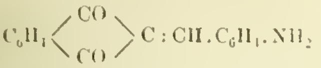
Dimethyl-p-aminobenzal-indandion—



$$C_6H_4\left\langle\begin{matrix}CO\\CO\end{matrix}\right\rangle C:CH.C_6H_4.N(CH_3)_2$$

is prepared by boiling molecular quantities of indandion dimethyl-para-amino-benzaldehyde in alcoholic solutio by heating an intimate mixture of these substanc 150° C. in the oil-bath. The substance (m. pt. 99 sparingly soluble in alcohol, from which it crystallis splendid steel-blue needles. It is more soluble in ben (deep red crystals), but the best solvent is glacial a acid. The hydrochloride is stable only in the absence o and is immediately dissociated by water. Bright red sl are produced on tannined cotton, and also on wool silk, from a weakly acid bath.

p-Aminobenzal-indandion—

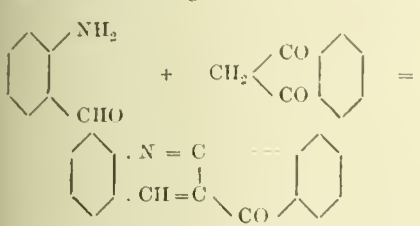


$$C_6H_4\left\langle\begin{matrix}CO\\CO\end{matrix}\right\rangle C:CH.C_6H_4.NH_2$$

Aminobenzaldehyde polymerises on standing and does not et in this condition. It can be depolymerised by disving in hydrochloric acid and reprecipitating by ammonia. e substance is now soluble in alcohol, and the solution ets readily with indandion. *p*-Aminobenzal-indandion strous blue leaflets from alcohol) decomposes at 247°. e solubility in all solvents is less than that of the ethylated product. Tannined cotton, and also wool and , are dyed bright yellow shades.

l′-*Nitro-4′-dimethylamino-benzal-indandion.* — The reion between indandion and nitrodimethyl-*p*-amino zaldehyde is carried out as above. The yield, as in the eeding condensations, is nearly quantitative. Owing to influence of the nitro group, the substance is not able of forming salts, and therefore cannot be fixed on fibre.

ONDENSATION OF O-AMINO BENZALDEHYDE WITH ANDION. — Indandion reacts readily, not only with zaldehyde, but also with aniline; and therefore with mino benzaldehyde, a double condensation takes place, molecules of water being lost.



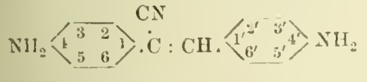
Quinolylene-phenylene-ketone.

uinolylene - phenylene - ketone may be described as a rene ketone in which a quinolylene nucleus replaces benzene nucleus. The reaction is carried out by heating intimate mixture of the two substances (in molecular ortions) on the water-bath. The yield is quantitative. substance melts at 175° (from alcohol). Insoluble ater or alkalis, it dissolves in not too dilute acids. An ne and phenyl-hydrazone are described.

uinolylene-phenylene-methane is obtained by distilling ketone with an excess of zinc dust and zinc oxide. t. 166°—167° (white crystals from alcohol). When the y is heated with lead oxide a *red* substance is produced, ch is doubtless analogous to *Bis*-diphenylenethane, the hydrocarbon obtained by Graebe from fluorene.—H. L.

7-Cyano-stilbene; Isomeric Diamino Bases of ——. M. Freund. Ber. **34**, [12], 3104—3108.

: author shows that 4.4′.*diamino-7-cyano stilbene*—



$$NH_2\left\langle\begin{matrix}3\ \ 2\\4\qquad 1\\5\ \ 6\end{matrix}\right\rangle.\overset{CN}{C}:CH.\left\langle\begin{matrix}2'\ \ 3'\\1'\qquad 4'\\6'\ \ 5'\end{matrix}\right\rangle NH_2$$

the isomeric bases 3.3′-diamino-7-cyano stilbene and -diamino-7-cyano-stilbene (just as *p*-diamino-stilbene enzidine) have the property of forming powerfully tantive tetrazo dyestuffs.

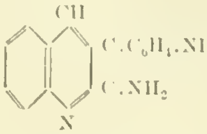
.4′-*dinitro-7-cyano-stilbene* (silky yellow needles, m. pt.) is prepared by the nitration of 7-cyano-stilbene Meyer. Annalen, **250**, 124). The yield is 60—70 per . of the weight of substance taken. The corresponding ino base is obtained on reduction in the form of red-vn needles (from alcohol) which melt at 188°. When is tetrazotised and combined with H-acid, a deep blue tuff is formed; with R-salt a violet-blue is produced.

.3′-*dinitro-7-cyano-stilbene* is the condensation product n-nitrobenzylcyanide with *m*-nitrobenzaldehyde. It is ystalline brown substance melting at 204°. The diamino crystallises from alcohol in flat red needles, m. pt. 145°—146°. The H-acid dyestuff dyes cotton a blue-red, the R-salt combination dyes a salmon red shade.

4.3′-*dinitro-7-cyano-stilbene* has been described by Remse (Ber. **23**, 3135). The diamino base obtained on reduction melts at 108°—110°. The dyestuffs obtained are intermediate in shade between those obtained from the two isomeric bases described above.

Pschorr has shown that the cyano-stilbene derivatives prepared from *o*-nitrobenzaldehyde are converted by a molecular transposition to derivatives of amidoquinoline (Ber. **29**, 196).

The author has obtained *py-1-amino-py-2-aminophenyl-quinoline*—



by the action of tin and hydrochloric acid on 4.2′-*dinitro-7-cyano-stilbene.* The latter substance melts at 184°, and is obtained by condensing *p*-nitrobenzyl-cyanide with *o*-nitrobenzaldehyde by means of sodium ethylate (Remse, *loc. cit.*). An intermediate body (not described by Remse) was obtained, *viz.*, 2′.4-*dinitro-7-hydroxy-7-cyano-diphenyl-ethane*—$NO_2.C_6H_4.CH(OH).CH(CN).C_6H_4NO_2$—melting at 138°. Concentrated sulphuric acid or sodium ethylate converts this substance into 2′.4-dinitro-7-cyano-stilbene.

—H. L.

Di-p-aminophenyl-cyano-butadiën; Substantive Nature of Azo Dyes prepared from ——. M. Freund. Ber. **34**, [12], 3169.

DI-*p*-AMINOPHENYL-CYANO-BUTADIËN—

$$NH_2.C_6H_4.CH:CH.CH:C(CN).C_6H_4.NH_2$$

a base analogous to cyano-diamino-stilbene (see preceding abstract), but in which the two benzene rings are separated by a chain of four carbons, is likewise capable of forming substantive azo dyestuffs. *p*-Nitrocinnamic aldehyde condensed with *p*-nitrobenzyl cyanide yields *di-p-nitrophenyl-cyanobutadiën.* This substance (m. pt. 276° C.) crystallises in yellow needles, which are very sparingly soluble in the usual solvents. On reduction with sodium sulphide, *di-p-aminophenyl-cyano-butadiën* is obtained. The product is crystalline, of a yellow-brown colour, and melts at 196° C. When combined with H acid, it yields a fine blue dyestuff, which dyes unmordanted cotton well. The dyed materials are fast to light, to washing, and to acids.—H. L.

PATENTS.

Colouring Matters [Black]; Production of New ——. I. Levinstein, C. Mensching, and Levinstein, Ltd., Manchester. Eng. Pat. 18,756, Oct. 20, 1900.

THE azo dyestuffs obtained from *o*-nitrophenol and its homologues and diazo-nitranilines give black dyestuffs for cotton when treated with sulphur and sodium sulphide. For example, the azo product obtained in the usual manner from 13·8 kilos. of *p*-nitraniline and an alkaline solution of 13·9 kilos. of *o*-nitrophenol is mixed with 140 kilos. of sodium sulphide and 60 kilos. of sulphur, the whole being heated to 170°—180° C. for three hours, water being added occasionally to prevent the melt becoming dry. It is then heated for one hour to dryness at 180° C., and after grinding, may be at once used for dyeing purposes. The azo dyestuff may also be boiled with 126 kilos. of sodium sulphide and 46 kilos. of sulphur in 150 litres of water, either in an open vessel or under a reflux condenser, for about 24 hours. The reaction product is then made acid, or air is blown through the liquid, until the dyestuff is precipitated. After filtering, the product may be used for dyeing, together with sodium sulphide. The azo products may also be mixed with dinitrophenol, picric or picramic acid, or oxydinitrodiphenylamines or their homologues, and heated with sulphur and an alkaline sulphide as described.—T. A. L.

Colouring Matters [Violet] belonging to the Diphenyl-α-naphthylmethane Series; Manufacture of Sulphonated ——. C. D. Abel, London. From the "Actiengesellschaft für Anilinfabrikation," Berlin. Eng. Pat. 22,456, Dec. 10, 1900.

The patentees sulphonate a diphenyl-α-naphthyl-methane derivative with fuming sulphuric acid at the ordinary temperature. For instance, 20 kilos. of Victoria Blue 4 R. (from tetramethyldiaminobenzophenone and methylphenyl-α-naphthylamine) are stirred into 80 kilos. of fuming sulphuric acid (30 per cent. SO_3) at a temperature not exceeding 20° C. The melt is then heated for about one hour to 35° C. until a sample dissolves completely in dilute ammonia, when the whole is poured on to ice, redissolved in sodium carbonate solution and the sodium salt of the new sulphonic acid which seperates is filtered off. It dyes wool a pure deep violet from an acid bath.—T. A. L.

Nitro-, Azoxy-, Azo-, and Hydrazo-Compounds; Improved Process for Reducing ——. R. J. Urquhart, Manchester. From Weiler-ter-Meer, Uerdingen a/Rhein, Prussia. Eng. Pat. 15,706, Aug. 3, 1901.

The patentees employ iron and caustic soda as reducing agents, the quantities in the case of nitrobenzene, which can be successively reduced to azoxy-, azo-, or hydrazo-benzene or aniline, being as follows:—1,000 kilos. of nitrobenzene and 750 kilos. of iron are heated together in a boiler to about 90° C. 800 kilos. of caustic soda lye (55° B.) are then gradually added, the temperature being maintained at 100°—120° C., by steam or by cooling. When the smell of nitrobenzene has disappeared and the product solidifies at 31° C., the azoxybenzene may be drawn off. In order to produce azobenzene, further 250 kilos. of iron and 30 kilos. of caustic soda lye are added. The solidifying point of the product falls to 25° C. and subsequently rises to about 63° C. denoting the formation of azobenzene. A further quantity of 250 kilos. of iron and 300 kilos. of caustic soda solution yields hydrazobenzene the solidifying point of the product first falling to about 55° C. and afterwards rising to 122°—125° C. In this case the temperature is allowed to rise to 130° C. in order to prevent the product solidifying in the apparatus. In order to carry the reduction on to aniline, another 250 kilos. of iron and 300 kilos. of caustic soda lye are added and the mixture is further heated. The aniline formed is subsequently separated by distillation. All or any of these proportions may be altered as may also the temperatures, and examples are also given in which the reduction takes place in an indifferent medium such as a high-boiling hydrocarbon.—T. A. L.

Marking Inks, for Marking Linen, Cotton, and Silk Fabrics, and the Like, and an Improved Vessel for Holding the Same; Impt. in Coloured ——. A. Raynes, London. Eng. Pat. 21,063, Nov. 21, 1900.

The process described consists substantially in forming Aniline Black on the fibre.—E. B.

V.—PREPARING, BLEACHING, DYEING, PRINTING AND FINISHING TEXTILES, YARNS, AND FIBRES.

Silk; The Fibroïn of. E. Fischer and A. Skita. Chem.-Zeit. Rep. 1901, **25**, [76], 274.

The only decomposition products of silk fibroïn which have hitherto been identified are tyrosine, an aminopropionic acid and glycocoll. The authors now find that the tyrosine is identical with the *l*-tyrosine of caseïn and other proteïds, whilst the aminopropionic acid is identical with *d*-alanine. In order to separate the other amino acids present in fibroïn, recourse has been had to the esterification method. It is found that the composition of fibroïn is more complicated than had been previously assumed, and when decomposed with hydrochloric acid, it yields, in addition to tyrosine, aminopropionic acid and glycocoll, *l*-leucin, *l*-phenylalanine, and some other amino acids. The separation of glycocoll from the amino acids richer in carbon, is
best effected by conversion into the esters and crystallisa
of the glycocoll hydrochloride from alcohol. In orde
determine the relation between the optically active forn
alanine and of lactic acid, the authors have decompo
d-alanine with nitrous acid, obtaining *d*-lactic acid, so-ca
sarcolactic acid. Hence the *d*-alanine corresponds in
stitution to *d*-lactic acid. They obtained from 100 part
fibroïn, 10 parts of *l*-tyrosine, 21 parts of *d*-alanine, 36 p
of glycocoll, and about 1—1·5 parts each of *l*-leucine
l-phenylalanine, and are at present investigating the c
position of silk gum, which, in contradistinction to fib
is rich in diamino acids.—T. A. L.

Gelatin for Albumin in Calico Printing, Substitutio
——. F. Binder and C. Sunder. Bull. Soc. Ind. M
house, 1901, 330—331. (Also Report on the ab
Paper. L. Baumann, *ibid.*, 329.)

The following compounds render gelatin insoluble w
printed in admixture with it and steamed for an h
Sodium carbonate (4 per cent. of the weight of the gela
sodium acetate, aluminium hydrate, chromic hydrate, fer
hydrate, ferrous carbonate, copper oxide, copper carbo
manganese oxide, magnesium carbonate, zinc tan
stannous hydrate, stannic hydrate, and lead acetate.
addition of vegetable or mineral oil, vaselin, &c., incre
the brightness and fastness of the prints. The copper, i
and manganese compounds and zinc tannate give
effects. Magnesium carbonate gradually thickens
printing mixtures, and finally coagulates them. The
results are obtained with zinc acetate. The colours m
with this keep well and coagulate after 4 minutes' steam
Reserve effects may be produced with advantage u
Aniline Black by the use of the mixture of gelatin and
acetate, along with suitable pigments, in place of the u
mixtures containing albumin. A reserve thickening suit
for this purpose consists of 25 parts of glue-gum tragac
paste (prepared by boiling for 6 hours equal parts of
and gum tragacanth paste), 10 parts of zinc acetate, 15 p
of sodium acetate, and 20 parts of oleïn.

Anent the foregoing process, Baumann states that
colours obtained are very bright, and they cost less
the similar colours fixed by means of albumin. On
other hand, however, they are less fast than the latter.
—E.

Chrome Mordants ("Half Discharges"), Action of A
Phosphates upon ——. F. Binder and C. Zundel. I
Soc. Ind. Mulhouse, 1901, 332—333. (Also Re
upon the preceding by C. Schoen. *Ibid.* 331—332.)

When a tissue padded with chromium sulphate-acetat
printed with thickened solutions of the ortho-, meta-,
pyrophosphates of soda respectively, and, after being stea
for a minute, is passed into a hot solution of sodium
bonate, an apple-green colour is obtained where the or
phosphate has been printed, the pyrophosphate givin
grey-purple, and the metaphosphate a dull green col
On dyeing with Gallocyanine, the compounds thus prod
attract the dyestuff considerably less than does the chr
hydrate in the ground of the tissue, "half discharge" ef
resulting. The compound formed from the ortho salt
more than that produced from the meta salt, while
from the pyro salt is very slightly coloured. To apply
reaction in practice, the tissue is first padded in a solu
of chromium sulphate-acetate and dried. It is then pri
with citric acid to produce a white reserve, steamed 1
minutes at 100° C., printed with sodium pyrophosph
again steamed, for a length of time depending upon
degree of "half discharge" desired, fixed in sodium
bonate solution, dyed with any suitable colouring ma
cleared with bleaching powder, soaped and finished.

Schoen who has examined the process, confirms
authors' statements.—E. B.

Methyleneresorcinol as a Mordant for Basic Dyestuf
A. M. Newjadomsky. Färber-Zeit. 1901, **12**, [19], 293–

C. Favre has observed (this Journal, 1901, 710)
"methyleneresorcinol," a compound produced by
action of formaldehyde on resorcinol, is capable of ac
as a mordant for basic dyestuffs, being, it is stated,

fficient in this respect than antimony tannate. The author inds that the mixture suggested by Favre for producing pon the cotton fibre the compound in question, deposits a recipitate after standing for $1—1\frac{1}{2}$ hours and is, consequently, not suitable for use on the large scale. A mixure of 500 c.c. of a 0·2 per cent. solution of resorcinol, 0 c.c. of a 40 per cent. solution of formaldehyde, and 10 c.c. f a solution of sodium bisulphite at 24° B., remains clear for –3 days and gives satisfactory results when padded upon otton tissues. To develop the mordanting compound, the issues may be hung in a cold room for 60 hours, as Favre irects. It is more convenient in practice, however, to ccomplish the development by a short steaming or to pass he tissues into boiling water. The dyeing of the mordant akes place in 20—30 minutes. The colours obtained are uller than those produced upon an antimony tannate ordant. They are faster to soap but less fast to light han the latter. It is difficult to obtain discharge effects pon them. In printing, a mixture of 1 grm. of Methylene lue, 20 grms. of acetic acid at 6° B., 1 grm. of resorcinol, nd 10 c.c. of formaldehyde (40 per cent. solution) (the hickening agent is not mentioned), printed and steamed r 15—10 minutes, gives a bright blue, which possesses ttle fastness to soap and light. Prolonged steaming dulls he colour, a change which is also noticed with other dyeuffs, for instance, Capri Blue and Torquoise Blue. The yestuffs of the triphenylmethane series, along with Rhodaine and Thioflavine T, withstand an hour's steaming. he fastness of the lakes produced from these dyestuffs is lso greater than that of other lakes of the kind. All the kes are brighter when formed upon oil-prepared tissues. dditions of metallic salts, namely, tartar emetic and zinc loride, increase the fastness of the lakes; thus, a mixture 1 grm. of Methylene Blue, 15 grms. of acetic acid at 6° B., 0 grms. of gum solution, 1·5 grms. of resorcinol, 10 c.c. formaldehyde (40 per cent.), and 10 grms. of zinc loride, gives a lake which is slightly faster than that tained as above described. Tartar emetic acts similaryt d is, in general, a more suitable addition than the zinc lt, as it is without the dulling action upon the colour lakes certain dyestuffs which the latter salt exhibits.—E. B.

lk; Method of Detecting certain Weighting Matters in ——. A. Romann. Bull. Soc. Ind. Mulhouse, 1901, 328.

See under XXIII., *page* 1147.

PATENTS.

rtificial Horsehair; Improved Process for Making ——. F. Lehner, Zürich, Switzerland. Eng. Pat. 17,759, Oct. 6, 1900.

HE improvements claimed consist in passing a thread of otton, ramie, cellulose, viscose, nitrocellulose, artificial k, or the like," or several such threads combined to the ickness of a single horsehair, through a solvent such as moniacal copper, zinc chloride, ether-alcohol, sulphuric id. The separate fibres and threads are thus caused to ften and form a homogeneous thread. They are then awn through suitable hardening liquids or exposed to the , to prevent excessive action of the solvents and to prerve the form of the thread. The following is an example the process for a thread composed of cellulose:—The y thread is drawn slowly through a solution of "16 parts weight" of freshly precipitated oxide of copper in 1 litre ammonia (sp. gr. 0·91). After being freed from cess of the solvent by means of a pair of rollers through ich it is drawn, it is passed slowly through a 5 per cent. lution of sulphuric acid, and it is then washed, wound on eel, dried, and finally bleached in a dilute chlorine bath, d washed and dried. The threads obtained, as described, y be further treated with solutions of india-rubber or latin, or with collodion, to fill any defective places in m.—E. B.

rn in the Form of Cops, Bobbins, or the like; Treating ——. W. Coventry, Salford. Eng. Pat. 20,332, Nov. 12, 1900.

is apparatus is an improvement capable of being ap- ed to the cop-dyeing machine previously described (this Journal, 1899, 912). The modified dye vessel is fitted with a central vertical air-pipe surrounded by movable cop-bearing carrier, making joint with a sleeve fixed on the bottom of the vat. The space between the central air-pipe and the interior of the cop-carrier and sleeve forms an annular chamber through which the dyeing liquid circulates. The upper part of the central air-pipe is enlarged and fits the interior of the cop-carrier like a piston. As the carrier slides upwards over the enlarged upper end of the air-pipe, an air-valve fitted in the latter opens and places that portion of the carrier which is above the piston end in communication with the air-pump. The enlarged end of the central pillar also serves to cut off that portion of the carrier which is still in contact with the liquid from the action of the air, and this avoids any risk of drawing some of the solution into the air-pipe.—G. T. M.

Dyeing Machines; Apparatus connected with Revolving Swift Hank ——. A. B Burrows, Liversedge, Yorkshire. Eng. Pat. 20,595, Nov. 15, 1900.

The swift is lifted from the dye vat by means of a mechanism which stops automatically when the frame is raised to the required height. This result is attained by attaching, by means of brackets or hangers, the uppermost horizontal side of the swift frame to a horizontal rail, which can be moved in a vertical plane by means of chains fastened to each end, connected together by a hook, and attached to a winding-on boss or drum driven by worm gearing. The end of the movable rail nearer the driving gear carries a bracket through which passes a vertical rod having at its upper end an adjustable stop-nut. The lower end of the vertical rod is connected with one arm of a bell-crank lever, the latter operating a strap fork-rod, which shifts the driving belt from the fast to the loose pulley. The height to which the swift rises is determined by the position of the adjustable stop-nut on the vertical rod. As the bracket on the horizontal rail attains the required position, it lifts the stop-nut, thus causing the automatic stop-motion to come into operation.—G. T. M.

Dyeing and otherwise Treating Yarn in "Cheese" and other Compact Form; Apparatus for ——. C. Hartley, Seedley, Lancashire. Eng. Pat. 20,150, Nov. 9, 1900.

It is often extremely difficult, after a dyeing operation, to remove the ordinary perforated metal tubes from the paper tubes on which the yarn is wound in "cheese" or similar forms. To overcome this difficulty perforated metal tubes, having longitudinal slits, are employed, and a tapering ring or conical nozzle is inserted into the split end of the tube, causing it to expand and press against the paper tube. After the dyeing operation the ring or nozzle is removed, the tube then collapses and is readily withdrawn from the "cheese."

The perforated metal tubes carrying the "cheeses" are mounted on a horizontal plate, fitted with a series of hollow vertical pillars, and from the closed upper ends of each of these four radiating tubes proceed to the upper ends of the same number of "cheese" bearing tubes. The hollow pillars and the lower ends of the perforated tubes being placed in communication with the air-pipe, the suction action of the pump is simultaneously applied to both ends of the "cheese."—G. T. M.

Dyeing and otherwise Treating Yarn in Cop and other Similar Compact Form; Apparatus for ——. C. Hartley, Seedley, Lancashire. Eng. Pat. 20,158, Nov. 9, 1900.

This apparatus, consisting of a cistern fitted with fluid inlet and outlet, and having round its upper edge a channel communicating with the interior by means of a slot, contains a movable box or frame sliding vertically on the sides of the cistern and supporting the perforated cop-carrying spindles on hollow tables attached to the frame plates. These hollow tables have outlets leading into the inner chamber of the frame. When the frame is in position, its outlet is in contact with that of the cistern. The apparatus is also fitted with a vertical air-pipe passing from the base of the cistern, through the inner chamber of the frame, and having at its upper end an air-chamber furnished with apertures corresponding with those of the hollow tables.

When the circulating pump is set in motion, the dyeing liquid passes successively through cops, spindles, hollow tables, frame-chamber and cistern outlet, and is then forced back into the channel round the upper edge of the cistern and thence into the cistern again.

After the dyeing operation the frame is slowly raised, and as the apertures of the hollow tables pass over those of the air-chamber, the cops are successively subjected to the suction action of the air-pump and drained of superfluous liquid.—G. T. M.

Dyeing, Sizing or Slashing, Washing, and Similarly Treating Warps; Apparatus for ——. W. E. Heys, Manchester. From Adolphe Masseron, J. Pivert, F. Chaplet, E. J. Mueller and J. Caquelin, Paris. Eng. Pat. 14,619, July 18, 1901.

The apparatus described consists of a system of rollers arranged to carry the whole or a portion of a warp through a series of dyeing becks, subsequently bringing the whole of the dyed and undyed warp into the sizing or slashing vats. Before passing to the slashing vat, the warp is subjected to the action of a hollow compensating roller, the function of which is take up any slackness of the warp and maintain uniformity of tension. Since the whole or only a part of the warp may pass under the compensating roller, it becomes necessary to control the amount of pressure exerted by the roller. Instead of employing several rollers, the required variation in weight is attained by the introduction or withdrawal of liquid through an opening in the hollow roller.—G. T. M.

Power-Dyeing Machines used in Dyeing of Yarns and the Like ——. E. Preston, Kidderminster. Eng. Pat. 21,542. Nov. 28, 1901.

The dye vat, made of sufficient length to accommodate one or more swifts placed in parallel, is deep enough to admit of the total immersion of the rotating frames in the dye liquor. An additional improvement is effected by closing the vat with aluminium or copper covers during the dyeing operation. The swift employed in this machine consists of a rectangular frame rotating about a horizontal axis by means of suitable gearing. Adjustable arms are arranged on the inner sides of the frame, the opposite arms being connected by rods or tubes carrying the hanks of yarn. The swifts are raised and lowered in the ordinary way.
—G. T. M.

Blue Shades Fast to Light; An Improved Process for Producing on Wool ——. H. E. Newton, London. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 21,130, Nov. 22, 1900.

The dyestuffs prepared by combining diazotised *p*-nitro-*o*-aminosalicylic acid (OH : COOH : NO_2 : NH_2 = 1 : 2 : 4 : 6) in an alkaline solution, with aminohydroxynaphthalene sulphonic acids containing the NH_2 and OH groups in the peri-position, such as the 3—3′ and 2—4 disulphonic and 4-monosulphonic acids of 1—1′-aminonaphthol, dye wool from an acid bath reddish shades, which do not resist light. By the action of copper salts these are turned from red to blue and are rendered fast to light.—E. B.

Dyeing Patterns on Fabrics. J. Bolland, Ashton-on-Mersey. Eng. Pat. 17,508, Oct. 3, 1900.

Portions of textile fabrics or other materials are preserved from the action of dye liquors by enclosing them in soft metal forms before dyeing. After dyeing, the forms are removed and the materials are washed, &c., and finished as usual.—E. B.

Wool; Rendering Incapable of Absorbing Dyestuffs. O. Imray, London. From The Farbwerke vormals Meister, Lucius und Brüning, Hoechst a/Main, Germany. Eng. Pat. 19,668, Nov. 2, 1900.

Wool is rendered incapable of absorbing dyestuffs of all classes except the basic class, by treating it with tannin substances in a hot bath and then with certain metallic salts; of these antimony and chromium salts being found to
be the most suitable. Aluminium and zinc salts have n
sufficient fixing power to be of much use. Stannous sal
may be used with advantage, especially when antimo
and chromium compounds have been employed to fix t
tannic acid, to strengthen the discharging action up
azo dyestuffs of the wool thus treated. Iron and copp
salts are less applicable, owing to the dulness of t
compounds which they yield. Titanium salts give a yell
compound which is not always advantageous. The followi
example illustrates the process :—100 kilos. of woollen ya
are boiled for an hour in about 3,000 litres of water wi
25 kilos. of tannic acid and are then treated for half
hour in a separate bath with 15 kilos. of tartar emetic. T
yarn is then rinsed and dried. The result is improved
adding to the rinsing bath 3 kilos. of sodium stannate alo
with the same amount of concentrated hydrochloric acid, a
working for some time in this. The yarn thus treated
woven in appropriate designs with white, unprepared wooll
yarn. Tissues are thus obtained which when they are dy
give two coloured effects, since the prepared wool absor
acid and mordant dyestuffs less and basic dyestuffs mo
than the unprepared wool.

The effect may be varied by dyeing with two dyestu
for instance, an acid and a basic dyestuff, of differe
colours, or the wool, *e.g.*, in the loose state, before bei
prepared, may be dyed, for example, with Cœrulein af
being mordanted as usual with chrome, and after it h
been prepared and spun with unprepared wool, the latt
may be dyed with an acid dyestuff, for instance, Victo
Scarlet 3 R, which will not dye the prepared wool.
scarlet and olive coloured material is produced in the lat
case.

For tissues, the process is especially valuable in printi
For example, a suitably thickened mixture, containing
litre 200 grms. of tannic acid and 100 grms. of acetic a
at 8° B., is printed upon a woollen tissue, and this is steam
for one hour and then treated for half an hour in a hot b
containing 5 per cent. (of the weight of the wool) of tar
emetic. After being well rinsed the tissue is dyed, vari
two-shade or two-colour effects being obtained according
the dyestuffs employed.—E. B.

Printing Cotton with Sulphur Dyestuffs; New Process
——. H. E. Newton, London. From The Farb
fabriken vormals F. Bayer and Co., Elberfeld, Germa
Eng. Pat. 19,670, Nov. 2, 1900.

The commercial preparations of the sulphur dyestu
(Vidal Black, Immedial Black, &c.), although they h
acquired a high technical value in dyeing, have b
employed only to a limited extent in calico printing. T
is due to the fact that they contain inorganic sulp
compounds, such as sodium sulphide, which blacken
copper rollers used in printing. The present invention
for its object the preparation of mixtures suitable
printing, containing the organic sulphur compounds i
reduced state and free from injurious sulphur compou
This is attained :—First, by dissolving the dyestuffs in wat
precipitating them with common salt or acids, and tre
ing with alkaline reducing agents the dyestuffs wh
have been thus purified. Secondly, by simultaneou
precipitating the inorganic sulphuretted compounds a
reducing the dyestuffs by means of suitable metals, s
as zinc, along with caustic alkalis. Thirdly, by effect
the reduction of the dyestuffs by means of alkaline reduc
mixtures, such as caustic soda and glucose, without met
and then precipitating the hydrogen sulphide by the additi
of suitable metallic salts, for instance, copper sulphate a
"pyrolignite of iron." As an example of the second
these methods, a mixture of 15 grms. of Katigen Black
20 c.c. of water, 10 grms. of zinc dust, and 18 grms.
caustic soda-lye at 48° B., is boiled for 2—3 minutes, u
the reduction is completed, 35 grms. of gum tragaca
paste (65 : 1,000) and 2 grms. of glucose (to increase
stability of the printing mixture) are added, and
mixture, after cooling, is strained to remove the z
sulphide which has been formed. The tissue printed w
this mixture is dried, steamed for 10 minutes with
pressure, rinsed, and soaped. A fast black colour is t
obtained.—E. B.

nting Textile Materials with Indigo. B. Willcox, ondon. From The Badische Anilin und Soda Fabrik, udwigshafen-on-Rhine, Germany. Eng. Pat. 22,402, ec. 8, 1900.

ol and silk, as well as cotton, are printed with Indigo tout the aid of a strong alkali, by the use in the printing tures of a solid hydrosulphite, in particular, the very le double salts, zinc sodium hydrosulphite and zinc ium hydrosulphite. The reduction of the Indigo takes e readily on the printed materials in the presence of kly alkaline substances, such as borax, magnesia, sodium ate, carbonate, bicarbonate and phosphate, and soap.

he process is carried out either by mixing the Indigo the hydrosulphite chosen and printing upon the erial previously prepared with an alkali salt, or by ctly printing a mixture of Indigo, hydrosulphite, and alkaline substance, such as magnesia or sodium bionate, which reacts only at a higher temperature. In er case the material, after printing, is steamed, when reduction of the Indigo takes place and the Indigo White h is formed, is fixed upon the fibre. The materials finally treated as usual to reproduce the Indigo Blue. example, wool and silk, first padded with a 5 per cent. tion of borax, and cotton similarly treated with a tion of sodium silicate at 6° B., are printed with a ture of 5—50 parts of "Indigo pure" in powder, 25— parts of zinc sodium hydrosulphite, 170—200 parts of r, and 800—600 parts of gum thickening (1:1). The erials are next steamed 3—4 minutes in a Mather and t's steam-ageing machine, and are then washed in the l way.

ool and silk can be printed with Indigo by this process ades ranging from a pale pearl-blue to a deep bluek. The fastness of the colours is greater than has erto been achieved in printing, and the fibres are not kened. As applied to cotton, the process offers the ntage that the Indigo can be printed without any ptional care being taken in the steaming and other ations.—E. B.

pet-cleaning Soap; Apparatus for Making ——. . S. Jones. From S. Feder and J. van de Bücken. ag. Pat. 14,085, July 10, 1901.

See under XII., *page* 1122.

ous and other Material [Yarn, &c.]; Drying of ——, d Apparatus therefor. F. Hiorth. Eng. Pat. 14,090, ly 10, 1901.

See under I., *page* 1095.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

ectrolytic Printing. Engineering, Aug. 16, 1901, 225.

the method devised by Friese-Greene (this Journal, , 841), the same presses and type can be used as tofore, but, instead of inking the type, the latter is ected to the negative pole of a source of electricity. paper is impregnated with suitable compounds, and pressure rolls are connected to the positive pole. As paper passes through the press, it is traversed by the ent, and the impregnating material is decomposed, ing a sharp impression of the type to appear on the ace of the paper. The amount of impregnating material led to give a good impression is stated to be small. It originally proposed to use a mixture of manganese hate and nitrate of soda; this gives a dark brown imsion, which tends to become blacker with age. It is ed, however, that means have been discovered for ining a perfectly black impression, sharper than can obtained with ink. It is possible to produce about 00 impressions per hour, and to print on both sides of paper. By using different impregnating materials, ts can be obtained in a greater variety of colours.—A. S.

Leather Dyeing; Application of Titanium Salts for ——. M. C. Lamb. J. Soc. Dyers and Colorists, 1901, **17**, [9 , 214—216.

Titanium salts unite with the tannin matter of leather to form on the fibre a yellowish-brown titanium tannate, which is exceedingly fast to light and to the action of soap. Basic titanium oxalate, potassium titanium oxalate, and "tanno-potassium titanium oxalate" have been experimented with; they all produce a yellow-brown tint on the leather, and also fix any excess of tannin matter in the hide. Potassium titanium oxalate, on account of its cheapness, is the most useful. This salt is exceedingly soluble in hot water, and may be applied to tanned leather either with the brush or in the dye-bath. The colour obtained depends on the nature of the tannage, and also on the amount of salt used, the range being from a bright yellow-brown, resembling the shade produced on leather by "Phosphine," to a reddish yellow-brown, like that given by Indian Yellow R.

The basic colours especially give much fuller and richer shades with titanium than without.

Application to Vegetable-tanned Leather.—Dry crust skins are wetted down by steeping in water at about 45° C. and then washed in the drum for about half-an-hour at a similar temperature, to remove any large excess of tanning matter, and to distribute the remainder evenly through the skins. The goods are then worked in the drum or tray (preferably the former) with a solution of titanium salt for a period of 15 to 30 minutes at about 45° C., until the leather has become a good commercial shade of yellow-brown. They are then well washed in warm water and dyed or topped with acid or basic dyestuffs as desired.

Calf skins should be well scoured with soda before treatment, whilst Persians and other foreign tannages should be scoured, soured, and retanned in sumach.

In order to obtain blacks, the leather must be first dyed with a neutral solution of logwood, and then passed through a bath of potassium titanium oxalate (2 lb. of oxalate to 50 galls. of water) at as high a temperature as the leather will safely stand (Procter).

When the leather has to be merely stained, the goods must be well scoured, set out, and allowed to "sam," then set out quite flat on the table, grain side up, and brushed from the middle with a 1 per cent. solution of titanium salt.

Application to Chrome-tanned Leather.—The leather, after tanning, either by the single or double bath method, is washed in borax solution to remove free acid, and then in water, and finally mordanted with a vegetable tannin substance. Three lb. of gambier and 1 lb. of sumach extract are dissolved in water and diluted with sufficient water at 50° C. to tan 100 lb. of leather (wet) in the drum or paddle. When a light yellow colour is produced on the goods, they are removed, washed, and placed in the titanium salt (2 to 3 lb. for each 50 galls. of water) in the trough. The tannin and titanium salt unite on the leather producing a yellow-brown tint. The goods are then washed, struck out, and fat-liquored.

Application to Chamois Leather.—A variety of shades may be obtained on this class of leathers by treating them with dilute alkali (mild) to remove oxidised oil, and then drumming with a solution of titanium salt (1 per cent.), and dyeing, also in the drum, at about 45° C., for half-an-hour without previous washing.

A list is given showing the colours obtainable with alizarin colours and natural dyestuffs.—R. L. J.

Horn and Ivory; Dyeing and Bleaching ——. Textile Colorist, 1901, **23**, [273], 285.

In order to produce light colours on horn it is necessary to bleach the horn previous to dyeing. The bleaching is performed by treating the horn in a bath made of red lead, quicklime, and potash lye, the quantities being regulated by the original colour of the horn. After treatment with the red lead solution, the horn is passed through an acid bath of about 20 per cent. strength. After bleaching, the horn is dried in bran and polished with a fine linen cloth when it is ready to be dyed.

The dyeing is performed by steeping the horn in an alcoholic solution of a suitable aniline dyestuff. A yellow may be produced by steeping the horn in a warm solution of potassium chromate, until the desired shade is obtained.

Ivory can be bleached by exposing it immersed in water for three or four days, to the rays of the sun; a quicker process, however, is to immerse it alternately in a 4 per cent. solution of potassium permanganate and a 1 per cent. solution of oxalic acid; the ivory being allowed to remain half an hour in each solution, after which it is transferred to a hot mixture of bran, lime, and water, and is finally rubbed dry with sawdust.

Hydrogen peroxide may be used for bleaching; chlorine imparts a yellow tint to the ivory. Ivory is dyed in an exactly similar manner to horn.—M. C. L.

VII.—ACIDS, ALKALIS, AND SALTS.

Hydrochloric Acid Free from Sulphuric Acid; Preparation of ——. C. Scheuer, Linden, Hanover. Ger. Pat. 123,861, Dec. 5, 1900. Zeits. angew. Chem. 1901, **14**, [38], 954.

The impure hydrochloric acid is run in a continuous stream into a boiling solution of magnesium chloride, boiling at 118° to 120° C. The hydrochloric acid distils over without loss, free from sulphuric acid and iron. When the magnesium chloride solution has taken up so much sulphate that the above-mentioned boiling point is no longer maintained, the solution can be used in the manufacture of magnesium sulphate.—C. A. M.

Manganic Acid and Barium Manganates. G. Kassner and H. Keller. Archiv, **239**, [7], 473—490.

Reviewing the work of Jolles, the authors find that the barium manganate obtained by precipitating potassium manganate with barium chloride in alkaline solution, is never pure, being contaminated with barium carbonate, oxides of manganese, and barium permanganate. Their results do not accord with the formula $BaMnO_4.H_2O$, since their salt only lost 2·97 per cent. in drying, as compared with the theoretical quantity, 6·57. They found that the reduction of barium manganate to manganite is best attained by means of hydrogen peroxide. When potassium ferrocyanide is employed for the purpose, the product is contaminated with iron; to remove this, prolonged washing, which results in dissociation, is necessary. The formula attributed to the salt $BaMnO_4, H_2O$, thus obtained, would appear to be correct, since after 12 weeks' drying it loses 6·8 per cent. in weight. They find that the theoretical quantities necessary for the preparation of potassium manganate do not agree quantitatively with the equation—

$$2KMnO_4 + 2KHO = H_2O + 2K_2MnO_4 + O,$$

more potassium hydrate, equivalent to one and a half or twice the quantity thus indicated, being necessary to obtain the theoretical yield of manganate.—J. O. B.

Potassium Ferro- and Ferri-Cyanides; Action of Carbon Dioxide on Aqueous Solutions of ——. J. Matuschek. Chem.-Zeit. 1901, **25**, [77], 815.

At the ordinary temperature and away from the action of direct sunlight, carbon dioxide acts slowly on an aqueous solution of potassium ferrocyanide whilst a ferricyanide solution of equal iron content is unaffected. At 100° C. both solutions are attacked by carbon dioxide with formation of ferric hydroxide, potassium carbonate, and hydrogen cyanide, the reactions in the two cases being expressed by the equations:—

$$(1)\ K_6Fe_2(CN)_{12} + 3CO_2 + 9H_2O =$$
$$Fe_2(OH)_6 + 3K_2CO_3 + 12HCN.$$

$$(2)\ 2K_4Fe(CN)_6 + 4CO_2 + 9H_2O + O =$$
$$Fe_2(OH)_6 + 4K_2CO_3 + 12HCN.$$

In both cases some of the hydrogen cyanide under decomposition in the presence of potassium carbonate, formation of ammonia and formic acid.—T. H. P.

Alkalis and Acids; Micro-Chemical Detection of Ozone and Water; Detection of Small Quantitie ——. F. Emich.

See under XXIII., *page* 1142.

PATENTS.

Sulphuric Acid; Apparatus for Concentrating –. C. A. Flanagan, Stretford, Lancaster. Eng. Pat. 3 Feb. 19, 1901.

A series of shallow open lead pans is set on brickw heated by the waste furnace gases, the pans communica by pipes, and the acid being delivered from the last of pans into the first of two or more stills by a siphon. stills are of cast-iron, enamelled inside, each set i separate furnace, at successively lower elevations. conical lead hood is provided to each still, having on outside a number of turned-up shelves, answering purpose of troughs, the uppermost of which receives water, which successively overflows each trough, an led away from the flange into which the hood is set. siphoned lead draught pipe with a luted joint set in e hood carries the vapours into a main pipe leading t condenser. The acid, as it is concentrated, passes by overflow pipe from still to still until it reaches the lo of the series, whence it is conducted to a cooling cist for siphoning into carboys. The condenser, receiving fumes from the stills, is an open wood-lined cistern, taining a series of closed leaden boxes, connected, the to the draught pipe, and then successively by siphon the rest of the series, from the last of which the un densed gases pass to a chimney or water tower. The w of condensation is taken by a pipe from each closed ve to a long trough connected to the lower end of the w in the acid cooler, or to the drain.—E. S.

Sulphuretted Hydrogen, and other By-Products f Alkali and other Works; Treatment or Utilization ——. G. Wilton, Beckton, Essex. Eng. Pat. 15, July 30, 1901.

The hydrogen sulphide is burned in a special furnace, the sulphur dioxide is scrubbed in towers packed w limestone. Down these towers, waste liquor from ammonia stills in the ammonium sulphate manufact is caused to trickle; or this waste liquor may be used absorb the acid independently of the limestone, to obt an inoffensive effluent. Another process consists in pass the sulphur dioxide, with excess oxygen, through tow containing iron scrap, sprayed with water, or mother liq derived from the crystallisation out of the ferrous sulph produced in the process, tanks being provided to collect effluent, which is concentrated so as to yield cryst Apparatus is shown in which these processes are combin The hydrogen sulphide is led into a brick-work furn immediately over burning coke on the firebars, and t passes into a second chamber, over refractory material bel which a gas burner is set, the flames from which ens combustion; baffle-plates are set above. Valved passa are provided for admission of air, which in this case is ma tained in excess. The SO_2 is taken from the furnace near the top of a tower made of a lead casing, lined w acid-resisting brick, and supported by wooden frami The first and second towers are charged with iron scr and the following tower or towers with limestone. The passes from the top to the bottom, and from the bottom the top of each successive tower.—E. S.

Bicarbonate of Soda; The Precipitation of ——. P. Na New York, U.S.A. Eng. Pat. 16,973, Sept. 24, 1900.

The invention relates to the precipitation of sodium bic bonate from ammoniacal solution of sodium chloride carbon-dioxide, which may be derived partly from purifi furnace gases, and partly from limekiln gases, the heat such gases being first utilised in distilling ammonia fr

ammonium chloride solution of the ammonia-soda
ocess. Instead of using furnace gases, producer gas may
first made, purified, burned for whatever purpose desired,
l the gases of combustion be applied as described. The
paratus consists of two revolving cylinders, arranged
rizontally, one above the other, the uppermost receiving
liquor to be treated, whence it flows through an external
ved passage into the lower cylinder, and thence into a
tling vessel, fitted with an agitator, and means for with-
wing the sodium bicarbonate deposited. Kiln gases pass
o the lower cylinder in a contrary direction to the flow of
uor, and are led from the opposite end into the upper
inder, into which also pass furnace gases, so led as to
x with the kiln gases: thus the liquor is constantly
ayed in an atmosphere of carbon dioxide. In another
m of apparatus, a single horizontal revolving cylinder
eives the liquor, which passes thence into a vertical
umn or tower after passage through a settling vat,
l finally flows into another settling vat, both con-
ucted similarly to that first described. The rich gases
ter near the bottom of the tower, from the top of which
y are led, after mixture with furnace gases, into the
inder, this arrangement including the two systems of
xing the gas with the liquor, with, and without pressure.
is stated that thus the advantage is gained "that only a
all part of the gas has to be pumped, and that against
pressure." Reference is made to Eng. Pats. 13,771 and
404, both of 1899 (this Journal, 1900, 1014 and 1901,
, respectively). There are 37 claims.—E. S.

rbonate of Magnesia, Manufacture of ——. W. Marsh,
Manchester. Eng. Pat. 17,888, Oct. 9, 1900.

the manufacture of magnesium carbonate by the Paterson
ocess (the treatment of burnt dolomite powder diffused in
ter with CO_2 under pressure), the inventor adds 5 per cent.
more of vegetable or animal charcoal, or of petroleum
to the burnt dolomite diffused in water and passes
carbon dioxide under a pressure of about 160 lb. to
sq. in., with agitation. When magnesite is used, a
all proportion of burnt dolomite or lime may be added to
liquid. The described process is stated to increase the
ld of light magnesium carbonate from 2 per cent. to
er cent.—E. S.

kali Cyanides; the Manufacture or Preparation of ——.
G. W. Johnson, London. From The Deutsche Gold und
Silber Scheide-Anstalt vormals Rössler of Frankfort-on-
Main, Germany. Eng. Pat. 21,820, Dec. 1, 1900.

is is an improvement on the synthetic process for the
duction of alkali cyanides from an alkali metal,
monia, and carbon, described in Eng. Pat. 21,732, 1894
is Journal, 1895, 968). Sodium cyanide, for instance,
melted in a vessel built in a furnace, in which the heat
be efficiently regulated, and the calculated quantity of
ali metal and carbon to form an amide being added, at a
nperature just sufficient to maintain fusion of the mass,
monia gas is passed through the mixture. The alkali
ide first formed combines with the cyanide to form a
lkali-cyanamide, with which the carbon combines to
duce a cyanide. The temperature is somewhat raised
ards the end of the operation. By "alkali metal" is
lerstood to be included lead-sodium alloy, for instance.
—E. S.

PATENTS.

ectrolytic Apparatus. [Bleaching Liquor.] M. Haas.
Eng. Pat. 14,946, 1901.

See under XI. A., *page* 1120.

lorine and Alkali; Electrolytic Apparatus for Producing ——. J. Mactear. Eng. Pat. 16,874, 1901.

See under XI. A., *page* 1121.

*kaline Salt Solutions; Process and Apparatus for the
Electrolytic Decomposition of* ——. A. J. de Brits e
Cunha. Eng. Pat. 16,801, 1900.

See under XI. A., *page* 1121.

VIII.—GLASS, POTTERY, ENAMELS.

Lead Oxide; Volatility of ——. M. Stoermer. Chem.-Zeit. 1901, **25**, [77], 818.

The author has made a number of experiments on the behaviour of lead glasses when heated, and from the results draws the following conclusions:—In the fritting of lead glasses a part of the lead oxide is lost, the loss being greater as the proportion of lead oxide in the glass increases. More lead is lost if the fritting takes place in a reducing fire. The ready-formed lead glasses do not lose in weight when again heated in an oxidising fire, but in a reducing (smoky) fire, the lead silicate is destroyed, lead being set free and vaporised. Lead silicate is hence not volatilised as such, but as metallic lead and during fritting as lead oxide. In the preparation of lead glazes, a smoky fire must, therefore, be carefully avoided, since it results in the volatilisation of part of the flux in the form of lead, the glaze being thereby destroyed, and rendered more difficultly fusible. The glaze will then not become bright at the same temperature, as if it were burnt in an oxidising fire.
—T. H. P.

Enamelling. Engineer, 1901, **92**, [2382], 194; [2384], 238; [2385], 264; [2387], 323; [2388], 347.

A detailed description of the manufacture of enamelled ware is given, with diagrams of the apparatus employed. In particular, attention is drawn to the decadence of enamelling in England, and it is shown how, on the other hand, the industry has undergone an enormous development in Austria and Germany. The enamelling industry includes:—(1) Hollow-ware enamelling for domestic use; (2) hollow-ware enamelling for chemical use; (3) enamelling locomotive and other tubes; (4) enamelling drain- and water-pipes; (5) signboard enamelling.

All enamelled ware first receives a fundamental or "grey" coating of a composition chiefly composed of glass. This is followed by a coating of "white" or glaze, any additional colour required being laid on above the white.

In signboard enamelling, the iron plates, after levelling or setting, are dipped into a hydrochloric acid (1 : 1) bath, then heated to redness to loosen the scale, cleaned in dilute sulphuric acid, rinsed in cold water, thoroughly scoured with fine sand, rinsed in boiling water, and allowed to dry. With hollow-ware, the hydrochloric acid bath may be omitted. The enamelling process should immediately follow the drying. The enamel mixings are applied to the metal either in the form of a powder or of a liquid paste, the latter method being the one more generally in use at the present time. When the enamel is applied as a powder, the metal is first rubbed with a cloth which has been dipped in a solution of gum, and the powder then carefully dusted through a sieve over the surface. When using the liquid paste, either the surface to be coated is dipped into the liquid, or the latter is carefully poured over it, any surplus being drained off, and any parts which are not to be coated, wiped clean with a cloth. The first or "grey" coating is dried at about 160° C., and then fused on in a suitable furnace (usually a muffle) at a cherry-red to white heat (about 1,200° C.). The object is then allowed to cool slowly and uniformly. The "white" coating which is next applied, should be made as liquid as possible, and should be fused on at a somewhat lower temperature (about 1,050° C.). The coloured coating is applied in a similar manner to the white.

In preparing the enamel mixings, the constituents are thoroughly ground and mixed, then fused together and reground. The fusing of the mixture is carried on in crucibles in suitable furnaces, and the melt is run into water, in order to render the material brittle and easy to grind. In grinding, it is essential that the construction of the mill be such as to prevent any iron-fitting from coming in contact with the material, as contamination with iron would cause discoloration of the enamel. The mixing of the powdered enamel constituents can be carried on in rotating barrels or churns. The "grey" or fundamental mixing should be kept in a condition only just sufficiently liquid to allow of being poured out, a suitable quantity of water being added when the mixing is required for use. The "white" composition is mixed with water and kept in tubs until used; it should be carefully protected from dust.

Some of the more important points to be observed are:—The plates or other articles must first be thoroughly cleaned.

The "grey" coating must be "fused not only on but also into the metal" at a bright red—almost white—heat, and must fuse at a higher temperature than the "white" composition, so that it is not affected when the latter is applied. The compositions should have approximately the same capacities of expansion and contraction as the metals to which they are to be applied. After the application of the enamel coatings, slow and uniform cooling of the articles is essential. It is important both for the sake of economy and for obtaining good results, that experimental tests be made with each separate batch of enamel mixings.

The following are examples of the compositions employed.

For "grey" or fundamental coatings:—

(1)

	Per Cent.
Almost any kind of glass.	49
Oxide of lead	47
Fused borax	4

(2)

	Per Cent.
Glass (any kind)	61
Red lead	22
Borax	16
Nitre	1

(3)

	Per Cent.
Quartz	67·5
Borax	29·5
"Enamelling soda"	3·0

This is specially adapted for iron pipes.

(4)

Frit of:—	Per Cent.
Silica powder	60
Borax	33
White lead	7

Fused and then ground with—
$\frac{3}{10}$ weight of silica frit.
Clay, $\frac{1}{10}$ weight of silica frit.
Magnesia, $\frac{1}{3}$ weight of white lead.

(5)

	Per Cent.
Silica	65
Borax	14
Oxide of lead	4
Clay	15
Magnesia	2

This is a fair average of several mixings, and can be varied slightly to suit different conditions of work.

For "white" or glaze:—

(1)

	Per Cent.
Felspar	33
Borax	22·5
Quartz	16·5
Oxide of tin	15
Soda	8
Fluorspar	3·75
Saltpetre	2·25

(2)

	Per Cent.
Cullet	20
Powdered flint	15
Lead	52
Soda	4·5
Arsenic	4·5
Nitre	4

(3)

Frit of:—	Per Cent.
Silica powder	30
Oxide of tin	18
Borax	17
Soda	8·5
Nitre	7·5
White lead	5·5
Ammonium carbonate	5·5
Magnesia	4
Silica powder	4

(4)

Frit of:—	Per Cent.
Silica powder	26
Oxide of tin	21
Borax	20
Soda	10·25
Nitre	7
Ammonium carbonate	5
Magnesia	3·25

This should be ground up with the following:—

	Per Cent.
Silica powder	4·25
Oxide of tin	2·25
Soda	0·5
Magnesia	0·5

(5)

	Per Cent.
Felspar	41
Borax	35
Oxide of tin	17
Nitre	7

(6)

	Per Cen
Borax	30
Felspar	22
Silica powder	17·5
Oxide of tin	15
Soda	13·5
Nitre	2

(7)

	Per Cent.
Borax	28
Oxide of tin	19·5
Cullet	18
Silica powder	17·5
Nitre	9·5
Magnesia	5
Clay	2·5

To this must be added, whils being ground, the followin percentages of the weight o the frit:—

	Per Cent
Silica powder	18
Borax	9
Magnesia	5·25
Boric acid	1·5

(8)

	Per Cent.
Borax	26·75
Cullet	19
Silica powder	18·5
Oxide of tin	19
Nitre	9·25
Magnesia	4·5
Soda	3

To this should be added, whilst being ground, the followin percentages of the weight o the frit:—

	Per Cent
Silica powder	1·75
Magnesia	1·75
Soda	1

No. 1 is for pipes, Nos. 2 and 3 for sign tablets, and Nos. 4—8 for culinary utensils. For colouring ename frits the following are chiefly used:—Blue, silicate of cobal or smalt; violet, peroxide of manganese; green, oxide of copper, with, if necessary, an addition of oxide of iron yellow, Naples yellow; orange, red oxide of iron and a antimony preparation mixed so as to give the desired tint red, sulphate of iron and alumina; brown, mixture of black and purple, oxide of iron mixed with a certain proportion of clay; black, oxides of iron, cobalt, and manganese.
—A. S.

Silicate Analysis [*Clays*]. M. Stoermer.

See under XXIII., *page* 1143.

PATENT.

Molten Glass; Separating ——, from Impurities. J. M. Garrison, Belle Vernon, Pennsylvania. Eng. Pat. 12,933, June 25, 1901.

The separator is a vessel closed at the bottom, and open at the top, and has a short elbow-shaped spout about half-way down. The inlet of this is contracted, and the lower end opening into the vessel, is expanded. The separator is immersed till the spout inlet is below the surface of the molten glass, and it is stated that pure glass flows into the vessel, and impurities are left floating on the surface of the molten glass outside.—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Puzzuolana: New Uses of ——. E. Leduc. Monit. Scient. 1901, **15**, [718], 633—635.

The author mentions that recently notices have appeared of the use of puzzuolana in conjunction with Portland cement, and gives an outline of the reasons that have led to the revival of its use. It is pointed out that the walls of the empty spaces left in a block of hardened cement, are coated with crystals of hydrate of lime, since the main cementing constituent, the silicate $SiO_2.3CaO$, breaks down into hydrate of lime, and a less basic silicate. Determinations of this free lime vary with the process used, *e.g.*, a strong solution of methylene iodide, or by means of sugar; probably 25 per cent. is about the true amount. Since good results are given by "fat" lime mortars and puzzuolana, it is probable that when puzzuolana is present, the lime set free during the hardening of cement, forms a new "puzzuolana cement." In the case of sea-water, the magnesium sulphate reacts with the lime, forming sulphate of lime,

:h forms sulpho-aluminates, with the somewhat unstable ainates present in cement. Four methods are suggested voiding the disintegration of the cement owing to the y form of these sulpho-aluminate crystals :—

To make blocks so compact that water cannot penee them.

To carbonate the surfaces, and so obtain the same lt as in No. 1.

To use cements containing no alumina.

To prevent the formation of calcium sulphate by fixing lime in a stable combination. It is stated that mixtures ement and puzzuolana yield this result, for a sugar tion takes up a larger amount of lime from plain ent than from a mixture of cement and puzzuolana.

wo materials are mentioned that might be used with ent, like puzzuolana—the slag from blast furnaces, and ft greyish-yellow rock, rich in silica, found abundantly he Ardennes (described by L. Cayeux in the memoirs of Société Géologique du Nord).

mixture of cement and puzzuolana is stated to be strong at first than pure cement, owing to the slows with which the lime and silica unite, when the mortar ns to set.

table, compiled by M. Séret, is added, giving crushing ngth of cement alone, and with admixtures of different zuolanas, trass, santorin earth, blast-furnace slag, &c.
—W. C. H.

rtz Schist in place of Fire-clay in Lime- and Cement-urnace Practice. Chem.-Zeit. Rep. 1901, **25**, [70], 59. From Stahl u Eisen, 1901, **21**, 898.

course of a discussion on a paper by E. Cramer, in ch, as the result of laboratory experiments, the resistance quartz schist to attack by lime in lime-burning was ed to be greater than that of fire-clay, it was contended ; this statement was not in accordance with actual tical experience, and cases were instanced in which rtz stones had been attacked. Although, however, an ficial stone, consisting of a mixture of quartz and clay, have an inferior resistance, especially mechanically, to -clay, the result may be different when the quarried ural stone, absolutely homogeneous and dense, is used in e of that in which the various constituents must and irregularly. It is stated that in cement works it been practically shown that whilst the best Kulmitz -clay was melted in from two to three months, Krumdorf quartz schist lasted from four to six months, and quartzose sandstone blocks now used held for eight to nonths.—W. G. M.

nent Manufacture ; The Rotatory Process of ——. W. I. Stanger and B. Blount. Proc. Inst. Civil Eng. 1901, **45**, [3], 3—31.

E authors describe the processes of Ransome (this rnal, 1885, 327 ; 1888, 850), Stokes (this Journal, 1888, ; 1889, 622), and Hurry and Seaman (this Journal, 6, 199 ; 1899, 117) for the manufacture of cement by ans of continuous kilns, and discuss fully the advantages this type of process over ordinary English practice. ey arrive at the following conclusions :—

. The rotatory process is so notably superior to older cesses, both in economy and in the quality of the prot, that it is likely to supersede them.

. The chief advantages of the system are the mechanical l continuous handling of the materials, from the crushers raw material to the stock boxes containing finished nent, and the production of an artificially-matured cement, is dispensing with the cumbersome process of aeration turning over and storage. The difficulties met with in paring a refractory lining for the kilns, have been satistorily solved and powdered coal has been successfully plied as fuel.—A. S.

Cement ; Detection of Powdered Slag in ——.
W. Fresenius.

See under XXIII., *page* 1143.

PATENTS.

Limekilns. W. Siepen, Horrem, Rhine Province, Germany. Eng. Pat. 10,811. May 25, 1901.

The lower part of the kiln is funnel-shaped, half the outlet being blocked by a horizontal iron plate. One semicircular loop or arch, extending further into the outlet, is bolted to the upper, and another to the under, surface of the iron plate, and bars are pushed in to rest on the lower arch at the back, and on a cross-piece in front, forming a grid to prevent lime in the centre of the kiln falling through, while lime which has fallen at the back is cleared out.—W. C. H.

Refractory Materials ; Manufacture of ——. R. J. Friswell, and The British Uralite Company, Ltd. Eng. Pat. 21,496, Nov. 27, 1900.

In the process for the deposition of silica in the interstices of asbestos and the like by the decomposition of an alkali silicate by carbon dioxide, described in Eng. Pat. 4628, 1898 (this Journal, 1899, 585), it is now stated that the reaction ceases before the CO_2 theoretically available in the sodium bicarbonate present is exhausted, thus necessitating frequent renewal of the solution. The materials to be rendered refractory, containing asbestos, silica, chalk, &c., saturated with sodium silicate, are immersed in a tank containing sodium bicarbonate solution, into which a continuous stream of carbon dioxide is passed. Agitation is maintained. As modified, and claimed, the process consists in exposing the articles saturated with sodium silicate and still moist, in an air-tight chamber into which cooled and washed furnace gases, or CO_2 from other sources, are passed, until absorption ceases.—E. S.

Cement and other Materials ; Apparatus for the Separation of the Flour or Finer Particles of ——. W. F. Gorcham, Belvedere, Kent. Eng. Pat. 15,341, Aug. 29, 1900.

The claims are for a fixed oblong trough narrowed towards the bottom, having one end higher than the other, for holding the material to be treated, with a slit or jets for delivering air under pressure into the lower part of the trough along its whole length, and a casing to conduct the air which rises from the trough into a chamber, where the light powdered material carried over by the air can settle, and a means for supplying powdered material to be treated at the higher end of the trough, and for discharging the coarser parts of the powdered material at the lower end.
—W. C. H.

Cement, Lime, and the like ; Iron Shaft-Furnace for Burning ——. E. H. Stein, Hanover. Eng. Pat. 23,574, Dec. 24, 1900.

The shaft-furnace is composed of an upper, or preparatory-heating, a middle or burning, and a lower, or cooling shaft. The whole is surrounded by a casing, through which air, for cooling the burning-shaft, passes ; part of this air is said to support the combustion, and part to dry the material before being burnt. The burning and preparatory-heating shafts are separately carried by the outer casing, which transmits their weight to the base-plate direct. The several shaft portions are built up of rings, composed of segments, which are not fastened to each other, but to the outer casing by means of stay-bolts, the heads of which pass into slots formed by lugs on the outer surface of the segments. This arrangement allows of expansion of the segments, without the setting up of tension in the whole ring, and facilitates the removal and repair of damaged portions.—W. C. H.

X.—METALLURGY.

Concentrating [Ore] Systems. Eng. and Mining J. 1901, **72**, [11], 322.

For the separation of minerals according to their differences in specific gravity, the superiority of power jigs over other mechanical appliances, such as vanners or concentrating tables, is claimed. It is not only expensive to reduce the whole product of a mine to the state of fine sand and slime, but it is wasteful of value, because the soft sulphides when once ground to slime cannot be recovered by any system of concentration. When, on the other hand, ores are crushed to, say, half-inch (12½ mm) size, the greater part of the sulphides are separated, whilst about 80 per cent. of the rock or quartz fragments are practically barren, and can be eliminated at this stage by running the material directly upon the coarse or rougher jigs; the pure coarse sulphides may be saved from further loss, and only the small proportion of mixed material requires to be re-crushed and re-jigged. Even when the mineral or sulphide is disseminated in such fine particles, that recourse must be had finally to table or buddle concentration, a large percentage of barren rock material can almost invariably be eliminated by jigging, before the ore-bearing material is reduced to sand and slime. As regards the choice of jigs, this does not lie so much between different styles, as between methods of use.

In the zinc-lead mining district surrounding Joplin, Mo., it is stated that the two-line or rougher and cleaner type of jig, supplemented sometimes with a line of sand-jigs, has held its own against all the other systems of jigging and concentrating tried. The crude ore from the mines rarely averages more than 2 or 3 per cent. of lead and 5—8 per cent. of zinc, usually in the hardest flint gangue, with no other elements of value than the lead and zinc. The products of the mills are, (1) nearly clean galena, averaging 76—83 per cent. of lead and rarely containing more than 2 per cent. of iron or zinc; (2) waste mundic or pyrite, containing 15—25 per cent. of zinc, practically all of which is recovered by magnetic separation; (3) clean blende, containing not more than 0·2 per cent. of lead and from 0·75 up to 10 or 15 per cent. of iron in the case of pyritic ores; (4) sand and flint tailings containing less than 0·2 per cent. of lead and generally not more than 1—2 per cent. of zinc; and (5) a small amount of slime or sludge, quite rich in zinc, which is treated in sludge-mills for the production of fine concentrates.—A. S.

Magnetic Concentration; The Waring System of ——. Eng. and Mining J. 1901, **72**, [11], 328.

Magnetic separators may be classified under five distinct types:—

(1) the revolving cylinder or drum type (*a*) with magnetic fields created in peculiarly formed grooves extending annularly around the drum; (*b*) with the magnetic fields lying over or between pole pieces extending across the face of the drum. Machines of the type 1*a* produce an almost clean diamagnetic product at a single pass, but are not adapted for the classification of magnetic minerals.

(2) The double pole crossed or tangent belt type, including also a variety of belt machines.

(3) Machines in which the magnetic particles are deflected out of the course of a falling stream of material.

(4) Vertical single or multiple magnets revolving partly over a belt or pan carrying the material to be separated.

(5) Magnets oscillating from side to side directly across a flowing stream of material. Machines of this type are not so capable of producing absolutely clean diamagnetic products as those of type 1*a*, but they give excellent results as regards the paramagnetic products.

The Waring system of concentration and classification is a combination of types 1*a* and 5, and is stated to have given good results in practice. According to this system, the zinciferous or cupriferous concentrates are dried and passed through a screen of ¼-inch mesh into a mechanical calciner, where the pyritic minerals are partially desulphurised, and the ferric oxide, ferrous carbonate, copper minerals, &c., reduced to the magnetic condition. This operation is so carried out that the blende and other minerals which are subsequently to be separated by magnetic repulsion, are not affected; the heat generated by the burning sulphur of the pyritic constituents is usually sufficient to produce the condition required. The material is cooled and delivered to a magnetic separator of the drum type, falling into the intense magnetic fields lying within the peculiarly arranged grooves of the machine. The diamagnetic blende is expelled by magnetic repulsion aided by centrifugal force, whilst the paramagnetic particles, no matter how low their permeability may be, remain attached to the polar rings, whence they are released upon arriving at the opposite side of the axis. The diamagnetic product requires no further treatment, it is always quite free from iron-bearing or other magne minerals. The paramagnetic product, containing iro copper ores, &c., as well as many garnet minerals, if su were present in the ore, may also contain particles of zi blende not separated from the pyrites, &c. in crushing, ar still adhering thereto. It is passed down an inclined pla in rapid flow under the magnetic classifier; the minera are here separated according to their degree of magnet permeability, the strongly magnetic pyrites first and t least magnetic minerals last into separate chutes on ea side of the inclined plane. The last product, which usually very small in amount, is either recrushed and ag run over the separator, or it is added at once to the appr priate class of finished material.

Two examples are given of the results obtained by th system of treatment:—

1. Ordinary pyritiferous zinc ores from Galena, Kansa averaging 44 per cent. of zinc and 15 per cent. of iron, a selling at 10 dols. per ton. These ores yield 64 per cent. clean blende, containing 64·2 per cent. of zinc, absolute free from pyrites, and selling at 28 dols. per ton; al 28 per cent. of burnt pyrites containing 49·5 per cent. iron, and 2·8 per cent. of zinc.

2. Colorado mixed sulphide ore, containing 10 per ce of lead, 14·6 per cent. of zinc, and 12·2 per cent. of iro and worth 140 dols. per 100 tons, yields by wet concentratio alone, products worth 697·57 dols., and by wet concentratio combined with magnetic separation, products worth 1136·1 dols.—A. S.

Iron; Passivity of ——. H. L. Heathcote. Zeits. Phy Chem. 1901, **37**, 368—373. Science Abstracts, 1901, 4 [9], 769.

The author takes as evidence of passivity the fact that n action visible to the naked eye occurs on dipping the met into nitric acid of sp. gr. 1·2 at 15°—17° C. Iron is in a cases rendered passive by nitric acid of sp. gr. 1·4 or 1·2 but only after some of the metal is dissolved. Electrolyt cally deposited iron (on copper) is rendered passive b 1·4 sp. gr. acid, but becomes active again after one or tw minutes in acid of sp. gr. 1·2. Yellow, purple, or blu annealed iron is rendered passive by acid of sp. gr. 1· although no visible action takes place. In concentrate nitric acid, iron retains its passive state for a long time, bu at the same time gradual solution of the metal takes plac Iron rendered passive by acid of sp. gr. 1·4 becomes activ after about 20 hours' immersion in acid of sp. gr. 1·2, bu the change takes place much more rapidly if the acid b kept in motion; for instance, if a stream of 1·2 sp. gr. aci be allowed to impinge on a passive iron rod immersed i acid of the same strength, the metal becomes active afte one minute. Exactly the opposite is the case, howeve when stronger acid (sp. gr. 1·275) is used. On immersio in other liquids the passive state persists for very differen periods: in concentrated potassium nitrate solution, a fe seconds; in twice normal caustic potash, 2—3 minute and in saturated solutions of potassium bichromate or ferri alum, several days. Iron can also retain its passive condition for some time, if kept *in vacuo*, after complete removing the acid. (See also this Journal, 1900, 1154.)

—A. S.

Steel; Process for Hardening ——. O. Gentsch. Chem. Zeit. Rep. 1901, **25**, [70], 260. Stahl u. Eisen, 1901 **21**, 851.

The first requirement for the satisfactory hardening of steel is the uniform heating of the tool. The author has constructed a furnace, with a coke fire beneath a chamott plate, and provided with a good chimney. The firing of th furnace costs M. 1·5 for coke, or M.10 for charcoal for a 10 hours' run. The furnace may be used for case hardening or for reheating. The tool to be hardened is painted over by means of a brush with a hardening composition from which, on heating, the steel takes up a quantity of carbon corresponding to its structure, a fine-grained steel taking up less than a cheaper coarse-grained one, and the latter being markedly improved by the process. As soon as the tool is red hot, it is dipped into a water-bath contain

whitening, then in rape oil, and lastly in mineral oil. ter the first bath the tool is very hard; tempering is ected not, as hitherto, by heating from without, but—in e second bath—by the heat remaining within the tool. rdening cracks are avoided. Experiments made by ection of the Minister of Railways with tools made from hler steel, and with others made from Bismarck steel rdened by the above process, showed, after three weeks, ifference of 25—30 per cent. in favour of the latter.
—W. G. M.

el; Compression of ——. A. W. Zdanowicz. Chem.-Zeit. Rep. 1901 **25**, [70], 260. From Stahl u. Eisen, 1901, **21**, 857.

the Whitworth process for compressing fluid ingots, the essure is so applied that only the solidified shell of the got is compressed, and the fluid metal within remains affected. In a process introduced by Beutter in the steel rks of St. Etienne, pressure is applied to the ingot from low, and there is no cover to the conical chill, so that the fect of the pressure is to force the ingot further upwards, th the result that the tapered sides of the mould bring teral pressure to bear upon the fluid metal within, cavities e prevented, and the metal is forced into the head. By is process (which is illustrated by drawings in the origi-al) superficial fissures are prevented, the scrap is reduced 4 per cent., porosity and internal strains are prevented, uation is reduced, and the molecular condition and echanical properties are improved. The reduction in aste causes a saving of 25 per cent. of the cost of the raw eel, but from this must be deducted the cost of com-ession, which amounts to about M. 8 per ton. A pressure 500 kilos. per sq. cm. [3·17 tons per sq. in.] is required applied until cold, or of 250 kilos. per sq. cm. if the block e removed at a red heat. Plant has been provided at the . Etienne Works to apply pressure to small crucible steel gots and to larger ingots requiring 30,000 or 60,000 kilos. ross pressure (according to whether they are to be removed ot or cold).—W. G. M.

Gold; Curious Occurrence of ——. B. H. Bennetts. Inst. Min. and Metall., Oct. 17, 1901.

DEPOSIT of gold on a piece of wrought iron, originally sed in a mine track, and which had lain in the gutter arrying off the mine water, has been found at the Mount yell Mine, Tasmania. On removing the precipitated opper, the gold was found deposited in places, especially ear three bolt holes, in the form of bright yellow plates. t was firmly attached to the iron, and had probably been eposited by the electric action of the iron-copper couple rom traces of chloride in the acid mine water. No gold, owever, could be detected in the mine water.—A. W.

opper Ores; Dry and Wet Treatment of ——. C. C. Longridge. Trans. N. Eng. Inst. Min. and Mech. Engineers, **50**, 1901, 88—122.

HIS paper is a general summary of the operations involved the extraction of copper from its ores, and treats in a ursory manner of the subject under the following head-ngs:—Reduction and concentration; calcination; methods f calcining copper-ores and mattes; chemistry of copper-re calcination; calcination losses; chemistry of copper-melting; methods of copper-smelting: (*a*) German or last-furnace process, (*b*) English or reverberatory-furnace rocess, (*c*) Welsh process, (*d*) Anglo-German process, *e*) Pyritic process, (*f*) converter or Bessemer process, *g*) Special processes; refining of coarse copper by dry ethods; slags for copper smelting; blast furnaces for opper smelting; remarks on blast furnaces; reverberatory urnaces for copper-smelting; remarks on reverberatory urnaces; wet extraction of copper.—A. W.

opper-Tin, Copper-Zinc, and Tin-Zinc Alloys; New Determinations of the Specific Gravities of ——. E. Maey. Zeits. physik. Chem. **38**, 289—291. Chem. Centr. 1901, **2**, [15], 841.

HE composition was calculated from the quantities of the ure metals used in the preparation of the alloys. The ollowing results were obtained.

Copper-Tin Alloys.

Tin.	Sp. Gr.	Tin.	Sp. Gr.
Per Cent.		Per Cent.	
28	8·903	70·3	7·972
39·2	8·980	78·4	7·726
42	8·791	80	7·735
56	8·357	100	7·284
59	8·210		

Copper-Zinc Alloys.

Zinc.	Sp. Gr.	Zinc.	Sp. Gr.
Per Cent.		Per Cent.	
0	8·862	67·8	7·878
19·8	8·459	68·4	7·833
52·4	8·149	76·1	7·714
53·5	8·143	85·0	7·595
61·4	7·976	87·9	7·481
63·7	7·951	94·1	7·311
65·4	7·904	100	7·087
7·1	7·873		

Tin-Zinc Alloys.

Zinc.	Sp. Gr.	Zinc.	Sp. Gr.
Per Cent.		Per Cent.	
0	7·281	75	7·110
5	7·233	100	7·087
0	7·190		

—A. S.

Aluminium; Crystallised Metallic Compounds of ——. O. Brunck. Ber. **34**, [12], 2733—2735.

BY melting together aluminium and various metals, and either pouring out the liquid alloy after a solid crust had formed on the surface, or allowing to solidify completely and then dissolving out all that 2 per cent. hydrochloric acid would dissolve, the author has obtained well-crystallised alloys of aluminium with copper (Cu_4Al_9), iron ($FeAl_3$), nickel ($NiAl_3$), cobalt (Co_3Al_{13}), manganese (Mn_2Al_7), and platinum (Pt_3Al_{10}). Stronger hydrochloric acid readily dissolves them all, save the last, from which it dissolves out all the aluminium.—J. T. D.

Sulphur in Iron and Steel; Determination of ——. W. A. Noyes and L. L. Helmer.

See under XXIII., *page* 1143.

Molybdenum; Electrolytic Determination of ——. L. G. Kollock and E. F. Smith.

See under XXIII., *page* 1145.

Cyanide Solutions containing Zinc; Testing ——. L. M. Green.

See under XXIII., *page* 1144.

PATENTS.

Pyritic Ores; Hot Blast Furnaces for Smelting ——, *&c.* F. L. Rondebush, London. From E. T. Bradford, Denver, U.S.A. Eng. Pat. 18,028, Oct. 10, 1900.

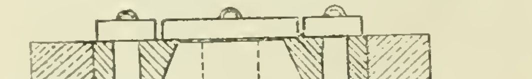
THE essential feature is that the blast is made to pass through a pipe which is coiled within the throat of the furnace. It thereby becomes heated before it reaches the tuyères.—J. H. C.

Metals such as Lead, Zinc, Copper, Iron, Silver, and Gold; Treatment of Mixed Ore for the Separation of ——. E. Ferraris, Sardaigne, Italy. Eng. Pat. 12,349, June 17, 1901.

THE mixed sulphide ore is heated with concentrated sulphuric acid in a furnace, by which is produced metallic sulphates, sulphur dioxide, water, and sulphur, the last named being then burnt and the whole of the sulphur dioxide converted into sulphuric acid. The sulphated ore is leached with water to dissolve the sulphates of copper, zinc, and part of the iron, the residue being then subjected to the usual process of lead smelting to recover the lead, silver, and gold. The copper and ferric iron are precipitated from the solution by zinc oxide and the copper further recovered as sulphate or metal. The ferrous iron is then precipitated by means of zinc oxide and compressed air, injected into the hot solution, the sulphate of zinc solution being concentrated by heat and air, and the salt crystaltised. The solid zinc sulphate can then be converted into anhydrous oxide by heating with carbon, the sulphur dioxide thereby evolved being converted into sulphuric acid for re-use, whilst the oxide can be used or smelted as a high grade zinc ore, all these operations being claimed in parts.—A. W.

Crucible Furnace ; New or Improved ——. O. Michael, Freiburg, in Baden, Germany. Eng. Pat. 10,303, May 17, 1901.

The furnace is built for the purpose of a preliminary heating of the pots or crucibles by the waste heat of the furnace, and is characterised by niches, *b*, in the walls of the shaft or furnace, the floors of which, *e*, are of the same level as the grating, *g*, carrying the melting pots or crucibles, *p*, so that metal difficult to fuse can be sufficiently heated within the crucibles, *c*, standing in the niches, by the waste gases passing into the branch flues, *l*, leading to the common flue, *n*, in preparation for the next smelting.



In this vertical section, the furnace is a horizontally rectangular one, and holds four central pots, *p*, surrounded with coke on the grating, *g*. In the centre of each of the four walls is cut a niche to hold one pot each, *c*, so that, while the four central pots are being finally heated, the four side pots with their contents are receiving a preliminary heating previous to taking the place of the central pots on the grating in the following heat.—A. W.

Metals [Al, &c.] ; Reduction of ——, and the Production of Alloys of the Same. H. S. Blackmore, Mount Vernon, U.S.A. Eng. Pat. 11,933, June 11, 1901.

The process is for the reduction of metals, and consists in liquefying refractory metallic oxides at a temperature below their normal melting points by the action of an inert heated flux, then adding thereto a metallic carbide, the carbon of which is capable of reducing the oxide and liberating the combined metal, the bath being replenished with oxide and carbide from time to time as the metal is reduced. The details of procedure may be varied in accordance with the 21 claims, and the method is specially applicable to the pr duction of aluminium and alloys of the same. The bat may consist of cryolite with added lithium fluoride, or of ar inert salt or body which may be a haloid salt and free fro hydrogen, and the metallic oxide may be added first and tl metallic carbide after, or *vice versâ*, the action between th two latter materials taking place at a temperature below tl melting point of the oxide, and resulting in the combinatio of the two electro-negative constituents. Alloys may l prepared by using a carbide of a different metal to that the oxide.

Aluminium is thus obtained by the action on its oxide its carbide in a bath of cryolite, containing a fluoride facilitate fusion and reduce specific gravity. The bath ma be a metallic oxyhaloid, such as an oxyfluoride, and th itself may be heated with a metallic carbide, which w result in the abstraction of the oxygen and haloid eleme and the liberating and alloying of the metals. In th respect aluminium oxyfluoride and calcium carbide a heated either together or in a molten inert bath, the carb combining with the oxygen, the calcium with the fluorin and the aluminium being obtained as metal. Aluminiu carbide may be produced in a molten bath of inert chemic salt, and the oxide added thereto.—A. W.

Iron ; Process of Melting ——, and Materials Employe therein. J. W. Maddison, and Wm. Rhodes, Wakefiel Eng. Pat. 16,484, Sept. 15, 1900.

A cupola furnace is first charged with coke, then with layer of wood, then a layer of mixed iron or steel, "scale and "salt," and on the top of all, the charge of iron ; th system of charging being repeated as often as desire Commonly 8 lb. of "scale" and ½ lb. salt are used for eac hundredweight of iron, with variations in the proportio of salt according to the size of the cupola.—J. H. C.

Iron ; Manufacture of ——. P. M. Justice, London. Fro B. Talbot, Pencoyd, Pennsylvania, U.S.A. Eng. Pa 22,408, Dec. 8, 1900.

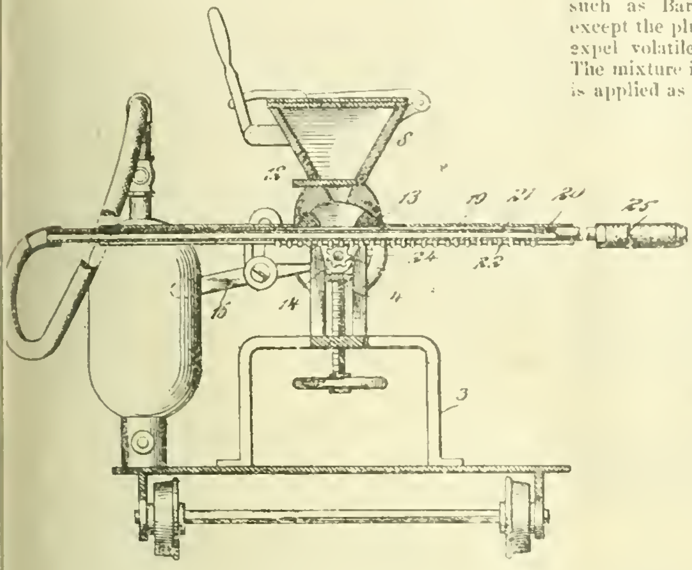
Molten iron is mixed with lime or other oxidisin material, or with puddling furnace slag, in a forehearth refining furnace, provided with a basic lining ; after whic it is charged into the puddling furnace for working in th ordinary way.—J. H. C.

Steel ; Production of Highly Carburised ——. R. Dietrich Sieg, Germany. Eng. Pat. 11,832, June 10, 1901.

Melted iron or low-carbon steel is poured in a thin strea into tar or other liquid or liquefiable carburising substance. —J. H. C.

Iron or Steel ; Machines for Use in Recarburising —— J. W. Davis, Converse, U.S.A. Eng. Pat. 13,59 July 1, 1901.

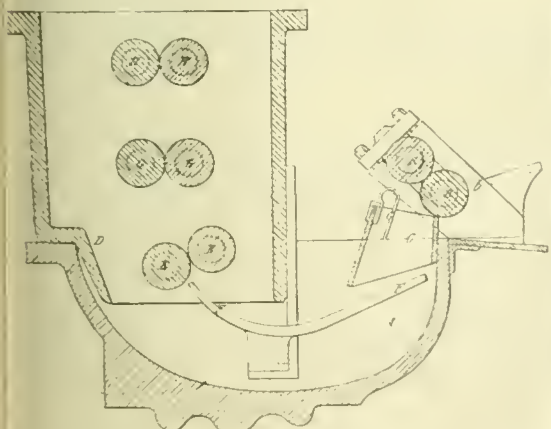
The machine for injecting carbon, carborundum or othe powdered material into iron or steel is claimed as a whol or in parts according to the principles shown in th accompanying drawing. It consists of a platform, mounte on truck wheels, on which are arranged standards, 3, with vertically moving frame, 4, which carries the feeding hoppe 8, and other working parts. The hopper has a top cove closed by a locking lever, and in the lower portion a slid valve, 12. The lower end is curved in a segment of a circl to move against the curved block, 13, having an openin wider than the lower opening of the hopper. The shaft, 14 with bearings in the frame, 4, carries an extension of th block, whilst another extension is attached to a sleev surrounding the shaft, to one of its ends and provided wit a hand lever, 16, by which the sleeve may be rotate relatively to the shaft and the block consequently adjuste to move the discharging tube attached. Through the block 13, is a transverse bore which is continued on either side b a guide tube, 19, registering with the bore. In this tube i the discharge tube, 20, provided at its upper side with longitudinal slot, 21, through which the material can pas from the hopper. On its lower side is a rack, 22, projectin through a longitudinal slot in the bottom of the outer tub 19. The rack is worked through a pinion by a hand wheel l, on the shaft. On one end of the tube, 20, is a fire-ay nozzle, 25, and on the other a flexible tube connected ith a compressed air reservoir carried also on the base atform. The apparatus can thus be moved to the furnace,



he nozzle pushed forward through the opening, and the arbon or other material forced into the bath, by the air lowing through the central tube.—A. W.

teel and other Metal Plates or Sheets; Apparatus for Coating ——, with Tin or other Metal. W. P. Thomas, Abercarn. Eng. Pat. 18,844, Oct. 22, 1900.

'he apparatus comprises in one structure feed rollers or ther devices, a flux box, a metal-coating bath or pot, and il-bath or grease-pot, and one or more pairs of finishing olls for the purpose of avoiding the use of more than one metal-coating bath, the pickled or prepared sheets being assed singly through the complete apparatus.



Two examples of the principle are given, of which the accompanying drawing represents the apparatus suitable for large sheets. It consists of feed rollers, B B, carried by brackets, *b*, at one end of the pot, A, a flux box, C, with guides, *c*, so placed that the sheets descend vertically through the centre of the box; guides, F, within the metal bath or pot, and one or more pairs of finishing rolls, E E, G G, and HH, in the grease-pot, D, preferably containing palm oil.
—A. W.

Blacking for Foundry Purposes; Manufacture of ——. J. Dunn, Glasgow. Eng. Pat. 19,009, Oct. 21, 1900.

Claim is made for a preparation consisting of a mixture of carboniferous products, such as plumbago, gas-retort carbon, paraffin still coke, and the like, with an infusorial earth, such as Barbadoes tripolite. Each of the constituents, except the plumbago, is first calcined separately in order to expel volatile matters, and only the residues employed. The mixture is thoroughly ground into a fine powder which is applied as blacking in the usual manner.—C. A. M.

Blast-Furnace Slag; Process of Treating Molten ——. A. D. Elbers, Hoboken, New Jersey, U.S.A. Eng. Pat. 8333, April 23, 1901.

The slag is disintegrated by protracted cooling under diminished air-pressure by running it into kilns of special construction and there leaving it. The slag is said to be thus reduced, to such pulverulent and sufficiently soluble condition, as to form a cheap substitute for lime for manuring the soil.—J. H. C.

Nickel; Preparation of ——. T. Michalowsky, Cracow, Austria. Eng. Pat. 17,569, Oct. 3, 1900.

Porous nickel, suited for forming electrodes for electric accumulator batteries, is obtained by electrolytic precipitation from solutions containing iron, zinc, or other like metals.
—J. H. C.

Aluminium; Preparing ——, for Soldering. C. P. Sorensen, Copenhagen. Eng. Pat. 16,864, Aug. 22, 1901.

The parts to be soldered are heated to about 300° C., and then treated in a strong lye of soda or other alkali, which removes the oxide, after which they are washed in cold water, the soldering then being proceeded with in the usual way, without the necessity of a flux. The brazing alloys may consist of zinc and brass filings or zinc and tin filings.
—A. W.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

(*A.*)—ELECTRO-CHEMISTRY.

Electro-motive Behaviour of Substances capable of different Stages of Oxidation. R. Luther. Zeits. für Elektrochem. 1901, **7**, [65], 897—899. From Zeits. phys. Chem. 1900, **34**, 488—494; and 1901, **36**, 384—404.

It is shown experimentally that with a substance which can have three stages of oxidation, the electro-motive force corresponding to the direct oxidation from the lowest to the highest stage is not the sum of the two electro-motive forces corresponding to the oxidation from the first to the second and from the second to the third stage respectively, but that the value lies between the two.

Incidentally it is shown that the difference in potential between a metal and its salt solution is independent of the anion. The second paper deals with the peculiar behaviour of chromium.—J. S.

Electro-thermal Reactions and Syntheses. W. Löb. Zeits. für Elektrochem. **7**, [66], 903—921.

An investigation on the behaviour of chloroform and carbon tetrachloride, when exposed to high temperatures produced by the electric current. The paper is divided into five parts, the first three of which deal with the historical, practical, and theoretical aspects of the subject, while the last two are devoted to the results obtained by the author with the two compounds named above. The apparatus used consisted of a decomposing flask, containing in its upper part the incandescent electric conductor, and of a series of absorption bottles, in which the gaseous products of the decomposition were absorbed by various reagents and retained for analysis. Nickel, iron, platinum, and platinum-iridium were used as materials for the incandescent spirals in the decomposing flask.

With regard to the absorption of the gases produced by the decomposition of chloroform, the author draws attention to the presence of chloroform vapour in the gaseous mixture, and to the error that would be caused by the liberation of carbon monoxide if caustic potash were used as the first absorbent. As cooling, even down to −18° C., failed to remove this constituent of the residual gases, the absorbing solutions were used in the following order:—Nordhausen sulphuric acid, phosphorus, acid cuprous chloride solution, caustic potash solution.

The results of the investigation may be summarised as follows:—

(1) The use of metallic conductors heated to incandescence by the electric current, affords a simple and accurate method for determining *qualitatively* the influence of temperature and the material of the conductor, upon the decomposition products obtained. Further experiments are, however, required to show how far the method can be applied to the *quantitative* determination of the energy absorption and reaction speed, of these decompositions.

(2) With regard to the thermal decomposition of chloroform, the results obtained indicate that an intermediate product—dichloromethane—is formed, but that the existence of this compound in the gaseous mixture is only of momentary duration.—J. B. C. K.

Carbon; Formation of ——, in the Electrolysis of Solutions of Ammonium Oxalate. H. Verwer. Chem.-Zeit. 1901, **25**, 792—793.

The many advantages of adding ammonium oxalate in the electrolytic analysis of a large number of metals has been demonstrated by Classen. Ammonium oxalate is particularly useful in the electrolysis of iron from the salts of organic acids, such as citrates and tartrates, in that the metallic precipitate can be obtained free from carbon. Heidenreich (Ber. 1896, **29**, 1585) and others have shown that salts of citric and tartaric acid always deposit electrolytic iron associated with considerable quantities of carbon. Avery and Dales (this Journal, 1899, 300) have, on the other hand, stated that electrolytic iron separates from ammonium oxalate solutions contaminated with considerable quantities of carbon. The author (this Journal, 1899, 610) controverts this statement. He now, however, finds that under some conditions carbon is deposited with iron from solutions of ammonium oxalate, and after several experiments he asserts that the precipitated iron never contains the slightest trace of carbon if the current is stopped and the solution removed before all the iron is precipitated. If, after complete separation of the iron, the liquid be further electrolysed, whereby the precipitated iron acts as the cathode, it was always found to contain carbon.

The author next precipitated iron from a solution consisting of 10 parts of ammonium oxalate and 1 part of Mohr's salt, and removed the solution whilst it was still coloured yellow with iron. The precipitate contained no carbon. Using the precipitated iron as a cathode, a solution of ammonium carbonate and bicarbonate was electrolysed for several hours. Another portion of precipitated iron was used as a cathode to a solution of pure ammonium oxalate which had been electrolysed for 12 hours. In both experiments the iron contained carbon. Solutions of potassium and sodium carbonate behaved similarly, the precipitated iron containing carbon, though in a less degree. These results indicate that a reduction of carbonic oxide to carbon takes place in aqueous solutions. Tartrates behave quite differently; the precipitated iron always contains carbon. The author is able to confirm Avery and Dale's statement (*loc. cit.*) that with Moore's method (Chem. News, 1886, **53**, 209), where a ferrous salt is electrolysed in the presence of ammonium metaphosphate, the precipitated iron is associated with a small quantity of carbon and a larger one of phosphorus.—J. L. B.

PATENTS.

Secondary Battery Plates; Manufacture of ——. I
Knettner, London. Eng. Pat. 17,490, Oct. 2, 1900.

Lead oxide, with or without the addition of finely divid lead, is mixed with a solution of a soluble silicate, an formed into a paste which is made into a plate, and the dipped into a dilute alkaline solution, from which it removed and placed in a second alkaline solution of great strength until the hardening process is complete, aft which it can be reduced or oxidised in the usual manne The special form of grid consists of a thin lead plate sheet, having an undercut rim on both sides equal in dep to the thickness of the plate. The grid is formed wi tubular apertures which may project on both sides, alternately on either side to the thickness of the plat having their edges slightly bent over to form lips. Th diameter of the apertures is about equal to their depth, an to the distance separating them, and the grid may perforated with smaller holes between the tubes. I a modification of the grid, the tubular apertures are half the length, and extend alternately on each side.
—G. H. R.

Secondary Electric Batteries; Manufacture of Electro Plates of ——. A. Nodon, Paris. Eng. Pat. 13,30
June 29, 1901. (U I.C., Dec. 1, 1900.)

Active material for electrodes, especially anodes, is mad by mixing minium or litharge with a solution of silicate soda or potash, at 30° B. A thick paste is formed which i packed into grids or frames, of lead or lead alloy. The are exposed to air, and when dry and hardened are agai immersed in the silicate solution. They are afterwar acted upon by a weak solution of sulphuric acid, with th formation of soluble sulphate, leaving insoluble lead silicat of brown colour which adheres strongly to the frames. Th plates are water-washed, and are then ready for forming.
—J. C. R.

Electrolytic Apparatus. [Bleaching Liquor.] M. Haas
Aue, Saxony. Eng. Pat. 14,946, July 23, 1901.

The electrolytic apparatus is an improvement on th described in Eng. Pats. 10,215 of 1899 and 9331 of 190 (this Journal, 1899, 771, and 1900, 752), and consists a vessel divided into several compartments by the electrode and mounted in a storage receptacle, the only liqui connection between which and the several compartmen consists in long narrow channels or pipes. Various modifications are described, in one of which long, narrow pipes ar employed to carry off the liquid to a collecting vessel.
—G. H. R.

Air, Gases, and Gaseous Mixtures; Apparatus [Ozoniser &c.] for Electrically Treating ——. R. J. Yarnold
London. Eng. Pat. 19,393, Oct. 30, 1900.

To avoid loss of efficiency incidental to rise of temperatur in ozonisers of the type described in Eng. Pat. 2629 of 189 (this Journal, 1899, 923), it is proposed to employ hollo electrodes, through which a current or stream of water o other cooling medium may be continuously caused to flow As a dielectric of high capacity for placing between th electrodes, compressed sheets of homogeneous compound of mica and shellac are employed, preferably using th compound known as micanite or megomit.—J. C. R.

Electric Furnaces for Dental and other Purposes. R
Winter and V. Pappenheim, Berlin. Eng. Pat. 13,367
July 1, 1901.

A furnace for dental work is described. Use is made o a series of rods or lengths of refractory clay, mounted o the inside walls of the furnace casing, and provided wit longitudinal holes for receiving heating wires of small cros section, whereby the wire, as well as the heating bodie surrounding them, on becoming incandescent, can expan independently of one another.—J. C. R.

lectrolytic Cells. J. H. Noble, Liverpool, and A. Merry, Liscard, Chester. Eng. Pat. 20,200, Nov. 9, 1900. (See Eng. Pat. 2372 of 1900 ; this Journal, 1901, 728.)

r is now proposed and claimed to (1) provide a head or ressure on the electrolyte in the porous (anode) cell onsiderably greater than that on the liquid surrounding he cathode cell, and proportional to the ampèrage used; 2) to avoid secondary action at the porous cell by louvres r a pervious inner cell open below, adapted to afford an asy and quick passage of the liberated gas to the top f the cell, but an obstructed one in the direction of the nter porous cell and cathode, preferably in the form of a uncated inverted cone ; (3) to glaze the top of the porous ell so that chlorine, when chlorides are being decomposed, hall not pass through this portion near the closure ; and 4) methods of feeding the electrolyte into the cell and rawing off the electrolytic products. Where brine is ecomposed, it is proposed to utilise the caustic alkali roduced by these, or mercury-using cells directly for oap-making in different ways.—J. C. R.

lkaline Salt Solutions ; Process and Apparatus for the Electrolytic Decomposition of ——. [*Intermediate Electrolyte.*] A. J. De Brito e Cunha, Lisbon. Eng. Pat. 16,801, Sept. 20, 1900.

HE porous diaphragms, which may be cylindrical or flat, re made of barium, or aluminium silicate, mixed with sodium ilicate, sodium hydrate, brine, or any other suitable solution nore or less concentrated according to the required porosity f the diaphragms. The mass is subjected for about 6 hours o 90 lb. pressure, and is afterwards moulded while hot, and ardens while cooling. Two diaphragms are employed, the ntervening space containing an intermediate electrolyte lesigned to separate the alkaline solution from the original lectrolyte, so as to avoid any recombination of the final roducts of electrolysis. Syphons are used for extracting he alumina, barium hydrate, and caustic alkali formed, and neans are provided for the utilisation of the intermediate austic alkali passed through by osmose action, and for roducing efficiency of current and facility of putting out of ircuit, changing diaphragms, and erecting the electrolytic ell.—G. H. R.

hlorine and Alkali ; Electrolytic Apparatus for Production of ——. J. Mactear, London. Eng. Pat. 16,874, Aug. 22, 1901.

HE cathode cell has in its bottom a central well in which s mounted a rotary propeller, and a space at the base of ts wall communicates with the central well by ducts formed nder the bottom. The anode cell is placed centrally in he cathode cell, the edges of its sides extending into a ecess formed in the bottom of the latter, and it is supplied vith pipes for supply, and for overflow of chloride solution, nd for outflow of chlorine. The spindle of the propeller asses through the cover of the anode cell, and is supplied vith a liquid seal, and a quantity of mercury fills the well, he space and the ducts forming a layer over the bottom of he cell.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

PATENTS.

luminium and other Metals ; Process for Obtaining [*part Electrolytic*]. G. Taddei, Turin, Italy. Eng. Pat. 13,379, July 1 1901.

LUMINIUM and other metals whose chlorides are less xothermic than that of sodium, are obtained by electroysing sodium chloride at a high temperature (1,000° C. y a continuous current, at about 4·5 V.) in one vessel, nd passing the chlorine into a second vessel heated to ,300° to 1,500° C., where it forms the chloride of the metal o be obtained. The sodium is passed into a third vessel vhere it meets and decomposes the metallic chloride from he second vessel, and from which the sodium chloride ormed is returned to the first vessel. The anhydrous hloride is obtained in the second vessel in the usual nanner, by bringing the chlorine—in this case prepared lectrolytically—into contact with an intimate mixture of alumina and carbon (tar) at a high temperature. The chloride and sodium are brought together as vapour in a chamber, not separately heated.—J. C. R.

Metals ; Apparatus for Refining ——, by Electrolysis. H. H. Lake, London. From A. G. Betts, New York, U.S.A. Eng. Pat. 14,967, July 23, 1901.

THE electrodes are contained in an electrolytic vat, adjacent to which extends a track formed by rails on which a carriage travels to and fro, bearing a pair of pressure rollers in the path of the electrodes, and a frame capable of vertical, reciprocating movements on the carriage, and adapted to engage, raise, and lower the several electrodes between the successive movements of the carriage. The electrodes are severally provided on their upper ends with oppositely projecting lugs which fit on projections on the frame, which has screws and nuts, and is operated by an intermittent motor, while another, working alternately with it, moves the carriage along the track. A movable brake prevents movements of the carriage, and is released by the final descending movement of the frame, which also carries an automatic switch for reversing the motor at either end of the path of movement of the carriage.—G. H. R.

ERRATA.—This Journal, 1901, 727, col. 1, under XI. B., read references as follows:—"Elect. Rev. (N.Y.)," &c., and "Elect. World and Engineer," &c.

XII.—FATS, OILS, AND SOAP.

Mixed Glycerides in Cacao-Butter. J. Klimont. Ber. 1901, **34**, [12], 2636.

BY means of fractional crystallisation from acetone, the author has separated cacao-butter into three parts :—(1) A fraction which after repeated crystallisation melted at 64° C., and had an iodine value of 0. Finally crystals melting at 70° C. were isolated from it. This fraction was judged to consist of a mixture of tripalmitin and tristearin.

The second fraction melted at 31°—32° C., and had a saponification value of 196·4 and an iodine value of 28·9, whilst its composition was $C_{55}H_{104}O_6$. It was concluded that it was a triglyceride containing palmitic, oleic, and stearic acid radicles.

The third fraction consisted of a mixed glyceride which melted at 26°—27° C., and had an iodine value of 31·7, and a saponification value of 210·5. Its composition was $C_{51}H_{95}O_6$.

Triolein could not be detected in the sample of cacao-butter.—C. A. M.

Sesamé Oil ; Occurrence and Detection in Commercial Arachis Oil ——. P. Soltsien. Chem. Rev. Fett- u. Harz-Ind. 1901, **8**, [10], 202—203.

THE author finds that Tambon's reagent (this Journal, 1901, 285) is not capable of detecting less than 2 per cent. of sesamé oil, and must therefore be regarded as much less sensitive than Baudouin's test. Referring to Tambon's statement that the fatty acids of arachis oil gave a red coloration with Baudouin's reagent, the author asserts that this must really have been due to the presence of small quantities of sesamé oil. All the commercial samples examined by him gave colorations corresponding to the presence of from 0·25 to 15 per cent. of that oil, whilst a specimen of arachis oil extracted by himself from the nuts gave absolutely no coloration. He was also informed by certain manufacturers that it was customary to add sesamé oil to the finest grades of arachis oil, with the object of influencing their behaviour towards cold and of improving their miscibility for salads.

The tin chloride test for the fatty acids of sesamé oil is, in the author's opinion, untrustworthy, since the reagent will give a brown coloration with the fatty acids of arachis oil, or even rose colorations in the case of old oils, althoug the reaction does not take place so rapidly as in the case sesamé oil.—C. A. M.

Walnut Oil: [Bulgarian] ——. N. Petkow. Zeits. Untersuch. Nahr. u. Genussm. 1901, **4**, [18], 828.

Five samples of cold-pressed walnut oil gave the following results on analysis :—

—	1.	2.	3.	4.	5.	Average.
Sp. gr. at 15° C.	0·9260	0·9255	0·9260	0·9260	0·9256	0·9258
Refractometer number at 40° C.	67·0	67·5	68·0	68·0	68·0	67·7
Iodine value .	147·92	148·10	148·43	148·40	148·20	148·21
Acidity (Burstyn degrees)	3·17	4·26	5·97	5·25	3·25	4·38

—W. P. S.

Cây-doc Oil of Tonkin. Chamber of Comm. J., Nov. 1901, 258.

The Annamites in the Province of Thaï-Nguyén, in Tonkin, give the name of Cây-doc to a tree of the *Clusiaceæ* species, the oleaginous grains of which produce an oil for burning purposes, which causes an important local trade. This tree, says the *Moniteur Officiel du Commerce*, is a pine-like conifer, 10 to 15 metres in height. The Director of Agriculture in Indo-China sent hôme a sample of the Cây-doc oil prepared by the natives by an unknown process. Examination showed that the composition of this oil of the "Garcinia Tonkinensis" is as follows :—

Glycerides	90·04
Resin acid (soluble in alkali)	4·21
Resin (insoluble in alkali)	1·17
Essential oil	4·58
	100·00

This oil contains 13·2 per cent. of oleïn, and yields 11·96 per cent. of glycerin. The aggregate of the solid fatty acids, when separated from the oily acid, melts at 55°. The raw oil is easily saponified; the soap produced can easily be dissolved in water, excepting 1·17 per cent. of its weight. This residuum consists of resin, soluble in benzine, but not soluble in alkalis. The oil supplies a soap of a brown colour, having the appearance and, up to a certain point, the pleasant odour of palm oil; it can absorb much water. The oil of the "Garcinia Tonkinensis" seems likely to play a part in the soap industry of Europe. The tree is cultivated in Tonkin, but is slow of growth, yielding a fair crop of seeds only after the twentieth year. The value of the crop of seeds from a tree at the place of production is said to be a Tonkin piastre, equal to about 2 frs. 50 cents. It appears that Tonkin is not able to supply much either of seeds or of oil prepared by the natives, to European factories.

Oils; Determination of Sulphur in ——. F. Jean.

See under XXIII., *page* 1147.

Vegetable Fats in Animal Fats; Detection of ——, *by the Phytosterol Acetate Method.* Bömer.

See under XXIII., *page* 1147.

PATENTS.

Oils and Fats; Bleaching of ——. J. C. W. Stanley and The Cotton-Seed Oil Sydicate, Ltd. London. Eng. Pat. 17,143, Oct. 2, 1900.

The claims of this patent are, for the most part, the same as those of Eng. Pat. 11,419 (this Journal, 1901, 910). The oil is circulated in a thin film from spreading nozzles and subjected to the action of artificial light, substantially as described before. In this patent, however, no claim is made for the simultaneous introduction of air or other oxidising gas.—C. A. M.

Detergents and their Manufacture. G. Bamberg, London. Eng. Pat. 17,166, Sept. 27, 1900.

Claim is made for a detergent powder prepared by mixing together soap and chemically treated oatmeal or other cereal. The finally-powdered meal (say 23 lb.) is treate with a solution of caustic soda (say 7 lb.) in sufficien water to give a specific gravity of 1·27, and a suitabl quantity (say 22 lb.) of soap shavings. The temperatur of the mixture rises and ammonia is given off in abundanc Finally the product is granulated and exposed to the ai until the whole of the excess of caustic alkali has bee converted into carbonate. The resulting dry soap powde is stated to be readily soluble in cold water, and to posse considerable cleansing properties.—C. A. M.

Soap; Apparatus for Making Carpet Cleaning —— H. Sefton-Jones, London, from S. Feder and J. van d Bücken. Aachen, Germany. Eng. Pat. 14,085. July 1 1901.

The object of this invention is to secure the thoroug incorporation at the right moment of the special substanc (glycocholic acid, taurocholic acid, &c.) added to remov stains and preserve the pattern. The apparatus claime consists of a vessel surrounded by a tightly-fitting chamb to prevent loss of heat, and provided with an air-tigh bipartite lid. The vessel rests upon an iron plate, which exposed to the heat of a fire. Through the centre pass an axle, bearing agitator-blades which revolve in opposit directions. A special apparatus is fixed to the side of th casing near the bottom, through which the addition substances are introduced into the unfinished soap by mean of a piston rod and a delivery pipe, whilst a discharge pip on the other side leads to the mould divisions. In each the moulds, movable pegs are loosely inserted at a certai height, and these being pressed out by the liquid soa indicate when the mould is filled. The vessel is provide with a thermometer and a safety-valve.—C. A. M.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(A.)—PIGMENTS, PAINTS.

Red Lead; Determination of Foreign Impurities in —— A. Jousser.

See under XXIII., *page* 1144.

(B.)—RESINS, VARNISHES.

Rassamala Resin. A. Tschirch and L. van Itali Archiv, **239**, [7], 541—547.

The resin of *Altingia excelsa*, the so-called Malaya storax, as at present prepared, has few characteristics i common with true storax. Two kinds of the resin we experimented with, *Rassamala bodas*, white (or yellow rassamala, and *Rassamala beurem*, red rassamala, consistin of hard, dusty, readily pulverisable pieces, with a glass fracture and an aromatic odour, recalling that of cinnamo pepper, and turpentine. The melting point ranged from 6 to 80° C. It was partially soluble in alcohol, meth alcohol, carbon bisulphide, and glacial acetic acid, mo soluble in ether, acetic ether, chloroform, and benzene, b slightly soluble in soda solution, and in acetone. The alco holic solution contained tannin. From the ethereal solutio a small amount of cinnamic acid crystallised out. Trea ment with sodium bisulphite showed the probable presenc of a little benzoic and cinnamic aldehyde. Oxidation wi chromic and sulphuric acids afforded evidence of the pr sence of benzoic acid. The resin gave no indication of th presence of esters. It is evident, therefore, that this res differs in every respect from the storax, a difference whic may be due to the method of preparation.—J. O. B.

Copals; Fusion of ——, *under Pressure.* W. Lipper Chem. Rev. Fett- u. Harz-Ind. 1901, **8**, [9], 177—178.

In the ordinary method of rendering copals soluble in oi by a partial destructive distillation ("Brenzreaktion"), th loss in the form of gas and copal oil varies from 25 to 5 per cent., according to the nature of the copal; and even the copal oil be recovered it is of little value. Vario attempts have therefore been made to avoid this loss durin he fusion, of which mention may be made of those of Violette and of Prechtl, who have proposed fusing the opal in closed vessels.

The author points out that Violette's statements are at ariance, since in one place he asserts that a copal melted t 350° C., and in another that it melted at 100° C. The opals thus treated were said to dissolve readily in linseed il and turpentine. In repeating Violette's experiments, he author heated 10 grms. of hard Manilla copal for a long ime in a glass bomb at 100° C., but no fusion occurred until after raising the temperature to 180 C. The copal hen appeared as a light-yellow mass, full of bubbles. On pening the bomb the pressure was found to be very light. On heating the contents with linseed oil, bubbles of water escaped, but the copal still remained insoluble.

Cowrie copal heated in the glass bomb for some hours at 00° C. left a light-yellow fused mass, which was comletely soluble in hot linseed oil. It was found that turentine and siccative could be added to the solution to ome extent, but that too much, precipitated the copal. On ooling, the copal separated from the varnish, but was reissolved on heating.

Manilla copal treated in the same way yielded a very ark mass, which, in the author's opinion, was superfused, seeing that in the first experiment the copal melted at 80 C. The mass was soluble in hot linseed oil, the soluon in this case, too, becoming turbid on cooling, and the opal being precipitated by turpentine and siccative.

Zanzibar copal (Animé), when subjected to the same process, remained practically unchanged, only an aromatic dour and a few drops of water being perceptible.

From these experiments the author concludes that copals o not fuse at 100° C. when heated in a closed vessel; and at those melted at a high temperature under pressure, though soluble in hot linseed oil and ethereal oils, separate out on cooling, so that the process cannot be regarded s technically practicable.—C. A. M.

PATENTS.

osin; Process of Treating ——, to obtain Rosin of Low Melting Point. F. Müller and G. Rossbach, Schwandorf, Bavaria, Germany. Eng. Pat. 17,427, Oct. 2, 1900.

CCORDING to this patent, the melting point of the rosin is wered, without any addition of foreign substance, by first melting it, and then heating it in a vessel by any suitable means. The longer the heating is continued, the greater the eduction in the melting point.—C. A. M.

arnishes and Products resembling Resins and Balsams; Manufacture of ——. A. Kronstein, Karlsruhe, Baden, Germany. Eng. Pat. 17,373, Oct. 1, 1900.

HE process claimed, consists of heating a fatty oil or other nsaturated organic compound to a temperature short of ecomposition, with the exclusion of oxygen or any oxidising gent, so that polymerised substances of high molecular eight are produced. The process may be applied to the anufacture of varnishes from drying oils, fish oils, rapeseed oil, castor oil, &c. Of other unsaturated organic compounds suitable for the purpose, the following are among hose chiefly employed:—Allyl cinnamate, styracin, allyland diallyl malonates, or "allyl salts of substituted malonic cid, of indene, and of substances of the type of eugenol, afrol, iso-eugenol, and styrol and its substitution products."

An admixture of 50 per cent. of Japanese wood oil with ls ordinarily used in the manufacture of varnishes yields product of the consistency of "stand oil," when thus eated to a temperature below the decomposition point.

The substances formed vary with the nature of the compounds used. Thus, amber-like products are obtained om bodies of the type of allyl cinnamate, styracin, and lyl or diallyl malonate. A compound resembling glass ith the properties of a resin is yielded by styrol and its rivatives, whilst esters of diallyl malonic acid produce a ubstance resembling natural balsam, which is soluble in the dinary solvents. Allyl cinnamate or diallyl malonate are nverted into resin-like bodies which are soluble in benzene d ethylene bromide, but insoluble in alcohol and ether.

By heating a solution of styracin in allyl cinnamate, in the absence of oxygen, a compound resembling Peru balsam is formed, whilst safrol, eugenol, iso-safrol and iso-eugenol give soluble solid substances resembling natural soft resins.

A special claim is made for the manufacture of oil of high viscosity, by heating wood oil, or mixtures containing more than 50 per cent. of that oil, with other oils or unsaturated organic compounds, in the absence of air, to about 200° C. until solidification occurs, and then raising the temperature to 300° C. until the mass liquefies, forming an oil which only becomes hard when exposed to the air.
—C. A. M.

(C.)—INDIA-RUBBER, &c.

Caoutchouc of French Indo-China. Ch. of Comm. J., Nov. 1901, 260.

THE *Monit. Officiel du Commerce* publishes a detailed report on four kinds of caoutchouc from Upper and Lower Laos. No. I. appears in the form of balls (having an average diameter of 5 to 10 cm.), of a pretty regular shape, the weight of which varies from 40 to 120 grms. The general colour of this caoutchouc is more or less dark. In the cells in the circumference, as well as in the centre, vegetable refuse is met with, also fragments of moss, bark, wood, and very small particles of earth. These are only small impurities not due to fraud. The odour of this caoutchouc is weak, of the usual kind; there is no odour of acid or putrid fermentation, no igneous smell. It is a remarkably dry, sinewy caoutchouc, no portion of which is resinous nor fatty. This kind has been quoted by brokers at 8 frs. per kilo. Its preservation is remarkable, even under very defective circumstances. Sample No. II. differs from No. I. in the following particulars. It is in lumps, 15 to 20 cm. long on an average, with a diameter of 5 to 7 cm., weighing on an average from 250 to 270 grms. The celllike structure resembles that of No. I. Two striking features may be noted: the almost black colouring and the stickiness of this sample. This sort is valued at 6 frs. to 7 frs. 75 cents per kilo. Sample No. III. shows crooked and irregular masses, weighing 417 grms. and valued at only 5 frs. 50 to 7 frs. 75. No. IV. is very similar to No. I., but the balls have a smaller diameter and weigh only from 30 to 80 grms. The loss from washing of these four samples is very trifling, and ensures therefore one of the most profitable industrial results. These samples (as well as the objects made from them, also photographs and tracings of the mechanical tests concerning them) may be seen at the Office National du Commerce Extérieur, Paris.

India-Rubber; Behaviour of ——, towards Nitrous Acid. C. Harries. Ber. 1901, **34**, [12], 2991—2992.

THE yellow compound produced on rubber tubes and stoppers by the action of nitrous acid is a nitrogenous derivative of acid character, probably a polynitrosate rather than a polynitrosite. It may be prepared by dissolving rubber (West African) in heavy petroleum and passing a rapid stream of nitrous acid (from arsenic and nitric acid) through the solution, or, more simply, by merely soaking the rubber in petroleum for 24 hours and churning the swelled mass with the current of gas until a test shows that the product is soluble in acetic ether and in alkalis. In either case a colloidal mass is obtained which breaks into golden scales easily dissolved by acetic ether, and precipitated therefrom when ether is added. The substance has the empirical formula $C_{40}H_{62}N_{10}O_{24}$, sinters at 95—100° C., decomposes at 135° C. with evolution of gas, dissolves readily in alkalis and is precipitated, unchanged, when acid is added. The molecular weight determinations gave unexpectedly low results.—R. L. J.

Gutta-percha from Eucommia Ulmoides. Imp. Inst. J., Nov. 1901.

SPECIMENS of a peculiar Chinese plant, known as "Tuchung," were forwarded to Kew more than 10 years ago for examination, with the statement that the tree is cultivated for its bark, which is a most valued medicine. The plant was named *Eucommia ulmoides* by Prof. D. Oliver, and the chief interest attaching to it was the presence in the tissues of an elastic gum, resembling caoutchouc or gutta-percha If the bark be broken across, this appears in the form of innumerable silvery threads, and in a later examination Prof. F. E. Weiss found the yield from the dry bark to be about 3 per cent. Since then further material has been obtained, as well as living specimens of the plant, which are at present growing in several botanic gardens in Paris, and at Kew, and with these a much more satisfactory examination has been possible (*Kew Bulletin*, Nos. 172—174, p. 89).

The order of the plant is difficult to decide, owing to its peculiarities, and while Oliver and Ballion agree in placing it among the *Trochodendraceæ*, it is referred to *Hamamelidaceæ* by Solereder. Wherever it is placed according to its morphological characters, however, the allied plants do not yield rubber or gutta-percha. The elastic gum produced by the plant is found to be of the nature of gutta-percha rather than caoutchouc, and the vessels containing it are much more similar to the cells which yield true gutta-percha from *Dichopsis* than to the lactiferous vessels of the common rubber-yielding trees. It occurs in every part of the plant except the wood and the outer parenchymatous layer of the young roots. Some preliminary experiments, to ascertain the yield and quality of the gutta, have been made by MM. Dybowski and Frow on material obtained from living plants in Paris. The dried leaves yielded 2·25 per cent. of substance soluble in toluene, which, considering that the fresh leaves contained 70 per cent. of moisture, is not a high return. The fruits, however, gave a much better result, as when undried, containing 7·4 per cent. of moisture, they yielded over 27 per cent. of substance soluble in toluene. The product obtained was of brown colour, and behaved exactly like gutta-percha. When immersed in hot water it softened, and could then be stretched out into thin sheets, like gold-beaters' skin, or moulded, whilst on cooling, it again became quite hard. As gutta-percha it was stated by experts to be of good quality.

The plant has proved to be very hardy, for at Kew a specimen obtained in 1897 from Paris has grown successfully in the open without protection, and in Paris two unprotected plants have survived exposure through two winters to as low a temperature as 18° or 19° F.

Eucommia ulmoides may therefore prove of value as a source of gutta-percha, and the Jardin Colonial is already making experiments with the plant in Annam, Tonkin, and North Africa.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Quebracho Extracts Soluble in the Cold, and their Chemical Analysis. J. Paessler and W. Appelius. Deutsche Gerber-Zeit. **44**, [33—42, and 45]. Zeits. angew. Chem. 1901, [37], 930.

In examining different Quebracho extracts soluble in the cold, the authors found that Vienna hide powder contains about 1 per cent. of free hydrochloric acid, and is therefore unsuited for testing Quebracho extracts containing sulphite, this acid acting on the latter in the hide filter. They therefore give the preference to neutral Freiberg hide powder, and consider that such powders as are capable of producing chemical changes like the one mentioned, should not be used for tannin analysis.—C. S.

Horn and Ivory; Dyeing and Bleaching ——. Textile Colorist.

See under VI., *page* 1111.

PATENTS.

Hides and Skins; Process for Removing Hair, Wool, Fur, and the like from ——. H. R. Riches, and The Wool, Hide, and Skin Syndicate, Limited, London. Eng. Pat. 14,727, Aug. 16, 1900.

The raw skins, after being softened in water and broken over the beam with the fleshing knife, are hung in specially constructed chambers and exposed to the combined action of ammonia, and the heat communicated by water vapours at a temperature of about 80° F., for a period of time which varies according to the class and thickness of the ski The wool or hair which is unimpaired by the treatment c then be removed by hand.

The method, "ammonia and heat," and the structu details of the steam-chambers, are claimed.—R. L. J.

Chrome Tanning or Dressing of Skins, Hides, and the li F. Valentiner, Leipzig-Plagwitz, Germany. Eng. P 19,831, Nov. 5, 1900.

Fluorine compounds of chromium, such as the c referred to below, form leather much more rapidly th the compounds usually employed in chrome tannage, a with greater security to the hide substance.

Preparation of "Fluorinated Chromium Hydroxide." Sodium bichromate (100 kilos.) is dissolved in water (4 kilos.) and mixed with formaline (5 kilos.). Hydrofluo acid (200 kilos. of 10 per cent. strength) is added, and whole heated at 60°—70° C. until a test portion treat with excess of caustic potash gives the characteris emerald-green coloration.

Application.—A hide or butt (20 kilos.) is placed in vat containing 40 kilos. of a solution of about $\frac{3}{4}$ per ce strength of fluorinated chromium hydroxide, stirred f quently and left until test portions, cut from the thick part of the hide, show that tanning is complete. The h is rinsed, drawn through a weak alkaline bath, and finish in the usual manner.

The process may be combined with a vegetable tanna which should follow rather than precede the chro treatment.—R. L. J.

Tanning Hides and Skins. P. Bez and E. Bez, Léran Ariège, France. Eng. Pat. 12,372, June 18, 1901.

The skins are placed in weak tan liquors of gradua increasing strength, the density of each liquor being a ficially raised by addition of a neutral salt, such as bari chloride, so as to produce a rapid penetration by osmo pressure. Thus, pits may be filled with the follow liquors:—I. A tan-liquor of density 1° Baumé, increa to 5° B. by addition of barium-chloride; II. A liquor density 2° B., raised to 10° B. by adding barium-chlori III. A liquor of density 3° B., raised to 15° B.; and, IV. liquor, of density 4° B., raised to 20° B. in the way indicat

On the same principle, uncombined tannin may be rapi washed out by placing the tanned hides in a still dea solution of barium chloride in water only.

Extreme rapidity (hours instead of days) and uniform of tannage are claimed for this process.—R. L. J.

XV.—MANURES, Etc.

Perchlorate in Chili Saltpetre; Determination of —— Grimm.

See under XXIII., *page* 1144.

Blast Furnace Slag; Process of Treating Molten —— A. D. Elbers. Eng. Pat. 8333, 1901.

See under X., *page* 1119.

XVI.—SUGAR, STARCH, GUM, Etc.

Sugar; Alkalinity of ——*: Revision of the Methods Determination.* A. Herzfeld. Zeits. Vereins Deuts Zucker-Ind. 1901, Sept. [548], Part I., 381—386.

The author deals with certain suggestions made by Silesian Commission for alterations in the standard meth of testing the alkalinity of sugars. The method con in dissolving the sugar in faintly alkaline water contain phenolphthaleïn, and prepared in such a way that the p color is discharged by the addition of not more than 0·5 of centinormal acid.

The alterations proposed by the Silesian Commis related to the cases where neutral sugars, when dissol in neutral phenolphthaleïn water, give no red coloration, it was suggested: (1) that from 1 to 3 c.c. of centinor alkali be added to the 10 per cent. sugar solution, and i red coloration ensue, as compared with the original, that sugar be returned as neutral, or not acid; (2) that a sample of the sugar be placed on litmus paper, and if a blue coloration be obtained, the sugar be described as not acid; (3) that the spotting method with turmeric be employed.

According to the standard method the maximum error that may occur is, that a sugar containing 0·0005 per cent. of acidity would be returned as alkaline. The wording of the Silesian suggestions appears to indicate that the phenolphthaleïn water has not been properly prepared, and that it was employed slightly on the acid side instead of on the alkaline. This is the only explanation of clause (1), and if the suggestion were carried out on a properly prepared phenolphthalein water, the sole result would be to magnify the maximum error indicated above. As regards the two other clauses the author points out that, since they relate to other indicators than phenolphthaleïn, they are quite out of the question. The "spotting" method, it is true, is the most delicate way of testing with turmeric, but litmus and urmeric alkalinities are very different from those found with phenolphthaleïn, and sugars which are distinctly acid to phenolphthaleïn, and which suffer inversion on heating n solution, may frequently show an alkaline reaction owards turmeric. The author concludes that there is no reason for modifying in any way the present method of testing.—J. F. B.

Glucose; Derivatives of——. Remarks on Koenigs and Knorr's Paper. A. Colley. Ber. 1901, **34**, [12], 3205—3207. (Compare this Journal, 1901, 626; also preceding abstract.)

The author remarks that he had already prepared acetobromoglucose long before the publication of the work of Koenigs and Knorr, but had not published his nvestigations.

In preparing acetobromoglucose from acetylbromide and glucose, some difficulty was experienced in moderating the reaction so as to avoid the production of free bromine, and consequent decomposition of the product; it was necessary o work at a temperature below −10° C. If protected from atmospheric moisture acetobromoglucose may be kept for a long time without change. The author confirms the observation of Koenigs and Knorr, that acetochloroglucose readily reacts with silver and barium acetates, with the formation of the pentacetylglucose melting at 131° C. He further attempted to replace the chlorine by a divalent radicle, by the interaction of acetochloroglucose with silver sulphate; but, instead of the sulphuric acid derivative of glucose expected, there was formed a considerable amount of the isomeric pentacetylglucose melting at 112° C., together with by-products which have not been investigated.—J. F. B.

Desiccation of Beetroots; Influence of——, in the Field on Storage in Silos. G. Levesque-Hérault. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **19**, [1 and 2], 159—161.

With the crop of beets obtained last year, the summer of which was very warm and dry, it was found that, when the beets were stored in silos for a few days before being used n the factory, dry rot very quickly set in. No rain fell for he first three weeks of working, and although the roots received, grew steadily richer during this period, yet, owing to the storage in silos, the value of the roots when used was found to gradually diminish. This result was due to the continued action of the drought on the roots, which had the effect of predisposing them to rapid change.—T. H. P.

Beetroot Juice; Krause's Method for the Determination of the Quotient of Purity of——. Drenckmann. Zeits. Vereins Deutsch. Zucker-Ind. 1901, **51**, [546], 655—663.

The use of finely ground pulp offering much inconvenience, inely grated, or minced chips were employed in the experiments made to compare the ordinary process of alcoholic digestion (clarifying with faintly basic lead acetate according to Weisberg) and Krause's method, varying the time of digestion and the temperature.

The results show that, by extending the time of digestion and de-aëration from 10 to 45 minutes, no increase in the sugar content occurs, but an increase of total solids, and a lowering of the quotient by 1 to 2 per cent.

On reducing the temperature of digestion from 90° to 70° C., the duration of time being 10 minutes, the extraction of sugar was unaltered generally, the dry substance not at all, so that a temperature of 70° C. is sufficient for digestion. Throughout the various conditions the sugar obtained was 0·2 to 0·3 per cent. higher than by alcoholic digestion.

Errors were to be expected from the greater tendency of aqueous solutions to retain air, as compared with alcoholic solutions, but no increase of volume due to this cause was found.

Strohmer's observations agree with the above. He finds that the determination of sugar, and therefore the sugar content of the beetroot, is very slightly, if at all, influenced by the time of digestion and de-aëration and the temperature, or by the fineness of the pulp; but that all these conditions affect the hydrometer, and consequently the quotient, and suggests that, as has been agreed upon in Prague, a uniform method of procedure be adopted to make the results obtained in different factories comparable.

Sachs is of opinion that it is better to work cold, the results being more comparable with those of diffusion; and the higher purity found by this method is no proof that it is wrong.—L. J. de W.

Vacuum Pan Construction [Sugar Manufacture]. Greiner. Zeits. Vereins Deutsch. Zucker-Ind. 1901, **51** [546], 701—708.

The greater magnitude of operations arising from adoption of the diffusion process, and heating by double and triple effect, led to the increased size of vacuum pans which are now introduced in many factories, where a single pan may take the whole of the first product. The question then arises, whether the safety and quality of the work do not suffer from dealing with such large portions of massecuite. The great fluctuations in the demand for steam, whether direct or indirect, are felt in the boilers, and economy of fuel is more likely to be assured where two or more pans are used, the boiling periods of which overlap, so that greater regularity results.

At the moment when the first grain is formed in the pan, the volume is the smallest during the whole boiling, representing 28 to 30 per cent. of the whole liquor used; where larger crystals are to be produced, less still; and the heating coils must not rise above this, since they should never be uncovered by liquor. Why not, then, as Rillieux proposed, carry out the concentration, formation, and growth of grain in separate vessels? The reason is, that the steam available at the end of the evaporating station, indirect steam being now used for heating, is no longer sufficient for boiling a mass with a boiling point of 120° to 130° C. under atmospheric pressure. The operation of concentrating should be interrupted when ready for graining, and the rest of the process continued at a spot where direct steam is available.

There are many faults in boiling. The obtaining of soft, floury grain is often ascribed to low steam when the real cause is want of exchange of heat. To this end, movement is necessary, as Hagemann and Jelinek have shown, since a heating surface may transmit three times more heat where there is movement of the mass than where there is none. To the same end, and with movement of the mass, the heating coils need be only one-third the size as would be required without such motion. A boiling mass can never be without motion, but the slight displacements observed take place rather in the body of the syrup than at the heating surface. The heating coils often fill the whole horizonal section of the pan, leaving only about 1-25th part free in the centre, and a small ring at the walls, thus preventing circulation. It is therefore no paradox to state that by lessening the heating surface the heating effect may be increased, if a portion is removed which impeded circulation. The author has found that by shutting off the outer ring, or, in large pans, the outer two, a fine and regular product was obtained. When the massecuite, however, has become so stiff that this motion no longer proceeds, the outer coils are then heated, the circulation of the mass being no longer necessary, as the grain will not deposit, owing to the great frictional resistance.

Fine or false grain is caused either by stagnation of a portion of the massecuite in the angular parts of badly-formed pans or by drawing in fresh liquor which, instead of becoming distributed among the mass, rises unmixed to the surface, where it undergoes active evaporation. The danger of false grain increases towards the end of the boiling as the difference in density between liquor and massecuite increases. This is to be avoided by introducing the liquor in thin streams.—L. J. de W.

Syrups; Process and Apparatus for Regulating Supersaturation in the Boiling of ——. H. Claassen. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**, [12], 1035—1042. Ger. Pats. 117,531 and 117,532.

Hitherto the concentration of syrups for crystallisation has been determined by experience—the string proof. This proof has no precision, owing to the variable composition of the syrup as regards purity and viscosity. For good work it is necessary that an appropriate temperature and water content should be established to maintain the necessary supersaturation, and that this optimum should continue long enough for the syrup to have time to deposit its sugar on the crystals already formed. These conditions are fulfilled by the new process.

To maintain the temperature long enough at the desired degree, corresponding to water content of the syrup and the degree of vacuum, without causing evaporation, the best means found is the introduction of steam into the massecuite.

As boiling proceeds, the purity of the syrup diminishes continuously by the precipitation of sugar, and the water content must also diminish with a corresponding rise of temperature. These two determinations are made by the instrument described below, and its use enables the conditions suitable for crystallisation to be kept constant. With decrease of purity, viscosity increases, and to remedy this obstacle to crystallisation the temperature must be raised, and the concentration diminished; that is, as boiling proceeds the quotient of supersaturation of the hot syrup is diminished. In this way the syrup may be reduced to a purity of 65.

The further desugarising is carried out in mixers. Here account must also be taken of the viscosity caused by cooling, and this viscosity can only be lessened by lowering the supersaturation. Thus, preposterous as it may seem, an addition of water may be the means of accelerating the deposition of sugar by lessening the viscosity more than the supersaturation. This should be so done that, after centrifugalising, the supersaturation is lowered approximately to 0. The control apparatus consists of a manometer, a thermometer, and two double scales. There is also a series of tables giving the water content corresponding to various temperatures and degrees of purity, as determined by the author's experiments. The purity of the syrup to be boiled being known, a reference to the tables will give the water content corresponding to the vacuum and temperature as read. On setting the index of the scale in accordance with these data, a reading is obtained of the temperature to which the syrup is to be brought by concentration. This point being reached, the valve is opened for direct admission of steam to keep the quantity of water fixed while grain forms. During the first hour after graining an advance is made from the next figure on the tables, and so on.

The claims are for (1) a process for regulating the supersaturation in the boiling of syrups, consisting in evaporating the syrup at first in the ordinary manner up to a concentration determined empirically. The heating is stopped and the temperature regulated according to the degree of the vacuum by the introduction of dry steam direct into the syrup until crystals are formed. The boiling is continued by introducing syrup, but maintaining a determinate concentration by means of the ordinary steam, or by steam introduced directly, to obtain the necessary temperature. During the whole boiling the mass is kept in movement by an agitator.

(2) The determination of the temperature necessary according to (1) by the establishment of an apparatus to control the degree of vacuum and water content; this latter is determined by the quotients of supersaturation, which are themselves dependent on the purity.

(3) The control apparatus described.

(4) The further treatment of the massecuite thus obtained in crystallisers with agitators, and with the addition of water or dilute sugar juices.

The supplementary patent proposes the addition of ready-formed sugar as seed, instead of graining the syrup itself. During the introduction of the seed the supersaturation of the syrup is to be kept lower than when graining, and as the seed is colder it should be introduced gradually, to avoid forming false grain.—L. J. de W.

Grosse's Process; Boiling and Crystallising Low Products by ——. E. Carlson. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **18**, [12], 1043—1044. From Deutsch. Zucker-Ind. 1901, 553 and 923.

The crystallisation of the last traces of sugar with a supersaturation of 0 would be too slow; the concentration therefore has to be carried to a degree a little higher than that indicated by the tables. To arrive at the exact point, the concentration is pushed a little further than actually required; then, from a sample taken, the degree Brix is determined, and the quantity of water calculated which is required to be added to restore it to the desired degree Brix. The water is not added directly, nor as sweet water from the filters, for the mixing would be too slow, and there would be danger of sugar being dissolved; it is preferable to use a quantity of molasses at 75° Brix heated to 50—60° C.

It appears from the tables that, in order to "spin off" a syrup of given purity, the concentration must be greater in proportion to the purity of the massecuite. When this purity is too great the concentration required is so great that crystallisation is impossible, and the purity should, in this case, be lowered by additions of undiluted molasses at 70° to 75°, but it is better to modify the previous stages of work, so as to have the product of relatively low purity.

Beyond the questions of temperature and concentration one has to consider the *purity* of the drained syrup; it corresponds to the limit of crystallisation of the product worked. If, with successive boilings of approximately equal quality, but with a gradual increase of concentration and time of cystallisation, there is not found a parallel diminution in the purity of the spun syrup, but rather an increase in viscosity and difficulty of centrifugalising, it is fairly certain that the limit of crystallisation has been closely approached.

For massecuites of sensibly similar properties, and conditions of working more or less constant, there exists a fairly constant difference between the purity of the massecuites of the second and last syrups. This difference remains so long as the limit of crystallisation is not approached, whether the initial purity rises or falls. As soon as this limit is neared, the difference in question loses its constant character, diminishing when the purity of the massecuite falls and *vice versâ*; on the contrary, the purity of the "syrup off" remains fairly constant. If it be found that by additions of molasses to the boiling mass the diminution of the quotient of the massecuite does not run parallel with that of the "syrup off," but that the difference only varies correspondingly, it is fairly certain that the limit of crystallisation is nearly reached, and it is evident that fresh additions of molasses are then of no utility.

After boiling, the massecuite is mixed either in the pan itself or in another mixer. If under each pan there is a mixer capable of holding the entire boiling, mixing is continued 36 hours in the pan, and a further 20 to 30 hours in the mixer, making a total of 75 to 80 hours for the whole operation. On mixing in a vacuum, it is observed that the mass becomes frothy, swells up, and seems to become fluid. This is not due, as generally believed, to the destruction of crystals by the wipers, but to the entrance of air through badly-made joints. Mixing 30 to 40 hours in a vacuum removes 0·5 to 0·7 more water.

Cooling should be conducted so slowly as not to supersaturate the mother-liquor unnecessarily. At the end of the cooling there is always found an increase of supersaturation, due to the fact that, at this limit, crystallisation does not proceed as quickly as the cooling. If the mother liquor is too viscous and too difficult to spin, the supersaturation may be suppressed by an addition of diluted molasses (75° Brix, out), heated not above 50°—60° C., or, more simply, by heating in the mixer if arrangements for this exist, or in e centrifugal casing. The two last methods should be ed very carefully, not to lower the concentration of the other liquor below the point of saturation.—L. J. de W.

rystallisation Products, particularly Sugar Candy; Process and Arrangement for facilitating Removal of ——, from Wire or Tubular Carriers. S. Boruett, Vienna. Zeits. des Vereins Deutsch. Zucker-Ind. 1901, **51**, [547], 761—762. Ger. Pat. 121,870.

ıE method at present in use for preparing sticks of sugar ndy is by allowing it to crystallise on woollen threads, the e of wire or metal tubes offering difficulties, as the sugar uld not be removed from the carriers. This is to be cilitated by passing an electric current so as to heat the rriers to about the melting point of the product.
—L. J. de W.

aramelan; Investigations on ——. IV. The Products of Hydrolysis of Caramelan. F. Stolle. Zeits. des Vereins Deutsch. Zucker-Ind. 1901, Sept., [548], Part II. 836—838.

ONTINUING his researches on caramelan (see this Journal, 00, 859), the author has investigated the hydrolysis of is body by heating it for 18 hours on a boiling water-bath th 3 per cent. hydrochloric acid. The colour of the lution gradually disappeared in the course of the treatent, with the separation of a brownish-red precipitate. is insoluble body amounted to about 30 per cent. of the igical caramelan, and has not been studied further. ere remained in the colourless solution a body of the ture of a reducing sugar. It could not be induced to ystallise, but the solid mass precipitated by ether from alcoholic solution, showed a tendency to bi-rotation, and ve solutions which were dextro-rotatory. The osazone s prepared, and was found to melt at 197° C., and, on alysis, numbers were obtained corresponding to the azone of a hexose. This osazone is insoluble in cold and iling water, also in dilute alcohol, but dissolves in boiling per cent. alcohol, glacial acetic acid, and acetone, and ystallises as yellow needles in spherical aggregates; its lution in acetic acid is laevo-rotatory.—J. F. B.

olasses Residues; Acids Soluble in Ether, derived from ——. A. Herzfeld. Zeits. Vereins Deutsch. Zucker-Ind. 1901, **51**, [547], 720—745.

ıE molasses residue principally examined, was obtained m Dessau, but for the sake of comparison some from ochhern was also used, and proved to be of approximately e same composition. The Dessau residue was of sp. gr. 41335, and contained 22·48 per cent. of water and 28·62 r cent. of ash.

The residue was acidified with dilute sulphuric acid, and aken out with ether eight times, until the weight of the tract, after evaporating off the ether, became constant. terwards, 50 kilos. of the acidified residue were extracted th double the volume of ether, and the extract was bjected to fractional distillation, esterification, and ystallisation of some of the salts of the acids.

The Dessau molasses residue contains, per 100 of dry lids, 20·6 per cent. of compounds soluble in ether. ese consist of 4·92 per cent. of formic acid, 20·88 per nt. of acetic acid, 20·9 per cent. of lactic acid, and about er cent. of propionic, butyric, and valeric acids. Succinic id was apparently present, but could not be identified with rtainty.—L. J. de W.

Saccharimeter; A New ——. P. Horsin-Déon.

See under XXIII., *page* 1141.

kalinity; Indicators for ——. Alterability of Stored Raw Sugars. Köhler.

See under XXIII., *page* 1147.

Honey-Dextrin; Nature of ——. E. Beckmann.

See under XVIII. A., *page* 1131.

PATENTS.

Glucose; Process and Apparatus for the Manufacture of ——, by Saccharifying Mucedines. L. C. A. Calmette, Lille, France. Eng. Pat. 11,622, Oct. 18, 1900.

Crushed maize or decorticated rice is introduced into a boiler with twice its weight of water, and hydrochloric acid equal to 0·5 per cent. of the weight of the grain, and the mixture is heated to boiling in three stages of one hour each at 100°, 110°, and 120° C., the acid being preferably added in small doses during the boiling. When the starch is converted into dextrose, maltose, and dextrin, the charge is concentrated to contain about 25 kilos. of grain per hectolitre, and discharged into a suitable apparatus, in which complete transformation of the maltose and dextrin into dextrose is effected by saccharifying mucedines, added in the form of young mycelium, without sporules.

Several species of mucedines, mucors or aspergillus, can be employed; the most suitable are those of the aspergillus group.

The mixture in the saccharifying vessel is emulsified by the action of filtered compressed air, sterilised by steam. A small dose of mucedines is added during the emulsifying action, which goes on for about 36 hours, or the time may be abridged to 24 hours by adding a leaven of mucedines previously prepared. The must is then rapidly cooled to 10°—15° C., or it may be heated to 55°, to check mucedine development, and filter-pressed. The residue forms an excellent food for animals, while from the filtered liquor syrups of various densities, or crystallised glucose can be obtained. When first introduced into the saccharifying vessel, sodium carbonate is added until the acidity is 0·25 per cent., reckoned as H_2SO_4: When the transformation into glucose is complete, the material is again neutralised with sodium carbonate until only very feebly acid.

The principal parts of the apparatus consist of an air-filter arranged for sterilisation by steam, an emulsifier in which the compressed air bubbles through the must in pipes, so contrived as to cause a circulation in the saccharifying vessel, which has the necessary pipes for charging, discharging, and for inlet and outlet of air, also means of cooling by water externally applied.—L. J. de W.

Starch; Method of Manufacturing Thin Boiling or Modified ——. C. B. Duryea, Manhattan, New York, U.S.A. Eng. Pat. 11,442, June 4, 1901.

For some purposes, particularly for steam laundry use, it is highly desirable to have starches yielding pastes of a less viscous and colloidal character than ordinary starches yield when boiled with water.

The method here employed for making a thin boiling starch consists in suspending the material in warm water with 1 per cent. of acid, preferably sulphuric acid, and treating it at about 55° C., but not exceeding 59° C. When the proper point of conversion is reached, the heating is discontinued and the charge washed, and neutralised with some suitable alkali.—L. J. de W.

XVII.—BREWING, WINES, SPIRITS, Etc.

Mycoderma Cerevisiæ. H. Van Laer. J. Fed. Inst. of Brewing, 1901, **7**, 337—356.

The author reviews at some length the investigations which have been carried out on this class of organism. The species most likely to be obtained when any beer or yeast is taken at random possesses the general morphological and physiological characters of the *mycoderma cerevisiæ* described by Hansen (Meddel. fra Carlsberg. Labor. 1888, **2**, [5]). It is a non-sporulating variety, and its cells have for the most part the appearance of *Pastorianus*. The morphological appearance is, however, dependent on age and conditions of culture. The membrane is impregnated with fatty matters soluble in alcohol [? ether], consisting of oleïn and solid glycerides. The cell contains three or four vacuoles, the refractive index of which differs but little from that of the protoplasm. When cultivated in beer wort at 25° C., there appear in the protoplasm shining, fatty corpuscles varying in number from one to three. Should the corpuscles be well formed, the vacuoles are very sharply defined, especially if the specimen be taken from the bottom of the culture flask. Glycogen appears in the young organism either at the centre of the cell as fine granulations or in the vacuoles as small spheres which give an intense reddish-brown iodine reaction. In old cultures the vacuoles sometimes contain crystalloids. The film has at first the appearance of a spider's web. Later on it becomes thicker and folds form in it, whilst packets of cells are continually being detached and form a deposit on the bottom of the culture vessel.

The depth attained by the colonies of a gelatin stab culture show that the organism is capable to a very great extent of existing in the absence of air. *Mycodermæ* do not liquefy gelatin. With the exception of *Saccharomyces mycodermiques* the commoner forms of this group have no other means of multiplication than that of budding (compare B. Fischer, Centralb. f. Bakteriol, 1893, **14**, 653; Brebeck, Zur Morphologie, Bakteriologie der Kahmpilze, etc., Jena, Gustav Fischer, 1894; Will, Zeits. f. das. Gesammte Brauwesen, 1897, 127).

The highest temperature of film formation is about 30° C., the maximum for most of the media examined by the author being about 42° C. Death occurs when the cells are heated to 50° C. or to 55° C. in wort or acid liquids. The cells preserve their vitality at 5° C., but there is no film formed on wort at this temperature, although this occurs on beer after 46 days.

The best mineral foods for *mycoderma cerevisiæ* are the same as for beer yeast. Phosphoric acid and potash are the mineral substances used mostly by this organism, magnesia occupying a second place. *Mycoderma* can make use of the nitrogen of ammonium salts for the synthesis of its nitrogenous constituents, provided that a suitable carbonaceous material is present; and, in a similar way very varied carbonaceous food can be utilised if the nitrogenous matter be appropriately chosen.

A large number of ternary substances can be utilised by *mycoderma cerevisiæ*. Among these are ethyl alcohol (Pasteur, Comptes Rend. 1862, **64**, 265), but methyl, propyl, and butyl alcohol are unattacked, as also is any monohydric alcohol richer in carbon than these. Pasteur (*loc. cit.*) found that mycoderma destroyed the sugars. Beyerinck and Seyfert have been able to confirm the disappearance of dextrose and levulose, whilst maltose, cane sugar, and lactose remained unchanged. Arabinose and xylose are readily destroyed by *mycoderma*.

All the experiments made to discover invertase in the condition under which yeasts show an inverting action have failed.

The author discusses the question of the influence of *mycoderma cerevisiæ* when present in pitching yeast. Hansen in 1878, found that all the beers of the lager cellars of the old Carlsberg Brewery were more or less contaminated with this organism without, however, exhibiting any indication of disease. In many cases the flavour was improved. Bělohoubek (Vortrag, Böhm. Bierbrauer, Prague, 1885) was the first to show that *mycoderma* is capable of causing considerable trouble in brewing. The author considers that the injurious action of this fungus depends on the vigour of the yeast and on its greater or less abundance. A beer which is free from yeast is very rapidly spoiled by mycoderma and soon develops a strong smell of mould. He brings forward experimental evidence showing that the presence of mycoderma in pitching yeast retards the fermentation somewhat, part of the extract being left undecomposed. This retardation is particularly noticeable in the case of Logos yeast.—J. L. B.

Yeast; Process for the Artificial Preparation of ——, without Lactic Acid Fermentation. M. Bücheler. Ger. Pat. 123,437, June 22, 1900.

The acidification of the mash in which the mother-yeast is prepared, is effected sometimes by a preliminary lactic acid fermentation, or the addition of commercial lactic acid, and sometimes by the substitution of a mineral acid for the lactic acid. According to the process here described, the acidification is brought about, making use of the salts of organic acids naturally present in the potato mash, by the addition of a small quantity of sulphuric or phosphor acid in such proportions that no excess of free miner acid remains. The maximum point is determined by tl behaviour to Methyl Violet as an indicator. Then tl acidity of the medium is due entirely to organic acid and all the advantages of a lactic acid mash are obtain with a minimum of cost and time. The mash is made i the usual way, the necessary quantity of mineral acid added, the whole is cooled down to the fermentatic temperature, and the mother-yeast is sown. After 18 20 hours the yeast is ripe, and the acidity of the mash just the same as before it was set up, being about 50 p cent. lower than is generally the case with lactic ac mashes. The avoidance of the lactic fermentation effect by this process saves 24 hours, and the sugar usuall consumed in that operation is made available for alcoh production; moreover this process is uniform and certain. —J. F. B.

Yeast; Increase of the Efficiency of Bottom-fermentati ——. A. Krause. Woch. für. Brau. 1901, **18**, [41 520—521.

The author criticises the so-called "normal" system fermentation in vogue in Germany, which consists i pitching the wort at a temperature of 5° C., and usin only half a litre of yeast per hectolitre. The whole proce of fermentation requires from 8 to 10 days in the vats, an owing to the low temperature and small quantity of yeas there are no visible signs of working for the first 15— hours. The wort lies exposed to any infection that may about, and is very liable to absorb bad odours from the ai since it is absolutely without any protection. When fe mentation does start, the liquid becomes saturated wit carbon dioxide, which still further retards the activity the yeast. Not until the stage of "Hochkrausen" reached, with a rise of temperature to 9°—10° C., is tl yeast in a position to afford protection to the wort, an even then it is retarded by the presence of the carbo dioxide and deficiency of air.

The "normal" system apparently only depends upon ol custom, when the wort had to be started cold, to avoi excessive rise of temperature later on. At the prese time, when such perfect arrangements are available f cooling the wort in the vats during fermentation, th system is out of date, and the low temperature, tends assist the development of wild yeasts.

A great economy of cooling power and vat space woul be effected, if fermentation were started at a high temperature and carried through more rapidly.

The author has been working most satisfactorily f several months according to the following system:—Th wort is pitched at a temperature of 9°—10° C., and th quantity of pitching yeast is doubled, being 1 litre of yea per hectolitre of wort. Visible fermentation starts almo at once; moreover, 6 hours after pitching the wort i aërated with filtered air for 18 hours. Thus the yea multiplies very rapidly, and soon attains its maximu activity, protection being afforded to the wort almost fro the very first; the carbon dioxide is also removed by th aëration. The temperature is never allowed to rise abov 10° C., the wort being cooled by water circulation. Th beer is ready for drawing off in about 3½ days, as again 7½ days by the old system. The vat space necessary f working the brewery is thus halved. The beer ripens mor quickly in the cellar; it also clears better and keeps bette The attenuation may be regulated as desired, according t the length of time during which the wort is aërated. —J. F. B.

Grain Yeast [Top-fermentation] and Bottom-fermentatio Beer Yeast; Differentiation of ——, by Determinatio of the Fermentative Power at Different Temperature C. J. Lintner. Woch. für Brau. 1901, **18**, [36], 446–447.

It is a well-known fact that pressed bottom-fermentatio beer yeast is unsuitable for baker's purposes; when it i used the dough rises rapidly to the proper height, but fall down during the baking, and the bread lacks the light con sistency of that prepared with grain yeast. Hayduck' method for the determination of fermentative power, a

° C., fails to account for this, since the beer yeasts nerally show a higher fermentative power than the grain asts at this temperature. Experiments made by Barth o prove that the difference is not to be attributed to any oteolysis of the gluten by the enzymes of the bottom-mentation yeasts.

In the baking of bread, the temperature of the interior of e dough does not exceed 104° C.; this temperature is ached gradually, and the efficiency of the yeast depends on the relative resistance of its fermentative power rise of temperature. The author has therefore carried t determinations of the fermentative power by Hayck's method at temperatures of 30°, 45°, and 50° C. e following table shows the uncorrected volume of gas lved by 10 grms. of pressed yeast from 100 c.c. of a 10 cent. sugar solution :—

——	30° C.	45° C.	50° C.
	c.c.	c.c.	c.c.
Beer yeast (bottom-fermentation)....	360	218	107
” ” ”	475	232	72
” ” ”	312	210	63
” ” ”	367	162	28
” ” ”	350	170	25
Grain yeast (top-fermentation).......	247	380	279
” ” ”	290	428	231
” ” ”	113	203	118
” ” ”	275	354	175
” ” ”	298	388	161
” ” ”	290	428	136
Weissbier yeast ”	210	255	180

Here, then, is the explanation of the superiority of grain ast over beer yeast for bread making :—whilst the volume gas evolved by beer yeast is considerably less at 45° C. n at 30° C, that evolved by grain yeast is greater at C. than at 30° C. The latter is also still considerably ive at 50° C., which is a great advantage in bread king.

This difference in the behaviour of the fermentative wers of the two types of yeast at 30° C. and 45° C., nbined with the raffinose test of Bau, is likely to prove considerable utility in the analysis of pressed yeasts. In s way yeast No. 5 in the above table, which was adulently sold as grain yeast, was proved to be a pressed er yeast.

The determination of the fermentative power at 45° l especially at 50° C. affords a measure of the relative ue of grain yeasts for baker's purposes, which is not wn by the determination at 30° C. The greater the ume of gas evolved at 50° C. the greater is the value of yeast from a bread making point of view, although the ults obtained at 30° C. may have been in quite another ection.

The author suggests that, since the value of bakers' yeast pends upon such a purely physiological factor, it may be ssible to acclimatise yeasts, hitherto unsuitable, so as to more resistant to high temperatures.—J. F. B.

ast; Agglutination of ——. H. P. Barendrecht. Centr.-Bl. f. Bakter. und Parasitenk. **7**, [2], 623—627. Chem. Centr. 1901, **2**, [14], 818.

suspensions of yeast be introduced into increasing antities of N/10 sulphuric acid, agglutination is observed, time being dependent on the amount of acid present. ing 15 c.c. of a yeast suspension, no action was observed th 0·2—0·3 c.c. of N/10 acid. Experiments with drochloric, phosphoric, formic, acetic, propionic, and eric acids, showed that the extent of the action is not portional to the degree of acidity, but that the weaker acid, the greater is the quantity necessary to produce most rapid agglutination. The phenomenon is parently due not alone to acidity, but also to the action the hydrogen ions. The yeast cells showed no perceptible eration under the microscope after agglutination. The cess is stated to be a physiological one, and to be ersible, as the particles after complete agglutination by phuric acid can be restored to their original condition agitation. The agglutination is connected with the life of the cells. Yeast cultivated in wort was not capable of agglutination, but acquired that property if ammonium salts were added to the wort. The concentration of the yeast suspension has little influence on the action.

The formation of flocks observed in the manufacture of yeast by the aeration process is quite a different phenomenon; here the acidity has no direct influence. The active agent in this case is a bacterium, which the author has isolated, and to which he has given the name *Leukonostic agglutinans*. This micro-organism produced lactic acid in wort, and on wort-gelatin containing cane sugar, formed a mucilaginous drop, but not in presence of dextrose, levulose, maltose, raffinose, and lactose. The agglomeration of yeast in the factory is probably due, therefore, to the agglutination of the cells by means of the mucilage produced by *Leukonostic agglutinans*.—A. S.

Enzyme Action. A. Brown. Paper read before the British Association (Section B), Glasgow Meeting, 1901.

The action of invertase on cane sugar, as examined by the usual methods, does not appear to follow the law of mass action, but resembles that of fermentation. It is probable, however, that in the inversion of cane sugar, the sugar enters into molecular combination with invertase previous to change, and, if such be the case, the time factor, which under the conditions would be of some magnitude, would limit the effect of mass action in inversion changes as observed in solutions of ordinary concentration. The author found by direct experiment, that at a certain point of dilution (with a 1 per cent. solution of cane sugar), invertase acting in sugar solution exhibits an order of change in conformity with mass action. Since the character of the action of fermentation has been shown to resemble that of inversion, the author considers it very probable that in this enzyme change, also, the action is limited by the time factor of molecular change, and that the influence may be exerted in all enzyme changes.—A. S.

Barley and Malt; Pentosan Content of, ——, with Special Reference to the Increase of Pentosans during Germination. W. Windisch and R. Hasse. Woch. für Brau. 1901, **18**, [40], 493—495.

The work of Tollens and his collaborators has proved that there is a small but distinct increase of the pentosans during the germination of the barley corn (see this Journal, 1901, 268). But it was not shown whether this increase was general, or localised in any particular part of the corn.

The authors have germinated barley and separated the coombes from the malt after kilning. The pentosans were then estimated as furfural-phloroglucide. The statistics are all referred to 100 parts of barley dry-substance.

——	1. (Laboratory.)	2*a*. (Laboratory.)	2*b*. (Large Scale.)
	Per Cent.	Per Cent.	Per Cent.
Yield :—			
Malt dry substance.............	91·89	93·12	85·28
Coombes dry substance	3·19	2·25	5·31
Loss in steeping and by respiration.	5·01	4·63	9·41
Pentosans :—			
In barley dry substance	8·16	8·27	8·27
” malt ” ”	9·41	9·49	10·60
” coombes ” ”	11·51	11·05	17·07

Hence, calculating to 100 parts of barley dry-substance,—

	Parts.	Parts.	Parts.
Pentosans :—			
In malt..........................	8·64	8·75	9·04
” coombes	0·37	0·25	0·91
Total	9·01	9·00	9·95
Total increase during germination	0·85	0·73	1·68
Increase in malt	0·48	0·48	0·77
” coombes ..	0·37	0·25	0·91

The distribution of the increase was found to occur proportionally more in the malt-corn or in the coombes, according as the growth was short or long.

The authors then studied the question of the distribution of the pentosans in the parts of the dressed malt. For this purpose the embryos were excised from the sample of malt (2*b*) prepared on the large scale, and the proportion of their weight to 100 parts of original barley was determined. The pentosans were then estimated in the residual malt-endosperms. There were found 9·28 per cent. of pentosans in the endosperms, equal to 7·17 per cent. calculated on the original barley dry substance. This represents a loss of 1·1 per cent., the whole of which would be accounted for by the pentosans in the embryos of the barley. Hence, the authors conclude that the pentosans formed during germination, are localised exclusively in the vegetative organs (acrospires and rootlets), and that the material from which these newly-formed pentosans are produced is not furnished by the pentosans of the original barley-corn, but is derived from the starchy or saccharine constituents of the growing corn, and that the pentosans, consequently, have no functions as reserve materials.

—J. F. B.

Sucrase or Invertase in Industrial Fermentations. G. Dejonghe. Bull. de l'Assoc. des Chem. de Sucr. et de Dist. 1901, **19**, [1 and 2], 77—81.

In his "Traité de la fabrication de l'alcool" the author, referring to the fact that in the fermentation of molasses the action ceases before the whole of the sugar is converted into alcohol and carbon dioxide, states that such cessation is not due to lack of invert sugar, since the sucrase secreted by the yeast remains active after the death of the yeast, and the inverting action of the sucrase appears to be unlimited: further there is no fear of the action of the sucrase being affected by the antiseptics employed in the fermentation since the soluble ferments are much more resistant to the action of antiseptics than are the living ferments. These views the author now upholds against objections raised by Verbièse and Effront, who consider that fermentation stops owing to want of invert sugar. He points out that the enfeeblement must take place in the yeast and not in the sucrase, since the latter is not an organised body but only organic material of a complex nature. Reference is made to the investigations of various authors on the great resisting power of sucrase to the action of antiseptics.—T. H. P.

Molasses; Fermentation of ——. E. Barbet. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **19**, [1 and 2], 81—86.

In the fermentation of molasses, it is necessary to facilitate the multiplication of the yeast cells so that sucrase may be secreted in quantity sufficient to invert enough sugar for the fermentation. This is done by supplying the yeast with suitable food, more especially with peptones and phosphoric acid, which are conveniently added in the form of maltopeptone or of saccharified maize. The author's process which makes use of a cheaper material, viz., the dead yeast cells from a previous fermentation, is carried out as follows. The mouth of the pipe by which the fermenting vat is emptied, is surrounded by a copper collar about 7 or 8 cms. high, and after the main bulk of the liquid has flowed away, the muddy residue consisting of dead yeast cells is led by another pipe into a copper autoclave. The spirit is then distilled off, after which a quantity of sulphuric acid equal to that necessary for each fermenting vat is added to the autoclave, which is then closed and subjected to a pressure of 2 atm. By this means the whole of the yeast cells are dissolved, and the liquid is pumped to the molasses requiring denitration, which is effected by the sulphuric acid present in the peptonised mixture. The method has been tested practically, and it is found that the time occupied by fermentation is diminished from 30 to about 21—23 hours from the filling of the vat; also during the filling the attenuation is more rapid. A disadvantage attending the use of this process is the rise of temperature brought about by the vigorous fermentation which takes place. This the author obviates by using less than the usual quantity of molasses in the vat and addin
to it a proportion of the fermented liquor from a previo
operation.—T. H. P.

Cleansing Material; New ——, *for Brewery Vessel*
A. Ljöö and V. Törnell, Stockholm. Austr. Pat. 412
through Woch. für Brau. 1901, **18**, [36], 447.

For cleaning and removing residues of organic matt
from pipes, vats, &c. in breweries, a mixture of alka
hypochlorite, and caustic soda is recommended. A sodiu
hypochlorite solution containing 0·32 per cent. of activ
chlorine will remove the slime of foul yeast from the sid
of glass beakers in 5 hours, whilst a 7 per cent. caust
soda requires a day and a 5 and 2·5 per cent. soda lye do
not remove it completely in 3 days. The best mixture
1 part of sodium hypochlorite with 0·5—1 part of causti
The strongly oxidising action of this mixture kills a
organisms, whereas calcium bisulphite only attacks th
outer layers.—J. F. B.

Wine; Plastering of ——. P. Carles. Ann. Chim. an
appl. **6**, 321—327. Chem. Centr. 1901, **2**, [15], 874.

The influence of an addition of gypsum in the wine-press
three-fold, physical, chemical, and physiological. The fir
depends upon the fact that gypsum reduces the solubili
of the tartar, and on the formation of alcohol, gives rise t
the separation of a crystalline powder, which acts as
filter. With vegetable albuminoids, gypsum gives precip
tates, which exert a clarifying action similar to that
tannin. The chemical action of gypsum is due to th
conversion of tartar into calcium tartrate, potassiu
sulphate, and free tartaric acid, the completeness of th
reaction depending upon the total quantity of tartar prese
the degree of dilution, the temperature and the percenta
of alcohol. In consequence of the influence of the
varying conditions, it is almost impossible to calculate th
amount of gypsum which should be added, in order th
not more sulphuric acid should remain than is equivale
to 2 grms. of potassium sulphate per litre. The physi
logical action is a consequence of the chemical one. Fr
tartaric acid has a favourable influence on the growth
normal wine yeast, but retards that of injurious organism
The great disadvantage of gypsum is the production of th
deleterious potassium sulphate.—A. S.

Brandies from Damsons and Grape Marc ("Trester
branntwein"); Examination of ——. A. Zega. Chem
Zeit. **25**, [75], 793–794.

The detection of the origin of brandies is difficult, and fo
the purpose the author makes use of the numbers obtaine
from the following determinations:—1. Estimation of fr
acid. 2. Estimation of alcohol in the form of ether
3. Estimation of alcohol, extract, ash, and sometime fuse
oil. 4. The furfural reaction, aldehyde reaction, and be
haviour of prussic acid to damson or plum brandy.
Behaviour of the distilled brandy to N/100 permangana
solution.

Estimation of Ether.—To 100 c.c. of the brandy, norm
potash solution is added until 1 c.c. remains in excess afte
neutralisation. It is then distilled to half its volume wi
a small flame. The flame is raised and about 30 c.c. col
lected. The distillate when made up to 100 c.c. serves fo
the estimation of alcohol and for the different reaction
The residue left in the flask is cooled, neutralised with N 1
sulphuric acid, and an excess of 10 c.c. of acid added; it
then allowed to stand for a short time and made up
100 c.c. 20 c.c. are neutralised with N/10 potash, usin
phenolpthaleïn as an indicator and another 20 c.c. wit
Methyl Orange. The difference between the two titration
shows the quantity of organic acid neutralised with the N 1
potash. If the quantity of alkali used for neutralising th
free acid be subtracted from this, the amount of N 1
potash is left, which is necessary for the neutralisation o
the combined organic acid (ether). With grape mar
brandy the relation of combined to total acid varies fro
1:2·5 to 1:5·3, and the author is of opinion that the rati
should not be lower than 1:2. For damson brandy he finds

imum relation of 1:4 and a maximum of 1:8·4. Expe-ental evidence is adduced showing that the amount of acid is always greater than combined acid in natural udies.

he treatment of the distilled brandy with N 100 per-nganate is carried out as follows:—1 c.c. of the distillate un into a stoppered glass cylinder together with 1 c.c. of 00 permanganate, well shaken, and allowed to stand. imilar experiment is carried out with a mixture of pure hol and water, and the progress of the oxidation com-ed. If the brandy distillate become brownish yellow cylinder is again shaken and the odour noticed. With pe marc brandy, a smell of aldehyde is noticed; with ason brandy the characteristic smell of plum stones. More manganate is added to the cylinders, and if the brandy derived from grape marc, a characteristic oenanthic ereal odour is detected, whilst the smell of the damson ndy remains unaltered. The cylinder containing the ture of pure ethyl alcohol and water is oxidised to acetic l.—J. L. B.

Malt Extracts; Examination of Commercial ——. W. J. Sykes and C. A. Mitchell.

See under XXIII., *page* 1148.

sel Oil in Alcoholic Liquids; Determination of ——. E. Beckmann.

See under XXIII., *page* 1148.

Saccharin in Wine and Beer; Detention of ——. T. Wirthle.

See under XXIII., *page* 1146.

PATENTS.

Yeast; Treatment of ——. G. C. Marks. London. Eng. Pat. 21,153. Nov. 22, 1900.

e protoplasm of yeast is continuously extracted by ing compressed or moist yeast in the cold with gum bic, chloride of sodium, carbonate of soda or other sub-nce possessing the property of liquefying compressed yeast. en the fermentation of the mixture is well established, h quantities of yeast are added from time to time, the ole being well mixed, and after each addition sufficient time wed for the mass to ferment again. In this manner the duct does not contain large traces of the substance loyed for producing liquefaction.—J. L. B.

r Wort; Mash Tuns for use in the Preparation of ——. I. Debeil, Belgium. Eng. Pat. 21,355, Nov. 26, 1900.

e mash tun has a conical bottom with a central opening the admission of water, this opening being provided with a er which serves as a central support for the perforated e bottom; it has feet resting on the base of the mash between which water can flow and spread in a sheet r the whole surface of the bottom. The outflow nings are situated in a channel formed around the ical bottom.—J. L. B.

Beer; Production of ——. H. A. Hobson, London. Eng. Pat. 20,819, Nov. 17, 1900.

e production of a hopped wort is claimed, by first sting hops in water, separating the infusion from the s and then mashing the malt, or malt and grain using hop extract as mashing liquor. The second claim is removing a certain proportion of the lupulin from the s, then making an aqueous extract and fixing the nic acid of the hops. The abstracted lupulin is then ored to the wort or finished beer.—J. L. B.

mentation Industries; Cleansing in ——. A. Sjöö and . Törnell, Stockholm, Sweden. Eng. Pat. 21,911, ec. 3, 1900.

e patentees claim the use in the fermentation industries a mixture of 1 part alkali hypochlorite with ½ to 1 part lkali hydrate.—J. L. B.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Bakers' Yeast; Utilisation of Brewers' Yeast and Treatment for making ——. W. Sarnighausen. Woch. für Brau. 1901, **18**, [39] 485–486.

Attention, of late years, has been turned to the utilisation of beer-yeast which was formerly a waste product of the brewery. The most important of these uses is for the manufacture of vegetable "meat extracts"; its richness in albumin also makes it eminently suitable for cattle food. After suitable purification, beer yeast may be employed as a substitute for distillery [top-fermentation] yeast in bread making. The impurities which must first be dealt with, consist mainly of precipitated albuminoids, hop resins, dead cells, &c.; the bitter flavour must be extracted and the yeast must be turned out in a preserved state suitable for competition with distillery pressed yeast. The washing and extraction of the bitter principles may be carried out conveniently in the same vessel. This may be improvised with a large wooden tub having a stirring shaft with a crank at the upper end and paddles at the bottom and held in position by passing through two boards fixed across the tub. The lowest paddle should just clear the bottom. A solution of ammonium carbonate is placed in the tub and the yeast, previously suspended in water is added through a hair-sieve. The vessel is then filled up with water, the colder the better, and the stirrer is run for five minutes each time at intervals. After a time, the yeast is allowed to settle, and the supernatant water is run off. For this purpose the tub is pierced with a vertical series of holes closed with pegs. The treatment with water is repeated two or three times until the yeast is clean. For the extraction of a hectolitre of thick yeast sludge, 1 lb. of ammonium carbonate is generally sufficient.

The extracted yeast after thorough washing is drained and pressed, and may then be preserved by the admixture of some harmless water-absorbent substance.—J. F. B.

Honey-Dextrin; Nature of ——. E. Beckman. Zeits. angew. Chem. 1901, **14**, [38], 951.

The author has examined the dextrin of honey by various methods, such as conversion into dextrinates and treatment with methyl alcohol in the presence of baryta water. It was found that basic lead acetate was also applicable as a reagent. For the determination of the molecular weight, the dextrin was converted into the benzoyl ester as in Schotten-Baumann's method. This ester can readily be obtained free from ash, and on its saponification the dextrin is converted into hemicellulose. The difficulty of determining the benzoyl group was overcome by using benzoyl sulphonic chloride in the place of benzoyl chloride. From his experiments the author concludes that honey dextrin must be assigned to the bioses.—C. A. M.

Milk; Acidity of ——. P. Vieth and M. Siegfeld. Milch-Zeit. 1900, **29**, 593—597; through Zeits. Untersuch. Nahr. und Genussm. 1901, **4**, [19], 890—891.

The authors have systematically examined a number of samples of milk from three English herds. The milk was tested after a 5 hours railway journey, and from 10 to 15 hours after milking. The results showed that in the hottest months the acidity was lowest, the maximum being reached during the first four months of the year.

The milk from other herds of cows at Hameln was also tested. The titrations were carried out with N/10 soda and N/10 baryta solutions. The acidity, as determined by the baryta solution was always about 3° higher than when titrated with soda solution. It was found that the acidity lay between 13° and 19° (using soda solution), the degrees representing the number of c.cs. of N/10 alkali used for 100 c.c. of milk. In this instance it was ascertained that for three herds the maximum acidity occurred in winter, and for two herds, in summer.—W. P. S.

Cherry Syrup in Raspberry Syrup ; Detection of ——. K. Windisch.

See under XXIII., *page* 1146.

Formaldehyde in Milk ; Modification of the Sulphuric Acid Test for ——. A. G. Luebert.

See under XXIII., *page* 1146.

Albuminoids : Determination of the Decomposition Products of ——. E. Hart.

See under XXIII., *page* 1149.

PATENTS.

Foods ; Process of Preparing Concentrated ——. C. M. Aikman, Glasgow. Eng. Pat. 17,416, Oct. 2, 1900.

Separated milk is sterilised by heat, then mixed with sugar, salt, potassium bicarbonate or other alkali, and malt extract, and concentrated *in vacuo*, at a temperature not exceeding 140° F., to a volume of one-fifth to one-sixth. Either corn flour, wheat flour, malt extract, cocoa, sugar, or meat extract, and flavouring materials are then added, and the whole is carefully dried and ground to a fine powder.—L. A.

Butter ; Manufacture of ——. M. Poppe, Bielefeld, Germany. Eng. Pat. 22,458, December 10, 1900.

Butter made from sterilized cream is flavoured so as to resemble butter made from sour cream, by mixing it with the volatile fatty acids obtained by saponifying genuine butter fat, and distilling the acidified soap.—L. A.

(B.)—SANITATION; WATER PURIFICATION.

Sewage ; Chemical and Biological Changes occurring during the Treatment of ——, by the so-called Bacteria Beds. E. A. Letts and R. F. Blake. Paper read before the British Association (Section B), Glasgow Meeting, 1901.

The explanation usually accepted as to the action of the so-called bacteria beds is, that the latter act as oxidising agencies, absorbing oxygen from the air during their periods of rest, and subsequently transferring it to the constituents of the sewage when the beds are filled, the transfer being mainly effected by nitrifying micro-organisms. It is found, however, that comparatively small amounts of nitrate and nitrite are produced in relation to the unoxidised nitrogen, which disappears during the treatment. For instance, the following results have been observed :—

——	Manchester.	Sutton.	Leeds.
Nitrogen disappearing as "free" and "albuminoid" ammonia (grains per gallon).	1·634	7·185	1·528
Nitrogen found in the effluent as nitrate and nitrite after double contact with bacteria beds (grains per gallon).	0·636	1·100	0·11
Percentage on nitrogen disappearing.	39	15	7

In order to ascertain whether part of the unoxidised nitrogen which disappears, is lost in the gaseous state as free nitrogen, the authors made analyses of the dissolved gases present, both in the original sewage, and in the effluent from both beds of a double-contact system. They found that :—(1) Practically no oxygen was present, either in the sewage or effluents. (2) The effluent from first contact always contained considerably more carbonic anhydride than the original sewage, and with two exceptions, the effluent from second contact also contained an excess of that gas. (3) In 11 out of 12 series of analyses, the quantity of nitrogen in the effluent was in excess of that present in the original sewage, and, generally speaking it was in larger excess in the effluent from double contact than in that from single contact. On the average, the excess of nitrogen in the effluent from second contact over that present in the sewage amounted to 0·272 part weight per 100,000, whilst the loss of unoxidised nitro which had occurred in the sewage (by Kjeldahl's meth amounted to 2·2 parts, or, 12 per cent. of the nitrogen from the sewage during purification was thus accounted whilst in one particular case it amounted to 31 per c It is probable, too, that only a fraction of the free nitro actually evolved, would be retained by the effluent, remainder escaping into the air.

The authors consider, also, that there can be no do that nitrogen passes into the tissues of animals and ve tables, the former of which may escape from the bact beds, and the latter (and possibly the former also) u remain permanently in the beds ; they have not, howe formed any estimate of the quantity so removed.—A. S.

Bacterial Treatment of Sewage ; Humus and the So-ca Irreducible Residue in the ——. S. Rideal. Paper r before the British Association (Section B), Glasg Meeting, 1901.

After referring to previous work relating to the subj the author gives the results of the examination of a num of the humus residues from the bacterial treatment sewage. The peaty deposit from a septic tank at Exe had the following composition :—

——	No. 1.	No. 2.	No.
Distance from bottom, in inches	3·00	9·00	13
Organic matter, per cent.	32·35	32·40	31
Ash, per cent.	67·65	67·60	68
Nitrogen, per cent.	2·38	2·34	2
Percentage of N in organic matter....	7·36	7·22	7
Ratio of carbon to one of nitrogen	6·8	6·9	6

The author concludes that if sewage has underg proper bacterial fermentation, the small quantity "irreducible residue" is of the nature of humus, and pr tically inoffensive. Kenwood and Butler state that Finchley in 1900, the deposit from open septic tanks co be removed with little offence, and has been spread, w out nuisance, over small areas of land in the neighbourho It has the agricultural value of humus, and like pe matters generally, it has a function in encouraging, when small quantity, the nitrifying actions in the final oxidati and itself undergoes slow oxidation to nitrates and carl dioxide.—A. S.

PATENTS.

Furnaces for the Destruction and Incineration of Ash and other Refuse ; Apparatus for consuming Smoke ——. F. Ball, Southwold, Suffolk. Eng. Pat. 17,6 Oct. 5, 1900.

The smoke from the furnace into which the refuse is passes through an arrangement of corrugated metal pla described as a radiator or consumer, placed at the end the grate. The radiator is at a high temperature, and said to render the smoke innocuous. After traversing radiator the smoke passes on to the chimney. A d chamber and screen are provided. The air supplied to furnace passes through flues at the side of the furnace, a is thus slightly heated, whilst the fire bars are deep corrugated in order to heat the air, which passes betw them. A high temperature is said to be thus secured the furnace.—J. A. B.

Refuse Destructors. G. Watson, Leeds. Eng. Pat. 18,8 Oct. 22, 1900.

The destructor is mounted on wheels to render it portal and comprises a furnace supplied with air, through passa at its side, preferably by means of a forced draught p duced by a boiler in which steam is generated by the produ of combustion from the furnace. A smoke box and d separator are affixed.—J. A. B.

Sewage Works ; Impts. in ——. D. Cameron, F. J. Co min, and A. J. Martin, Exeter. Eng. Pat. 19,264, O 27, 1900.

Grit chambers are contracted upwards, by means of fix or movable guide boards or plates, in order that the flo g solids may be confined within the stream of the sewage, d not be left behind in the chamber. Valves are also ovided for drawing off the supernatant liquid when the it is to be removed from the chambers, these valves being aced at the bottom of vertical pipes or wells, communica-g with the chambers through openings at different levels, through narrow vertical slots, in order that the valves ay not become choked with grit.

In order to distribute the sewage effluent uniformly over e surface of large filter beds, it is conveyed through annels below the beds to vertical pipes, which rise through e material of the bed and terminate in flared castings or nnels, from which the liquid overflows on to the filter d.—L. A.

iquid [Impure Water]; Purifying Apparatus. L. Gathmann, Washington, Columbia, U.S.A. Eng. Pat. 9982, May 14, 1901.

HE object is to purify water from suspended impurities. he water is caused to pass into and through a vessel of ch internal shape and construction that a vortical motion imparted to the body of liquid, causing those impurities hich are of greater specific gravity than the water or liquid be carried inwards towards the centre of rotation, and wnwards by gravitation, whilst the lighter impurities are o driven towards the centre, and caused to rise. Secondary tlets are provided at the top and bottom of the vessel r carrying away the separated impurities. Impurities ving the same specific gravity as the liquid coalesce, and e also driven towards the centre of rotation, and upwards downwards.—L. A.

(*C.*)—DISINFECTANTS.

lphuric Acid as a Typhoid Disinfectant. S. Rideal. Paper read before the British Association (Section B), Glasgow Meeting, 1901.

HE author recommends sulphuric acid as a cheap and ective agent for sterilising drainage waters from an area fected with typhoid. 750 c.c. of tap water were infected th one drop of a 24-hour broth culture at 37° C. of *acillus typhosus*, and agar plate cultures were made with c.c. of the mixture. It was found that an addition of c.c. of N/10 sulphuric acid per pint was sufficient to destroy e bacilli. Allowing for the alkalinity of the sewage, an dition of 4 grms. of sulphuric acid per gallon would be fficient to ensure the death of typhoid organisms in an fected drainage water. The author states that the free idity produced would be speedily neutralised when the eated water became mixed with any fresh sewage which d not been similarly treated, and, as the infected sewage ust always represent a very small proportion of the total ainage to be dealt with, this method of ensuring the sence of typhoid organisms in drainage waters would be tisfactory in practice.—A. S.

henol, Salicylic Acid, and Salol; Determination of ——, in Dressings. F. Telle.

See under XXIII., *page* 1149.

PATENTS.

ash or Dip for Sheep and other Animals. J. J. C. Roxburgh, Edinburgh, and C. F. H. Scott, St. Boswells, Roxburgh. Eng. Pat. 17,537, Oct. 3, 1900.

SOLUBLE mineral oil" (8 galls.), strong solution of nmonia ($\frac{1}{2}$ gall.), and heavy coal-tar oil ($\frac{1}{2}$ gall.) are ixed together, with or without the addition of from 0·1 5 per cent. of arsenic trioxide.—L. A.

sect Life or Mildew; Compositions or Compounds for Use in Agriculture or Horticulture, for Eradicating ——. G. H. Richards, London. Eng. Pat. 20,194, Nov. 9, 1900.

ALICYLIC acid or tartaric acid are dissolved in nicotine, d the crystalline product is mixed with camphor and mpressed into cakes or tablets, which are used for migating.—L. A.

"Antiseptic or Detergent." C. Billing, Liverpool. Eng. Pat. 10,549, May 21, 1901.

POTASSIUM-SODIUM-AMMONIUM metaborate is prepared by dissolving one equivalent, or 112 parts, of potassium hydroxide in 150—200 parts of "boiling water," stirring in one equivalent, or 382 parts, of crystallised borax, and, when dissolved, adding 30 parts of ammonia solution (0·880). The solution is allowed to crystallise. The addition of ammonia is said to prevent the potassium and sodium metaborate from absorbing atmospheric carbon dioxide.—L. A.

XIX.—PAPER, PASTEBOARD, Etc.

Cellulose: The Mixed Esters of ——, and the Reactions of Cellulose with Nitrating Acid. C. F. Cross, E. J. Bevan, and R. L. Jenks. Ber. 1901, **34**, [12], 2496.

THE authors have investigated a number of mixed esters of cellulose, such as acetobenzoates, nitrobenzoyl nitrates, and conclude from the result that, under treatment with mixtures of nitric and sulphuric acids, the cellulose hydroxyls would react with both negative radicles yielding nitrosulphuric esters. This has been verified. The maximum fixation of sulphuric acid so far obtained, was 4 to 6 parts with bleached cotton, and 1·9 to 4·2 parts with unbleached cotton. These percentages are calculated to the weight of the original cellulose. The essential condition, most favourable to the retention of the sulphuric residues in combination, was found to be short duration of exposure to the action of the mixed acids. The products were variously and exhaustively purified, and the removal of the residual acids was carefully followed as a necessary precaution against possible error.

The presence of the mixed esters in the products purified by exhaustive washing was verified by treatment with diluted acetone, in which these products are soluble.

The investigations, of which this is a preliminary account, are being prosecuted in the direction of isolating the mixed esters in a form available for analysis.—C. F. C.

Hydrocellulose: Production of ——. (Ger. Pat. 123.121, March 2, 1900), R. Sthamer, Hamburg. Zeits. angew. Chem. 1901, [36], 905.

A DIFFERENT hydrocellulose from that obtained by the process described in the abstract following is produced by immersing the crude cellulose in glacial acetic acid containing free chlorine, and warming the mixture to a temperature of 60°—70° C. with stirring. The product furnishes acetyl derivatives, distinguishable from the known similar compounds by their greater solubility in water and in alcohol. —C. S.

Hydrocellulose; Method of Producing ——. (Ger. Pat. 123,122, March 2, 1900), R. Sthamer, Hamburg. Zeits angew. Chem. 1901, [36], 905.

CELLULOSE is treated with hydrochloric acid, at a temperature of 60°—70° C., in presence of a quantity of potassium chlorate insufficient to produce conversion into oxycellulose. —C. S.

PATENTS.

Paper, Paper Board, or like Cellulose or Fibrous Material: Preparation or Treatment of ——, for Embossing and other purposes. A. H. Martin, R. E. Tinker, and T. D. Ryan, all of Buffalo, U.S.A. Eng. Pat. 8643, April 26, 1901.

THE process claimed, consists in treating paper or similar material with a mixture of glue, sugar, or glucose, white or red lead, a filler (talc) and glycerin, drying, heating in order to make the material pliable, and then subjecting to pressure in order to produce the desired effects.—A. C. W.

Celluloid Compounds and High Explosives; Manufacture of ——. J. E. Blomén. Eng. Pat, 9984, May 14, 1901.

See under XXII., *page* 1140.

Drying of Fibrous and other Material, and Apparatus therefor. H. H. Lake. Eng. Pat. 14,090, 1901.

See under I., *page* 1095.

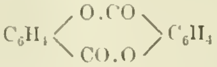
XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Bismuth Salicylate; a New Crystalline ——. P. Thibault. Bull. Soc. Chim. **25**, [16—17], 794—796.

The author states that previous methods of obtaining bismuth salicylate, *viz.*, the precipitation of aqueous or glycerin solutions of bismuth nitrate with sodium salicylate, yield products which are not uniform and contain nitric acid in the proportion of about 6 per cent. Causse's method, in which freshly precipitated bismuth oxychloride is treated with an alkaline solution of sodium salicylate, yields a product which contains a considerable proportion of chlorides, even after much washing, whilst on continued washing, its crystalline character disappears, and salicylic acid is lost. The author recommends the following method for obtaining a pure crystalline product:—15 grms. of crystallised bismuth nitrate in nitric acid solution are precipitated with excess of caustic soda or potash. On boiling, all the hydrated oxide is converted into the yellow crystalline anhydrous oxide. This is washed completely, and 10 grms. of salicylic acid, mixed with 200 c.c. of water, is added and left in a water bath until the reaction is complete, decanted whilst warm, washed with cold alcohol, and dried on the water oven. A greyish red crystalline powder results, formed of small transparent prisms. Water decomposes it slowly in the cold, more rapidly when warm; water saturated with salicylic acid is without action, also ether and cold alcohol; but when treated with warm alcohol salicylic acid is liberated. It commences to decompose at 140 C. with production of phenol and blackening. Cold and hot acids separate salicylic acid, and give the corresponding bismuth salt; alkalis separate salicylic acid, and leave bismuth oxide. The salt corresponds to the formula $(C_7H_6O_3)\ 3Bi_2O_3$.—C. T. T.

Disalicylide. A. Einhorn and H Pfeiffer. Ber. **34**, [12], 2951—2953.

On attempting to obtain the β-lactone of salicylic acid by the action of phosgene gas on that acid in solution in pyridine the authors isolated, instead, disalicylide.



which is formed to the extent of about 12 per cent. with a mixture of amorphous anhydrides of salicylic acid. From these it is separated by recrystallisation, first, from glacial acetic acid, and, finally, from chloroform. It is thus obtained in prismatic needles, melting at 200°—201° C. It distils without decomposition, and is but slightly soluble in alcohol, more soluble in benzene, chloroform, and glacial acetic acid. It is not soluble in dilute soda solution, and only slightly dissolved by prolonged contact with strong solution of caustic soda. Heated with a molecular proportion of phenol to 200° C. for a few hours, it yields salol; when treated in a similar manner with β-naphthol, or with guaiacol, β-naphthol-salol and guaiacol-salol are formed, the latter separating from solution in absolute alcohol in small, brilliant crystals, melting at 70° C. The same method applied to other *o*-hydroxy-acids of the aromatic series, and to alcohol-acids, has been found by Mettler to yield other dimolecular anhydrides. Thus, from cresotinic acid the *o*-, *m*-, and *p*-dicresotides melting at 231·5°, 207·5°, and 245·5° C., respectively, were obtained; and from α-hydroxy-isobutyric acid, mandelic acid, and benzilic acid corresponding dimolecular anhydrides were isolated, which will ultimately be described.—J. O. B.

Salvosol-Potash and Salvosal-Lithium. Pharm. Zeit. **46**, [70], 694.

These two medicinal preparations are combinations of the respective alkalis with salol-*o*-phosphinic acid—

$(COOC_6H_5)C_6H_4O.PO(OK)(OH)$ and
$(COOC_6H_5)C_6H_4O.PO(OLi)(OH)$.

They are obtained by the action of the alkali on salol
phosphinate. Both are crystalline. The potassium compou
is soluble to the extent of 1 : 20 in cold water. It
decomposed by heat, salol and salicylic acid being liberat
Salol-*o*-phosphinic acid is liberated on warming with dil
mineral acids. On heating with strong alkali, salicylic ac
phosphoric acid, and phenol result. The lithium salt is m
soluble, and, on heating, evolves the odour of phenol with
precipitating.—J. O. B.

Cactus Alkaloids.—IV. A. Heffter. Ber. 1901, **34**, [1
3004—3015. (See also this Journal, 1895, 384; 18
554, 827; 1898, 688.)

Four alkaloids—mezcaline, anhalonidine, anhalonine a
lophophorine—have hitherto been found in the "mes
button," *Anhalonium Lewinii.* Kauder has also isolat
from the drug anhalamine and pellotine, the latter p
viously found by the author in *Anhalonium Williams*
The author now confirms Kauder's results, but does
regard it as proved that pellotine is a constituent of
Lewinii. A. Williamsii, the dry plant of which contai
3·5 per cent. of the alkaloid, is so similar to *A. Lewin*
that the presence of pellotine equivalent to 0·2 per ce
of the hydrochloride would be easily explained by t
presence of the former plants among the mescal buttons.

Anhalamine, $C_{11}H_{15}NO_3$, is obtained by adding ammon
after crystallising out the bulk of the mezcaline sulpha
and shaking with chloroform. At the first extraction
solvent is found to contain spherical jelly-like lumps, whi
are filtered off, washed with a little chloroform, and press
between paper. Though this appearance does not ag
occur, many extractions are required to remove the wh
of the alkaloid. It is purified by repeated recrystallisati
from hot absolute alcohol, when it forms spherical agg
gates of microscopic needles, melting at 185·5° C. It
soluble in hot water, from which it crystallises in needl
The hydrochloride crystallises by slow evaporation fr
water in thin shining leaflets containing $2H_2O$. The chlor
platinate forms flat yellow needles, little soluble in co
water. The aqueous solutions of the salts give a bl
coloration with ferric chloride, which turns green
heating and then disappears. Pellotine and anhalonidi
give the same reaction, but not mezcaline, anhalonine, a
lophophorine, which contain no hydroxyl group.

Anhalamine contains two methoxyl groups. When d
solved in caustic soda it gives, by the action of benzoyl chlori
benzoylanhalamine benzoyl ester, $C_{11}H_{13}O_3N(COC_6H_5)_2$, a
benzoylanhalamine, $C_{11}H_{14}O_3N.CO.C_6H_5$. The alcohol
solution of the latter gives a blue coloration with fer
chloride, and the compound is soluble in caustic sod
the benzoyl group has therefore apparently taken the pla
of an imide hydrogen atom. Thus anhalamine appears
be a secondary base of the formula—

$$C_9H_7(OCH_3)_2(OH) : NH.$$

Mezcaline.—It is now found that the base is an oi
liquid, which very readily absorbs carbon dioxide, formin
a crystalline carbonate. By oxidation of a 1 per ce
solution of the sulphate by potassium permanganate, t
trimethyl ether of gallic acid is produced. The meth
iodide compound of the base, when shaken with chlorofor
gives a crystalline base, methylmezcaline, which aga
unites with methyl iodide. A solution of mezcaline
caustic soda, when shaken with benzoyl chloride, gives
once benzoylmezcaline, $C_{11}H_{16}O_3N.COC_6H_5$. Mezcaline
thus a secondary base; its constitution is represented
the formula $CH_3.NH.CH_2.C_6H_2.(OCH_3)_3$[1 : 3 : 4 : 5
Dibromomezcaline was obtained by the action of bromi
water on mezcaline or its hydrobromide suspended
water.

Anhalonidine.—When treated in alkaline solution wi
much benzoyl chloride, two benzoyl compounds we
obtained similar to those produced by anhalamine. Meth
anhalonidine hydriodide, $C_{13}H_{17}O_3N.HI$, is obtained
warming the base with 1 mol. of methyl iodide. Wh
2 mols. of methyl iodide are used, methylanhalonidi
methyl iodide is also formed. Thus anhalonidine is

condary base; no nitroso compound could be obtained, ice the alkaloid is decomposed by sodium nitrite in acid lution. The formula is thus $(CH_3O)_2(OH)C_{10}H_7:NH$. xidation and bromination experiments gave no useful salt.—A. C. W.

andragora Root; Alkaloids of ——. O. Hesse. J. prakt. Chem. 1901, **64**, [15, 16, 17, 18], 271—286.

ENTZEL had stated that the base accompanying hyoscya-ine in the mandragora root was a hyoscine of the formula $H_{23}NO_3$ (Dissertation, 1900). This statement was corrected Thoms and Wentzel (this Journal, 1901, 605). The thor has experimentally examined Wentzel's research: kilos. of dry Trieste mandragora root were moistened ith soda solution (only the alkaloids separated by soda ere in question, hyoscine in particular), and extracted by her under the reflux condenser. The ethereal solution was peatedly extracted with dilute sulphuric acid, the acid solu-n made alkaline with sodium bicarbonate and extracted th chloroform, which took up some hyoscyamine. The ses were therefore again dissolved in sulphuric acid, and e solution treated with sodium bicarbonate and chloroform before. The hyoscyamine now remained in the aqueous lation. The syrupy bases from the chloroform solution ere neutralised with hydrobromic acid, and the filtered lution brought to crystalisation. The hydrobromides were tracted with acetone, which left the pure hyoscine salt, $_{17}H_{21}NO_4.HBr$, melting at 194° C. (Wentzel gave 197° C.), e author did not observe the rise in the melting point of e gold salt, from 198° to 206° C., given by Wentzel. The se is decomposed by baryta into tropic acid and oscine, $H_{13}NO_2$.

The mother liquors of the hyoscine hydrobromide yielded endohyoscyamine on the addition of sodium bicarbonate d extraction with chloroform; the solution then, after dition of normal sodium carbonate, yields a new base, andragorine, which forms the gold salt, $C_{15}H_{19}NO_2.AuCl_4$. Mandragorine is decomposed by baryta into opic acid and (probably) tropine.

The yields of the different alkaloids were: hyoscyamine 36, hyoscine 0·04, pseudohyoscyamine 0·01 per cent., d a still smaller quantity of mandragorine.—A. C. W.

cetyltropic Acid. O. Hesse. J. prakt. Chem. 1901, **64**, [15, 16, 17, 18], 286—288.

TROPINE and hyoscyamine are converted into apo-atropine the action of acetic anhydride, the tropic acid radical ing transformed into the atropic acid radical. Acetyl loride has no action on these bases. Acetic anhydride d acetyl chloride convert hyoscine into an acetyl mpound. The author now finds that tropic acid gives acetyl compound, $C_9H_9O_3(C_2H_3O)$, by the action of etic anhydride. Acetyltropic acid forms white leaflets, hich melt at 80° C.; it is readily soluble in ether, alcohol, etone, and chloroform, less soluble in benzene. It is most insoluble in cold water, and little soluble in hot, om which it separates as an oil, which crystallises only ter many days. A solution of acetyltropic acid in nmonia gives with silver nitrate a turbidity which soon isappears.—A. C. W.

ropidine; Conversion into Tropine. R. Willstaetter. Ber. **34**, [12], 3164—3165.

y heating tropidine hydrobromide to 200°—210° C. for three ours in a sealed tube with six times its weight of 10 per nt. sulphuric acid, the author has obtained a mixture of tropine and tropidine, which, on distillation and recrystal-ing from ether or from benzine, gave 24 per cent. of the eoretical amount of ψ-tropine boiling at 240°—241° C. orr.), and melting at 108°—108·5° C. (corr.). Since is alkamine can be converted by oxidation into tropinone, d this ketone yields on reduction, geometrically isomeric opine, the last step in the synthesis of the solanaceous kaloids, atropine, atropamine, belladonine, and the coca kaloids, tropacocaine and racemic cocaine, has been complished.—J. O. B.

Purine Derivatives; Comparative Experiments on the Pharmacological Action of ——. O. Schmiedeberg. Ber. **34**, [12], 2550—2559.

THE pharmacological action of pure purine and some of its derivatives are compared in this paper with the results obtained with caffeine and theobromine.—J. O. B.

Morphenol; Preparation of ——. E. Vongerichten. Ber. 1901, **34**, [12], 2722—2723.

A SIMPLER method than that described in this Journal, 1900, 283, for the preparation of morphenol, consists in heating methylmorphimethine methyl iodide with alcoholic potash. at 160° C. The product of the reaction is poured into dilute sulphuric acid, extracted with ether, the ethereal extract taken up with dilute caustic soda, the solution filtered, and morphenol precipitated by sulphuric acid in grey crystalline flocks. The yield is 70 per cent. of the theoretical.

When treated in a similar manner dihydromethylmorphimethine methyl iodide gives trimethylamine and a compound free from nitrogen. By the same reaction Skraup and Wiegmann obtained ethylmethylamine from morphine and codeïne, and ethyidimethylamine from codeine methyl iodide. —A. C. W.

Terpene Series; Reduction in the ——. *Myrcene and other Olefinic Compounds.* F. W. Semmler. Ber. 1901, **34**, [12], 3122—3130.

IN the reduction of unsaturated terpene ketones by alcohol and sodium, a double bond is also reduced only if it is in a neighbouring position to the ketone group. Thus carvone gives dihydrocarveol; carvenone and carvotanacetone give tetrahydrocarveol; isothujone gives thujamenthol and pulegone gives menthol. No cyclic terpene is reduced by alcohol and sodium, whence the author concludes that no cyclic terpene hitherto known contains the two double bonds in neighbouring positions.

Myrcene is an olefinic terpene, discovered by Power and Kleber in Bay oil. It is reduced by ethyl alcohol and sodium to dihydromyrcene, hence it contains two double bonds in neighbouring positions. Both myrcene and dihydromyrcene add four atoms of bromine. By the action of glacial acetic and sulphuric acids, dihydromyrcene is converted into cyclo-dihydromyrcene, which is very similar to cyclo-linaloolene. The cyclic compound only forms a dibromide. Myrcene yields succinic acid on oxidation, whilst dihydromyrcene forms levulinic acid and a ketoglycol, $C_8H_{16}O_3$, which is further oxidised to a δ-diketone, $C_7H_{12}O_2$. Acetone is also formed. The most probable formula for myrcene appears to be—

$$CH_2:C(CH_3).CH_2.CH_2.CH_2.C:(CH_2).CH:CH_2.$$

Power and Kleber treated myrcene by Bertram's method in order to convert it into an ester and thence into an alcohol, $C_{10}H_{18}O$. Barbier has recently obtained an alcohol of this formula. The author has repeated these researches, and finds that the products are not individual substances: the myrcene is partially inverted.—A. C. W.

Vanillin: Preparation of ——, *from Protocatechuic Aldehyde.* (Ger. Pat. 122,851, May 22, 1900.) R. Sommer, Vienna. Zeits. angew. Chem. 1901, [36], 905.

THE characteristic feature of this method is the employment of dimethyl sulphate as the methylating agent, with or without the presence of alkalis.—C. S.

Ethoxy-Isoeugenol (Propene-Pyrocatechin-Oxyethyl-Ether); Preparation of ——. C. Pommeranz. D.R.P. 122,701, Jan. 3, 1900. Through Oesterr. *Zeits.* für Pharmacie, **55**, [34], 818.

ONE hundred grms. of safrol are heated to 150° C. for 20 hours with 400 grms. of 25 per cent. ether-alcoholic solution of caustic potash, the temperature being carefully maintained between 140° and 150° C. during the whole period. The reaction product is then diluted with four times its volume of water, shaken out with ether, the ethereal solution removed, the aqueous layer rendered faintly acid with H_2SO_4 and the liberated ethoxy-isoeugenol removed by again shaking out with ether. The ethereal solution is dried with anhydrous sodium sulphate, the ether distilled off, and the residue fractionated *in vacuo*. Thus obtained, ethoxy-isoeugenol is a colourless, almost odourless liquid, boiling at about 172 C. at 22 mm. pressure. Its alcoholic solutions are coloured green with ferric chloride. It is applicable as a medicinal agent, and for the preparation of [synthetic] perfumes.—J. O. B.

Citronellal: Constitution of ——. C. Harries and O. Schauwecker. Ber. 1901, **34**, [12], 2981—2991. (See also this Journal, 1900, 769.)

Citronellal dimethylacetal, by oxidation with permanganate in acetone solution, gives 80 per cent. of a glycol, which, on further oxidation with chromic acid, gives a dialdehyde, $C_{10}H_{18}O_3$, and a ketoaldehyde, $C_9H_{16}O_2$. The latter must be formed by further oxidation of the former. It then follows that citronellal has the formula—

$$CH_2:C(CH_3).CH_2.CH_2.CH_2.CH(CH_3).CH_2.CHO.$$

—A. C. W.

Storax: Oriental ——. A. Tschirch and L. van Itallie. Archiv **239**, [7], 506—532.

The constituents of liquid oriental storax (derived from *Liquidambar orientalis*) are: Free cinnamic acid, vanillin, styrol, styracin, ethyl cinnamate, and storesinol, partly free and partly as ester. No benzoic acid was detected. Storesinol, $C_{16}H_{26}O_2$, occurs as a white, odourless, aggregating powder, melting at 156°—161° C. It is insoluble in light petroleum spirit, but dissolved by most other solvents, and by dilute alkali. It is an isomer of benzoresinol, but has a lower melting point than that substance. It forms a crystalline compound with potassium hydrate, separating in acicular crystals. When fused with alkali, acetic and salicylic acids are formed. On distillation with zinc dust it yields phenol, toluene, and benzene; dry distillation alone gives these bodies as well as cresol, and apparently phenylacetylene. By the action of bromine, brominated amorphous derivatives are obtained. Storesinol does not acetylate, nor does it form a benzoyl compound, nor give any nitrogenous compound with hydroxylamine and phenylhydrazine. Oxidised with nitric acid, it gives picric and oxalic acids. The existence of methoxyl or ethoxyl groups could not be proved.—J. O. B.

Storax, American; ——. A. Tschirch and L. van Itallie. Archiv **239**, [7], 532—540.

The constituents of American storax (derived from *Liquidambar styraciflua*) are very similar to those of Oriental storax, consisting of cinnamic acid, vanillin, styrol, styracin, cinnamic phenyl-propyl-ester, and styresinol, partly free and partly in the form of the cinnamic ester. No ethyl cinnamate was, however, detected. Styresinol is apparently an isomeride of storesinol, having the same formula, $C_{16}H_{26}O_2$, and the same melting point, 261°—162° C. but differing in optical activity, its specific rotation being + 13° 39′ as compared with + 52° for storesinol. In all others respects, both in its combinations and decomposition products, it is identical with storesinol.—J. O. B.

Lemon Oil; New Aldehydes of ——. H. von Soden an W. Rojahn. Ber. 1901, **34**, [12], 2809—2811.

The appearance of the paper by Burgess (this Journ 1901, 745) compels the authors to publish their work whi still unfinished. Lemon oil was freed from citral by shaki with sodium monosulphite, and sodium bicarbonate (T mann, this Journal, 1899, 169). The unattacked oil w distilled *in vacuo* and shaken with acid bisulphite solutic The product after washing with petroleum spirit, gave mixture of aldehydes on adding soda and distilling wi steam. The high boiling compounds were separated distilling *in vacuo*; the distillate was then fractionat The fraction boiling at 185°—190° C. appears to be mixture of octyl and nonyl aldehydes. The latter, which more abundant, gives a semicarbazone melting at 85° C the octyl aldehyde semicarbazone melted at 72° C. Fr 10 kilos. of lemon oil 10—15 grms. of aldehyde w obtained. Burgess apparently regards the aldehyde, whi he found in lemon oil, as identical with the aldehyde orange oil. The latter is, however, normal decyl aldehy according to Stephan (this Journal, 1901, 275).

The fluorescent substance found by Burgess, which doubtless identical with the compound previously found Crismer and by Theulier, is not the only fluorescent co pound in lemon oil. On shaking with bicarbonate solutic acidifying and extracting with ether, small quantities acids volatile and non-volatile with steam are obtained, which the latter are fluorescent. The higher boili fractions of lemon oil, containing oxygen compounds, al give a slight blue fluorescence, which may be due to meth anthranilate.—A. C. W.

Rose Oils; Occurrence of Phenylethyl Alcohol in — *III.* H. von Soden and W. Rojahn. Ber. 1901, [12], 2803—2809. (See also this Journal, 1901, 1900, 768, 1036, 1037.)

The authors have utilised this year's harvest of roses Schladebach to determine the amount of phenyletl alcohol in the flowers and the proportion of this constitu to the total volatile oil; also to compare the yields fr petals and calyx. The principal result may be at or stated: phenylethyl alcohol is, in quantity, the ch constituent of the perfume of the rose; the amou obtained by distillation is 5—6 times as great as quantity of the commercial pure rose oil.

Experiments 1—3 were made with flowers plucked June 20; experiment 4 was performed 2½ weeks later. the distillation, the fresh material was mixed with its o weight of water in the apparatus and about twice its wei of distillate collected (in the case of fresh calyces, 4 times the weight). In distilling the dried petals calyces, the water lost in drying was also added. The t crude oil was extracted from the distillate by ether, it conta a large proportion of phenylethyl alcohol and since this only a weak odour, the value of this oil is less than that the ordinary commercial oil. The chief quantity of oi contained in the petals, but the oil from the calyx is some importance to the aroma of the product. The yie and properties of the crude oils are given in the ta below. The yields of oil are somewhat too low, since volatile oil was still present in the contents of the still.

—	Experiment 1.	Experiment 2. 50 kilos. of Fresh Flowers gave		Experiment 3. 50 kilos. of Fresh Flowers gave when dried		Experiment 4. 50 kilos. of Fresh Flowe gave	
	50 kilos. of Fresh Flowers.	*a.* 41·5 kilos. of Petals.	*b.* 8·5 kilos. of Calyces.	*a.* 9·5 kilos. of Dry Petals.	*b.* 2·5 kilos. of Dry Calyces.	*a.* 40·5 kilos. of Petals.	*b.* 9·5 kilos. Calyces.
Extracted crude oil	37·50 grms.	28·00 grms.	2·00 grms.	9·50 grms.	2·50 grms.	23·50 grms.	..
Sp. gr. at 30° C.	0·944	0·916	0·897	..	0·894	0·916	..
Rotation in 100 mm. tube	0° 17′ at 34° C.	0° 40′ at 34° C.	..	..	..	0° 8′ at 30° C.	..
Solidified at	28° C.	29° C.	..	..	..	25° C.	..
Acid value	3·4	3·0	..	..	..	5·5	..
Ester value	19	16	..	..	..	17	..

The crude oils were separated into their constituents by adding water and distilling with steam. When no more "essential oil" was observed to pass over, the receiver was changed, and distillation continued until the conden water was almost odourless. The residue consisted alm entirely of paraffins. The whole of the distilled water ixed with 10 per cent. of 35 per cent. caustic soda lye, owed to stand, filtered, and shaken with ether. After aporation of the solvent, almost pure phenylethyl alcohol mained. The acid constituents (phenols, acids, lactones, c.) were extracted from the alkaline liquor after acidifying. ıe "essential oils" obtained directly by distillation of e crude oils were similar in properties to ordinary rose s (the oil from dried petals had, however, a certain unpleasantness of odour). The oils from experiments 1 and 4a still contained phenylethyl alcohol, which was removed by distilling in steam, adding caustic soda, &c., as before. This method for isolating the alcohol is more convenient than that previously described.

The properties and approximate composition of the crude oils are given in the following table:—

—	Experiment 1.	Experiment 2a.	Experiment 3a.	Experiment 4a.
ssential oil," per cent	10	10	20	27
. gr. at 30° C.	0·845	0·828	0·837	0·863
lidifying point	23° C.	27° C.	26° C.	18°—19° C.
enylethyl alcohol, per cent	60	57	50	54
id constituents, per cent	7·5	8	15	3
sidue (mainly paraffin), per cent	17·5	15	10	3
ss per cent	5	0	5	13

The yields of "essential oil" were very different in periments 2a and 4a, which are comparable; it is well own that the yield of rose oil during the same harvest pends largely on conditions of weather, moistness of l, &c.

The author calls attention to the enormous loss of enylethyl alcohol in the distilled water, in Bulgaria alone 00—4,000 kilos. per annum. Possibly a portion is used the form of rose water.

Benzyl alcohol has been found in the aqueous distillate oduced in preparing ylang-ylang oil in Manila.

—A. C. W.

smine Flowers; Essential Oil of ——. VI. A. Hesse. Ber. 1901, **34**, [12], 2916—2932. (See also this Journal, 1899, 296, 396, 513, 1159; 1900, 770; 1901, 275, 289.)

E author first replies to E. Erdmann (this Journal, 1901,)). The sample of "jasmine pur" previously examined s again tested; not a trace of methyl anthranilate was ınd. A new sample from the same harvest was also amined, and it was found from this and other experiments t the ester (methyl anthranilate) was not present in preciable quantity in pure extracts.

In regard to the production of oil during *enfleurage*, the vent property of fats for the oil hardly comes into estion, but rather their property of absorbing perfumes. e difficult solubility of benzyl alcohol in petroleum spirit unimportant; jasmine oil and benzyl acetate, its principal nstituent, are very readily soluble, and, in any case, 000—15,000 parts of solvent are used for one part of the in the blossoms. It is thus inconceivable that only per cent. of the oil is extracted (see also the distillation periments below). Erdmann proposes comparative ex- iments by *enfleurage* and maceration; in the former ocess the fat is treated with the blossoms 20—30 times as many days; the macerations would have to be nducted on the same days with the same material. For hnical reasons the experiment is practically out of estion, and less oil would be obtained than by extraction h petroleum spirit, since, under these conditions, the fat . worse solvent.

t is somewhat generally supposed that jasmine flowers id no essential oil on distillation, the perfume being umed to be destroyed. In fact, certain constituents of ential oils (esters of terpene alcohols) may be decom- ed, but the constituents of the jasmine oils obtained by raction and *enfleurage* are so stable that they cannot be preciably decomposed in distillation. At the time the nade previously examined (this Journal, 1901, 275) was de, 650 kilos. of fresh blossoms were distilled, producing a grammes of oil and 620 kilos. of water. The latter gave, er addition of common salt and extraction with ether, grms. of a brown oil which, on distillation with steam, ded 127 grms. of volatile oil (inclusive of oil extracted n condensed water). The yield is thus 0·0194 per t., by far the greater quantity being extracted from the densed water. The oil was examined for methyl hranilate and indole in the manner previously described; proper fraction was also examined for the latter con- uent; certainly far less than 0·2 per cent. is present. Less than 1 per cent. of indole is difficult to detect: 5 drops of the oil are mixed with the least possible excess of picric acid, and the picric acid or the picrate dissolved by means of a few drops of alcohol. On evaporation of the alcohol the small red needles of the picrate separate distinctly. The benzyl acetate was estimated as before (this Journal, 1899, 513). The saponification value of the acetylated oil showed that 8—10 per cent. of other free alcohols must be present, together with about 12 per cent. of free benzyl alcohol.

The distilled oil contains the high proportion of 1·5 per cent. of methyl anthranilate, whilst the oil extracted from fresh flowers is free from this substance, and that obtained by *enfleurage* contains 0·24—0·3 per cent. On the other hand, both distilled and extracted oil contain no indole (or a very small quantity), whilst the ten times greater quantity of oil produced by *enfleurage* contains 2·5 per cent. In order to ascertain whether storage in an open space would increase the proportion of the oil or alter the quantities of methyl anthranilate and indole, 80 kilos. of fresh blossoms were kept 24 hours and then distilled with steam; the oil was then extracted from the condensed water as described above. The yield was 0·0162 per cent. of rectified oil, containing 41·3 per cent. of benzyl acetate. The oil contained no indole; the quantity was insufficient to test for methyl anthranilate.

In *enfleurage* the glass plates of the "châssis" are covered on both sides with a thin layer of fat, upon which the jasmine flowers are spread. The plates are then placed one upon the other, thus forming a number of spaces with layers of fat above and below, by which the expired perfume of the flowers is absorbed. After 24 hours the flowers are removed from the layer of fat; they are then used as manure. 150 kilos. of these used flowers, corresponding to 500—600 kilos. of fresh blossoms, were distilled with steam, and the total oil isolated as before. Indole could not be detected in it. It was found that about as much oil was contained in the used flowers as in the corresponding quantity of fresh flowers. Thus the previous statement as to the production of oil during *enfleurage* is confirmed.

The following table contains the quantities of oil contained in 1,900 kilos. of flowers, as shown by extraction and distillation, and produced by the same quantity in *enfleurage*, together with the composition of the different oils, so far as it was determined:—

Process.	Extraction.	Distillation.	*Enfleurage.* Absorbed by the Fat.	*Enfleurage.* Remaining in the Flowers.
	Grms.	Grms.	Grms.	Grms.
Yield, containing	178	194	1,784	195
Jasmone........	5·7	6·2	53·5	6·2
Benzyl acetate..	35·6	44·2	1,248·8	68·2
,, alcohol .	21·3	23·2	107·0	34·3
Methyl anthranilate....	Not detected	2·87	5·3	2·86
Indole.........	Not detected	Not detected	44·6	Not detected

If the indole were a product of the decomposition of the vegetable albumin, it would be found in the stored flowers and in the used flowers from *enfleurage*. It may thus be a constituent of the expired perfume alone; experiments are in process to collect the perfumes expired by living and by plucked flowers.

Methyl anthranilate is obtained by distillation and by enfleurage, but not by extraction; it is apparently produced during the two former processes by the decomposition of some more complicated compound.

In view of the different oils obtained by different processes from the same flower, the author proposes to call the oil contained in jasmine flowers and produced by distillation or extraction—"essential oil of jasmine," and that developed by the flowers in *enfleurage*—"essential oil of jasmine flowers."—A. C. W.

Orange Flowers: Essential Oil of ——. I. A. Hesse and O. Zeitschel. J. prakt. Chem. 1901, **64**, [15, 16, 17, 18], 245—260.

According to Passy (Comptes Rend. **124**, 783; this Journal, 1897, 631) blossoms from which perfumes are obtained may be divided into two classes—flowers containing no essential oil, but producing perfume so long as they live (jasmine, tuberoses), and flowers which contain perfumes stored in oil cells (roses, orange blossom). A. Hesse has shown that jasmine flowers produce very large quantities of oil during life, but that they do contain small amounts of oil (see preceding abstract). Thus *enfleurage* is the only rational method of obtaining jasmine oil.

Orange flowers contain the oil in cells, which may be perceived by the naked eye, thus the various processes by which the oil is extracted give comparative results, if properly carried out. The authors have compared these processes. The crude oils were rectified in steam in order to remove resins, paraffins, and other non-volatile substances. The oil floating on the distilled water, termed "separated oil," was removed and dried over sodium sulphate; the oil dissolved and suspended in the water, termed "water oil," was collected by salting out and extracting with ether, the ethereal solution was then dried over sodium sulphate, t solvent distilled off and the last traces removed by means a current of air *in vacuo* at 40 C. The "separated oi and "water oil" mixed in the proper proportions give t rectified "mixed oil" of the corresponding crude oil.

Distillation—either with steam or with water over open fire—is the most usual process. The products Néroli oil and orange flower water. The latter reprodu the odour of the flowers much better than the former. T results of distillations conducted by Pillet Frères at Gra in May 1900, working on fresh flowers and blossoms whi had been kept 24 hours, are given in the table. It appe that about one third (containing the most valuable c stituents) of the perfume in the blossoms passes into orange-flower water.

Maceration consists in extracting the blossoms with fat at 60°—70° C. For the purpose of this investigati about 50 kilos. of pomade were prepared from 510 kilos, blossoms, without any other addition. The essential was isolated by the method previously given (this Journ 1899, 396). The pressed flowers, after the maceration, generally used as manure; the authors find, however, t they still contain large quantities of the valuable odorifer substances; quantitative results are not yet available.

Extraction by means of a volatile solvent gives very g results. The authors examined a sample obtained fr Grasse with every guarantee of purity. The commerc product, the first extract of the orange blossoms, conta about 50 per cent. of non-volatile, odourless substan (paraffins, vegetable wax, &c.). In order to study t behaviour of orange blossoms in the enfleurage proce 86 kilos. were subjected to *enfleurage à froid*; 8·5 grms. oil were obtained.

The table gives the yields and properties of the vari oils. The percentage of esters deduced from the sapon cation value is given in column 8 calculated as lina acetate, and in column 9 as methyl anthranilate. Colu 10 gives the percentage of methyl anthranilate direc determined.

Description of Oil.			Yield from 1,000 Kilos. of Flowers.	Specific Gravity at 15° C.	αD.	Saponification Value.	Calculated as Linalyl Acetate.	Calculated as Methyl Anthranilate.	Methy Anthra late, directl determin
1.	2.	3.		5.	6.	7.	8.	9.	10.
			Grms. about		° ′		Per Cent.	Per Cent.	Per Ce
Distillation.	A. Néroli oil	....	800	0·875	+ 4 40	38·8	13·6	10·5	0·6
	B. Water oil from fresh flowers	Separated oil	233	0·948	+ 2 7	67·2	23·5	18·1	..
		Water oil	133	0·963	+ 1 47	81·2	28·4	21·9	..
		Mixed oil	366	0·950	+ 2 0	72·0	25·2	19·4	16·0
	C. Water oil from kept flowers	Separated oil	276	0·912	+ 1 20	41·7	14·6	11·3	..
		Water oil	194	0·968	+ 2 30	82·9	29·0	22·3	..
		Mixed oil	470	0·933	+ 1 30	60·2	21·1	16·3	11·1
Extraction.	D. Volatile oil from pure extract	Separated oil	396	0·891	..	44·8	15·7	12·1	..
		Water oil	215	0·933	..	84·0	29·4	22·7	..
		Mixed oil	611	0·907	..	55·2	19·3	14·9	7·6
Maceration.	E. Volatile oil from pomade	Mixed oil	388	0·913	− 5 0	78·1	27·3	21·8	9·2
	F. Volatile oil from press cakes	Separated oil	..	0·882	+ 3 40	71·8	25·2	19·4	0·3
		Mixed oil	..	0·930	+ 2 0	42·0	14·7	11·3	8·8
Enfleurage.	G. Enfleurage oil	Mixed oil	89	0·909	+ 5 31	58·2	20·4	15·7	5·2

As regards the quality of the oil obtained by the different processes, the true odour of the orange flower is given only by the mixed oils, *e.g.*, néroli oil *plus* orange-water oil, a if the odour of the total oil be the criterion, the thr ocesses of distillation, maceration, and extraction give nal results.

Jeancard and Satie explain the difference between oils tained by distillation and extraction of pomades by suming a saponification of esters in the distillation (this urnal, 1900, 847). The authors consider that the made extract contained vaseline and non-odoriferous tracted matter. (Compare A. Hesse, this Journal, 1901, 5). The acidity of the condensed water cannot be used calculate the amount of acetic esters saponified, since the ter contains higher fatty acids and phenols. Pure linalyl etate was found to be saponified to the extent of 20 per nt. by boiling with water for three hours; a mixture of alool and linalyl acetate, containing 25·7 per cent. of the ter, lost about 2 per cent. of the ester when distilled steam. Methyl anthranilate is not decomposed by iling with water. Assuming that 20 per cent. of the alyl acetate present is decomposed in the distillation, it y be calculated that the mixture of the oils A. and B. the above table would contain *before* distillation about per cent. of linalyl acetate, which is the amount found the mixed oil obtained by extraction.

The high percentage of methyl anthranilate in the oil tracted from orange flower water is noteworthy; after noval of this ester and saponification, geraniol and enylethyl alcohol were detected; the alkaline liquor ntained phenylacetic acid.

In regard to the estimation of methyl anthranilate (this urnal, 1901, 289), it has now been found that the sulate of the ester partially dissociates, especially in the sence of resinous substances, which are precipitated h it. Therefore the solution of the sulphate should be filtered; any insoluble matter is brought into solun by alcohol, and the titration and saponification then nducted.

The authors give a table of the boiling points of alyl and benzyl acetates and alcohols, carefully deterued:—

—	762 mm.	25 mm.	10 mm.
alyl alcohol ..	198°—199° C,	98°—98·5°	81°—81·5°
zyl alcohol ..	205·5°	107°	89°—89·5°
zyl acetate ..	216°	110°—111°	92·5°—93°
alyl acetate ..	About 220° C. with decomposition.	115°—116°	96·5°—97°

—A. C. W.

charin; New Reactions for the Detection of ——.
M. Spica.

See under XXIII., page 1146.

rphine in Opium; Determination of ——, by means of Ammoniacal Silver Chloride. C. Reichard.

See under XXIII., page 1149.

coniine, Belladonna, and Henbane; Determination of the Alkaloids in Extracts of ——. Stoeder.

See under XXIII., page 1146.

ecacuanha Root; Determination of Alkaloids in ——. Stoeder.

See under XXIII., page 1147.

Morphine; Characteristic Reaction for ——. C. Fleury.

See under XXIII., page 1146.

Pomegranate Bark, and Extract of same: Alkaloidal Determination of ——. N. Stoeder.

See under XXIII., page 1150.

PATENTS.

Chloral: Improved Process and Apparatus for Continuously Producing and Rectifying ——. J. A. Besson, Caen, France. Eng. Pat. 17,202, Sept. 27, 1900.

Chloral and its hydrate are the most volatile products of the action of chlorine on strong alcohol, and may therefore be removed by continuous distillation. The patentee describes and claims a suitable apparatus; chlorine and chlorinated alcohol are introduced into a vessel heated in a water bath, from which the vapours pass into a second, thence into a third heated vessel. The residual chlorine is absorbed by alcohol in a cylinder provided with baffle plates. The rectifier, which also acts continuously, is provided with baffle plates; it is fed at the middle with chloral, and at the top with sulphuric acid (66° B.) The final purification is effected by rectifying over chalk or sodium bicarbonate in the usual manner. The same apparatus may be used for converting chloral into chloroform.—A. C. W.

Cyanamide and its Compounds; Manufacture of ——. G. W. Johnson, London. From the Deutsche Gold- und Silber Scheide-Anstalt vormals Rössler, Frankfort-on-Main, Germany. Eng. Pat. 21,819, Dec. 1, 1900.

Sodium cyanide dissolves in molten sodamide; if the temperature be raised, a violent reaction takes places at about 440° C., with production of disodium cyanamide: $NaNH_2 + NaCN = CNNNa_2 + H_2$. In the processes claimed, solid or molten sodamide is slowly introduced into the molten cyanide, or metallic sodium is added to the molten cyanide and ammonia passed through, the nascent amide then acting on the cyanide.—A. C. W.

Pharmaceutical Compounds; Manufacture or Production of New ——. H. E. Newton, London. From Farbenfabriken vormals F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 8165, April 20, 1901.

When quinine is heated with phenyl salicylate (salol) in an oil bath at 170°—190° C., phenol distils and the quinine ester of salicylic acid remains. The product is dissolved in chloroform and shaken with 1 per cent. acetic acid in order to remove unchanged quinine—

$$OH.C_6H_4.CO.OC_6H_5 + C_{20}H_{24}N_2O_2 =$$
$$C_6H_5.OH + OH.C_6H_4.CO.OC_{20}H_{23}N_2O.$$

The compound is a white crystalline powder melting at 140° C.; it is soluble in chloroform, hot alcohol, and benzene, little soluble in ether and cold alcohol. Ferric chloride colours the alcoholic solution reddish brown. The corresponding cinchonidine compound melts at 65°—70° C.; its acid sulphate forms white needles which melt at 165° C. The claims are for the manufacture of these salicylic esters, the compounds as new articles of manufacture and their use for therapeutic purposes.—A. C. W.

Phthalic Acid and Benzoic Acids; Impts. in the Manufacture of ——. O. Imray, London. From The Basle Chemical Works, Basle, Switzerland. Eng. Pat. 15,527, July 31, 1901.

By heating the naphthols in presence of alkali with metallic oxides or peroxides such as copper or iron oxide, barium, lead, or manganese peroxide, to a temperature above 200° C., they yield phthalic and benzoic acid, together with a few intermediate products. For instance, 10 kilos. of α- or β-naphthol, 90 kilos. of caustic soda, and 90 kilos. of cupric oxide, are stirred together with a little water and heated at 240°—270° C. until the cupric oxide becomes reduced to cuprous oxide. The excess of alkali is removed by lixiviation with a small quantity of water, the acids are then dissolved in water and decanted from the cuprous oxide. This solution is saturated with carbon dioxide and filtered from unaltered naphthol. The filtrate is decomposed with sulphuric acid and evaporated, the precipitated acids being purified by distillation. The distillate consists of phthalic and benzoic acids. In place of using a large excess of alkali, a smaller quantity may be taken and the operation conducted under pressure. The naphthols may

also be replaced by other naphthalene derivatives such as nitronaphthalene, the naphthylamines, naphthalene sulphonic acids or by nitroso-, and nitro- or sulpho-naphthols.
—T. A. L.

XXI.—PHOTOGRAPHY.

Gelatin ; Indirect Action of Sulphite upon ——. Lüppo-Cramer. Eder's Jarhb. Phot. 1901, **15**, 44 ; through Chem.-Zeit. Rep. 1901, **25**, 272.

The author has found that the oxidation-products of several organic developers, especially those of "adurol," *p*-aminophenol, and "metol" exert a tanning influence upon the gelatin of a photographic plate ; this action being more or less weakened, or even prevented, by sulphite. But as the above-mentioned three substances are made more powerful developers by increasing additions of sulphite, it seems possible that the tanning and the developing influence of the sulphite are not independent phenomena, but that one is the consequence of the other, *e.g.*, that development proceeds more slowly where the film has been tanned. Adurol and quinol are stronger developers of collodio-bromide in the absence of sulphite. Thus it appears that the practical developing value of a substance cannot be predicted from its purely chemical reducing properties, since the substitution of an indifferent body like collodion by gelatin alters the action altogether.—F. H. L.

Developers ; Substitution in ——. Lüppo-Cramer. Eder's Jarhb. Phot. 1901, **15**, 63 ; through Chem.-Zeit. Rep. 1901. **25**, 272.

Among the halogen derivatives of developers, "adurol" has recently attained considerable importance owing to its excellent qualities. From his experiments with this body the author has thought that the dicyanoquinol lately obtained by Thiele and Meisenheimer by the action of nascent hydrocyanic acid upon quinone might prove a useful developer, but the idea was erroneous. As this compound is not readily attacked by alkalis, it cannot be imagined that one or both of the nitrile groups are displaced by carboxyls when dicyanoquinol is treated with an alkali carbonate. The explanation of the fact that dicyanoquinol does not develop must be rather that the cyanogen group, like the carboxyl group in substances which would otherwise develop, destroys the power of reducing the latent photographic image.—F. H. L.

Mercury Intensification ; The Chemical Process in ——. F. Novak. Chem.-Zeit. Rep. 1901, **25**, [76], 280.

According to Chapman Jones (this Journal, 1893, 983) when finely divided metallic silver is treated with mercuric chloride the double compound $AgClHgCl$ is formed. By the action of ammonia on this, a black residue is obtained which contains compounds having the formulæ $NH_2AgHgCl$ and $NHAgHg_2Cl$. This observation is confirmed by Leteur's experiments (Comptes Rend. 1900, 130, [5] ; this Journal, 1900, 275). When ammonia acts on a mixture containing little silver chloride and much mercurous chloride, the former is not completely dissolved, some of it always remaining in the black residue. According to Leteur, after three digestions with ammonia, the proportion of silver chloride to the total weight of the chlorides taken was 0·213, whilst Chapman Jones gives $142{\cdot}5 : 614{\cdot}5 = 0{\cdot}233$ as the proportion of silver chloride to the total chlorides in the product of the reaction of ammonia on the silver mercurochloride which approximates very closely to Leteur's result.—T. A. L.

Photographic Reducers ; Ammonium Persulphate and other ——. Brit. Jour. Phot. 1901, **48**, [2159], 594—595. See also Chem.-Zeit. Rep. 1901, **25**, [76], 280.

The following reducers in conjunction with various developers have been comparatively tested by Messrs. Lumière :—(*a*) ammonium persulphate, 4 per cent. solution ; (*b*) potassium permanganate, 0·5 grm., sulphuric acid, 1 c.c. water 1 litre ; (*c*) Cerium sulphate, 6 per cent. solution ; (*d*) Potassium ferricyanide, 5 grms., sodium thiosulphate 50 grms., water, 1 litre ; (*e*) Potassium bichromate 1 grm. ; sulphuric acid, 1 c.c. ; water 1 litre. Ammonium persulphate (*a*) preferably attacks the denser deposit ; also preserves all six steps of gradation of the negatives developed by the different developers ; a development with diaminophenol two steps were los each of the other reducers, and on the hydrami diamino-resorcinol, hydroquinone, oxalate of iron, pyro-acetone-developed negatives, one step was lost ; w the *p*-aminophenol-developed negative there seemed to no difference between the action of (*a*) and the ot reducers, in fact the persulphate appeared to reverse usual behaviour. Persulphate (1) acts more quickly u a wet than a dry negative. (2) unlike the other reduc it does not begin to reduce until some time after imm sion and proceeds steadily ; (3) continues to act aft negative is taken from the bath until stopped by a solut of alkali sulphite or bisulphite ; (4) in strong or w solution gives the same result, the time of action o being affected ; (5) unlike other reducers it does remove any veil due to over-exposure or over-developm
—J. W. H

PATENT.

Photographic Copying of Line Drawings and the Process for Producing Paper for the ——. H. Han Wevelinghoven. Germany. Eng. Pat. 15,673, Aug 1901.

It is stated that the method now in use for produc positive copies of line drawings by photographic me consists in applying to paper a "sensitive mixture ferric oxides, tartaric acid, and gelatin," which pape exposed to the action of light under the drawing t copied. Where the light passes, the ferric oxide is redu to ferrous oxide and the gelatin again becomes soluble. order to render possible the use of ordinary drawing printing paper the patentee claims a process for apply a coating insoluble in water (gelatin, chrome alum, aluminium acetate ; varnishes ; casein, &c.) and the coating soluble in water (dextrin, &c.), upon which sensitive layer is applied. The first coating prevents penetration of the sensitive layer into the paper and second permits of the removal of the ferrous oxide.
—A. C. W

XXII.—EXPLOSIVES, MATCHES, Etc.

PATENTS.

Primer for Producing Ignition by Electricity ; Ma facture of ——. R. Kändler, Dresden. Eng. 20,800, Nov. 17, 1900.

The composition claimed is said to possess great con tivity, and can be ignited with certainty and in place a great distance, even by a weak induction spark. composed of the following finely powdered ingredients Potassium chlorate, 5 parts ; antimony sulphide, 3 pa lead ferrocyanide, 2 parts ; and gas carbon, 1 part. T are intimately mixed, with water added to prevent igni by friction, and the mass is finally dried and powdered grinding upon wood.—C. A. M.

Explosive ; a New ——. O. Imray, London. F J. L. Norris, Washington City, U.S.A. Eng. Pat. 8 April 23, 1901.

The explosive consists of a mixture in about the follo proportions :—Nitroglycerin, 70 ; oil of mirbane, 15 ; empyreumatic oil, 15 per cent. by weight. The empy matic oil is the lighter oil of wood tar (*oleum picis liqui*). Magnesia, granulated charcoal, wood pulp, or o substances may also be introduced to give consistency a granulated or moulded explosive is required.—C. A. M

High Explosives and Celluloid Compounds ; Manufac of ——. J. E. Blomén, Pompton Township, Jersey, U.S.A. Eng. Pat. 9984, May 14, 1901.

According to this patent any two or more of the follo substances are nitrated together :—viz., cellulose, an arom hydrocarbon, (*e.g.*, benzene, naphthalene) ; and a hydr derivative of a hydrocarbon, such as phenol or cresol. base formed is suitable for the manufacture of cellu A second claim is for the addition to this explosive

an oxygen-conveying salt, such as the nitrates or orates of various metals. A neutral substance like affin may be added to check too rapid combustion.
—C. A. M.

okeless Powder Charges for Guns. H. Maxim, Brooklyn, New York, U.S.A. Eng. Pat. 13,620, July 4, 1901.

is invention has the object of obtaining uniform eleration of the combustion of the charge and a ultaneous completion of the combustion throughout the ire mass; of securing the same ends in an explosive rge capable of maximum density of loading; and of bling the charge itself to support the projectile without use of a cartridge shell.

The principle of the invention lies in the construction of charge of one or more units of explosive material, ferably in the form of rods or bars, with longitudinal l lateral perforations, so that explosion occurs from face combustion in each of the different sections. The ious forms in which the charge may be constructed are merated in different claims. Thus, it may consist of centric tubes of smokeless powder, each of which has a nber of transverse perforations. Or it may be a indrical mass divided by radial planes into longitudinal tions, each of which is perforated laterally. Or a solid l may be perforated longitudinally and transversely at form distances. Or there may be a central longitudinal foration with other longitudinal perforations to which a nber of transverse perforations form vents; and so on.
—C. A. M.

plosives; Improvements in ——. J. W. Mackenzie. ondon. From The Robin Hood Powder Company, Swanton, Vermont, U.S.A. Eng. Pat. 14,525, July 16, 901.

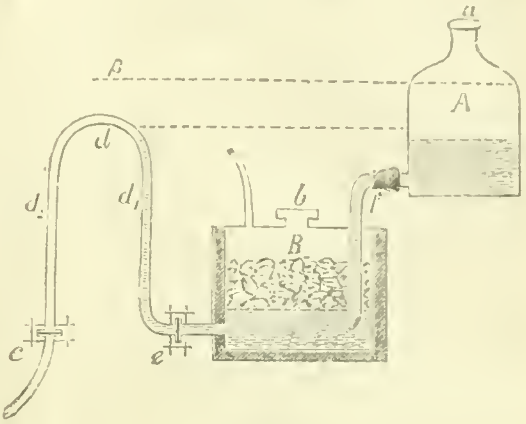
E explosive for which claim is made, is stated to be okeless, and to subject the gun to very little strain. It prepared by mixing in approximately the proportions ntioned, the following ingredients:—Ammonium picrate, ·5; potassium picrate, 15·5; barium nitrate, 39·5; od flour, 9·5; wheat flour, 1·25; lamp-black, 0·25; l potassium ferrocyanide, 0·50 per cent. The mass is aded into a dough with a paste of gum arabic or gum gacanth, then granulated, and finally rendered non-orbent by coating it with petroleum, previously subjected the action of nitric acid, adding to the supernatant liquid er settling, ammonium hydroxide, which eventually sinks the bottom, leaving the purified petroleum ready for use.
—C. A. M.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

drogen Sulphide Apparatus for Continuous Working. H. Koch. Chem.-Zeit. 1901, **25**, [81], 873.

E apparatus shown in the figure consists of a glass acid sel A of about 15 litres capacity, having its side tubulure nected by means of stout rubber tubing with the leaden e *f*. The evolution vessel B is composed of lead and is out 32 cm. in length. It is fitted into a wooden box, l has its outlet tube connected with the ∩-shaped den tube *d*, which has a diameter of 40 mm. This tube o arranged that its top is parallel with the centre of that rtion of the vessel A occupied by the acid. The con-tions of the ∩-tube at *c* and *e* are constructed on the ge principle, and are covered with iron rings. In using apparatus, about 15 kilos. of iron sulphide are intro-ced into B, and from 8 to 10 litres of sulphuric acid sp. gr. of 15° B into A. If the pressure of gas drives the d back into A, the liquid in the tube *d* is also driven the same level. When a fresh supply of acid is essary, it is introduced at *a*, and a corresponding antity of spent liquid is forced from B through the e *d*. This apparatus will work for months with a nimum of attention, and when the iron sulphide requires renewing, the apparatus can be washed out by passing a current of water into A, and eventually removing the water by means of a pump. To obviate all unpleasantness the outlet of the tube *c* is connected directly with the drain.—C. A. M.



Saccharimeter; A New ——. P. Horsin-Déon. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1901, **19**, [1 and 2], 101—104.

The author describes a new form of saccharimeter constructed by Messrs. J. and J. Frie, of Prague. The instrument is a half-shadow one for use with white light, and is graduated for the French normal weight, so that it registers 100 with a quartz plate, 1 mm. in thickness. The optical arrangement is as follows: The polariser is a nicol, one-half being cut like a Jellett prism into two parts having an equal inclination, one to the right and the other to the left; this gives the double image. Next comes a fixed dextro-rotatory quartz disc, rather more than 4 mm. thick, which gives a dextro-rotation to each of the two rays emerging from the polariser; as these two rays have different planes of polarisation, they are affected in varying degrees by the quartz, the right hand rays suffering a retardation in relation to those on the left. Hence, on observing these rays through the analyser, the left is coloured blue whilst the right side is very pale yellow. The compensator, a non-achromatised lævo-rotatory quartz wedge 15 mm. in length, tends to bring the right-hand rays back into their original condition, that is, to give equality of tint. Next is placed a small disc of lævo-rotatory quartz which produces a final tint rather darker than Soleil's sensitive tint, and finally the analyser. Starting with a uniformly-tinted field and displacing the compensator to the right, for example, the left-hand rays, being polarised in a plane forming with the vertical an angle greater than that formed by the right-hand rays, are deviated to a still greater extent, so that they appear violet whilst those on the right are still only light yellow. The difference between the angles is chosen sufficiently small to allow of one of the sides passing to the blue and violet, while the other only traverses the scale from pale orange to pale yellow. Hence one-half of the field always appears almost colourless and the other passes through the darker tints of the spectrum; but when the zero position is approached, the light side begins to become tinted before the other loses its colour. The instrument also admits of the application of a system of double compensation by which the readings are controlled. The mechanical arrangements are very carefully executed, the polariser being kept quite out of reach of dust, the same being the case with the compensator, quartz plates, and vernier, which are enclosed in a massive box. The vernier is engraved on glass, which is less subject to variations of temperature than copper, and less sensible to external actions than ivory, besides being free from danger of oxidation.—T. H. P.

INORGANIC CHEMISTRY.—QUANTITATIVE.

Mineral Poisons, especially Arsenic and Antimony; A Method for destroying Organic Matter, applicable in Searching for ——. G. Denigès. J. Pharm. Chim. 1901, **14**, [6], 241—246.

By the method described below portions of the cadaver may be destroyed within a few hours. Even the cacodyl molecule is oxidised. 200 grms. of the substance in coarse fragments are heated with 200 c.c. of nitric acid (sp. gr. 1·39), and 5 c.c. of a 2 per cent. solution of potassium permanganate. Disintegration is complete, and the frothing will have ceased after a period of 15—30 minutes, which varies according to the nature of the organ to be destroyed. The mass is then transferred to a porcelain basin of 1 litre capacity, and the first basin rinsed with 100 c.c. of nitric acid at 50—60 C. and 100 c.c. of warm water. The dish is covered by a large funnel, which fits just below the spout, and from which the neck has been removed. The mixture is kept in gentle ebullition for at least two hours; it is better to heat more gently for 4—5 hours. In any case evaporation must not be pushed to such an extent that the liquid blackens; this will not be the case if 70—80 c.c. remain. If the mixture should blacken, heating must be stopped and 10—15 c.c. of nitric acid added. After evaporation to the desired volume, the funnel is removed, and, without cooling, 100 c.c. of pure sulphuric acid added (if there is much fat, more acid may be required; the mass must remain fluid even after the action of the acid and intense blackening). Nitrous fumes are evolved, which then disappear and the liquid begins to turn black. After about two minutes from the appearance of the black coloration, 5 c.c. of nitric acid are added from a pipette in a thin stream over the centre and round the mass. This addition of nitric acid is four times repeated: the mixture is then rapidly heated for 5—6 minutes, so that the sulphuric acid strongly attacks the supernatant fat, the burner is removed and three quantities of 5 c.c. each of nitric acid added in the same manner as before at intervals of two minutes. The funnel is then replaced, and the sulphuric acid brought to the boil. Nitric acid is then added, 50—60 drops at intervals of 2—3 minutes, at the rate of a drop per second, by means of a funnel with capillary tube inserted in the orifice of the large funnel. The residual liquid at last changes to reddish yellow, then to pale yellow; it is now evaporated down to 10—15 c.c., 50—60 drops of nitric acid being added in four or five portions during the evaporation. After cooling, 100 c.c. of water are added, the liquid boiled to remove nitrous fumes, and sufficient water added to make a 10 per cent. solution (by volume) of the residual acid. The colourless liquid so obtained contains the whole of the arsenic and antimony in the original matter.

In destroying wool and hair, a rapid effervescence commences in the cold and proceeds without heating; solution is complete in 15—20 minutes. Double the ordinary quantity of nitric acid should be used. In the case of bone, after attacking with nitric acid and evaporating to 70—80 c.c., the liquid is filtered through cotton wool or gun cotton washed with nitric acid: these retain the fat, which is carefully washed. The filtrate is largely diluted, precipitated by sulphuric acid and filtered, the new filtrate is evaporated to 70—80 c.c., the fatty matter added, and then the liquid treated with sulphuric acid as described before.

In order to destroy the cacodyl molecule, after evaporation to the final 10—15 c.c., 5—6 grms. of potassium nitrate are added, and the mixture heated until sulphuric acid nearly ceases to be evolved. The liquid is then cooled and diluted.—A. C. W.

Indicators; Employment of certain ——, *with Artificial Light.* A. Kufferath. Zeits. angew. Chem. 1901, [37], 916—918.

The following indicators, suitable for ammonia titrations, were examined:—Methyl Orange, Fluoresceïn, Cochineal, Coralline, *p*-nitrophenol, Alizarin Green B, Resazurine, and Luteol, both by daylight and that of a 16-cand electric glow lamp, a 13·5-candle Auer lamp, and a 12—12 candle acetylene lamp.

The conclusions arrived at by the author, from the test detailed in the paper, are that the acetylene light is to b recommended in the case of indicators giving a change to colour of different kind to the original such as:—Methy Orange, Cochineal, Corallin, Alizarin Green B an Resazurine, whereas the choice of a light is immaterial whe the change is of another character, such as from colourle to pale yellow (*p*-nitrophenol and Luteol), or fro pale yellow to yellow-green fluorescence (Fluoresceïn).

—C. S.

Alkalis and Acids; Microchemical Detection of —— *Ozone and Water; Detection of Small Quantities* ——. F. Emich. Monatsh. für Chem. 1901, **22**, [7 670—678.

Microchemical Detection of Alkalis and Acids by means Litmus-Silk.—In order to bring litmus into a conditio suitable for use in microchemical analysis, the author fix it on silk in the following manner. Commercial litmus boiled with somewhat less than an equal weight of wate the first impure extract being rejected, while the residue again treated several times with small quantities of h water and the solution filtered; the boiling filtrate supersaturated with sulphuric acid, and used for dyein silk which is left in the hot solution for half-an-hou and is then washed in running water, by which means assumes a reddish violet tint; after drying, such "r litmus-silk" is kept in the dark. For preparing "bl litmus-silk," the red form is placed in a little water, which extremely dilute alkali solution is carefully adde until the change in colour occurs, after which the silk washed quickly once with distilled water, pressed betwe paper and dried. Under the microscope, using a condens and a magnification of about 200, both indicators sho strongly coloured threads. The author employs the threads in the following way. A single coloured cocoo thread is fastened to a piece of wax and cut with sha scissors, so that there remains free about a centimeter the thread which is drawn through a drop of alcohol clean it, and then examined under the microscope to s that the cut end is uninjured in any way. A drop weighi about 0·05 mgrm. of the liquid to be examined is arrang on a suitable support, so that the end of the silk can dipped in it and allowed to remain there during t concentration of the drop by evaporation, and when all t liquid has dried up, the tip of the thread is again examin under the microscope, after which it is cut off and the s got ready for the next test. In the auther's experimen the small quantities of liquids used were measured means of loops of platinum wire and the evaporation of t drops was carried out on cover-glasses of rock crystal, which means the disturbing influence of the alkali in gla was avoided. When red litmus-silk is employed, t smallest amounts of the different alkalis which can distinctly detected are given. Barium and calciu carbonates distinctly show alkalinity when unweighab quantities of them are rubbed up with water and tested wi the red silk. Except in the case of sodium compound the above quantities are smaller than are required to gi the faintest trace of a flame coloration. 1/4000 mgrm. ammonia can be detected in this way. The alkaline reacti of strychnine, morphine, and of guanidine carbonate can observed in quantities of a few hundred-thousandths of mgrm. The decomposition of glass by water may shown by triturating 0·1 mgrm. of glass with 1 mgrm. water and testing the liquid with litmus-silk; the reacti shows even with the more infusible glasses, but not wi porcelain.

Microchemical Detection of Ozone.—Since, in t oxidising actions of ozone, acid or alkaline substances a frequently formed, litmus-silk may be used for the detecti of small quantities of ozone. Thus with the red sil potassium iodide or ferrocyanide may be used, or with t blue silk, sulphur or potassium or calcium sulphocyanid this last salt is converted by ozone into a paste of gypsu needles.

Detection of Small Quantities of Water.—The hygro-opic properties of very small quantities of a salt can be udied by bringing the salt between two small electrodes, e deliquescing of the salt being evidenced by its greatly creased conductivity.—T. H. P.

rric Salts ; Note on the Reduction of ——. G. T. Morgan. Analyst, 1901, **26**, 225—227.

is well known that zinc is not altogether a satisfactory ducing agent for ferric salts. In the following process, hich admits of the use of pure zinc, either granulated or sheets, the efficiency of the metal is considerably creased by employing it in the form of the zinc-copper uple.

A weighed portion (4 to 6 grms.) of ferric ammonium lphate was dissolved in 100 c.c. of dilute sulphuric acid per cent.) and the cold solution poured on to a zinc-pper couple, produced by immersing 8 grms. of granulated nc for two or three minutes in 200 c.c. of a 10 per cent. lution of copper sulphate ; a vigorous action set in, and ter 10 minutes a drop of the solution no longer gave the iocyanate colouration. The reduced solution, decanted om the couple and rapidly filtered to remove any floating rticles of metal was made up to 250 c.c. with recently iled dilute sulphuric acid, and aliquot portions were then thdrawn and titrated with standard permanganate solution. e percentage of iron in the specimen of ferric alum nployed was 11·50, whilst two volumetric estimations, rried out in the above manner, gave 11·34 and 11·44. nder these experimental conditions the amount of zinc quired to reduce the quantities of ferric salt usually taken r volumetric estimations is small, and the couple may be ed for several determinations.

The zinc-copper couple may be employed for reducing ric salts in hydrochloric acid solution, the action being r more rapid than that of zinc or ammonium hydrogen lphite ; it is therefore applicable for the volumetric alysis of iron ores with standard bichromate solutions. e author gives numbers to support this statement.

When the zinc-copper couple or granulated zinc is added a neutral solution of ferric alum, a portion of the iron is ecipitated as basic sulphate. The whole of the iron thus ndered insoluble is in the ferric condition, whereas the rtion remaining dissolved is entirely converted by the ducing agent into the ferrous state. The brown pre-pitate, which rapidly forms when the couple is employed, adily dissolves in dilute acid, and the reduction then llows the normal course.—J. L. B.

lcium, Strontium and Barium ; Determination of ——, *as Oxalates.* C. A. Peters. Amer. J. Science, Silliman, **12**, [4], 216—224. Chem. Centr. 1901, **2**, [15], 869.

the determination of calcium by titration of the oxalate th permanganate, accurate results are obtained if hydro-loric acid (with a manganese salt) be used as solvent. rontium salts can be precipitated with sufficient accuracy ammonium oxalate, if the solution contains one-fifth of volume of 85 per cent. alcohol. The titration with rmanganate follows satisfactorily if the strontium oxalate decomposed either by sulphuric acid or by hydrochloric id (with a manganese salt). Barium salts can be precipi-ted by ammonium oxalate with sufficient completeness if e solution consists to the extent of one-third of 85 per nt. alcohol. The barium oxalate can be dissolved in drochloric acid, after addition of a manganese salt, and en titrated with permanganate.—A. S.

licate Analyses. M. Stoermer. Chem.-Zeit. 1901, **25**, [76], 809—811.

HE chemical analysis of a clay by the usual methods ly determines the constituents, but gives no indication to how the various elements are combined. For this rpose, Seger and Aron propose and employ a rational alysis, which consists in decomposing the clay with ncentrated sulphuric acid, leaving quartz and felspar dissolved. About 3—5 grms. of the dry finely-powdered burnt substance are treated in a platinum dish with 0 c.c. of water and 50 c.c. of concentrated sulphuric acid. e dish is covered with a watch-glass and gently heated until the sulphuric acid begins to fume strongly. After cooling and dilution with water, about 100 c.c. of hydrochloric acid are added, and the whole is boiled. The precipitate formed is then extracted several times with soda lye and hydrochloric acid, and the residue is finally heated, and weighed in a platinum crucible. This gives the amount of quartz and felspar and, by difference, the remainder of the clay. The residue of the quartz and felspar is heated with hydrofluoric acid and a drop of sulphuric acid. Silica is removed, leaving alumina and alkali as sulphates. The alumina is precipitated from the hydrochloric acid solution of these by ammonia and, on weighing, gives the alumina present in the felspar, $K_2OAl_2O_36SiO_2$. Multiplied by 5·41 this number gives the amount of felspar, which, subtracted from the weight of quartz and felspar, gives the quartz. The rational analysis is especially valuable in the porcelain and pottery industries. The mixtures are calculated according to the results of the rational analysis by which the raw materials are examined.—T. A. L.

Cement ; Detection of Powdered Slag in ——. W. Fresenius. Zeits. angew. Chem. 1901, **14**, [38], 951.

THE detection of this adulterant is based on the treatment of the powdered cement in a centrifugal machine with a liquid of definite specific gravity, such as a mixture of methylene iodide and benzene. The sulphur in the slag is also determined by treating the substance with a definite quantity of sulphuric acid and arsenic trioxide, filtering from the arsenic trisulphide, and titrating the excess of arsenic trioxide in the filtrate in the usual way.—C. A. M.

Sulphur in Iron and Steel ; Determination of ——. W. A. Noyes and L. L. Helmer. J. Amer. Chem. Soc. 1901, **23**, 675—679.

THE authors have examined the different methods for the determination of sulphur in iron, and find that the best solvents for the iron are either bromine and water or dilute nitric acid with a little potassium bromide and an excess of potassium chlorate. These two methods of dissolving the metal are carried out as follows :—(1) A mixture of 5 grms. of the iron and 7 grms. of potassium chlorate is added in portions to 120 c.c. of dilute nitric acid (sp. gr. 1·20 or 1:2 by volume) and 1 grm. of potassium bromide contained in a flask, which is cooled if necessary. When the metal is dissolved, the liquid is transferred to a flat porcelain dish and evaporated to dryness in such a way that contact with the products of combustion of the gas is avoided. The dry mass is treated with concentrated hydrochloric acid, the liquid diluted and filtered, the filtrate and residue being treated as described below. (2) When dissolving the iron in bromine, the latter must be free from sulphur, which may be removed by distilling the bromine with a little sodium carbonate. 5 grms. of the iron is then added in portions to a mixture of 8 c.c. of bromine with 200 c.c. of water, cooling after each addition. Solution takes place readily, and when it is complete, the liquid is boiled for a short time to expel excess of bromine, filtered, and the residue washed.

The insoluble residue obtained by either of these methods is mixed with sodium carbonate in a platinum crucible into which the filter is also burned by means of a spirit lamp, the oxidation being completed by the addition of potassium nitrate and heating. The mass is then dissolved in water, the liquid filtered, acidified with hydrochloric acid, mixed with 5 c.c. of barium chloride solution, and digested until the precipitated barium sulphate settles rapidly, when it is filtered off and weighed as usual. Three-fifths of the weight of the barium sulphate thus obtained are added to that yielded by the filtrate from (1) or (2) which is treated as follows :—The whole of the filtrate and washings are added to 130 c.c. of 10 per cent. ammonia in a 500 c.c. flask and the liquid made up to volume. After mixing thoroughly, the solution is filtered through a dry filter and 300 c.c. of the filtrate, which must be strongly alkaline, evaporated in a wide beaker to 100 c.c., the products of combustion of the gas being meanwhile kept out of contact with the liquid. A drop of dilute hydrochloric acid (sp. gr. 1·12) and 10 c.c. of barium chloride solution are then added, and the liquid digested hot till the precipitated barium sulphate settles quickly after stirring, when it is filtered, washed, and weighed in the ordinary way. The weight of the barium sulphate, increased by three-fifths of that obtained from the insoluble residue as above described, represents the sulphur in 3 grms. of the iron.

The authors find that with iron of a given character, the proportion of sulphur in the residue is probably nearly uniform, so that the original solution can be at once precipitated with ammonia without previous filtration, and a constant correction applied for the sulphur of the residue, thus considerably shortening the determination.—T. H. P.

Cyanide Solutions containing Zinc: Testing ——. L. M. Green. Inst. of Min. and Metall., Oct. 17, 1901.

After briefly reviewing the drawbacks of the existing methods for estimating the various working constituents of cyanide solution used for gold extraction, the author gives a plan and methods for analysis, of which the following summary shows the essential points:—

1. *Total Cyanide.*—To 50 c.c. of the solution are added excess of sodium hydrate and a little potassium iodide solution, after which the liquid is titrated with silver nitrate until a distinct permanent yellow cloudiness is obtained, any white cloudiness near the end point, due to zinc ferrocyanide, being disregarded. Result = T c.c.

2. *Protective Alkali (alkali and alkaline earth hydrates + half the monocarbonates).*—Excess of potassium ferrocyanide, to precipitate zinc, is added to 50 c.c., and 2 T c.c. of silver nitrate solution run in to precipitate the cyanide, after which phenolphthalein is added and the solution titrated with decinormal nitric acid till colourless. Result = *p* c.c.

3. *Alkali Hydrates.*—An excess of barium chloride to precipitate sulphates and carbonates is added to 50 c.c., 2 T c.c. of silver nitrate run in, and the solution titrated with nitric acid till colourless, as in 2. Result = *h* c.c.

4. *Cyanides, Chlorides, &c. precipitated by Nitrate of Silver.*—To 50 c.c. are added 2 T c.c. of silver nitrate, then *p* c.c. of nitric acid, one drop of potassium chromate and the titration with silver nitrate continued until permanent red indication. This test is unimportant in itself, but necessary for the subsequent zinc determination. Result (total $AgNO_3$ added) = N c.c.

5. *Zinc, less the Ferrocyanide.*—To 50 c.c. are added about 10 c.c. of roughly decinormal sodium carbonate to precipitate basic zinc carbonate and zinc ferrocyanide, and 2 T c.c. silver nitrate and the whole well shaken. The solution, after adding phenolphthaleïn, is rendered colourless with decinormal nitric acid with occasional shakings, during which operation the basic zinc carbonate assumes its normal composition. It is preferable then to add another c.c. of acid, shake and neutralise back with sodium carbonate to a pink shade. An excess of potassium ferrocyanide is added to react with the basic zinc carbonate according to the following equation:—

$$6[3Zn(HO)_2, 2ZnCO_3] + 20K_4FeCy_6 = 5[K_4FeCy_6 3Zn_2FeCy_6] + 36KHO + 12K_2CO_3.$$

The alkalinity is then determined with nitric acid. Result = S c.c.

6. *Total Zinc.*—To 50 c.c. are added about 10 c.c. of sodium carbonate and N c.c. of silver nitrate, sufficient, that is, to decompose the zinc ferrocyanide. After shaking well, phenolphthalein is added and the solution neutralised as in test 5, excess of potassium ferrocyanide is then added and the alkalinity again estimated. Result = Z c.c.

Provided the nitric acid solution be decinormal and the silver nitrate contain 13·05 grms. per litre, the following are the factors for the various results:—

Total cyanides (estimated as KCy)	T × 0·02 %
"Protective alkali" (estimated as KHO) .	*p* × 0·0112 %
Alkali hydrates (as KHO)	*h* × 0·0112 %
Alkali carbonate (as K_2CO_3)	(*p*−*h*) × 0·0276 %
Ferrocyanide (as $K_4FeCy_6 3H_2O$)	(*z*−*s*) × 0·0351 %
Zinc	Z × 0·0081 %

—A. W.

Red Lead; Determination of Foreign Impurities in —. A. Jousser. J. Pharm. d'Anvers, 57, 231. Pharm. 1901, 67, [1631], 385.

2·5 grms. of the sample are stirred, in the cold, with 20 c. of nitric acid (1 : 1), and when the whole of the red lead converted into PbO_2, hydrogen peroxide solution is add gradually to dissolve the latter; a few drops are usual sufficient. Foreign impurities, such as colcothar, powder brick, sand, barium sulphate, &c., remain undissolved, a can be collected, washed, dried, and weighed.—A. S.

Perchlorates in Chili Saltpetre; Determination of —. Grimm. Chem. Ind. 1901, 24, [17—18], 476.

For this purpose it is usual to determine the chloride in th sample as such, and again, after conversion of the pe chlorate into chloride by ignition, with or without th addition of manganese peroxide. The difference between th two results is a measure of the perchlorate present. In ord not to loose chlorine, overheating must be avoided, and, this is not easy when operating over a naked flame, th author recommends the following plan as very satisfactor —The dish (platinum, nickel, or iron) containing th mixture of nitre and manganese dioxide (20 grms. of nit + 3 grms. of dioxide) is covered over with anoth somewhat larger dish, inverted, both resting on a th asbestos card, the latter being heated from below by a go Bunsen burner. The temperature is raised gradually to th maximum, and maintained for one hour. In presence magnesium chloride it is unnecessary to add an alk before ignition, with a view to preventing a loss of chlorin The excess of sodium nitrate suffices to fix the halogen.

—H. T. P.

Bismuth; Determination of ——. C. A. Grabill. Eng and Mining J. 1901, 72, [12], 354.

The author has examined the method for the determinati of bismuth recommended by Warwick and Kyle (th Journal, 1901, 620). He finds that the basic bismut oxalate is slightly soluble in the cold, and more so in the h solutions prescribed; it is possible, whilst adhering to th conditions laid down, to lose 2·8 per cent. of bismuth wh working with 1 grm. of material. The permanganate shou be standardised by means of an ore similar to the one und examination and containing a known proportion of bismut It is also pointed out that copper nitrate in presence excess of oxalic acid, forms sparingly soluble copp oxalate; therefore, if copper be present in large amount, must be separated by another method.—A. S.

Uranium: Quantitative Separation and Determination ——. E. F. Kern. J. Amer. Chem. Soc. 23, [10], 6 —726.

This work was undertaken with the object of finding o the most accurate and satisfactory method for the technic estimation of uranium. The usual quantitative methods f estimation of uranium are reviewed and their values checke by experiment, and new methods and modifications a suggested as the result of experimental comparison. Aft an historical introduction the following subjects are dea with:—Separation of uranium from members of the fift and sixth groups; separation of vanadium from uranium separation of uranium from members of the third and fourt groups, particularly iron; separation of uranium fro cobalt, nickel, and zinc; separation of uranium from th alkalis and the alkaline earth metals; separation uranium from the alkali and alkaline earth metals b electrolysis of acetate solution; separation of uranium fro phosphoric acid; determination of uranium as oxide; dete mination of uranium as phosphate; precipitation of urani by ammonium dihydrogen phosphate; the volumetric est mation of uranium; titration of uranium solutions wit potassium permanganate, including reduction of uran solutions by metallic zinc, metallic aluminium, metalli magnesium, and by passing uranyl solutions throug reductor; reduction of uranyl solutions by stannou chloride; estimation of uranium in pitchblende by th various methods and by ether extraction. The conclusio drawn from this investigation, briefly stated, are a follows:—

(1) In order to separate uranium and the other members f group 4 from the metals of groups 5 and 6, the solution hould contain not more than one part of concentrated acid either hydrochloric or nitric acid) in 50 parts of solution.

(2) The separation of uranium from the metals of groups and 4 is best accomplished by means of either a saturated olution of sodium carbonate, or else by ether followed y a saturated solution of ammonium carbonate. The atter method is preferable when the introduction of fixed lkalis and silica is undesirable.

(3) The ether extraction method for the separation of ranium from iron depends on the fact that ferric chloride s extracted from an aqueous hydrochloric acid solution, whereas the uranyl chloride is retained in the aqueous olution. For this separation it is necessary that the ydrochloric acid used for the solution be of 1·10 specific gravity and that three ether extractions be made. The ther used should be free from alcohol, and also previously haken up with hydrochloric acid (sp. gr. 1·10).

(4) The separation of uranium from iron by means of odium carbonate is complete, provided a large excess of a saturated solution of sodium carbonate be used, and the olution boiled for at least 15 minutes after the precipitation. The boiling is necessary in order to get all the uranium into olution. By such treatment no uranium remains with the ron, which is completely precipitated as ferric hydroxide n a form readily filtered and washed.

(5) The separation of uranium from the alkalis and lkaline earths by means of electrolysis is complete, easily accomplished, and gives accurate results.

(6) The separation of uranium from the alkalis and alkaline earths is accomplished by precipitating the uranium hree times from a hot solution with ammonia in the presence of ammonium chloride.

(7) The separation of uranium from the alkalis and alkaline earths by means of an excess of ammonium phosphate in the presence of ammonium acetate is complete. The precipitations should be made from a hot solution and he boiling continued for at least 15 minutes.

(8) The yellow slimy amorphous precipitate of an ammonium uranate, formed by precipitating uranium with ammonia in the presence of an ammonium salt, is converted nto a darker crystalline form by boiling it for about 20 minutes, and then allowing it to settle in the cold.

(9) The separation of the filter-paper from the precipitate of ammonium uranate for the purpose of igniting to UO_2 or U_3O_4 is unnecessary.

(10) The complete oxidation of uranium to U_3O_8 is accomplished by igniting ammonium uranate, in either a platinum or porcelain crucible, over a blast-lamp. This is done by having the crucible in a slanting position and igniting intensely over a blast-lamp for about ten minutes, after which the crucible is allowed to cool in a slowly decreasing Bunsen flame.

(11) The reduction of U_3O_4 to UO_2, as recommended by Rose for the purpose of control, was found unreliable.

(12) The estimation of uranium as phosphate is easily and accurately done when the precipitant used is ammonium phosphate, in the presence of ammonium acetate. The precipitate of $UO_2NH_4PO_4$ on boiling becomes crystalline, and is easily filtered and washed. The ignited precipitate previous to weighing should be moistened with nitric acid (sp. gr. 1·42), dried and re-ignited at low redness in a porcelain crucible. Above this temperature, and especially so in platinum, a reduction of the $(UO_2)_2P_2O_7$ always occurs. Whenever this happens it may be reoxidized to $(UO_2)_2P_2O_7$ by moistening the greenish mass with nitric acid (sp. gr. 1·42) and re-igniting at low redness. The ignitions should be done in porcelain.

(13) The most rapid determination of uranium is accomplished by reducing a sulphate solution by means of pure metallic zinc and titrating it with standard potassium permanganate solution in an atmosphere of carbon dioxide. The reductions, whether made by means of metallic zinc, aluminium, magnesium, or in a long Jones reductor, were in all cases complete, and the results obtained were concordant with those obtained gravimetrically.

(14) When hydrochloric acid solutions of uranium are reduced by means of metallic zinc, aluminium, or magnesium, the reduction goes lower than UCl_4. It approached and in several cases reached the subchloride UCl_3. When stannous chloride is used, the results are utterly unreliable; so no reduction of uranium in an hydrochloric acid solution can be used for the estimation of uranium.—C. T. T.

Tellurium; New Gravimetric Method of Determining ——. A. Gutbier. Ber. 1901, **34**, [12], 2724—2726.

This method depends on the fact that hydrazine hydrate and its salts separate the tellurium quantitatively from all tellurium compounds; acid solutions are precipitated either with hydrazine hydrate itself or its hydrochloride, whilst, with alkaline solutions, hydrazine hydrochloride is employed. The author describes the method of procedure in the case of telluric acid, and from this the application of the process to other tellurium compounds can be readily derived. In a roomy platinum or porcelain basin provided with a spout, and with a platinum or glass cover, a weighed quantity of telluric acid is dissolved in warm water, and to the solution a 10—20 per cent. solution of hydrazine hydrate is added by means of a pipette inserted in the spout, the dish being meanwhile kept covered to avoid loss by spurting. Action at once sets in, the solution assuming a dark blue to black coloration, and, after heating to boiling for a short time, metallic tellurium separates in flocks, while the supernatant liquid again becomes colourless. A further quantity of hydrazine hydrate is added, this procedure being continued until the reagent causes no further coloration in the liquid. The dish must be kept covered and, before each addition of the hydrazine hydrate, the solution must be heated to completely precipitate the tellurium. When all the tellurium is separated, the liquid is allowed to cool somewhat, and is then filtered through a filter which has been dried at 105° until constant in weight, the tellurium being washed repeatedly with hot water, and finally brought on to the filter. After thorough washing on the filter, the precipitate and paper are dried at 105° carefully and quickly, in order to avoid oxidation of the tellurium.—T. H. P.

Molybdenum; Electrolytic Determination of ——. L. G. Kollock and E. F. Smith. J. Amer. Chem. Soc. 1901, **23**, 669—671.

On electrolysing at 75° C. a solution of sodium molybdate, containing 0·1302 grm. of molybdenum trioxide and 2 drops of concentrated sulphuric acid in 125 c.c. with a current of 0·1 ampère at a pressure of 4 volts, it was found that the whole of the molybdenum was deposited on the cathode as a black deposit of hydrated sesquioxide. When the latter is dissolved in nitric acid and the solution evaporated to dryness, it yields white molybdic acid, the weight of which agrees well with that of the sodium molybdate taken. This method may be applied to the determination of molybdenum in molybdenite which is first fused with a mixture of sodium carbonate and nitrate, the cooled mass being then extracted with water and the liquid filtered, acidified with sulphuric acid, and electrolysed. In case the sulphur in the mineral is to be determined, the filtered aqueous extract is acidified with acetic acid, then boiled to expel carbon dioxide, and electrolysed. The sulphur is then precipitated as barium sulphate from the liquid remaining after electrolysis.

—T. H. P.

Indium. C. Renz. Ber. **34**, [12], 2763—2765.

Indium can be determined in its salts by precipitating their hot solutions with dimethylamine. After washing and drying, the iodium hydroxide is removed as completely as possible from the filter, and, after the latter has been separately burnt, is ignited and weighed as In_2O_3.

Indium hydroxide behaves towards bases as a weak acid. By carefully drying the precipitated hydroxide at 100° C., the meta-acid, $InO.OH$ is obtained. The corresponding *magnesium indate*, $(InO)_2.O_2Mg.3H_2O$, is obtained by heating to boiling a solution of indium chloride with magnesium chloride, as a white powder, insoluble in water.

The author has prepared *indium molybdate*, $In_2(MoO_4)_3.2H_2O$, by precipitating an indium salt with ammonium molybdate. It is a bulky white precipitate which becomes horny on drying; its formation can be used as a means of separating indium from zinc. *Indium platinocyanide*, $In_2(PtCy_4)_3$, is obtained by the reaction of indium sulphate on barium platinocyanide. It forms white hygroscopic crystals, easily decomposed on heating.—J. T. D.

ORGANIC CHEMISTRY.—QUALITATIVE.

Cherry Syrup in Raspberry Syrup; Detection of ——. K. Windisch. Zeits. Untersuch. Nahr. Genussm. 1901, **4**, [18], 817—825.

The author states that both the fruit and stones of cherries contain amygdalin, which forms hydrocyanic acid on fermentation. This fact is used for detecting the admixture of cherry juice to other fruit juices. The method recommended is as follows: 20—30 c.c. of the syrup are distilled until about 2 c.c. have come over. To the latter, one drop each of tincture of guaiacum and very dilute copper sulphate solution are added. The formation of a blue colour indicates the presence of hydrocyanic acid. The colour is fugitive. Should the coloration be faint, a little chloroform may be added. On shaking, the colour dissolves in the chloroform, and becomes more apparent. As some cherries contain very little amygdalin, negative results by the above test do not prove the entire absence of cherry syrup.

The method may also be used for the detection of cherry wine in red wines.—W. P. S.

Saccharin in Wine and Beer; Detection of ——. F. Wirthle. Chem.-Zeit. 1901, **25**, [77], 816.

The following improved method allows of the detection of 0·25 mgrm. of saccharin per 100 c.c. of wine, which corresponds in taste with about 0·12 per cent. of sugar. 200 c.c. of the wine are evaporated in a basin to about 20 c.c., which is introduced into a separating funnel together with the residue in the basin after stirring up with a few drops of sodium hydroxide and water, the whole being then strongly acidified with hydrochloric acid and shaken up with three separate quantities of 50 c.c. of ether. The ethereal solution is filtered into an Erlenmeyer flask, mixed with a few drops of concentrated sodium hydroxide solution and about 10 c.c. of water, well shaken, and the ether distilled off. The liquid is introduced into a small porcelain basin, to which the rinsings of the flask with a few drops of caustic soda and some water are also added; a small piece (about 1 grm.) of caustic soda is then placed in the liquid, which is slowly heated in an air-bath to 215°, and the temperature kept for a quarter of an hour at 215°—220°, the thermometer being placed in the air-bath so that the stem from 37° up is above the cork. The cold mass is extracted with warm water, carefully acidified with hydrochloric acid, and shaken up with ether and light petroleum spirit. The ethereal liquid is evaporated, the residue dissolved in a few c.c. of water: to the solution thus obtained are then added a few drops of ferric chloride solution of such a strength that a layer 1 cm. thick has a pale yellow tint. If only very small quantities of saccharin be present, *i.e.*, less than 1 mgrm. per 100 c.c. of the wine, a dirty brown colour is obtained on the addition of ferric chloride. In this case the liquid is mixed with a little water, acidified, and shaken up with ether and light petroleum spirit, the ethereal solution being purified by shaking three times with 20 c.c. of water, carefully evaporated, and the residue dissolved in a few c.c. of water. With this liquid, very dilute ferric chloride solution gives a fine violet coloration.—T. H. P.

Saccharin; New Reactions for the Detection of ——. M. Spica. Gaz. chim. ital. **31**, [2], 41—46. Chem. Centr. 1901, **2**, [15], 871.

The methods proposed by the author are based (1) upon the conversion of the imino group of the saccharin into nitric acid, and (2) upon the oxidation of the saccharin to sulphaminobenzoic acid, and detection of the latter by means of the diazo reaction. The method of working is as follows:—The liquid (wine, syrup, &c.) to be examined is acidified with pure sulphuric acid (with a solid, the acid aqueous extract is taken), shaken with ether, or a mixture of ether and light petroleum spirit, and the extract divided into three portions, and evaporated to dryness on the wate bath One portion is examined by the method previous described by the author (Gaz. chim. ital. **25**, [1], 207), fo the presence of salicylic acid, the latter, if present, bein converted into picric acid. The second portion is treate with a few drops of pure sulphuric acid and a small cryst of potassium permanganate, and heated gently; the exce of permanganate is removed by oxalic or sulphurous aci and the mixture diluted with a few c.c. of distilled wate A few drops of a solution of diphenylamine hydrochlorid are then added, and finally, by means of a pipette, whic reaches to the bottom of the test-tube, pure sulphuric acid run in, without allowing the liquids to mix. In presence saccharin, the well-known nitrate reaction is observed— blue ring at the zone of contact between the two liquid The test is stated to be sensitive to the extent of 0·0007 pe cent. of saccharin in wine. The third portion is mixe with a little lime, and heated, with shaking, to incipien charring. A few c.c. of water are added, the mixtur heated to boiling, and, after standing some time, the liqui decanted into another tube, and treated with a few drops o pure hydrochloric acid, and a small piece of zinc. Afte about twenty minutes the reduced liquid is poured off, an a few drops of dilute alkali nitrite solution, and 5— drops of a solution of α-naphthylamine hydrochloride added Immediately, or after a few minutes, or even, when only trace of saccharin is present, in the course of some hours, crimson-red coloration is produced, if saccharin be present. —A. S.

Formaldehyde in Milk; Modification of the Sulphuric Aci Test for ——. A. G. Luebert. J. Amer. Chem. Soc 1901, **23**, 682—683.

The following is an improved method for the detection o formaldehyde in milk. Five grms. of coarsely powdere potassium sulphate are placed in a 100 c.c. flask, 5 c.c. o the milk distributed over it by means of a pipette, and 10 c.c of sulphuric acid (sp. gr. 1·84) carefully poured down the side of the flask, which is now allowed to stand quietly until the colour develops. If formaldehyde is present, the violet coloration of the potassium sulphate takes place in a few minutes, the colour gradually dispersing through the entire liquid. If no formaldehyde be present, the liquid will at once assume a brown colour, rapidly changing to black. Milk which has stood for several hours previous to testing gives the reaction even more rapidly than a fresh sample. The test is sensitive to a dilution of at least one part of formaldehyde in 250,000 of milk.—T. H. P.

Morphine; Characteristic Reaction for ——. G. Fleury. Chem.-Zeit. Rep. 1901, **25**, [76], 276.

A fragment of the suspected substance is dissolved in a porcelain dish in a drop of $\frac{1}{20}$ sulphuric acid in the cold; lead peroxide is then added, and the mixture is stirred for 6—8 minutes. After standing 3—4 minutes, the clear liquid is decanted and treated with a drop of ammonia. when a brown coloration is formed, due to the presence of protocatechuic acid, a decomposition product of the morphine.—T. A. L.

ORGANIC CHEMISTRY.—QUANTITATIVE.

Belladonna and Henbane; Differentiation of the Extracts of ——. Stoeder. J. Pharm. Chim. 1901, **14**, [7], 297.

A solution of 0·1 grm. of the extract in 2 c.c. of water is shaken with 10 c.c. of ether, which is then shaken with 5 c.c. of water and two drops of ammonia. In the case of extract of belladonna, a blue fluorescence is observed in the ammoniacal liquid.—A. C. W.

Aconitine, Belladonna, and Henbane; Determination of the Alkaloids in Extracts of ——. Stoeder. J. Pharm. Chim. 1901, **14**, [7], 297.

Six grms. of the extract are dissolved in 30 c.c. of water; 60 c.c. of chloroform and 3 c.c. of ammonia are added, and the mixture frequently shaken during three hours; 50 c.c. of the chloroform solution are filtered off and evaporated. The residue is taken up in 10 c.c. of N/10 sulphuric acid, and the excess of acid titrated as below (see following abstract).—A. C. W.

ecacuanha Root; Determination of Alkaloids in ——. Stoeder. J. Pharm. Chim. 1901, **14**, [7], 296—297.

HE ipecacuanha powder (12·5 grms.) is shaken with 25 c.c. of chloroform and 10 c.c. of ammonia at intervals ring 12 hours; 5 c.c. of water are added to make the wder agglomerate. The chloroform solution is filtered, d 100 c.c. distilled. The residue is dissolved in 20 c.c. N/10 sulphuric acid, the solution filtered, hæmatoxylin lded, and the excess of acid titrated by N/10 alkali. ux vomica may be determined in the same manner.
—A. C. W.

arbon Bisulphide in Benzol; Detection of ——. E. Votoček and R. Potměšil. Chem.-Zeit. Rep. 1901, **25**, [76], 275.

HE method employed depends upon Hofmann's reaction, $S_2 + 2C_6H_5NH_2 = CS(NHC_6H_5)_2 + H_2S$, which, especially alkaline solution, proceeds very rapidly. The alkaline lphide formed is detected by the nitroprusside reaction. he method is a speedy one, and only requires about 5 minutes for its completion.—T. A. L.

digo; A New Hydro-Compound of ——. Its Uses and Quantitative Determination. W. Vaubel. Zeits. angew. Chem. 1901, [36], 892—893.

the course of an investigation of Indigo Blue and digo Red, the author found that, in presence of zinc ust, indigo dissolves to a deep red solution in alcoholic lkali of any kind. The same result ensues when the zinc replaced by iron, ferrous sulphate, ferro-ammonium sulhate, aluminium, tin, or palladium; but not with silver, ercury, copper, or platinum.

The method adopted for preparing this new product as to shake up 5 grms. of Indigo Blue with 30 c.c. of 0—12 per cent. caustic soda, 100 c.c. of alcohol, and grms. of zinc dust in a closed vessel, leaving the whole o settle for 12 hours, and then filtering off as quickly as ossible from the residual indigo and zinc dust. On coming contact with air, the product is reconverted into Indigo lue, and if zinc dust be added, complete decolorisation nd formation of Indigo White occurs. An admission of air en results in the reappearance of the red intermediate ompound, which finally changes back into Indigo Blue.

Though at first the compound was regarded as probably ne containing zinc and sodium, a more complete examinaion led to its being considered a hydro compound, or at he most an alkali compound, and the author has given it he name dihydroindigo blue, in conformity with its assumed omposition.

Further experience has shown that the following proportions are the best for the preparation of the product:—ndigo, 1 grm.; zinc dust, 0·8—1·2 grms.; caustic potash 15 per cent.), 20 c.c. (or a corresponding amount of NaHO); alcohol (98 per cent.), 50 c.c. An excess of lkali considerably hinders the reaction, which, on the ther hand, does not develop satisfactorily when the alkali s less than the quantity stated.

The author recommends this reaction as a quantitative olorimetric test for indigo; in any case, the rapidity with which the reaction begins will afford an indication as to the lyeing capacity of the indigo.—C. S.

Silk; Method of detecting certain Weighting Matters in ——. A. Romanu. Bull. Soc. Ind. Mulhouse, 1901, 328—329.

A SAMPLE of the silk to be examined is rinsed in hot water, nd is then boiled with Alizarin, with the addition of chalk. It is afterwards washed and soaped. Pure silk thus treated akes a pale pink tint, while silk weighted with tin oxide is dyed an orange colour, which, if alumina be also contained n the silk, is more or less red, according to the amount of the latter present. By comparison with samples of known composition, it is possible, approximately, to determine the quantities of tin oxide and of alumina present, from the nature and intensity of the colour produced. Tannic acid may be similarly detected by treating the silk with a ferric salt, the various tannin matters giving characteristic colours.—E. B.

Fats in Animal Fats; Detection of Vegetable ——, by the Phytosterol Acetate Method. Bömer. Zeits. angew. Chem. 1901, **14**, [38], 951.

ACCORDING to the author, the addition of 1 per cent. of vegetable fat to an animal fat raises the melting point of the cholesterol or phytosterol acetate by 4°—6° C. From 50—100 grms. of the fat are saponified and extracted with ether. The crude phytosterol is recrystallised from a little alcohol, and then converted into the acetic ester by heating with acetic anhydride. This ester only dissolves with difficulty in alcohol.—C. A. M.

Cholesterol and Phytosterol; Quantitative Extraction of —— from Fats. E. Ritter. Chem.-Zeit. 1901, **25**, [81], 872.

THE following simple method is stated to yield higher results than those obtainable by any of the other published methods. About 50 grms. of the fat are heated on the water bath in a porcelain basin of about 1½ litre capacity, with about 100 c.c. of alcohol. When the alcohol boils, a hot solution of 8 grms. of sodium in 160 c.c. of 99 per cent. alcohol is introduced, and the heating continued until the alcohol has evaporated, after which 75 grms. of sodium chloride and sufficient water to dissolve nearly the whole of the contents of the basin are added. The liquid is continually stirred and evaporated to dryness, the drying being eventually completed in the oven at 80° C. The mass is then pulverised, and the fine powder left in the hot-water oven, and finally for some time in an exsiccator over sulphuric acid. It is next extracted for about nine hours in a Soxhlet apparatus with ether, and the ethereal extract transferred into an Erlenmeyer flask, leaving most of the small quantities of soap and glycerin adhering to the sides of the extraction flask. The latter is washed out with ether, the combined extract and washings evaporated to dryness on the water-bath, and the residue dissolved in as little alcohol as possible. The flask, which holds about a litre, is then nearly filled with water, little by little, with constant shaking. The precipitate is collected on a filter, washed with water, and dried on the paper at about 60° C. When dry it is transferred, with the aid of ether, into a weighed flask, and, after evaporation of the ether, dried at 100°—120° C. and weighed. The action of the sodium chloride is more than one of disintegration, for it cannot be replaced by, *e.g.*, paper or sand.—C. A. M.

Sulphur in Oils; Determination of ——. F. Jean. Ann. Chim. anal. appl. **6**, 321. Chem. Centr. 1901, **2**, [15], 867.

THE so-called solidified ("gefrorene") oils are produced by the incorporation of varying quantities of sulphur. For the determination of the sulphur, 5 grms. of the oil are heated in an enamelled iron crucible to 150° C., 4 c.c. of caustic soda of 36° B. and 2 c.c. of alcohol added, and the whole evaporated to dryness with constant stirring. The soap is dissolved in warm water, precipitated by adding excess of sodium chloride, filtered, and washed with salt solution. In the filtrate the sulphur compounds formed are titrated with N/10 iodine solution, after the addition of sodium carbonate and starch solution. 1 c.c. of N/10 iodine = 0·0016 grm. of sulphur. The author found in these oils from 0·58 to 0·70 per cent. of sulphur; in colza oil, 0·031 per cent.; and in rape oil, 0·044 per cent. of sulphur.—A. S.

Alkalinity; Indicators for ——. Alterability of Stored Raw Sugars. Köhler. Zeits. Vereins deutschen Zuckerind. 1901, **51**, [546], 663—681.

THE regulations which came into force on January 1st for the determination of the alkalinity of raw sugar have caused great dissatisfaction, part of the sugar made in the earlier part of the season being found acid, and therefore subject to a deduction, only alkaline and neutral sugars being considered fit for delivery. Phenolphthalein is objected to by the raw sugar manufacturers as unsuitable, but the refiners refused to accept litmus as indicator. Consequently the Silesian Section of the Union appointed a committee to study the action of various indicators, and to determine the alteration of alkalinity in raw sugars during storage.

They found that Herzfeld's method was satisfactory for discriminating between alkaline and acid sugars, but required supplementing as regards the examination of neutral sugars. One of the eight samples examined was pronounced by part of the commission to be alkaline by Herzfeld's test; by the others, acid. The sugar, however, was quite neutral; in fact, to litmus and turmeric it was alkaline. For when 5 c.c. of centinormal acid were added to the 10 per cent. sugar solution, no noticeable change of colour could be observed, but on adding 1 to 2 c.c. of centinormal alkali a distinct red colour was visible. A literal interpretation of Herzfeld's instructions would make this sugar not as not-alkaline, but as acid.

The committee therefore propose a provisional modification that in the case of neutral sugars, or those which give no red colour with neutral phenolphthalein water, one of the three following methods be used:—(1) To the 10 per cent. sugar solution 1 to 3 c.c. of centinormal alkali is added: if a red coloration appears the sugar is to be pronounced neutral or not acid; (2) a portion of the sugar is to be placed on litmus paper and sprinkled with water; if the paper is coloured blue, the sugar is to be pronounced not acid; (3) the spot method with turmeric is to be applied. Further, it is suggested that the term neutral sugar, or not-acid sugar, be also introduced.

The spot method of H. Steffens is made by means of a thin tube drawn out to a capillary, with the end cut off sharp at right angles. The sugar solution is applied with this tube to a paper coloured with sensitised turmeric. Alkalinities of 1 in 160,000 have thus been distinctly shown.

Herzfeld maintains that it is unscientific to speak of a neutral sugar, that phenolphthalein is the best indicator for certain substances which are present in raw juice, act the part of acids, and give the juice the power of self-inversion when heated. Such bodies are pectin substances, which are converted into parapectic acid on heating; asparagin and glutamin, which at higher temperatures show increased acid properties; the latter are only imperfectly removed on defecation.

A sugar which had been found to be neutral, but alkaline to turmeric, was heated in solution for 16 hours at 95° C., and showed 0·26 per cent. of invert sugar. Another, that was alkaline to phenolphthalein, heated for the same time, showed under 0·05 per cent.

Ostwald regards the inversion of sugar as the true te of acidity, so that indicators are only a secondary, and n always a reliable sign. Sugars also which are not alkalir to phenolphthalein frequently keep well in store, no doub but those which are alkaline keep better, and it mu ultimately be of great advantage to manufacturers t produce only such sugars.—L. J. de W.

Malt Extracts; Examination of Commercial ——. W. J. Sykes and C. A. Mitchell. Analyst, 1901, 2 227—231.

For the determination of total solids, the specific gravity c a 10 per cent. solution of the extract was taken and th number of grms. per 100 c.c. found by referring t Schultze's table. The phosphoric acid was precipitated a phosphomolybdate, weighed as the ammonium compoun and the result divided by 28·5.

The statement of Bömer, that zinc sulphate can replac ammonium sulphate for salting out "albumose nitrogen" i malt extracts, has not been confirmed; the authors cit numbers which show that both sulphates give practicall the same results. In some cases determinations were mad of the "nitrogen" precipitated by bromine in the filtrat from the zinc sulphate precipitations by Allen's modifie tions of Rideal and Stewart's method. It was found th the amount precipitated in this way closely approximated t that of the albumose nitrogen and to that precipitated b phosphotungstic acid.

The specific rotatory power was determined in the 10 pe cent. solution, and calculated on the total solids. Kieselguh was found to aid the clarification.

In the estimation of the diastatic power the author decided to dilute the sample under examination to a specifi gravity of 1013—that is, to the same specific gravity as th malt extract used in determining the diastatic power of malt, and to calculate the result in the same way as examining a malt. This will give an estimate of the amour of diastatic power which has been lost during the manufac ture of the extract. For example, a commercial ma extract was diluted to a specific gravity of 1013; 1 c.c. o this was added to 100 c.c. of a 2 per cent. solution o soluble starch, and after the prescribed treatment th reduced copper weighed (this Journal, 1896, 560). correction was made for the reducing substances present i the malt extract.

The following table gives the complete results of th analyses of a series of malt extracts; also of severa substances which might be used as adulterants :—

——	Water.	Total Solids.	Ash.	Phosphoric Acid.	Total Nitrogen.	Albumose Nitrogen.	Nitrogen precipitated by Phosphotungstic Acid.	Ammoniated Nitrogen.	Reducing Substances as Maltose.	Specific Rotation of Solids.	Diasta Capac
1. Wort evaporated on water-bath.	18·80	81·20	1·60	0·67	0·69	0·09	..	0·05	..	97·2	..
2. Medicinal.........	19·90	80·1	1·04	0·49	0.70	0·15	0·103	0·09	59·5	103·8	21·6
3. French............	19·90	80·1	1·62	0·50	0·42	0·098	0·21	0·021	51·04	117·3	12·0
4. „	18·20	81·8	1·62	0·52	0·79	..	..	0·032	52·3	110·3	10·0
5. Scotch	23·4	76·6	1·90	0·76	0·53	..	..	..	54·0	97·9	13·0
6. English medicinal	21·1	78·9	1·32	0·53	0·77	0·19	..	..	56·0	111·5	5·6
7. „ „	21·3	78·7	1·75	0·77	1·52	0·17	0·19	..	56·2	63·5	100·0
8. „ „	19·9	80·1	2·20	0·66	1·03	..	..	..	56·1	87·3	25·7
9. „ „	17·5	82·50	1·60	0·75	0·68	..	..	..	51·4	115·1	22·0
10. Bakers'............	24·4	75·6	2·10	0·79	0.98	0·14	..	..	52·56	85·9	24·0
11. "Diastase".......	21·1	78·9	3·90	1·15	2·25	..	..	..	45·60	38·1	115·0
12. Glucose	15·8	84·2	0·55	0·065	0·20	..	..	..	62·8	128·2	..
13. Malto - dextrin, "non-fermentable."	24·9	75·1	0·55	0·23	0·19	..	..	..	50·3	153·1	..
14. Dextrin syrup.....	18·0	82·0	1·0	0·24	0·30	..	..	..	55·68	134·1	..

—J. L. B.

Fusel Oil in Alcoholic Liquids; Determination of ——. E. Beckmann. Zeits. angew. Chem. 1901, **14**, [38] 951.

The author's method is based upon the fact that the alcohols of fusel oil readily form esters with nitrous acid. The alcoholic liquid under examination is treated with calcium chloride and then extracted by shaking with carbon tetrachloride. The fusel oil in the extract is converted into nitrous esters by treatment with sodium nitrite and potas sium bisulphate, and the excess of nitrous acid removed b treatment with sodium bicarbonate. The liquid is the shaken with water, and the combined nitrous acid titrate with permanganate in a sulphuric acid solution which i kept cool in ice-water. Any aldehydes which may b present in the carbon tetrachloride solution are previousl removed by means of sodium bisulphite.—C. A. M.

Albuminoids; Determination of the Decomposition Products of ——. E. Hart. Zeits. physiol. Chem. 33, 347—362. Chem. Centr. 1901, 2, [15], 854—856.

THE results obtained by Haslam (see this Journal, 1901, 94), as to the amount of hexone bases given by eteroalbumose on decomposition with boiling dilute sulhuric acid, differed from those obtained by Pick (Zeits. physiol. Chem. 28, 219), who used boiling concentrated hydrochloric acid. In an attempt to discover an explanation of this difference, the author prepared two amples of heteroalbumose from syntonin, (1) by a oagulation process, and (2) by Pick's alcohol-precipitation method. Both preparations contained about 16·1 per ent. of nitrogen (on the ash-free substance), but the product obtained by precipitation with alcohol yielded much more ash (consisting essentially of sodium chloride) han that obtained by coagulation. From the filtrates from he heteroalbumose, protalbumose was also prepared by Folin's method (Zeits. physiol. Chem. 25, 152). The different substances were then decomposed with sulphuric acid. The following results were obtained:—

—	Syntonin.	Heteroalbumose (by Coagulation).	Heteroalbumose (by Precipitation with Alcohol).	Protalbumose.
	Percentage of Total Nitrogen.			
Histidin.......	4·53	1·92	0·64	5·76
Arginin........	10·29	17·46	17·36	9·30
Lysin..........	3·98	3·76	8·11	3·76
Ammonia	4·32	2·92	4·95	4·01
Humin substances.	8·34	11·65	6·80	9·17
Sum.......	31·46	37·71	37·86	32·00

The figures show that the heteroalbumose obtained by precipitation with alcohol yields less humin-nitrogen (and correspondingly more lysin-nitrogen and ammonia-nitrogen) than that obtained by coagulation. This diminution of the yield of humin-nitrogen is undoubtedly due to the presence of a fairly large quantity of sodium chloride, and by further experiments, the author found that by decomposition with sulphuric acid in presence of sodium chloride (or sodium sulphate, and, to a less extent, of dilute hydrochloric acid), albumin can in some cases give non-nitrogenous humin substances.—A. S.

Formaldehyde; Determination of ——. A. G. Craig. J. Amer. Chem. Soc. 1901, 23, 638—643.

VARIOUS methods for the determination of formaldehyde or trioxymethylene have been examined by the author, with the following results. The acid permanganate method yields concordant numbers. The Grützner method of heating with potassium chlorate, a measured volume of standard silver nitrate solution and nitric acid, and weighing the silver chloride formed on titrating the remaining silver nitrate, seems to give unreliable results. In Blank and Finkenbeiner's method, 1 grm. of trioxymethylene or 2 c.c. of formaldehyde is mixed with 25 c.c. of double normal soda solution in a flask, and 50 c.c. of 2·5 or 3 per cent. hydrogen peroxide added cautiously, the addition lasting three minutes; after standing for 10 minutes, the liquid is titrated with sulphuric acid using litmus as indicator. As thus carried out, the method gives good results. The Legler method which depends on the formation of hexamethylene tetramine by the action of ammonia on formaldehyde yields accurate results.—T. H. P.

Phenol, Salicylic Acid, and Salol; Determination of ——, *in Dressings.* F. Telle. J. Pharm. Chim. 1901, 14, [7], 289—291.

IN place of using bromine water in titrating phenol, salicylic acid and salol, the author proposes to add standardised sodium hypochlorite solution to an acid solution containing potassium bromide. The hypochlorite solution is prepared by diluting 35 c.c. of the commercial solution (containing about 10 per cent. of available chlorine) to 1 litre. One mol. of salicylic acid is equivalent to 4 Br., 1 mol. of phenol to 6 Br., 1 mol. of salol to 10 Br.

The process is applied to dressings as follows:—2 grms. of the dressing, cut or torn into pieces, are moistened with alcohol in a 200 c.c. flask, and 2 c.c. of caustic soda (33 per cent.) added. After shaking, 40—50 c.c. of water are added, the liquid boiled, cooled, made up to the mark, and 1·5 c.c. of water added to compensate for the volume occupied by the cotton. The flask is well shaken and the liquid filtered; 50 c.c. are taken for an estimation of salicylic acid, 25 c.c. for phenol or salol. To this are added 5 c.c. of potassium bromide and 15 drops of hydrochloric acid, the hypochlorite is then run in until the liquid appears yellow. In the case of salicylic acid, 5 c.c. each of chloroform and alcohol are added; at the end of the titration the former is seen to be yellow.—A. C. W.

Caffeine; Determination of ——. Beitter. Chem.-Zeit. 1901, 25, [81], 869.

THE author classifies the methods discussed by Juckenack and Hilger (this Journal, 1897, 567). As regards tho methods in which water is used as the extracting solvent, he considers these liable to give erroneous results. He has been unable to avoid loss in using the method of Brunner-Leins (this Journal, 1898, 965). Of organic solvents, chloroform is, in his opinion, the most satisfactory, and he has obtained very concordant results by Keller's method of extraction (this Journal, 1897, 568). On the other hand, the method of purification used by Keller is stated to be liable to cause loss, so the following modification is recommended:—The chloroform extract is freed from chloroform, and the residue taken up with 15 c.c. and subsequently with three successive portions of 5 c.c. of water on the hot water bath, and filtered. The aqueous extract is then extracted with chloroform, and the residue left on evaporation of the chloroform dried at 85° C., and weighed. The caffeine thus obtained is white and crystalline, and only in the case of Paraguay tea is it sligatly coloured. The method was found to give accurate results in test experiments.—C. A. M.

Morphine in Opium; Determination of —— *by means of Ammoniacal Silver Chloride.* C. Reichard. Chem.-Zeit. 1901, 25, [77], 816—818.

THE author finds that the use of ammoniacal silver chloride has advantages over that of silver nitrate for the determination of morphine (see this Journal, 1901, 160). In the case of the first reagent the presence of chloro-compounds exerts no disturbing influence on the determination; the reaction also takes place more quickly than with silver nitrate. The procedure is as follows:—(1) If the opium is not in the solid state, but, for instance, in alcoholic solution, the latter is mixed with three times its volume of water and evaporated on the water bath to one-third of the total volume. (2) For solid opium, a weighed quantity of the dry powder is treated with 10 to 20 times its weight of boiling water and the solution frequently agitated for the space of an hour, by which time all the morphine is in solution. The solution obtained in either of these ways is filtered from the insoluble residue, which is washed several times with small quantities of boiling water. To the total filtrate is added a slight excess of ammoniacal silver chloride, the liquid being then warmed to accelerate the reduction. The brownish tint of the liquid due to the precipitation of the alkaloids of the opium by ammonia gradually changes to the black of the reduced silver. After several hours the precipitated silver and mixture of alkaloids are filtered off and washed with hot water until the wash water becomes clear and gives no black coloration with ammonium sulphide. After drying at 130° C., the filter paper is burned and heated with the precipitate in a weighed porcelain crucible until the latter becomes constant in weight. Two atoms of silver correspond with one molecule of crystallised morphine ($C_{17}H_{19}O_3N + H_2O$). In none of the samples of opium examined by the author could the presence be detected of compounds such as sugar, which like morphine, have the property, under certain conditions, of reducing ammoniacal silver chloride. Should such substances be suspected, the alkaloids should be precipitated by means of ammonia and removed by filtration, the filtrate being then treated with ammoniacal silver chloride; any reduction of the latter will be thus made evident.—F. H. P.

Pomegranate Bark and Extract of Pomegranate Bark; Alkaloid Determination of ——. N. Stoeder. Pharm. Centralh. **42**, [36], 547.

Pomegranate Bark.—20 grms. of the dry powder are treated with 100 c.c. of chloroform and 5 c.c. of solution of ammonia, and allowed to stand for 12 hours with frequent agitation; 20 c.c. of water, or sufficient to cause the aggregation of the powder, is then added, and after thorough shaking, the mixture is allowed to subside. Seventy-five c.c. of the chloroform solution (= 15 grms. of powder) are then withdrawn, filtered, and the filter washed with more chloroform until a drop of the filtrate when evaporated leaves a residue which gives no precipitate with Mayer's reagent. Two-thirds of the chloroform is then distilled off, the residue transferred to a separator, the distilling flask being washed out with two successive 5 c.c. of chloroform. The chloroformic extract is then shaken out with 10 c.c. of N/10 HCl solution, and the acid alkaloidal solution filtered. The chloroform extract is then washed with successive portions of 5 c.c. each, of water, which are then passed through the same filter, until the filtrate is free from alkaloidal and acid reaction. Three drops of 1 per cent. alcoholic solution of hæmatoxylin are then added, and the amount of free acid titrated back with N/10 alkali. The mean molecular weight of the total pomegranate alkaloids is taken as being 147·6. From 0·4 to 0·5 per cent. of alkaloid should be present in bark of European origin, or from 1·7 to 2 per cent. in East Indian bark.

Extract of Pomegranate Bark.—Dry extract of European pomegranate should yield from 1·25 to 1·5 per cent. of total alkaloids when treated as follows:—Six grms. of the extract are thoroughly rubbed down with a mixture of 10 c.c. of solution of ammonia and 25 c.c. of water, and allowed to stand for three hours, with frequent shaking. 120 c.c. of chloroform are then added, and the mixture left for another 12 hours with frequent agitation. It is then allowed to separate and 1 c.c. of the clear aqueous liquid is withdrawn, shaken out with 3 c.c. of ether, and the ether evaporated; the residue, when treated with 4 drops of water, should give no alkaloidal reaction with Mayer's solution. 80 c.c. of the chloroformic solution (= 4 grms. of the extract) are then withdrawn, and treated by the method prescribed above for pomegranate bark. Extract of East Indian pomegranate bark, should contain from 4 to 5 per cent. of alkaloids; of this, therefore, only 3 grms. should be taken for the alkaloidal determination.—J. O. B.

Quebracho Extracts, Soluble in the Cold, and their Chemical Analysis. J. Paessler and W. Appeluis.

See under XIV., *page* 1124.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Radio-active Lead. K. A. Hofmann and E. Strauss. Ber. **34**, [12], 3033—3039.

The authors have again prepared radio-active lead sulphate from a large number of minerals containing uranium, and have confirmed the results already published (this Journal, 1901, 76, 290, and 625). The principal steps in the process of preparation were — evaporation with sulphuric acid; conversion of the sulphates into sulphides by treatment with ammonium sulphide; evaporation of the sulphides with hydrochloric acid; extraction of the chloride mixture with NaCl solution (in which radio-lead chloride dissolves readily, leaving ordinary lead chloride mostly insoluble); precipitation with H_2S; conversion of the sulphide into sulphate; and heating the latter to 450° for several hours.

"Radio-lead" resembles ordinary lead in the formation of insoluble sulphate and chromate; precipitation from acid solution by H_2S; solubility of its salts in KOH solution solubility of the chloride and nitrate in water; precipitatio by ammonium carbonate; and in the insolubility of th neutral chloride in alcohol (96 per cent.). It differs fro ordinary lead in the ready solubility of its chloride in NaC solutions; it may be separated from lead by the additio of pure NaCl, whereby the lead is mostly precipitated an the active substance remains mostly in solution; or dilut HCl (3 per cent.) may be poured over the chloride an H_2S then passed, when the new substance will go int solution, the free acid preventing formation of its sulphide Another point of difference is that its chromate is not converted into sulphate by repeated warming with dilut sulphuric acid; it must first be digested with ammoniu sulphide and the residue then evaporated with HCl an H_2SO_4. If the sulphides prepared from the sulphates b means of ammonium sulphide are treated with fumin hydrochloric acid at the room temperature, ordinary lea sulphide remains brownish-grey for a considerable time whereas radio-lead sulphide becomes white at once Ordinary $PbSO_4$ gives a blue luminescence, under th cathode discharge; whilst the radio-active sulphate give a bright blue radiation and phosphoresces in addition The active salts sometimes become rose-coloured, but th authors do not know the conditions which give rise to thi colour.

The radio-activity of the sulphate cannot be due to th admixture of or induction by radium, polonium, o actinium, as mixtures prepared from these bodies an ordinary $PbSO_4$ are completely decomposed by the authors method of isolation and yield inactive $PbSO_4$.

In causing the discharge of the electroscope, all th salts of radio-active lead examined are nearly equall powerful. Only the sulphate, however, affects the photographic plate through aluminium and through glass. Th sulphide, chloride, chromate, &c., prepared from strongl active sulphate were photographically inactive, but on reconverting them into the sulphate, the activity was restored The activity of radium and polonium, on the other hand is practically the same in all their compounds. If th radio-active sulphate be evaporated with nitric and sulphuric acids, or if it is heated for 15 hours in the air at 450° C., the photographic activity becomes especially powerful; the activity disappears after about six months, but can be restored by exposing the sulphate to cathode rays. If the sulphate is only partly converted into sulphide, by heating it with sulphur, the activity is destroyed, but returns on allowing the substance to oxidise back to sulphate in the air. The effect of the sulphate on the gelatin-bromide plate excels that of bismuth oxychloride (polonium) prepared simultaneously from the same pitchblende, and is as great as that of the barium sulphate (radium) prepared from the same mineral. On the other hand polonium preparations discharge the electroscope much more rapidly than radio lead sulphate; therefore, the photographically demonstrable radiation is not identical with that which causes the electrical discharge.—H. B.

Bromine on Metallic Silver; Action of —— in the Light and in the Dark. V. v. Cordier. Monatsh. für Chem. 1901, **22**, [7], 707—716.

The author has made experiments on the action of bromine on silver similar to those already described on the action of chlorine. His results show that the behaviour of bromine towards silver is quite different from that of chlorine, for whilst light favours the formation of silver chloride, it exerts a retarding influence on the production of the bromide. When a roll of silver gauze, which has been submitted to the action of bromine either in the light or in the dark, is placed in a current of carbon dioxide, no loss of bromine can be observed.—T. H. P.

Salicylates of Sodium and Ammonium; Solubility of Metallic Hydroxides in ——. J. Wolff. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901.

Concentrated solutions of salicylates of soda and ammonia dissolve certain freshly precipitated metallic hydroxides.

'he proportion of oxide dissolved varies with the con-entration of the liquids and the nature of the oxide.

Cupric hydroxide dissolves instantaneously in the cold, s solubility being very great. The colour of the solution s a fine emerald green.

Ferric hydroxide and alumina only dissolve with heat at bout 80° C., and are much less soluble. The ferric solution a an intense red; the alumina, colourless. Chromium ydroxide is soluble with difficulty to a green-blue solution.

The ferric solution is precipitated by concentrated soda, ut not by ammonia.

The copper solutions are changed to blue without ormation of precipitate, and alumina is likewise not recipitated by soda or ammonia.

If a current of SH_2 gas is passed through a solution of xide of iron and alumina in salicylate of ammonia, the ron is precipitated completely as sulphide; the alumina emains in solution. The method can only be used uantitatively when small quantities of the oxides are resent.—L. J. de W.

gg Albumin; Formation of α-Pyrrolidinecarboxylic Acid and Phenylalanine by the Hydrolysis of ——. E. Fischer. Zeits. physiol. Chem. **33**, 412—416. Chem. Centr. 1901, **2**, [15], 856.

Among the amino-acids formed on the hydrolysis of egg-lbumin with hydrochloric acid, the author has isolated, by istilling the ethyl esters under diminished pressure and ollecting in fractions, (1) active α-pyrrolidine carboxylic cid, (2) racemic α-pyrrolidine carboxylic acid, and (3) henylalanine.—A. S.

"Active" Oxygen. VII. Auto-oxidation of Unsaturated Hydrocarbons. C. Engler and W. Frankenstein. Ber. 1901, **34**, [12], 2933—2941.

Fulvene was discovered by Thiele (Ber. **33**, 666). The ulvenes quickly absorb oxygen from the air and resinify. Dimethyl fulvene was now prepared by condensation of yclopentadiën with acetone, and was used in the form f 5—7 per cent. benzene solutions.

When a benzene solution of dimethylfulvene is shaken up with air, it gradually grows turbid and then deposits a voluminous translucent precipitate which later becomes lense, and when separated and washed represents a white granular precipitate. The time taken to deposit this ompound is much shortened if the liquid is exposed to the ction of light and heat. It is found that the dimethylfulvene has taken up two molecules of oxygen per molecule, the resulting compound being hence a diperoxide of the composition $C_8H_{10}O_4$. It explodes at 130°, and when a small quantity of it, in a melting point tube, is heated in a beaker of sulphuric acid, it explodes and generally bores a sharply defined round hole in the bottom of the beaker. The diperoxide is insoluble in benzene and its homologues and in alcohol, ether, petroleum etc.; it is soluble in, but decomposed by, hot nitrobenzene or acetic acid. It will not keep but quickly becomes yellow, especially under the action of heat and light, and loses its explosive properties. As an oxidising agent, in the ordinary sense of the word, the diperoxide has however small power; thus with titanic acid it gives a yellow coloration only after long shaking, vanadic acid being reddened under similar conditions. Methylethylfulvene behaves similarly to the dimethyl compound, whilst methylphenylfulvene takes up oxygen much more slowly, giving a peroxide of the composition $C_{13}H_{12}O_4$. Cyclopentadiene absorbs only a small quantity of oxygen, a resinous body being formed. By allowing (1) hexylene and (2) dimethylfulvene to absorb oxygen in presence of indigo-sulphuric acid solution it is found that half the total oxygen at first absorbed is in the "active" condition. The various possible formulæ for dimethylfulvene diperoxide are discussed.—T. H. P.

Glucose; Isomeric Acetohalogen Derivatives of ——, *and Synthesis of Glucosides.* E. Fischer and E. F. Armstrong. Ber. **34**, [12], 28·5—2900.

The utility of Colley's acetochloroglucose in the synthesis of the glucosides has been greatly curtailed on account of the great difficulty in obtaining it in a pure crystalline form. Konigs and Knorr (this Journal, 1901, 626) have recently prepared β-acetobromoglucose in the pure state, and have obtained several important derivatives, showing that the pentacetylglucose melting at 134° C., belongs to the β series. The authors have now succeeded in preparing both the α- and β-acetohalogen compounds of glucose from the corresponding pentacetylglucoses. The pentacetylglucose was treated in sealed tubes at the ordinary temperature with dry, liquefied hydrogen chloride or bromide (obtained by means of liquid air). The products were:—

From α-pentacetylglucose, melting at 112° C.	α-Acetochloroglucose, m.p. 63°—64° C. α-Acetobromoglucose, m.p. 79°—80° C.
From β-pentacetylglucose, melting at 134° C.	β-Acetochloroglucose, m.p. 73°—74° C. β-Acetobromoglucose, m.p. 88°—89° C.

The authors have also applied their method to the preparation of β-acetochlorogalactose, m.p. 74°—75° C., but only one pentacetylgalactose, the β-derivative, is as yet available. From octacetylmaltose they have obtained heptacetylchloromaltose, which yields methylmaltoside on treatment with methyl alcohol and silver acetate. From its behaviour towards enzymes, this maltoside is recognised as a β-derivative. Emulsin splits it up into methyl alcohol and maltose whilst yeast enzymes attack the maltose molecule, forming glucose and β methylglucoside, the latter reaction being exactly analogous to the hydrolysis of amygdalin by yeast enzymes.

Lastly, the authors have improved upon Michael's method for the synthesis of phenolglucoside from acetochloroglucose. β-Acetochloroglucose is treated with phenol and sodium ethylate in alcoholic solution for 24 hours at the ordinary temperature, and then saponified with baryta water, the yield being 35 per cent. of the theoretical. A yield of 60 per cent. was obtained by treating the acetochloroglucose in ethereal solution with dry sodium phenolate. Evidence was here obtained of the formation of a double compound, and two molecules of sodium phenolate were required.

The observations made, afford evidence in confirmation of Fischer's previous theory that the isomerism of the α and β groups of glucosides is stereochemical, as regards the terminal carbon atom, and not structural, since all mobile hydrogen atoms are here replaced by acetyl groups.

—J. F. B.

New Books.

Notes on Essential Oils, with special reference to their Use, Composition, Chemistry, and Analysis. By T. H. W. Idris. With Table of Constants of the more commonly occurring Oils. 2nd Edition. Idris and Co., Pratt Street, Camden Town, London. 1900. Price 5*s*.

Small 8vo volume, containing preface, table of contents, and 223 pages of subject-matter, with alphabetical index. The subject-matter is classified as follows:—Constituents of Essential Oils: I. Terpene and Camphor Groups. II. Benzene Derivatives. III. Methane Derivatives: (*a*) Alcohols; (*b*) Aldehydes; (*c*) Acids; (*d*) Ketone. IV. Geraniol Series. Essential Oils.

Condensation. Ein Lehr- und Handbuch über Kondensation und alle damit zusammenhängenden Fragen, auch einschliesslich der Wasserückkühlung; für Studierende des Maschinenbaues, Ingenieure, Leiter grösserer Dampfbetriebe, Chemiker und Zuckertechniker. Von F. J. Weiss, Civilingenieur in Basel. Julius Springer, Berlin. 1901. Price M. 10.

Large 8vo volume, contains preface, table of contents and 384 pages of subject-matter, illustrated with 96 engravings. There is no alphabetical index, but the table of contents is well arranged and clear. Its subdivisions are as follows:—Classification of Condensors: A. Mixed Condensation. B. Surface Condensation. C. Time for the first Exhaustion of the Condensing Space. D. Power Requirements. E. Uses of Condensation. F. Calculation of a large Central Condensing Plant. G. Evaporation Connections. H. Valve Gearing and Distribution of Steam with Condensing Engines, &c.

JAHRBUCH DER CHEMIE. Bericht über die wichtigsten Fortschritte der reinen und angewandten Chemie, unter Mitwirkung von den Herren H. Beckurts, C. A. Bischoff, E. F. Dürre, J. M. Eder, P. Friedländer, C. Häussermann, F. W. Küster, J. Lewkowitsch, M. Märcker, W. Muthmann und F. Röhmann. Herausgegeben von RICHARD MEYER. X. Jahrgang. 1900. Friedrich Vieweg und Sohn, Braunschweig. 1901. Unbound, M. 14. Bound, M. 15.

THIS Jahrbuch contains preface, list of contributors, table of contents, and subject-matter filling 532 pages, and followed by indexes of subject-matter and authors. The subjects represented, with contributors, are as follows:—I. Physical Chemistry. F. W. Küster. II. Inorganic Chemistry. W. Muthmann. III. Organic Chemistry. C. A. Bischoff. IV. Physiological Chemistry. F. Röhmann. V. Pharmaceutial Chemistry. H. Beckurts. VI. Chemistry of Foodstuffs. H. Beckurts. VII. Agricultural Chemistry. M. Märcker and W. Naumann. VIII. Metallurgy. E. F. Dürre and Fr. v. Kügelgen. IX. Fuels and Explosives; Inorganic Chemical Technology. C. Häussermann. X. Technology of the Carbohydrates and the Fermentation Industry. M. Märcker, W. Naumann, and E. H. Schultze. XI. Technology of Fats, Oils, and Petroleums. J. Lewkowitsch. XII. Chemistry of Coaltar and Dyestuffs. Richard Meyer. XIII. Chemical Technology of Textile Fibres. P. Friedländer. Photography. J. M. Eder and E. Valenta.

A DICTIONARY OF DYES, MORDANTS, AND OTHER COMPOUNDS USED IN DYEING AND CALICO PRINTING, by CHRISTOPHER RAWSON, WALTER M. GARDNER, AND W. F. LAYCOCK, Ph.D. Chas. Griffin & Co., Ltd., Exeter Street, Strand, London. 1901. Price 16*s.* nett.

8vo volume, containing preface, list of firms referred to and subject-matter filling 372 pages.

In this dictionary each substance receives first a general description as regards origin, preparation, and general properties. Then follows a paragraph under the head of *Properties,* next *Application,* then *Examination and Analysis,* and, finally, *Impurities.*

PHARMACOPEDIA. A Commentary on the British Pharmacopœia, 1898. By EDMUND WHITE, B.Sc., and JOHN HUMPHREY. Henry Kimpton, 13, Furnival Street, London, E.C. 1901. Price 14*s.* nett.

CROWN quarto volume, containing 576 pages of subject-matter and 46 full-page plates of illustrations. At the end is an alphabetical index of subjects. The preface gives a full definition of the general purpose of the work, the works of reference consulted, &c. Then follows the subject-matter, arranged in alphabetical form, each substance being first generally described, and then treated under the headings of "CHARACTERS AND TESTS," and finally, under "NOTES."

DIE PHYSIKALISCHEN UND CHEMISCHEN METHODEN DER QUANTITATIVEN BESTIMMUNG ORGANISCHER VERBINDUNGEN. Von Dr. WILHELM VAUBEL. Julius Springer, Berlin. 1902. 2 volumes. Unbound, M. 24; bound, M. 26·40.

THE first volume contains 593 pages of subject-matter, and is illustrated with 71 wood engravings. It commences with a preface, and this is followed by a table of contents. This first volume is devoted to the following subjects:—I. Method of Determining the Melting- and Solidifying Points. II. Boiling Points and Vapour Pressures. III. Specific Gravities. IV. Method of Solution and Extraction. V. Method of Precipitation. VI. Of Capillary Analysis. VII. Determining Viscosity. VIII. Determining the Electrical Conductivity. IX. Estimating the Refractive Indices. X. Calorimetric Methods. XI. Spectro-Color metric Method. XII. Method of Dye Testing or Dy Trials. XIII. Determining the Optical Activity. XIV Estimating the Heat of Combustion. XV. Heat of Reactio XVI. Flash-Point and Temperature of Ignition.

Volume II. contains 518 pages of subject-matter, an 21 wood engravings. It is devoted to the followin subjects, arranged as chapter titles. I. Method of Dete mining Carbon and Hydrogen. II. Nitrogen. II Halogens. IV. Sulphur and Phosphorus. V. Method o Evaporation and Ash Determination. VI. Acidimetr VII. Alkalimetry. VIII. Method of Saponification. IX Acetylising. X. Benzoylising. XI. Method of Bromin tion. XII. Iodising. XIII. Diazotising. XIV. Metho of Formation of Azo-Dyestuffs. XV. Methods of Dete mination by Condensation with Phenylhydrazine. XVI Aldehydes with Phenols. XVII. Aldehydes with Amine XVIII. Decomposing with Acids. XIX. Treatment wit Nitrous Acid. XX. Action of Nitric Acid. XXI. Oxidisin with Arsenic Acid. XXII. Oxidation with Concentrate Sulphuric Acid. XXIII. Method of Oxidation with Halogen and their Oxy-compounds. XXIV. With Chromic Acid XXV. With Permanganate. XXVI. Methods of Oxidatio with Fehling's Solution or other Cupric Compounds XXVII. With Mercuric Compounds. XXVIII. Method o Determining with Silver Nitrate. XXIX. Oxidation wit Compounds of the Gold-Platinum Group. XXX. Reductio with Sulphurous or Hydrosulphurous Acid. XXXI. Re duction with Stannous Chloride. XXXII. Estimatio by means of Enzyme or Fermentative Action. XXXIII Determining the Antitoxins.

At the close of this Vol. II. is the alphabetical index o subjects covering both volumes.

Trade Report.

I.—GENERAL.

TRADE OF EGYPT.

Ch. of Comm. J., Nov. 1901.

Small increases occurred, during 1900, in imports of hides and leather goods, stone and earthenware, and glass. The export of gum, of which large stocks are warehoused at Kordofan, but cannot be moved, from lack of means of transport, amounted to 25,075 qrs., of the value of 111,211 £E The export of earth-nut kernels also showed a large reduction. Of cane sugar, 37,811 qrs., and 906,451 cantars of 50 kilos, were exported.

IMPORTS OF TANGIER (MOROCCO).

Foreign Office Annual Series, No. 2723.

Candles came almost entirely from the United Kingdom but 132 cases were brought from France, and 506 from Belgium, in 1900, which is an increase on former figures.

The principal chemicals were potash, 564*l.*, and soda, 380*l.*

The United Kingdom sent 1,075*l.* worth of matches, against 2,125*l.* from Italy, and 1,695*l.* from France.

The oils imported were cotton-seed oil, 3,967*l.*, of which 2,286*l.* came from the United Kingdom; linseed oil, 72*l.*; olive oil, 574*l.*, from Spain.

CHEMICAL FIRE ENGINES FOR HAYTI.

Bd. of Trade J., Nov. 7, 1901.

The United States Minister at Port-au-Prince calls the attention of manufacturers of chemical fire engines to the market in Hayti. He says: "In this capital, as well as in all of the principal cities of the Republic, the houses are chiefly constructed of wood, which, in this climate, soon becomes like tinder, needing but a match to start a large and destructive conflagration that destroys half a city before the flames are mastered. The cities have good engines, which are practically useless, on account of the limited supply of water."

Tariff Modifications in Mexico.

Bd. of Trade J., Nov. 7, 1901.

With regard to the modifications introduced into the exican Customs Tariff from Nov. 1st, the following is a t of articles affected, the new rates of duty being compared ith those hitherto in force. Surtaxes, amounting in the ggregate to 10½ per cent. of the duties, are leviable on e new, as they were on the old, rates:—

Note.—*Additions to the Tariff are printed in italic type.*]

Tariff No.	Tariff Classification.	New Rates of Duty.	Former Rates of Duty.
		$ c.	$ c.
0	Fish oil, *in glass bottles*	Kilo.— (legal) 0 12	Kilo.— (legal) 0 10
0a	" *in tins or wooden vessels.*	" 0 10	
1	Cod-liver oil, *in glass bottles*.	" 0 12	" 0 10
1a	" *in tins or wooden vessels.*	(gross) 0 10	
3	Vaccine virus *and serums for hypodermic injections.*	Free.	Free.
3a	Potato starch	Kilo.— (gross) 0 03	Kilo.— (net) 0 04
	Cotton seed oil—		
	Purified—		
2	In tank-car or tank-ship .	(net) 0 10	" 0 10
2a	In barrels, drums, or tins.	(gross) 9 09	
	Crude—		
2b	In tank-car or tank-ship .	(net) 0 05	" 0 05
2c	In barrels, drums, or tins.	100 kilos.— (gross) 1 50	
	Cocoanut oil, and crude or boiled linseed oil—	Kilo.—	
3	In tank-car or tank-ship .	(net) 0 10	(net) 0 10
3a	In barrels, drums, or tins.	(gross) 0 09	
8	Vegetable tar	" 0 06	(legal) 0 10
5	Dyewoods *and barks*, whether pulverised *or not.*	" 0 05	(gross) 0 05
0	Crucibles of platinum........	Free.	" 0 01
1	Tin, in bars or in matte	Kilo.— (gross) 0 12	(legal) 0 12
4	Lead, in *bars*, pigs, or *ingots*.	" 0 03	(gross) 0 05
7	Lead, manufactures of, not eleswhere specified.	(legal) 0 08	(legal) 0 07
0	Lead in *sheets, or in tubes or* pipes; *also lead for window panes.*	(gross) 0 05	(gross) 0 05
1a	*Ferro-manganese, containing 25 per cent. or more of manganese.*	" 0 05	Not specially tariffed.
0	Magnesium, barium, or strontium carbonates.	" 0 03	Kilo.— (legal) 0 08
4	Emery	" 0 01	" 0 01
5	Spar........................	" 0 08	" 0 08
3	Ochres	" 0 07	" 0 08
4	Plumbago	" 0 05	" 0 08
5	Paraffin candles.............	" 0 18	(gross) 0 20
5	Tiles, *ridges, and ventilators of earthenware, for roofs*, and earthenware tubes for drainage.	Thousand 2 50	Thousand 2 50
7	Insulators, of glass or china, for electrical conduction.	Free.	Free.
1	Sizing for woven stuffs.......	Kilo.— (gross) 0 04	Kilo.— (legal) 0 05
4	Natural or artificial madders (alizarins).	" 0 07	(gross) 0 05
3	Bicarbonate of potash or soda	(legal) 0 08	(legal) 0 03
3a	Carbonate of potash or soda ..	(gross) 0 01	" 0 03
0	Colours in powder or in crystals.	" 0 07	(gross) 0 08
0a	Colours prepared	" 0 12	" 0 08
1	Chloride of lime, soda, or potash.	" 0 01	(legal) 0 01
3	Dye-woods, extracts of	" 0 07	(gross) 0 05
4	Medicinal soaps	(legal) 0 75	(legal) 0 40
5	Orchil	(gross) 0 07	(gross) 0 05
1	Salts of strontium and of barium, *not otherwise specified.*	(legal) 0 08	(legal) 0 08
2	Sulpho-olein, *alkaline*	(gross) 0 05	(gross) 0 05
0	Beer, cider, and refreshing beverages, in bottles.	(net) 0 20	(net) 0 20
5	Beer and cider, in barrels	(gross) 0 08	(gross) 0 08
	White or cream-laid paper, satined or not, suitable for printing.	(legal) 0 07	Not specially tariffed.
	White or coloured paper, satined or not, suitable for writing.	" 0 20	" "
	Straw and other wrapping paper, not elsewhere specified.	" 0 06	Kilo.— (legal) 0 05
753	Paper, painted, glazed, embossed, or enamelled; *including that known as "couché."*	Kilo.— (legal) 0 10	Kilo.— (legal) 0 10
854	Lubricating oils	(gross) 0 05	" 0 05
898a	Scented soap	(legal) 0 75	" 1 00

Imports of Reval (Russia).

Foreign Office Annual Series, No. 2719.

Reval took, during 1900, from the United Kingdom, drugs, 101,515 poods; colours and dyestuffs, 5,142 poods; and gums and resins, 57,885 poods. The principal imports from Germany were drugs, 136,093 poods; colours and dyestuffs, 34,218 poods; and gums and resins, 22,874 poods.

Customs Decisions of Victoria.

Bd. of Trade J., Oct. 31, 1901.

Description of Articles.	Tariff No.	Rate of Duty.
Casein, used in photographic process..	..	Free.
Paint—		
Nubian, as varnish	577	2*s.* per gall.
Removing compound, being a solution of caustic alkali.	..	Free.
Paper—		
Peltine, chemically prepared, *viz.*—		
Uncut	433	6*s.* per cwt.
Cut...........................	431	2*d.* per lb.
Varnish—		
Thin litho and extra strong litho....	577	2*s.* per gall.
Vinegar—		
Tarragon	579	6*d.* per gall.

Comparison of British and American Trade for the First Seven Months of 1901.

Comm. Intelligence, Oct. 26, 1901.

Candles.—British exports of candles were 219,977*l.*, the American exports being 31,000*l.*

Cement.—British exports of cement were 375,207*l.*, against the American total of 76,825*l.*

Chemicals, Drugs, Dyes, and Medicines.—British exports were as follows during the seven months:—

	£	£
Bleaching materials—		
To United States	123,880	
Other countries...............	51,566	
		175,446
Salphate of copper.....................		804,696
Medicines, &c.		789,137
Soda compounds		618,370
Other articles		1,610,905
Total		3,998,554

American exports were as follows:—

	£
Acids	23,350
Ash..................................	7,453
Baking powder	34,764
Sulphate of copper	439,916
Dyes	46,237
Ginseng..............................	57,416
Acetate of lime........................	123,159
Medicines.............................	388,615
All other	655,280
	1,776,190

Glass and Earthenware:—

British exports of—	£	American exports of—	£
Glass and glassware	621,610	Glass and glassware............	258,620
Earthenware, stoneware, chinaware, &c.	1,187,669	Earthenware, stoneware, chinaware, &c.	55,958

Rubber.—

Manufactures of caoutchouc	648,859	India-rubber manufactures and scrap	386,000
Caoutchouc shoes	89,392	India-rubber shoes	58,271

Chemical Manures.—American returns place these goods under the heading "Fertilisers," and divide their exports into "crude phosphates," 399,308 tons, and "all other," 7,853 tons.

British chemical manures exported to—	£	American fertilisers exported to—	£
Germany	171,267	Germany	218,120
Belgium	67,782	United Kingdom	71,724
France	95,936	France	57,240
Spain	335,426	Other European Countries	275,375
British West Indies and Guiana	117,196	West Indies and Bermuda	7,456
Other countries	582,242	Other countries	49,309
Total	1,369,849	Total	679,224

Hides and Skins:—

British exports of skins and furs of all sorts to—

	£
France	202,150
United States	478,466
Other countries	198,164
British total	878,780

American exports of furs and fur skins to—

	£
United Kingdom	331,741
France	13,195
Germany	93,010
British North America	100,084
Other countries	7,329
	545,359

American exports of hides and skins to—

United Kingdom	2,400
Germany	47,254
British North America	41,153
Other countries	15,110
	105,917
American total	651,276

Soap and Starch:—

British exports of—	£	American exports of—	£
Soap	668,147	Soap	207,109
		Starch	218,418

Sugar:—

Sugar, refined, and candy	240,709	Molasses	34,562
		Syrup	306,515
		Brown sugar	675
		Refined	50,805
		Candy and confectionery	66,484
British total	240,709	American total	459,041

Tin:—

Unwrought tin	70,651	Manufactures of tin	64,99

Zinc:—

Zinc and spelter: Wrought and unwrought	99,502	Zinc ore	159,01
		Pigs, bars, plates, and sheets	42,75
		All other manufactures	10,63
British total	99,502	American total	212,47

RUSSIAN CUSTOMS REGULATIONS.

Foreign Office Miscellaneous Series, No. 569.

This is a translation, by Mr. A. A. Wotzel, of the Board of Trade, of the Russian regulations concerning the receip of goods into the jurisdiction of the customs establishments the inspection thereof, payment of duty thereon, and releas thereof.

CHEMICAL IMPORTS OF SICILY (ITALY).

Foreign Office Annual Series, No. 2716.

Caustic soda comes chiefly from the United Kingdom.

Carbonates comprise carbonate of lead, 2,000 kilos., in 1900; carbonate of potash, 53,000 kilos., in 1900, and 67,000 kilos., in 1901; carbonate of soda, 16,000 kilos., in 1900, and 14,000 kilos., in 1901. Of the total imports of carbonates the United Kingdom supplied 134,000 kilos., in 1900, to 69,000 kilos., supplied by Germany.

Chlorides consist of chloride of lime, of which 87,000 kilos. were imported in 1900, and 39,000 kilos., during 1901 and potassium chloride, imported to the extent of 139,000 kilos., in 1900, and 59,000 kilos., during 1901. Of the tota amount during 1900, 85,000 kilos. came from Germany alone.

During 1900, Germany provided 140,000 kilos. of nitrate of soda; the United Kingdom only supplied 14,000 kilos.

Sulphates consisted principally of sulphate of ammonia to the extent of 697,000 kilos., in 1900, and 674,000 kilos., in 1901, and sulphate of copper 173,000 kilos., in 1900, and 301,000 kilos., in 1901; the greater part of the latter article came from the United Kingdom.

TRADE OF ZANZIBAR.

Foreign Office Annual Series, No. 2718.

Imports.—During 1900, hides showed an increase o 17,234*l.*

Exports.—Copra showed a decrease of 26,644*l.*; gum copal, 16,574*l.*: rubber, 16,012*l.*; and ivory, 11,958 Hides showed an increase of 15,173*l.*

IMPORTS OF JAPAN.

Chem. and Druggist, Oct. 26, 1901.

The following table gives the values in yen* of the principal drug staples imported for 10 years:—

Year.	Mercury.	Soda-ash.	Caustic Soda.	Chlorate of Potash.	Amorphous Phosphorus.	Paraffin Oil.	Bicarbonate of Soda.	Nitrate of Soda.	Glycerin.
1891	105,660	..	255,306	207,907	80,873	143,609	48,152	..	21,608
1892	95,546	..	173,010	309,917	86,086	225,974	60,218	..	26,807
1893	115,082	..	192,420	742,317	166,637	150,611	72,565	..	26,855
1894	127,541	..	205,467	840,640	178,232	363,015	80,754	..	41,291
1895	141,302	126,149	234,000	419,053	260,823	266,340	102,917	..	59,694
1896	139,302	145,698	84,263	429,042	174,898	192,533	119,113	288,696	66,235
1897	156,527	184,060	229,593	497,651	280,636	327,916	115,616	149,443	90,912
1898	176,303	373,370	422,714	632,060	298,253	270,349	143,335	117,320	266,786
1899	219,013	482,877	521,852	418,884	216,124	286,807	157,710	231,488	272,867
1900	258,698	..	929,526	679,312	244,979	511,559	153,564	41,114	89,294

* 1 yen = 2*s.* 0½*d.*

IMPORTS AND EXPORTS OF BOSNIA AND HERZEGOVINA (AUSTRIA).

Foreign Office Annual Series, No. 2715.

Imports which showed an increase, during 1900, were minerals, 1,064 tons, and drugs, perfumery, and colours, 878 tons.

There was a falling-off in sugar, 448 tons, and bricks earthenware, and china, 2,569 tons.

Exports which showed an increase were minerals, 9,680 tons; dyestuffs, 956 tons; and chemicals, 818 tons.

Those showing a decrease were sugar, 319 tons, and mineral oils, 3,937 tons.

CHEMICAL PREPARATIONS IN HUNGARY.

U.S. Cons. Reps., Nov. 1901.

hemical preparations (apart from gunpowder, which ns a monopoly of the Hungarian Government) can be dy imported, with the following exceptions, mentioned he customs administrative ordinance of the Minister of ance, issued in 1882:—

Vhite face paint may be imported only with special nse of local authority where consignee resides.

xplosives and inflammables, under the existing regula s as to safety—collodion cotton up to 1 kilo. (2·2046 lb.) , with license of local authorities.

ny other substances concerning which special orders be issued, *e.g.*, liquors, foods, and other objects inju s to the public health.

THE AUSTRALIAN TARIFF.

Chem. and Druggist, Nov. 16, 1901 ; *and*

Bd. of Trade J., Nov. 21, 1901.

ubjoined are particulars of the Australian tariff which e into operation on October 8 last, from the paper lished for the Government of the Commonwealth of stralia. The tariff is divided into 16 divisions, ely:—(1) Stimulants, (2) narcotics, (3) sugar, (4) icultural products and groceries, (5) apparel and tex- s, (6) metals and machinery, (7) oils, paints, and nishes, (8) earthenware, cement, china, glass, and stone, drugs and chemicals, (10) wood, wicker, and cane,) jewellery and fancy goods, (12) leather and rubber) paper and stationery, (14) vehicles, (15) musical ruments, and (16) miscellaneous. The letters "n.e.i." n "not elsewhere included."

pirits, *viz.*:—		
Spirits and spirituous compounds, n.e.i., when not exceeding the strength of proof	per gall.	14*s.*
When exceeding the strength of proof	per proof gall.	14*s.*
Amyl alcohol and fusel oil	per gall.	14*s.*
Methyl alcohol and collodion	„	3*s.*
Perfumed and bay rum	„	25*s.*
ine, medicinal or medicated and Vermouth (in bottle)	„	8*s.*
lucose	per cwt.	8*s.*
ugar, *viz.*:—		
The produce of sugar-cane, including molasses, golden syrup, and syrups, n.e.i.	„	6*s.*
lue, laundry	per lb.	2*d.*
andles, tapers, and night-lights: solid spirit-heaters, including the weight of the immediate containing package; stearin, paraffin wax, beeswax, and Japanese or vegetable wax; also lard and refined animal fats	„	1½*d.*
imejuice and other fruit-juices and fruit-syrups (non-spirituous)	per gall.	1*s.*
inseed cake and oil-cake	per cental	1*s.*
oap, *viz.*:—		
Perfumed, toilet, and medicated (including the weight of wrappers)	per lb.	4*d.*
N.E.I., including polishing	„	1*d.*
tarch	„	2*d.*
lanures	Free	
letals and manufactures of metals	Free	
able-waters, aerated or mineral, and preparations packed for household use for the production thereof, including sparklets; also ale, porter, and other beer, cider, and perry containing less than 2 per cent. of proof spirit	*ad val.*	20 %
(Special exemptions from metal duties: Crucibles; capsules, metallic. Electrical materials—*viz.*, accumulators or storage batteries, except glass jars, cable (covered), carbons, incandescent lamps. Scales—*viz.*, chemical, analytical, and assay.)		
Blacking, including dressings, soaps, oils, inks, pastes, polishes, stains, and varnishes for leather; Berlin and Brunswick blacks, furniture oil-paste and polish, and bronzing and metal liquids	„	20 %
Greases, axle, and thickened or solidified oils: solid or viscous compounds for lubricating, and tallow (unrefined)	per cwt	4*s.*
Oils, *viz.*:—		
Cotton-seed, in bulk or otherwise	per gall.	2*s.*
(Including castor), in vessels not exceeding 1 gall.):—		
¼ pints and smaller sizes	per doz.	6*d.*
½-pints and over ¼-pints	„	1*s.*
Pints and over ½ pints	„	2*s.*
Quarts and over pints	„	4*s.*
Over a quart	per gall.	1*s.* 4*d.*
In vessels, exceeding 1 gall., *viz.*:—		
Olive	„	1*s.* 4*d.*
Castor, china, colza, linseed, gasoline, mineral, spirit oils, n.e.i., and cotton-seed when methylated pursuant to departmental by-laws	„	6*d.*
Lubricating (mineral), mineral n.e.i., and kerosene	„	3*d.*
N.E.I.	„	6*d.*
(Special exemptions: Oil *viz.*, fish, including cod (unrefined), seal, whale, penguin, petroleum (crude), degras, sod, naphtha, benzine, mirbane, and turpentine.)		
Paints and colours, *viz.*:—		
Ground, in liquid, partly or wholly prepared for use … per cwt. and 15 %	*ad val.*	1*s.*
Colours (dry), dry white-lead, and patent driers and putty	per cwt.	1*s.*
Varnishes, varnish-stains, lacquers, enamels, Japans, liquid sizes, patent knotting, oil and wood finishes, petrifying liquids, damp-wall compositions and lithographic varnish per gal.	(and 15 % *ad val.*)	1*s.*
(Special exemptions: Colours, artists', dyes (dry), not packed for retail sale: lamp, ivory, bone, and vegetable blacks: London purple and Paris Green; sulphate of copper; ultramarine blue; whiting.)		
Cement, plaster of Paris, &c.	per cwt.	1*s.*
Filters of all kinds, fire and glazed bricks, fire-lumps, fire-clay manufacturers, n.e.i., asphalt and roofing tiles	*ad val.*	15 %
Glass, n.e.i.: also Seltzogenes and Accessories and Siphon-bottles	„	15 %
Glassware, n.e.i.	„	20 %
(Special exemptions: Glass—*viz.*, lenses, unmounted; locket, brooch, and watch-glasses; bottles, empty, of not more than 6 fl.-dr. capacity. Scientific instruments and Apparatus—*viz.*, Instruments for measuring the density of liquids. Scientific Apparatus (glass)—*viz.*, beakers, flasks, test-tubes, vacuum-tubes, burettes, pipettes, weighing-bottles and tubes, eudiometers, nitrometers, radiometers, fat-extraction tubes, filter-pumps, gas-washing, reduction, and absorption balls and tubes, test-measures in centimetres and grms.; also carbonic acid, sulphuretted hydrogen, decomposing-water, and bacteriological apparatus of glass.)		
Glue, not liquid, and gelatin, sheet	per lb.	2*d.*
Glue, gelatin, and cements, n.e.i., including mucilage and printers' roller-composition	*ad val.*	20
(Special exemptions: Dry gums, shellac, dextrin, sandarach, and mastic. From stone duty: Pestles and mortars—agate.)		
Acetic acid, extract or essence of vinegar, and vinegar:—		
Containing not more than 6 per cent. of absolute acid	per gall.	6*d.*
Containing more than 6 per cent, but not more than 30 per cent.	„	2*s.* 6*d.*
For every extra 10 per cent. or part of 10 per cent.	„	10*d.*
Acids, *viz.*:—		
Hydrochloric, nitric, and sulphuric	*ad val.*	15 %
Ammonium carbonate and calcium carbide	per cwt.	5*s.*
Drugs and chemicals, *viz.*:—		
Salicylic and boric acids; bisulphites of potassium, sodium, calcium; and magnesium, foaming powders and liquids, and malt and hops substitutes	*ad val.*	20 %
Insecticides, sheep washes, and disinfectants, n.e.i.	„	15 %
Medicines, *viz.*:—		
Patent and proprietary medicines, and other medicinal compounds; non-spirituous medicinal extracts, essences, juices, infusions, solutions, and syrups; medicinal waters and oils, n.e.i.; and medicines for animals	„	25 %
(Special exemptions: Essential oils (non-spirituous), bacteriological products and serum).		

Perfumery, including perfumed ammonia, camphor in blocks or tablets, toilet preparations (non-spirituous) perfumed or not; lanoline, glycerin, vaseline, and petroleum jelly not medicated	*ad val.*	20 °/₀
Saccharin	per lb.	20*s.*
Soda crystals	per cwt.	1*s.*
Stationery, manufactured, including inks and ink powders; wax, sealing and bottling	*ad val.*	25 °/₀
(Special exemptions: Paper—*viz.*, emery and flint-paper and cloth, filter paper, litmus paper.)		
Explosives, *viz.*:—		
Ammunition and fireworks	*ad val.*	20 °/₀
Powder, sporting	per lb.	4*d.*
„ n.e.i.	„	1*d.*
„ blasting	Free	
Photographic dry-plates, films, and sensitised paper	„	15 °/₀
(Special exemptions: Scientific instruments and apparatus imported by governing bodies for use in universities, colleges, schools, or public hospitals.)		
India-rubber manufactures	Free	

U.S. Imports of Chemical Raw Materials for First Nine Months of 1901.

Bd. of Trade J., Nov. 14, 1901.

The following raw materials for use in chemical manufactures were imported into the United States during the nine months ended 30th September, 1900 and 1901, respectively:—

Articles.	Nine Months ended 30th September.	
	1900.	1901.
	Lbs.	Lbs.
Iron ore	1,584,345,280	1,625,274,240
Sulphur, crude	261,842,510	267,637,440
Hides and skins	234,668,656	229,751,187
Lead ore	166,788,085	172,027,987
Copper ore	67,399,360	147,943,040
Soda, caustic; sodium nitrate, &c.	363,066,994	377,734,824
Potash	108,210,849	121,871,190
Dyewoods	105,490,969	72,280,320
Tin in bars, &c.	64,847,417	56,908,901
Copper pigs	54,443,878	56,230,624
Gums	58,277,583	49,668,085
India-rubber, crude	34,193,337	40,181,040

The following table shows the value of the principal groups of manufacturers' materials imported in the nine months of 1900 and 1901:—

Articles.	Nine Months ended 30th September.	
	1900.	1901.
	Dolls.	Dolls.
Chemicals, drugs, &c.	39,479,137	40,910,420
Hides and skins	39,655,802	41,168,929
India-rubber and gutta-percha	21,551,804	21,021,442
Tin	15,281,577	14,679,768

Note.—Dollar = 4s. 2*d.*

III.—TAR PRODUCTS, PETROLEUM, Etc.

Drawback on Tar and Pure Ammonia in United States.

Chem. Trade J., Oct. 19, 1901.

The provisions of Treasury Decision 22,332, dated July 5th, 1900, establishing a rate for allowance of drawback on coke manufactured by the New England Gas and Coke Company, of Boston, Mass, from imported slack coal, are, by a circular of the United States Treasury Department, extended, as far as applicable, to cover tar and pure ammonia (the latter being combined with sulphuric acid as ammonium sulphate), manufactured by the said company wholly from the same imported material, and exported. In the liquidation of entries, the rate of drawback which shall be allowed on the tar shall be 20 c. per long ton, and for each such ton exported, 26·32 long to of coal shall be charged against the record of importatio The rate of drawback which shall be allowed on th ammonium sulphate shall equal $\frac{3}{8}$ c. per pound on the pu ammonia contained therein, determined by official analys of samples to be taken as ordered by the collector; provide that the quantity shall not exceed 560 lb. for each long to of ammonium sulphate exported, and that for each ton exported, 112 long tons of coal shall be charged against th record of importation.

Asphalt at Palermo (Sicily).

Foreign Office Annual Series, No. 2716.

The asphalt exported from the port of Palermo, duri 1900, was 494 tons.

The total shipment from Sicily amounted to 74,130 ton the greater part of which went to Germany, the Unit States, and France.

Paraffin Wax Imports of Sicily (Italy).

Foreign Office Annual Series, No. 2716.

Paraffin wax is imported chiefly from the United Kingd

IV.—COLOURING MATTERS, Etc.

Indigo in India.

Chem. Trade J., Nov. 9, 1901.

The following report has been received at the India Offic giving the final forecast of the indigo crop of 1901:—

Area.—Last year a slight improvement took place in th cultivation of this crop, but during the present year the has been a decline, in consequence of the continu fall in prices. The total area returned, in December 190 amounted to 262,175 acres; the area this year is estimat at 160,897 acres, a decrease of about 39 per cent. Com pared with the average areas of the preceding five and t years, the decline amounts to 50 per cent. in each case.

Condition.—In the forecast, issued on July 11th las it was reported that damage was done to the indigo crop b locusts and grasshoppers; whilst the late commenceme of the rains stunted the growth of the plants. The prospe of the crop continued unsatisfactory till the end of Augus but the fine, dry weather during September was general favourable for manufacture, and the product of dye reported to have been better than was originally anticipate Assuming 100 to represent a normal crop, the avera condition of the present year's crop is now reported to va from 50 to 85 per cent.

Output.—The total estimated production of indigo dy this year works out to 28,352 factory maunds (Doa 16,913 maunds; Benares, 11,439 maunds), or 40 per cen below last year's estimate, and the average estimated yie of the preceding five and ten years. The exports of indi from October 1st, 1900, to March 31st, 1901, amounted 37,791 standard maunds, of which 23,575 maunds went Calcutta, 12,138 maunds to the Punjab, and the rest to oth parts of the country.

VII.—ACIDS, ALKALIS, AND SALTS.

Sulphur in Japan.

Chem. and Druggist, Oct. 26, 1901.

Prices opened at 2·25 yen* per picul†, and closed 2·28 yen per picul. Exports tend to increase considerabl owing to improving demand abroad.

The values and exports during 10 years were a follows:—

Year.	Catties.	Yen.	Year.	Catties.	Yen.
1891	31,663,045	284,832	1896	20,507,630	308,588
1892	21,844,290	280,963	1897	15,822,307	321,341
1893	17,373,205	238,832	1898	21,045,468	477,014
1894	21,103,646	244,542	1899	27,806,719	574,868
1895	26,445,913	296,136	1900	29,726,987	698,284

* 1 yen = 2*s.* 0½*d.* † 1 picul = 133·3 lb. 100 catties = 1 picul.

SULPHURIC ACID PLANT AND SULPHUR IN SICILY.

Foreign Office Annual Series, No. 2716.

A British firm is erecting plant for the manufacture of ulphuric acid on a large scale.

The total exports of sulphur, for 1899, were 494,000 tons, nd for 1900, 562,000 tons.

Sulphur exports from Catania, during 1900, amounted to 75,998 tons, of which 114,258 tons went to foreign ountries, as against 98,092 tons, in 1899

The Anglo-Sicilian Sulphur Company's contract with the mine owners expires next July, and the company will robably exercise their option of a renewal for a further ve years, the result having been of mutual benefit. The verage price for best thirds brimstone, during 1900, was *l.* 13*s.* 6*d.* per ton f.o.b. Catania.

Rich sulphur beds were discovered in the Comitini district, the neighbourhood of the Cannarella mine, near Castro-iovanni, and also in the Agira district, and satisfactory rospecting operations were carried through at Cametrice Piazza Armerini district), at Linosella (Agira District), at avalcator, and in other places.

MAGNESITE: U.S. CUSTOMS DECISION.

Eng. and Mining J, *Nov.* 2, 1901.

Merchandise invoiced as magnesite and returned by the cal appraiser as "ground magnesite, not perfect, as agnesite cement," was assessed at 20 per cent. *ad valorem*, der paragraph 89, Act of 1897. The importers claimed e article to be free from duty under paragraph 605, as magnesite crude or calcined, not purified." The protest as sustained and the article is to be admitted free from duty.

III.—GLASS, POTTERY, AND ENAMELS.

GLASS IMPORTS OF SICILY (ITALY).

Foreign Office Annual Series, No. 2716.

Window and plate glass come mostly from Belgium, ble glass from Germany and Austria-Hungary.

TILES, EARTHENWARE, AND GLASSWARE IMPORTS OF BRAZIL.

Foreign Office Annual Series, No. 2724.

Encaustic tiles come chiefly from Belgium, and roofing es from France.

In earthenware and glassware, the United Kingdom upplies a fair portion of the granite table-ware, but Belgium the largest supplier, whilst for porcelain ware, Germany ads the list, followed by France, Portugal, Belgium, and en the United Kingdom. For common kinds of glassware, the leading suppliers are Germany, Belgium, and France. The United Kingdom participates in the trade of better quality goods. The United Kingdom also has a share in the window-glass trade, but the bulk comes from Belgium.

IX.—BUILDING MATERIALS, Etc.

PORTLAND CEMENT EXPORTS OF GERMANY.

U.S. Cons. Reps., Nov. 1901.

Germany's exports of Portland cement have considerably increased during the last few years; even in 1900, notwithstanding the unfavourable business situation, a further increase has been noted. In 1894, the exports of Portland cement from Germany amounted to 362,000,000 kilos. (355,535 tons); in 1900, to 543,990,000 kilos. (534,276 tons), or 15,315,000 kilos. (15,041 tons) more than in 1899.

From Stettin, the exports of Portland cement have decreased; these amounted to 80,632,000 kilos. (79,192 tons) in 1900, against 88,689,000 kilos. (87,105 tons) in 1899. On the other hand, Hamburg has taken the leading place, and trade has further developed in 1900, although the increase was not so considerable as in the preceding year. In 1900, the exports of Portland cement from Hamburg amounted to 306,571,800 kilos. (301,097 tons), valued at about 3,000,000 dols.; in 1899, to 293,483,900 kilos. (288,243 tons), valued at about 2,950,000 dols.

The principal countries importing it from Hamburg are the United States, which alone took 115,381,400 kilos. (113,321 tons); Australia, with 32,100,000 kilos. (31,527 tons); Brazil, with 19,300,000 kilos. (18,955 tons); and Cape Colony, with 17,200,000 kilos. (16,893 tons). Since 1896, the exports to Cape Colony have been quintupled. Among other countries importing Portland cement may be mentioned the Argentine Republic, Chile, and British North America. The chief exports to European countries were made to Great Britain, Norway, Spain, and Portugal.

The exports of Portland cement *viâ* Bremen showed a slight decrease last year, amounting to 49,123,400 kilos. (48,246 tons), compared with 52,332,400 kilos. (51,398 tons) in 1899.

CEMENT TRADE OF NATAL.

Bd. of Trade J., Oct. 31, 1901.

Importation. — The cement consumed in Natal is at present imported. One company has recently been formed there to manufacture cement, and the initial results are satisfactory. The following table shows the quantity and value of cement imported into Natal, distinguishing the countries of origin, in each of the years 1898, 1899, and 1900, and also in the first six months of 1901:—

Country.	1898.		1899.		1900.		First Six Months of 1901.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Barrels.	£	Barrels.	£	Barrels.	£	Lbs.	£
nited Kingdom	8,656	2,731	13,947	4,566	67,996*	20,297*	17,220,752*	13,728*
gium	25,887	7,433	48,824	14,264				
rmany	28,576	8,882	39,208	11,085				
her countries	6,013	1,839	10,617	3,162				
Total	69,132	20,885	112,596	32,877	67,996	20,297	17,220,752	13,728
transit	13,967	..	7,961	1,279				

* Detailed statistics have not yet been published.

Several brands of Belgian cement are, according to the elgian Consul, greatly appreciated. German cements are vading the South African market more and more.

The following are the conditions of contract for the town Durban:—

Testing.—For testing purposes, blocks are made and posed to the air for a day to allow them to set. They e then placed in moulds and plunged into water for six ys, immediately after which they are tested. If the average block is unable to withstand a pressure of 743 lb. per $2\frac{1}{4}$ square inches, *i.e.*, 330 lb. per square inch, the cement is refused.

The cement must be of a bluish colour and weigh not more than 112 lb. per bushel. It must be finely ground and give not more than 7 per cent. residue from a sieve of 2,500 holes, or 50 holes to the lineal inch, nor more than 25 per cent. from a sieve of 4,900 holes, or 70 to the lineal inch.

Samples for testing will be taken from three barrels chosen at hazard from each lot of 100 barrels. In cases where the trials of each of these lots of 100 barrels do not give satisfaction, the entire lot would be refused and the contractor required to remove it immediately at his own expense, the administration reserving the right to annul the rest of the contract.

Price.—The gross price varies from 9*s.* 6*d.* to 11*s.* 1*d.* per barrel delivered on the quay. The retail price varies from 14*s.* to 16*s.*, according to the brand. English cement is the dearest.

Import Duty.—According to the tariff of the South African Customs Union, the import duty on cement is at the rate of 6*d.* per 100 lb. (English).

CEMENT TRADE OF CONSTANTINOPLE (TURKEY).

Constantinople consumes annually 10,000 tons of cement, imported chiefly from France (70 per cent.), followed by Germany and England. The two latter countries are increasing their exports, the quality of the cement being considered superior to that of the French product. It is stated that English cement can no longer compete with German cement. As regards French cement, custom will protect the import for some time to come, facilitated as it is by the low rate of transport, *viz.*, about 6 francs (4*s.* 10*d.*) per ton.

The annual import of cement into Constantinople is divided as follows:—

—	Tons.	At per Ton.
		£ *s.* *d.*
Roquefort	3,000	1 5 7
Natural Portland	2,500	1 7 2
Artificial cement (2nd quality)	1,250	1 12 0
„ „ (1st quality)	1,000	1 17 7
Belgian, Italian, German, and Austrian cements.	500	1 16 0
English cement	500	2 8 0

NOTE.—Actual prices, but the quantities are only approximate.

German cement is sold c.i.f. Constantinople; French and English cement free on board at the port of shipment. The import duty, which is borne by the buyer, is nominally 8 per cent. *ad valorem*, but in reality it amounts to 12 per cent., and even to 14 per cent.

PUMICE STONE BRICKS IN GERMANY.

Eng. and Mining J., Oct. 19, 1901.

In the Neuwied district, between Coblentz and Andernach, there is a large industry in the manufacture of bricks from volcanic sand and pumice stone, which are found along the base of the Eifel. The surface soil is stripped off, and the sand piled up, to be shovelled into the mixing bed of water and lime close at hand. Before moulding, the pumice is screened, the larger pieces being broken to pass through a sieve having ½ in. meshes. These screened pieces are then covered with a thin coating of cement, and the brick is moulded. The cement is not mixed with the pumice so as to form solid cement blocks, but by the fragments being coated first. The brick is then obtained by these coatings adhering to one another. For the manufacture of 20,000 bricks about 4½ tons of lime are required. After the mixing process the substance is poured into iron moulds provided with bottoms of detachable boards, which, after the removal of the moulds, act as driers. The bricks are ready for shipment when they have been exposed to the air for a very short time.

X.—METALLURGY.

ALUMINIUM PLANT IN CANADA.

Eng. and Mining J., Oct. 12, 1901.

The new Canadian plant of the Pittsburg Reduction Company is ready for operation, and the company will try to secure an export trade with Great Britain. At first the crude aluminium will be exported, but later a rolling mill similar to that at New Kensington, Pa., will be built near the new works. The total cost of the present plant has been about 1,000,000 dols. The company now has abou 10,000 H.P. installed and will manufacture about 10 to of aluminium daily.

ALUMINIUM CONVENTION.

Chem. and Druggist, Oct. 26, 1901.

A convention has recently been concluded between t producers of aluminium comprising the Pittsburg Alumin Reduction Company, which is believed to control the tra in the United States; the Neuhausen Aluminium Compa of Neuhausen, Switzerland, together with the Baden wor owned by the company at Rheinfelden; the Lend works Austria; and the British Aluminium Company in Englan The object of the convention is to arrange prices on common basis, to seek new markets for the sale of alum nium, and to support the industries already utilising t metal.

ANTIMONY DEPOSITS IN NOVA SCOTIA.

Imp. Inst. J., Nov. 1901.

These deposits are situated in Hants County, No Scotia. They were discovered in 1882, and worked t 1892, when the mines were closed, and remained until 1899.

The mineral occurs as stibnite in two veins, one of whi has been traced upon the surface for a distance of ov 1,200 ft. The thickness of the ore has varied from a f inches to 7 ft., this being the greatest thickness attained, which case the ore was solid stibnite. When the ore exposed, it oxidises to hermesite or valentinite. It is fou in places associated with pyrites, mispickel, and gale More or less gold is always found in the ore, and t amount varies with the percentage of antimony. Up 1892, 3,121 tons were shipped, containing over 50 per ce of antimony. The St. Helens Metal Recovery Compa after proving that they can successfully treat the mine have erected works to treat 600 tons per month, and ha agreed to buy ore containing antimony as low as 12 cent., and to pay for 75 per cent. of the gold content.

Samples of ore taken from different parts of the v give the following analyses:—

Thickness of Ore.	Percentage of Antimony.	Value of Gold (per 2,000 lb.).
Ins.		Dols.
12	5·50	26·00
6	10·50	30·00
6	4·95	3·60
24	41·13	185·00
6	33·00	35·40

The average thickness of ore left in the vein is estima at 6 ins., containing 12 per cent. of antimony and 23 d of gold per ton of 2,240 lb. At a greater depth (be the old working) high grade ore gave on analysis 60·29 cent. of antimony, and 2·66 oz. of gold per ton of 2,000 and a second grade ore 5·27 per cent. of antimony a 1·38 oz. of gold per ton. There are probably other veins the district.

ZINC ORES IN NEW SOUTH WALES.

U.S. Cons. Reps., Nov. 1901.

Zinc ores are widely distributed over New South Wa Specimens of ore from ninety-six different localities h been received at the Department of Mines in Sydn There are several combinations of this ore among th specimens, such as red oxide of zinc, which contains 80·3 cent. of zinc. The carbonate of zinc contains 52 per c of zinc, in combination with silver and zinc blende. phide of zinc, containing 67 per cent. of zinc when pu also often contains iron, and sometimes cadmium. This the most common ore of zinc, and is found associated w galena in most of the silver mines of New South Wa No attempt has been made to work this mineral speci for the production of zinc, but its occurrence is regarded detrimental to the ores of silver and lead with which it nearly always associated.

WOLFRAM AND MOLYBDENITE IN QUEENSLAND.

Bd. of Trade J., Oct. 24, 1901.

Of the 189⅓ tons which formed the year's output of wolfram, 188 tons came from Wolfram Camp, on the Hodgkinson field. The mineral appears to be plentiful, but the fall in price has latterly checked production. At a shallow depth the mineral occurs in a clean state, and requires little labour to fit it for the market. In the deeper ground it is found disseminated through quartz, from which it is separated by dollying and sluicing. Associated with wolfram is molybdenite. Twelve months ago very little was known about molybdenite, but latterly a market has been established, and 60*l.* a ton has been obtained for the mineral on the field. Bismuth is also found, the miners receiving about 3*s.* per pound. As the clean surface deposits become rarer, the erection of concentrating machinery to supersede the present tedious process of hand dressing has been suggested, and it is said that a suitable plant can be set up at a cost of about 1,500*l.* But it would be rash to predict any assured permanency for the field. Wolfram generally occurs in patches, and rarely is there any defined lode. The demand for all these rare minerals is limited, and a small increase in production floods the market and brings down the price. Cornwall, Saxony, Spain, Portugal, and North and South America all produce wolfram, so that there does not seem to be much room for expansion.

MANGANESE IN BRAZIL.

Foreign Office Annual Series, No. 2724.

The influence of high exchange is depressing in connection with manganese mining.

Experts calculate that this industry cannot be carried on profitably at an exchange over 12*d.* per milreis. But even with the rate about 10*d.*, it would seem that there is little profit in the business, and several of the workings have been closed. No doubt the lower value in consuming centres is also partly responsible for this state of things. Shipments continue to be made, and some 34,000 tons of manganese ore left this port, during the first eight months of 1901, for the United Kingdom, the United States, and Belgium, and notwithstanding all drawbacks, there is still considerable activity in mining affairs, several prospecting parties being in the field, among which Belgian enterprise is particularly well represented.

MINERAL PRODUCTION OF JAPAN.

Eng. and Mining J., Nov. 9, 1901.

Mr. I. Hosoi, of the Imperial Bureau of Mines at Tokio, gives a statement of the mineral production of Japan for the year 1900. The figures given below are in metric tons, with the exception of those for gold and silver, which are in kilograms, and for petroleum, in gallons :—

Metals :		
Gold	kilos.	2,130
Silver	,,	58,953
Antimony, crude	tons	81
Antimony, refined	,,	349
Copper	,,	25,304
Tin	,,	12
Lead	,,	1,877
Pig iron	,,	21,299
Oil :		
Crude oil	galls.	22,175,825
Refined oil	,,	2,077,223
Other ores and minerals :		
Graphite	tons	94
Manganese ore	,,	15,228
Iron pyrites	,,	16,146
Arsenic	,,	5
Sulphur	,,	14,435
Chemical products :		
Sulphuric acid	,,	932

The important increases over 1899 were in copper and sulphur. Sulphur from Japan is being exported largely to the Western States of America.

XII.—FATS, OILS, Etc.

VEGETABLE WAX IN JAPAN.

Chem. and Druggist, Oct. 26, 1901.

Exports, during 1900, greatly decreased compared with 1899, owing to the high price of raw material, on account of poor harvest ; stocks in foreign markets also contributed to the decline.

The quotation in January was 14·50 yen per picul, which continued until May, when the market became quieter, buyers offering 14 yen, whilst sellers complained of unremunerative prices, and it closed at 15·25 yen per picul, at the end of the year. The following is a comparative table of exports during ten years :—

Year.	Catties.*	Yen.†	Year.	Catties.	Yen.
1891	2,673,057	316,835	1896	2,148,314	371,701
1892	2,449,701	285,567	1897	4,205,843	730,576
1893	3,150,967	383,766	1898	3,789,791	609,760
1894	4,401,195	562,135	1899	4,569,613	642,219
1895	2,792,330	334,847	1900	3,702,087	561,435

* 1 catty = 1⅓ lb. 1 picul = 100 catties. † 1 yen = 2*s.* 0½*d.*

SOAP AND CANDLES IMPORTS OF BRAZIL.

Foreign Office Annual Series, No. 2724.

Soap and candles are made extensively within the country. Of the soap imported, during 1900, the greater part was supplied by the United States.

Stearin came chiefly from Belgium and France, and the latter country, together with Germany, supplied spermaceti. Wax is brought from Germany.

OLIVE OIL IN SICILY (ITALY).

Foreign Office Annual Series, No. 2716.

The importation of some 278,000 kilos. of olive oil from Spain, during 1900, is remarkable for an olive-growing country. Most of the output goes to the United States. The exports of olive oil to the United Kingdom, during 1900, amounted to 42,000 kilos.; during the first half of 1901, this rose to 62,000 kilos.

The quantity of olive oil produced at Catania, in 1900, was about 1,980,000 gallons, of poor quality.

STEARIC ACID IMPORTS OF SICILY (ITALY).

Foreign Office Annual Series, No. 2716.

During 1900 and 1901, the imports of stearic acid from the United Kingdom, amounted to 22,000 kilos., in each year ; the imports from Germany being 30,000 and 10,000 kilos., for the two years, from Holland, 28,000 kilos., in 1900, and 11,000 kilos., in 1901 ; and from Belgium, 17,000 kilos., in 1900, and 13,000 kilos., in 1901.

OIL DUTIES IN MEXICO.

Bd. of Trade J., Oct. 24, 1901.

The following paragraphs relating to oils have been altered, the new rates of duty being as stated :—

Tariff No.	Tariff Classification.	New Rate of Duty.		
			Pes.	Cts.
	Cotton-seed oil—			
182	Purified, in tank car or tank ship.	Kilo., net	0	10
182*a*	Purified, in barrels, drums, or tins.	,, gross	0	09
182*b*	Crude, in tank car or tank ship	,, net	0	05
182*c*	,, in barrels, drums, or tins	100 kilos., gross	4	50
	Cocoa-nut oil, and crude or boiled linseed oil—			
183	In tank car or tank ship	Kilo., net	0	10
183*a*	In barrels, drums, or tins	,, gross	0	09
854	Lubricating oils	,, ,,	0	05
	Fish oil—			
50	In glass bottles	Legal kilo.	0	12
50*a*	In wooden vessels	,,	0	10
	Cod liver oil—			
64	In glass bottles	,,	0	12
64*a*	In wooden vessels	Kilo., gross	0	10

A decidedly protective policy is discernible, especially in the case of crude imported oils, which are clarified or prepared for market in Mexico. The increase of duty on such oils is levied on the prepared article.

Soap Imports of Zanzibar.

Foreign Office Annual Series, No. 2718.

Soap of the common mottled variety comes from the United Kingdom and Germany, but German soap is in most request, being more malleable and less liable to break.

XIII. B.—RESINS, VARNISHES, Etc.

Sticklac and Gum-benjamin (Gum-Benzoin) at Chiengmai (Siam).

Foreign Office Annual Series, No. 2717.

The former brisk trade with Bangkok in gum-benjamin and sticlac has now practically ceased to exist.

Gum-benjamin now either finds its way down to the Tonquin markets, by way of the Red River, or to Bangkok, by way of Paklai, on the Mekong River, and Utaradit.

The "Ton Khamjan," or gum-benjamin tree, is found growing along the slopes of the hills around Chiengmai.

XIII. C.—INDIA-RUBBER, Etc.

India-Rubber at Zanzibar.

Foreign Office Annual Series, No. 2718.

In the island of Pemba, especially at its northern end, the *Landolphia Kirkii* grows. It is found over scattered areas, and does not attain to a large size, but grows to a considerable length, and the latex is clean and white. With respect to the rubber trees that have been planted experimentally in the Government plantations, the Assam rubber, *Ficus elastica*, is possibly the most vigorous, but the Central American variety, *Castilloa elastica*, appears to be well suited to the climate; of the others the Pará and Ceara rubber trees grow rapidly, either from seed or cuttings, but their yield has so far been small. The so-called gutta-percha tree appears to be of doubtful economic value as the latex obtained from it loses its plastic character after a few months and becomes friable.

Rubber Exports of the British Central Africa Protectorate.

Foreign Office Annual Series, No. 2722.

The amount of rubber exported was less in 1900 than in 1899, the value being 9,300*l.* as against 13,100*l.* A larger amount of rubber than during 1899 has come in transit through the Protectorate from outside countries.

Rubber Culture in Perak (Straits Settlements).

U.S. Cons. Rep., Nov. 1901.

"De Indische Mercuur" states that the director of the Government plantations has issued a report on the results of cultivation in the district of Perak. By moderate tapping of 89 Para rubber trees, averaging 14 years of age, 327 lb. of first-class and 33 lb. of second-class rubber were produced. The first class, equal to the best Para rubber, was sold in London at 3*s.* 10*d.* (93 cents.); the second class, at 2*s.* 6*d.* (61 cents.), per pound. Each tree yielded about 2 lb. of rubber.

XIV.—TANNING; LEATHER; GLUE, Etc.

Sumach Exports of Sicily (Italy).

Foreign Office Annual Series, No. 2716.

The sumach crop, in 1900 and 1901, was disposed of as shown in the table.

Of the ordinary variety, the exports, for 1900, were 9,611,496 kilos., and for 1901, 6,810,403 kilos.

Sumach can still be procured from other growers than those belonging to the ring, though it is a question whether it can be shipped at the same rates, especially by vessels calling here in the ordinary way.

To—	Quantity.	
	1900.	1901.
	Kilos.	Kilos.
United Kingdom	9,356,000	6,516,000
France	6,752,000	5,310,000
Germany	4,745,000	1,121,000
United States	2,882,000	3,617,000
Belgium	2,564,000	1,148,000
Holland	1,123,000	646,000
Austria-Hungary	812,000	476,000
Russia	728,000	499,000

XVI.—SUGAR, STARCH, Etc.

Importation of Saccharine.—Notice to Importers.

Chem. Trade J., Nov. 2, 1901.

The following notice has been issued by the Commissioners of Customs:—

Saccharine and Substances of a like Nature or Use.

Notice is hereby given that, under the regulations made by the Commissioners of Customs and the Commissioners of Inland Revenue, in pursuance of section 8 of the Finance Act, 1901, the importation into the United Kingdom of saccharine (including substances of a like nature or use) is prohibited, except in packages containing not less than 11 lb. net weight, and into the ports of London, Harwich, Dover, Folkestone, Newhaven, Southampton, Hull, Leith, Goole, Grimsby, West Hartlepool, and Grangemouth.

Any smaller quantity than that specified imported into the ports named, and any quantity whatever imported at other ports or through the medium of the Foreign and Colonial Parcel Post, will be forfeited, and the importer of the goods will render himself liable to a penalty of 50*l.* in respect of each offence committed in contravention of these regulations. (See also this Journal, 1901, 949.)

Import Duties on Articles containing Sugar in United Kingdom.

Bd. of Trade J., Nov. 21, 1901.

A further amended schedule of the fixed rates of duty on articles containing sugar has been issued by the Commissioners of Customs, from which it appears that the following additions require to be made to the schedules already published:—

Milk powder:—		*s.*	*d.*
If declared by the importer not to contain any added sugar		Free.	
If declared by the importer not to contain more than 36 per cent. of added sugar	cwt.	1	6
In all other instances, and in cases in which the importer wishes to dispense with sampling and test	cwt.	3	4

Importations entered as free will be delivered on deposit of duty at the 1*s.* 6*d.* rate pending analysis. Importations entered at the 1*s.* 6*d.* rate are liable to sampling at the discretion of the officers.

Further, that "Soy, when containing molasses or other sweetening matter," formerly assessed for duty at the rate of 2*s.* per cwt., is now dutiable at the rate of 1*s.* per cwt. (See also this Journal, 1901, 515, 629, 948.)

1900–1 Sugar Campaign in Austria-Hungary.

Bd. of Trade J., Nov. 7, 1901.

No change in the number of sugar factories in the Dual Monarchy has taken place during the last year. Of the 213 existing factories, 128 are in Bohemia, 64 in Moravia and Silesia, and 21 in Bosnia.

Beet Sugar.—The area of beet cultivation increased during the last campaign four per cent., from 325,000 to 339,000 hectares. The total production of beet was 1,000,000 tons below that of the previous year, the two harvests in question having yielded 7,410,000 tons and 8,480,000 tons respectively, but last year's beet was two per ent. richer in sugar than that of the previous year, so that he actual amount of sugar produced only fell below the revious year's yield by 10,000 tons, the figures being ,080,000 and 1,090,000 tons respectively.

Refined Sugar.—The total exportation of refined sugar mounted, during the last campaign, to 544,600 tons, as ompared with 517,500 tons, during the previous year. Half ound its way to England and America *viâ* Hamburg, an ncrease over the previous year of 33,100 tons. The exportation of refined sugar to India also showed an increase rom 44,100 tons, during 1899—1900, to 52,600 tons, during 900–1901. The exportation to Switzerland, on the other and, has decreased during the last two campaigns from 2,600 tons to 8,500 tons; whilst Italy and the Balkan States continue to lose their importance as markets for Austro-Hungarian sugar. Japan, also, has not fulfilled xpectations, owing to the Excise regulations which ncourage the importation of raw sugar. Whereas during he campaign of 1899—1900 23,100 tons of refined sugar were shipped from Austria-Hungary to Japan, during the ast campaign, the total exportation only reached 20,000 ons. China took 800 tons last year as compared with ,200 tons during the previous campaign. Portugal is a ew and promising market, and imported from the Dual Monarchy 4,800 tons of refined sugar last year, as compared with 2,100 tons during the previous campaign. It ppears, therefore, that whilst the production of refined ugar in Austria-Hungary increases year by year, the umber of foreign markets for its disposal shows a distinct endency to become smaller.

Raw Sugar.—During the campaign of 1900—1901, 89,700 ons of raw sugar were exported from Austria Hungary as ompared with 133,000 tons in the previous year. Of this uantity 58,900 tons went to England, 13,400 tons to America, and 4,100 tons to Japan.

SUGAR INDUSTRY IN ITALY.

Bd. of Trade J., Oct. 24, 1901.

The past two seasons have witnessed a remarkable evelopment of the Italian beet-sugar industry. Previous o 1899, there were in the whole of Italy only four sugar actories, with a total annual capacity of about 8,000 ons. During the season of 1899–1900, the number of actories increased to 24, and the production of sugar uadrupled. At the end of the year 1900, there existed 28 aw-sugar factories and 10 refineries, whilst six factories and wo refineries were in course of construction. The industry ontinued to develop during the season just closed, but such trides as had been generally anticipated were not made. This was chiefly due to the imposition of a new sugar tax—which, in a measure, checked the spirit of enterprise—as well as to the fact that the beet crop was both meagre in quantity and indifferent in quality.

Official data as to the yield of the season of 1900–1901 are not yet accessible, but the amount of raw sugar manuactured will probably reach 550,000 metric quintals (55,000 metric tons).

SUGAR MACHINERY IN CUBA.

Bd. of Trade J., Oct. 31, 1901.

The following is a complete list of articles included under the heading of "Machinery and apparatus for making ugar and brandy," dutiable, for a period of 12 months from he 1st October, at the rate of 5 per cent. *ad valorem.*

The following articles, whoever be the importer :—

Weighing machines (platforms) for weighing sugar cane.
Complete machines of every kind for grinding cane.
Cane shredders.
Sugar clarifiers.
Complete apparatus for diffusion.
Purifying apparatus.
Filters and filtering apparatus.
Apparatus called "*trenes jamaiquinos*" complete.
Fornaces for making animal black.
Steam desiccators (*trampas*) and granulators.
Centrifugal machines, mixing and lifting (*subidores*) machines, with their motors.
Vessels called "*bombonas*" and "*cachimbus.*"
Skimmers, distributors, and sugar moulds.
Apparatus or vessels (*tachos*) acting in vacuum, also their machines, pipes, and cocks, of copper or iron, polarimeters.
Skimming pails (*cachaceras*).
Sugar crushers.
Cars (*porta-templa*).
Sulphur dioxide apparatus.
Dumping apparatus for cars (*porta-templa*).
Cane-transporting apparatus.
Furnaces for burning bagasse.
Automatic circulator and regulator for vacuum pan apparatus.
Apparatus for compressing sugar.

SUGAR IN BRAZIL.

Foreign Office Annual Series, No. 2724.

This industry has attained considerable development in the State of Rio, particularly in the neighbourhood of Campos, but, as the yield has been over-stimulated, prices have dropped to about 80 reis per kilo., *i.e.*, about 1$\frac{3}{8}$*d.* per lb. for refined (crystal) sugar.

Many of the factories have decided to ship their sugars, unrefined, to Liverpool.

XVIII. A.—FOODS.

FOOD ADULTERATION IN BRAZIL.

Foreign Office Annual Series, No. 2724.

The regulation prohibiting entry of alimentary preparations and liquids containing substances injurious to public health is still in strict operation, and the greater part of the goods re-exported during the year, valued at 27,400*l.*, consisted of imported articles of this nature. The admixtures which are the most frequent causes of condemnation are boric, salicylic, and sulphuric acids, and alcohol of bad quality.

XVIII. B.—SANITATION.

DISCHARGING CHEMICALS INTO SEWERS.

Chem. and Druggist, Oct. 26, 1901.

At Bow Street Police Court, on Oct. 23, a firm was charged with allowing chemicals or manufacturing refuse to fall into a public sewer. For the prosecution it was explained that action was taken under section 9 of the London County Council (General Powers) Act of 1894, and it was stated that, for some time, sewermen had been overcome by sulphurous fumes, and one had his hand and arm burned by coming into contact with acid. The nuisance was traced to defendants' premises, and samples were taken last month. It was found that one contained 201 grains, per gall., of sulphurous acid, others 318 and 295 grains. The fumes could be noticed half a mile away from the defendants' premises, and the sewers had been much corroded. If the acid had been treated with lime or soda, the discharge would have been rendered perfectly harmless. The counsel for the defence said this was the first prosecution of the kind under the Act. The defendants, and their predecessors of the same name, had been in business for about 30 years, and this was the first complaint made against them. They felt strongly that they should have had their attention called to the matter before these proceedings were taken. It was customary for them to mix two or more chemicals which together were harmless, but in the present case one of them appeared to have been separately discharged, and so caused the nuisance. A fine and costs were imposed.

XIX.—PAPER, PASTEBOARD, Etc.

WOOD PULP IN CANADA.

Comm. Intelligence, Nov. 21, 1901.

The Department of Customs has published a statement of the exports by Canada of pulp wood and wood pulp for the year ended June 30, 1901. The values thereof amount to 3,335,265 dols., of which 966,920 dols. were sent to Great Britain, 2,302,215 dols. to the United States, and 66,194 dols. to other countries. The total of 3,335,265 dols. is an increase of 616,477 dols. over the exports of previous years.

To the United States, this is an increase of 244,321 dols., and to Great Britain, an increase of 366,372 dols. The exports of pulp wood showed an increase of 494,247 dols., the United States taking 500,744 dols. worth more in 1891 than in the previous year, and Great Britain, 6,172 dols. less. Of wood pulp, the increased value disposed of was 122,230 dols., the details being: increase to Great Britain, 372,541 dols.; increase to other countries, 6,109 dols.: decrease to the United States, 256,423 dols. Thus, while the United States increased their purchases of pulp wood from Canada by over half a million dollars, and decreased their purchases of the manufactured article by over a quarter of a million, Great Britain's decrease was in the pulp wood and that but small, while in the manufactured article, involving greater labour and the employment of a larger amount of capital, the mother country took from Canada an increased amount greater than the decrease of the United States by 116,121 dols.

It is estimated that the capital invested in pulp mills (as distinct from paper mills) in Canada, at the present time, is not less than 20,000,000 dols. The total annual product of the mills is estimated at 300,900 tons of mechanical pulp and 169,800 tons of chemical pulp, the former valued at 10 dols. and the latter at 30 dols. a ton, making in all a total value of over 8,000,000 dols. The amount of pulp wood consumed for the quantity of wood pulp stated is 970,000 cords a year. These calculations are based upon the stated capacity of the 44 Canadian mills which have sent returns to the Dominion statistician.

Barium-coated Paper for X-Ray Screens: U.S. Customs Decision.

Eng. and Mining J., Nov. 9, 1901.

Paper covered with barium-platinum-cyanide crystals, used to show the shadows produced by the Roentgen machine, is not a manufacture of paper, but is dutiable as a surface-coated paper under paragraph 398, Act of July 24, 1897, at the rate of 2½ cents per lb., and 15 cents *ad valorem*. The addition of the chemical preparation does not alter the character of the article as paper. To amount to a manufacture there must be a new name, character, and use.

Paper Imports of Brazil.

Foreign Office Annual Series, No. 2724.

In the paper and stationery trade, Great Britain supplies 13,000*l.* to Germany's 103,000*l.* France sends almost four times and Belgium three times as much as Great Britain.

XX.—FINE CHEMICALS, Etc.

Tartrates in Odessa (Russia).

Chem. and Druggist, Oct. 26, 1901.

There are two factories for the manufacture of cream of tartar in Odessa, and the value of the output last year was 49,770*l.*, an increase of 210*l.*, compared with 1899.

Otto of Rose in Bulgaria.

Chem. and Druggist, Oct. 26, 1901.

It has been suggested to the Bulgarian Customs that, in future, all flasks of otto of rose exported from the country should bear the Customs House seal. Hitherto the packages containing the flasks have been sealed, and the new suggestion is put forward with a view to suppress ottos which are sold as Bulgarian, but made elsewhere with a modicum of otto from the Balkans.

Citric Acid and Citrate of Lime at Messina (Sicily).

Foreign Office Annual Series, No. 2716.

The yield of citric acid has declined over 50 per cent., falling from 2,186 to 983 cwts. Messrs. Nascio, Aveline and Co., of Messina, manufacture this product.

The total production of citrate of lime, in 1899, amounted to 20,875 cwts., of which 9,246 cwts. were shipped to ports of the United Kingdom, as against 20,030 and 5,509 cwts., respectively, in 1900. The quantity exported to the United Kingdom has fallen off very conspicuously.

Essential Oil and Citric Acid Exports of Sicily (Italy).

Foreign Office Annual Series, No. 2716.

Essences and volatile oils consisted of 35,000 kilos. o orange essence, in 1900, and 33,000 kilos., in 1901; 23,00 kilos. of lemon essence, in 1900, and 27,500 kilos., in 1901 Of the totals of both kinds, the United Kingdom too 35,000 kilos., in 1900, and 28,000 kilos., in 1901; whil 10,000 kilos. went to the United States, in 1900, and 7,00 kilos., in 1901.

Half the production of citrate of lime and orange and lemon juice went to the United Kingdom. Orange juic amounted, in 1900, to 13,000 kilos.; crude lemon juice, in 1900, to 730,000 kilos., in 1901, to 461,000 kilos.; an concentrated lemon juice, in 1900, to 14,000 kilos. Of the total, France took 439,000 kilos., in 1900, and 404,000 kilos., in 1901; the United Kingdom, 275,000 kilos., in 1900, and 19,000 kilos., in 1901.

Chemical and Drug Imports of Brazil.

Foreign Office Annual Series, No. 2721.

The United Kingdom takes the lead only in regard t potash, Germany and the United States being preferre for other chemicals and for drugs, of which France als sends an important proportion.

Monazite Sands at Espirito Santo (Brazil).

Foreign Office Annual Series, No. 2724.

Important finds have been made of monazite sands, whic will prove very valuable to this State so soon as the questio of foreshore rights has been settled with the Federal Government.

Errata.

This Journal, Oct. 31, 1901.

Page 1043, col. 2, line 19 from bottom, for "aboat" *rea* "about"; line 18 from bottom, for "ground-nut" *read* "earth-nut"; lines 4 and 10 from bottom, fo "ground-nut" and "ground-nuts" *read* "earth-nut" and "earth-nuts."

Page 1044, col. 1, in first two tables, for "ground-nut" *read* "earth-nut"; col. 2, first table, for "ground nut" *read* "earth-nut."

Page 1045, col. 1, line 23 from top, instead of "It coagulates," &c. *read* "The milky fluid coagulates"; als for lines 24—26, *read* "sea salt alone, effects bu slight coagulation until aided by the action of heat."

BOARD OF TRADE RETURNS.

Summary of Imports.

Articles.	Month ending 31st Oct.	
	1900.	1901.
	£	£
Metals	3,044,719	2,621,791
Chemicals and dyestuffs	413,115	423,825
Oils	917,248	1,048,268
Raw materials for non-textile industries.	6,850,815	5,353,345
Total value of all imports	11,225,897	9,449,229

Summary of Exports.

Articles.	Month ending 31st Oct.	
	1900.	1901.
	£	£
Metals (other than machinery)	3,603,162	3,354,125
Chemicals and medicines	771,126	787,755
Miscellaneous articles	3,233,783	3,437,857
Total value of all exports	7,608,071	7,579,737

IMPORTS OF CHEMICALS AND DYESTUFFS FOR MONTH ENDING 31ST OCTOBER.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Bleaching materials Cwt.	22,646	16,327	12,855	5,231
Soda compounds... „		22,645		7,531
Borax, &c. .... „	22,071	9,139	11,280	5,134
Brimstone .... „	27,113	32,206	6,532	8,254
Nitrate of potash.. „	15,035	20,339	12,995	18,004
Chemicals, other Value £	..	..	122,688	141,852
Cutch and gambier. Tons	2,396	829	44,246	17,065
Dyes:—				
Alizarin.......Value £	..	..	13,394	15,325
Aniline and other „	..	..	55,036	55,726
Indigo .... Cwt.	142	1,120	2,282	16,998
Bark............. „	20,370	30,293	6,590	10,294
Valonia .... Tons	2,138	2,356	27,732	25,744

IMPORTS OF RAW MATERIAL FOR NON-TEXTILE INDUSTRIES FOR MONTH ENDING 31ST OCTOBER.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Bark, Peruvian .. Cwt.	1,625	3,666	4,770	11,623
Caoutchouc ...... „	37,345	33,909	459,860	382,108
Gum:—				
Arabic .... „	15,918	8,347	25,615	15,089
Lac, &c. .... „	5,776	3,783	16,948	15.221
Gutta-percha .... „	16,718	9,606	220,640	100,501
Hides, raw:—				
Dry........... „	56,894	17,367	141,333	53,911
Wet .... „	52,491	68,403	116,894	161,952
Ivory .... „	793	677	29,903	25,382
Manure:—				
Guano .... Tons	560	3,580	2,897	14,815
Bones.......... „	7,701	5,202	33,464	18,594
Paraffin.......... Cwt.	81,370	122,936	119,690	122,521
Linen rags .... Tons	1,017	1,906	8,896	14,365
Esparto .... „	20,005	11,977	79,318	43,798
Pulp of wood..... „	44,094	32,290	245.022	81,684
Rosin............ Cwt.	89,926	145,192	26,026	32,896
Tallow and stearin „	159,859	113,595	205,056	159,697
Skins:—				
Goat .... No.	881,285	1,211,823	77,650	117,559
Sheep.......... „	1,428,280	1,197,340	154,131	113,933
Nitrate of soda... Tons	10,340	6,022	88,099	57,357
Phosphate of lime „	26,541	41,566	41,943	62,295

IMPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 31ST OCTOBER.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Cement.......... Tons	11,071	29,669	20,712	48,628
China and earthenware. Cwt.	34,181	44,333	89,227	101,764
Drugs .... Value £	..	..	111,757	113,857
Glass:—				
Sheet .... Cwt.	56,538	129,364	35,900	72,006
Plate .... „	12,334	36,011	15,277	38.971
Flint .... „	42,613	58,390	76,844	105,585
Botties .... Gross	119,619	131,825	51,921	57,026
Other.......... Cwt.	26,867	30,002	49,725	58,277
Glue and gelatin. „	14,616	21,660	33.778	43,924
Leather, unmanufactured. „	133,955	120,413	825,682	787,784
Oil-seed cake .... Tons	20,814	21,743	146,140	137,912
Paints and pigments. Value £	..	..	106,753	119,375
Paper, pasteboard Cwt.	499,606	541,291	351,916	382,778
Scientific instruments. Value £	..	..	62,461	65,300
Soap and soap powder. Cwt.	13,487	23,060	18,654	27,054
Zinc manufactures. „	29,198	35,945	36,716	41,296

IMPORTS OF OILS FOR MONTH ENDING 31ST OCTOBER.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Cocoa-nut....... Cwt.	24,285	55,068	27,711	68,161
Olive............ Tuns	632	787	24,912	29,905
Palm .... Cwt.	75,527	116,859	85,718	131,148
Petroleum:—				
Illuminating.. Gall.	20,201,045	19,842,897	393,500	359,976
Lubricating... „	3,064,162	3,764,760	91,561	112,758
Seed............ Tons	3,575	4,059	94,184	97,718
Train, &c. ...... Tuns	2,297	3,967	38,965	71,083
Turpentine ..... Cwt.	53,754	70,799	77,938	89,476

IMPORTS OF METALS FOR MONTH ENDING 31ST OCTOBER.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Copper:—			£	£
Ore............. Tons	6,097	6,144	77,670	62,731
Regulus .... „	8,340	10,945	350,633	419.221
Unwrought..... „	5,514	5,018	400,154	343,481
Lead, pig and sheet „	21,059	15,186	336,350	181,378
Pyrites .... „	59,947	52,924	103,567	90,584
Quicksilver .... Lb.	76,710	15,112	9,380	1,619
Silver ore....... Value £	..	..	110,457	63,337
Tin .... Cwt.	75,697	66,503	472,721	374,582
Zinc.............. Tons	4,658	6,471	93,018	109,128

EXPORTS OF DRUGS AND CHEMICALS FOR MONTH ENDING 31ST OCTOBER.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Alkali .... Cwt.	334,253	..	106,271	..
Bleaching materials „	132,458	142,471	38,076	47,188
Copper sulphate .. Tons	719	410	16,898	8,882
Chemical manures „	33,244	42,273	206,209	216,815
Medicines....... Value £	..	..	117,792	118,685
Soda compounds:—				
Ash............ Cwt.	..	131,585	..	28,419
Caustic .... „	..	116,731	..	58,370
Bicarbonate .... „	..	30,993	..	10,816
Crystals .... „	..	22,847	..	3,018
Sulphate........ „	..	42,341	..	3,138
Other sorts ..... „	..	23,680	..	11,177

EXPORTS OF MISCELLANEOUS ARTICLES FOR MONTH ENDING 31ST OCTOBER.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Gunpowder..... Lb.	775,000	Cwt. 5,882	14,731	17,365
Candles......... „	1,844,500	2,525,300	33,630	42,174
Caoutchouc..... Value £	..	..	119,683	96,969
Cement......... Tons	20,326	25,503	38,777	47,933
Products of coal. Value £	..	..	174,081	85,841
Earthenware ... „	..	..	169,062	162,985
Stoneware ...... „	..	..	17,168	16,676
Glass:—				
Plate .... Sq. Ft.	196,122	Cwt. 7,603	14,596	11,613
Flint .... Cwt.	9,421	8,807	23,979	21,412
Bottles .... „	81,042	64,952	41,058	33,502
Other kinds ... „	26,839	19,715	26,206	21.278
Leather:—				
Unwrought .... „	12,738	10,141	125,098	102,773
Wrought...... Value £	..	..	57,591	57,189
Seed oil .... Tons	2,380	3,968	83,583	94,838
Floorcloth....... Sq. Yds.	2,102,800	2,140,590	105,977	105,064
Painters' materials Val. £	..	..	172,788	166,453
Paper............. Cwt.	91,944	82,461	145,781	132,099
Rags.............. Tons	3,909	5,406	23.304	30.048
Soap .... Cwt.	62,434	72,811	74,300	82,627

Exports of Metals (other than Machinery) for Month ending 31st October.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Brass	Cwt.	11,531	10,483	57,285	51,374
Copper	"	64.873	101.570	250,462	371,773
Lead	Tons	2.767	3,836	55,829	52.509
Plated wares	Value £	..	..	51.937	56.207
Tin	Cwt.	9,575	12,441	65,393	73,352
Zinc	"	15,114	14.409	15,233	11,679

Monthly Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

Applications.

20,492. J. Lowden. Apparatus for revivifying spent, foul, or waste lime from gas works or chemical works. Oct. 14.

20,549. H. Backe. Improvements in or relating to cooling or evaporating apparatus. Oct. 14.

20,757. D. Turk. An improved device for regulating and controlling the supply of gas and air to furnaces and the like. Complete Specification. Oct. 16.

20,998. E. Geille. Improvements in or relating to muffle furnaces. Oct. 19.

21,191. E. J. Hess. A method of and apparatus for production of liquid air, and for the production of motive power. Oct. 22.

21,282. D. B. Morison. Improvements in evaporating and condensing apparatus. Oct. 23.

21,727. A. F. Kécheur and W. A. B. Heerey. A new or improved carburetting apparatus. Complete Specification. Oct. 29.

22,102. G. R. Hislop. Improvements in regenerative settings of gas and other retorts. Nov. 2.

22,244. H. Devonport. Improvements in ovens or furnaces for annealing metallic articles, and for burning bricks and the like. Nov. 5.

22,274. T. Lowe and J. Whysall. An improved composition for removing and preventing incrustations in steam generators, and for cleaning liquor pumps and connections or the like. Nov. 5.

22,301. G. B. Schwerin. Improvements in and relating to apparatus for the extraction of water, and other fluid from mineral, vegetable, and animal substances. Nov. 5.

22,308. Per. W. Lindberg. Improvements in centrifugal separators. Nov. 5.

22,455. M. Blake and R. H. Smart. Improvements in or relating to vacuum pans, and other apparatus heated by steam worms. Complete Specification. Nov. 7.

22,512. The British Thomson-Houston Company, Ltd.—From Asa F. Batchelder, United States. Improvements in electric air-compressors. Complete Specification. Nov. 8.

22,677. E. K. Dutton and E. L. Dutton. Improvements in centrifugal machines for separating, clarifying, and discharging liquids and matters, and in apparatus connected therewith. Nov. 11.

22,891. J. A. Drake. Improvements in or connected with regenerative and other furnaces and kilns. Nov. 13.

23,043. G. A. Bell. Improvements in and relating to filtering apparatus. Nov. 14.

23,049. G. G. M. Hardingham.—From P. Menia, Belgium. Improvements in filter-presses. Nov. 14.

23,129. H. Herberz. Improvements relating to hot air drying apparatus. Complete Specification. Nov. 15.

23,235. T. Kirkland. Improvements in and relating to apparatus for heating liquids. Nov. 16.

Complete Specifications Accepted.*

1900.

15,315. W. T. Sugg. Apparatus for compressing gases. Nov. 6.

16,817. W. W. Hewitt. Apparatus for drying. Oct. 30.

17,054. P. Naef. Process and apparatus for treating materials with liquid and gas. Oct. 30.

18,928. E. L. D. H. Saragonet. Charging apparatus for Siemens-Martin and other furnaces. Oct. 30.

20,216. F. de Mare. Mercurial centrifugal pump. Nov. 20.

21,302. W. W. Harris. Refrigerating apparatus. Oct. 23.

21,431. G. T. Zohrab. *See* Class II.

22,354. G. W. Blackburn. Coolers, condensers, and heating apparatus. Nov. 20.

1901.

15,989. A. F. P. Hayman. Stoppers for inclined retorts. Oct. 2.

16,071. E. Stauber. Apparatus for rapidly drying moist material. Nov. 20.

17,624. F. C. Crean. Apparatus for disintegrating and drying pulp. Nov. 20.

19,237. E. Füllner. Process of separating mechanical admixtures from liquids, and apparatus therefor. Nov. 6.

II.—FUEL, GAS, AND LIGHT.

Applications.

20,726. C. R. Hinekesman. Improvements in connection with burners for incandescent gas lighting. Oct. 16.

20,747. A. J. Boult.—From A. M. Plaissetty, France. Improvements in or relating to the manufacture of incandescent filaments and mantles. Oct. 16.

20,760. H. Praetorius. Improved process and apparatus for mixing liquid fuels of different specific gravities. Complete Specification. 16 Oct.

20,986. W. R. Harrison, A. Robb, and T. L. Bell. Improvements in or in connection with apparatus for the production of acetylene gas. Oct. 19.

21,082. A. C. Wells. Improvements in and relating to acetylene gas generators, or the like. Oct. 21.

21,120. A. H. Byron. Composition of matter for generating gas for motive power purposes, method of producing the gas, and apparatus to be used in connection therewith. Complete Specification. Oct. 22.

21,125. F. Crossley. Improvements in incandescent gas burners. Oct. 22.

21,354. H. Higgins. Improvements in or relating to the treatment of peat, and in apparatus therefor. Oct. 24.

21,356. G. H. Hughes. Improvements in or relating to the production of gas Oct. 24.

21,376. J. Radcliffe. Improvements in the manufacture or production of combustible gas. Complete Specification. Oct. 24.

21,377. J. Radcliffe. Improvements in apparatus suitable for the manufacture or production of combustible gas for calcining or roasting ores and other substances, and for other purposes. Complete Specification. Oct. 24.

21,415. A. G. Browning and H. Musgrove. Improvements in the composition of artificial fuel and kindlers. Oct. 25.

21,534. C. Killing. Improvements in incandescent gas burners. Complete Specification. Oct. 26.

21,615. M. Koblenzer. Improvements relating to the manufacture of incandescent gas mantles. Oct. 28.

21,692. H. D. Fitzpatrick.—From F. H. Macpherson, Canada. Improvements in vapour generators for incandescent lighting. Complete Specification. Oct. 29.

21,720. H. A. Humphrey. Improvements in the purification of gases. Oct. 29.

21,756. E. F. Colborn. Improvements in the production of combustible gas from hydrocarbon oil. Complete Specification. Oct. 29.

21,757. J. Cayrol. Improvements in burners for lighting-gas and other combustible gases. Complete Specification. Oct. 29.

21,763. P. Hudson. Improvements in apparatus for producing and projecting light for signalling and other purposes. Oct. 29.

21,771. C. S. Burtwell. Improvements in apparatus for generating acetylene gas. Oct. 29.

21,837. A. L. Schubert. *See* Class IX.

21,926. R. Farrington. An invention for protecting ncandescent gas mantles against concussion and breakage. Oct. 31.

21,982. W. A. Feurt and H. H. Martin. Improvements n acetylene gas generators. Complete Specification. Oct. 31.

22,016. W. J. Crossley and J. Atkinson. Improvements n gas producers. Nov. 1.

22,105. J. W. Bray. Improvements in and relating to acetylene gas burners. Complete Specification. Nov. 2.

22,131. H. A. Humphrey. Improvements in centrifugal apparatus for purifying gases. Nov. 2.

22,349. C. H. Schill. Improvements in the manufacture of gas, and in apparatus employed in such manufacture. Nov. 6.

22,486. J. F. Henderson and C. W. Clayton. An automatic carbonic acid gas generator and holder. Complete Specification Nov. 7.

22,645. W. H. Westwood, E. T. Wright, and W. W. S. Westwood. Improvements in the discharging mouthpieces of inclined gas-making retorts. Nov. 9.

22,648. W. Doman and S. W. Bullas. Improvements in apparatus for purifying gases. Nov. 9.

22,760. F. Paul, jun., and A. F. Gundlack. Improvements in the generation of gas. Complete Specification. Nov. 11.

22,786. D. Irving, W. P. Gibbons, and G. B. A. Gibbons. Improvements in the construction of regenerative and other furnaces for gas retorts. Nov. 12.

22,931. The Simon - Carves Bye-Product Coke - Oven Construction and Working Company, Ltd.—From The Société Anonyme de Carbonisation, France. Improvements in or relating to coke ovens. Complete Specification. Nov. 13.

23,056. R. Fabry and F. Linard. Improvements in coke ovens. Complete Specification. Filed Nov. 14. Date applied for 29 June 1901, being date of application in Belgium.

23,206. W. P. Thompson.—From Compagnie Générale d'Incandescence par le Pétrole et l'Alcool, France. Improvements in and relating to incandescent burners. Complete Specification. Nov. 16.

23,212. J. De Brouwer. Improvements in apparatus for charging retorts in the manufacture of gas. Nov. 16.

Complete Specifications Accepted.

1900.

18,279. P. Naef. Treatment of fuel and the recovery of by-products. Nov. 20.

19,074. R. Marston. Manufacture and use of nitrogen and nitrous oxide from atmospheric air. Oct. 23.

19,087. P. R. De Faucheux D'Humy. Manufacture of fuel. Oct. 30.

19,254. R. P. Pictet. Method of and apparatus for the separation of gases from their mixtures. Oct. 30.

19,377. W. J. Crossley and J. Atkinson. Gas producers. Oct. 30.

19,776. J. Mallol. Incandescent gas burners. Nov. 6.

20,484. T. S. Clapham. Apparatus for use in the purification of gas. Oct. 30.

20,588. F. Coe. Incandescent gas lighting and burners. Oct. 30.

20,893. H. Holm. Carbonisation of peat, and apparatus therefor. Oct. 30.

21,431. G. T. Zohrab. Drying and condensing of peat or other material, and apparatus therefor. Oct. 30.

21,641. A. Custodis. Manufacture of coke. Nov. 20.

22,644. C. Humfrey. Washes for producer or other gases. Oct. 30.

23,605. The Portable Gas Fountain Syndicate, Ltd. —From J. Thovert, France. Incandescent gas burners. Oct. 30.

23,662. A. J. Boult.—From Desiderius Turk and The Actiengesellschaft "Lauchhammer," Germany. Process for the production of gases of high calorific value from low calorific fuel material. Oct. 30.

23,701. A. Rosenberg. Self-igniting incandescent gas lights. Oct. 30.

1901.

83. J. Bonnet and J. S. Muller. Machines for the manufacture of incandescent gas mantles. Oct. 30.

100. E. J. Duff and The United Alkali Company, Ltd. Means to be employed in the treatment of producer gases. Nov. 20.

2020. E. Gobbe. Apparatus for the utilisation of the heat of coke removed from retorts or ovens. Nov. 20.

3586. J. H. Darby. Apparatus for the manufacture of coke. Nov. 6.

4323. E. R. Besemfelder. Manufacture of cyanogen compounds from gas mixtures containing ammonia. Oct. 23.

5757. A. Hayes. Vaporising and burning hydrocarbon oils. Nov. 13.

5948. R. W. B. Creeke. Apparatus for washing and cleansing gas from ammonia and other impurities. Oct. 30.

16,347. H. H. Lake. From P. Jebsen, Norway. Treatment of peat. Oct. 30.

16,356. P. A. Fichet and R. M. J. Heurtey. Gas generators. Nov. 6.

17,171. E. B. Cornell and W. C. Alderson. Process and apparatus for making a fixed gas for lighting, heating or any other purpose. Oct. 23.

17,510. F. W. C. Schniewind. Manufacture of gas. Nov. 13.

17,852. S. F. Pierce. *See* Class X.

17,865. F. Chailly. Manufacture of fuel briquettes, blocks, or pieces. Nov. 6.

17,975. J. O. O'Brien. — From M. Wagner, France. Acetylene lamps and generators. Nov. 20.

18,513. O. Ruppert. Manufacture of illuminating gas and coke, and apparatus therefor. Nov. 13.

19,247. G. Ihle. Bunsen burners for use in incandescent lighting. Nov. 6.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Applications.

20,716. T. Rigby. Improvements in the treatment of furnace gases or producer gases, and connected with the recovery of ammonia and tar from the same, and in apparatus therefor. Oct. 16.

21,874. A. Nikiforoff. Improvements in the manufacture of the benzols and their homologues, and in apparatus therefor. Oct. 30.

IV.—COLOURING MATTERS AND DYESTUFFS.

Applications.

20,551. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture of azo colouring matters and intermediate products relating thereto. Oct. 14.

20,552. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture of derivatives of indigo, and of intermediate products relating thereto. Oct. 14.

20,553. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture of a new colouring matter, of lakes therefrom, and of an intermediate product relating thereto. Oct. 14.

20,741. R. B. Ransford.—From L. Cassella and Co., Germany. The manufacture of purified sulphur dyestuffs from dialkylamidooxydiphenylamines and new intermediate products Oct. 16.

21,077. O. Imray. — From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of phenylamidoacetonitrile and homologues thereof. Oct. 21.

21,773. R. B. Ransford.—From L. Cassella and Co., Germany. The manufacture of acridine dyestuffs. Oct. 29.

21,879. G. W. Johnson.—From Kalle and Co., Germany. Improvements in and connected with the manufacture and production of black colouring matters containing sulphur. Oct. 30.

22,128. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in the manufacture and production of new derivatives of the anthraquinone series. Nov. 2.

22,189. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of colouring matters belonging to the triphenylmethane series. Nov. 4.

22,222. G. W. Johnson.—From Kalle and Co., Germany. Improvements in the manufacture and production of brown dyes containing sulphur. Nov. 4.

22,306. R. B. Ransford.—From L. Cassella and Co., Germany. The manufacture of dyestuffs. Nov. 5.

22,385. C. D. Abel. — From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of sulphurised colouring matters directly dyeing cotton. Nov. 6.

22,583. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in the manufacture or production of anthraquinone derivatives. Nov. 8.

22,674. A. Smith. Improvements in the method of preparing indelible inks for marking linen and cotton textile materials. Nov. 11.

22,733. O. Imray. — From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Improved manufacture of phenylglycine, its homologues, and salts thereof. Nov. 11.

22,734. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of sulphurised colouring matters directly dyeing cotton. Nov. 11.

22,762. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture of colouring matter of the anthracene series. Nov. 11.

22,838. H. E. Newton. — From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in the manufacture or production of derivatives of the anthracene series. Nov. 12.

Complete Specifications Accepted.

1900.

12,899. H. E. Newton. — From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of azo colouring matters, and of intermediate products for use therein. July 3.

19,202. G. B. Ellis.—From F. A. Pertsch, Switzerland. Manufacture of anthrainic acid and colouring matters. Oct. 30.

20,718. B. Willcox.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of new colouring matters of the anthracene series and of intermediate products related thereto. Oct. 23.

20,719. B. Willcox.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of colouring matters of the anthracene series. Oct. 30.

21,310. R. B. Ransford.—From L. Cassella and Co., Germany. Manufacture of a sulphide colour and of its leuco compound. Oct. 30.

21,365. G. B. Ellis.—From Société Chimique des Usines du Rhône, anciennement G. P. Monnet et Cartier, France. Manufacture of sulphonated aldehydes and colouring matters therefrom. Nov. 6.

21,821. B. Willcox.—From The Badische Anilin and Soda Fabrik, Germany. Manufacture of an initial material for the production of indigo. Nov. 13.

21,897. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of dyestuffs of the anthracene series. Nov. 6.

21,898. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Manufacture or production of dyestuffs containing sulphur. Oct. 23.

22,214. G. B. Ellis.—From Société Chimique des Usines du Rhône anciennement G. P. Monnet et Cartier, France. Manufacture of substituted sulphinides. Oct. 30.

22,328. W. L. Wise.—From Knoll and Co., Germany. Manufacture of biacetate of anthrapurpurine. Nov. 20.

22,391. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of compounds of phenyldimethylpyrazolone and dimethylamidodimethylphenylpyrazolone with camphonic acid. Oct. 23.

22,758. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of phenylglycine-ortho-carboxylic acid. Oct. 23.

23,902. F. Kehrmann. Manufacture of colouring matters of the thiazine series and of intermediate products therefor. Nov. 6.

1901.

392. O. Imray. — From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of a bluegrey dyestuff for cotton. Nov. 20.

913. H. E. Newton.—From The Farbenfabriken vormals . Bayer and Co., Germany. Manufacture or production f dyestuffs capable of giving on fibre shades fast against ashing. Nov. 13.

1787. J. Y. Johnson.—From The Badische Anilin und oda Fabrik, Germany. Manufacture and production of olouring matters on the fibre, and of products for use herein. Nov. 20.

11,022. A. Rahtjen. Method of preparing monobrome-idigo and dibrome-indigo as well as monochlore-indigo nd dichlore-indigo as well as monochloremono-brome-ndigo. Nov. 13.

11,533. A Thilmany. Manufacture of composite colour-g matters or pigments. Nov. 20.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Applications.

21,272. H. E. Newton.—From The Farbenfabriken ormals F. Bayer and Co., Germany. Improvements elating to printing with the aid of dyestuffs containing alphur. Oct. 23.

21,595. T. Burnley and R. J. Midgley. Improvements in connected with the method of and means for treating amie or rhea fibre, china grass, or other similar vegetable bre. Oct. 28.

21,628. H. E. Newton.—From The Farbenfabriken ormals F. Bayer and Co., Germany. Improvements in the anufacture or production of derivatives of cellulose. ct. 28.

21,645. P. Boureart. An improved process and appa-atus for the mercerisation of vegetable fibres. Complete pecification. Oct. 28.

21,881. H. L. Offermann. An improved process for ashing wool. Oct. 30.

22,407. C. F. Topham. Improvements in or connected ith the manufacture or treatment of fibres, or filaments, roduced from solutions of cellulose. Nov. 6.

22,688. W. Rodger. An improved method of producing ariegated or parti-coloured effects upon yarns or fabrics or ther substances. Nov. 11.

22,689. W. Rodger. An improved method of producing ariegated or parti-coloured effects upon woollen, worsted, nd silk yarns or fabrics, or mixtures thereof. Nov. 11.

22,968. A. J. E. Hill. Improvements in the treatment f fabrics. Nov. 13.

22,996. J. T. Pearson. Improvements in mercerising, istring, drying, and otherwise treating yarn and other imilar fibrous substances and materials with liquids, air, nd other gases. Nov. 14.

23,042. C. Bardy. Improvements in the manufacture of iscose silk. Nov. 14.

23,181. T. Pratt. Improvements in apparatus for mer-erising cotton yarns in hank form, applicable also for lyeing, bleaching, drying, and otherwise treating such yarn r yarns of other fibrous material by analogous processes. ov. 16.

Complete Specifications Accepted.

1900.

15,191. J. O. Obermair. Dyeing apparatus. Oct. 30.

21,072. F. B. M. Raabe. Manufacture of yarn from ertain vegetable waste material. Nov. 13.

22,776. G. de Keukelaere. Machines for dyeing textile naterials. Nov. 20.

22,947. R. Spitz. Manufacture of yarn, and cloth therefrom. Oct. 30.

23,110. A. J. Boult.—From A. Gagedois, France. Bleaching of vegetable fibres and fabrics. Nov. 20.

23,157. C. F. Topham. Apparatus for use in the production of textile fibres or filaments from solutions of cellulose or of other material from which fibres or filaments can be formed. Nov. 13.

1901.

1285. C. D. Abel.—From Actiengesellschaft für Anilin Fabrikation, Germany. Dyeing. Oct. 30.

4303. J. Imray.—From E. Bronnert, M. Frémery, and J. Urban, Germany. Manufacture of thread from cellulose solutions. Oct. 23.

VII.—ACIDS, ALKALIS, and SALTS.

Applications.

21,314. A. Mason. Improvements in the use and utilisation of carbonate of lime obtained in the recovery of sulphur from alkali waste, and commonly called "Chance mud." Oct. 24.

22,470. R. Hodgson. Improvements in apparatus for the manufacture of broad salt from brine. Nov. 7.

22,629. C. Dreher. Process for the manufacture of faintly acid and neutral solutions and salts respectively of titanic acid and lactic acid. Complete Specification. Nov. 9.

22,889. G. F. Berry. A new or improved method or process for the recovery, collection, and utilisation of waste carbonic acid gas, given off in the manufacture of certain acids. Nov. 12.

23,124. W. P. Thompson.—From Stassfurter Chemische Fabrik vormals Vorster und Grüneberg A. G. Germany. Improvements in the production of anhydrous cyanide of sodium from an aqueous solution. Complete Specification. Nov. 15.

23,125. W. P. Thompson.—From Stassfurter Chemische Fabrik vormals Vorster und Grüneberg, A. G., Germany. An improved process for making briquettes of a mixture of cyanide of potassium and cyanide of sodium. Complete Specification. Nov. 15.

23,188. C. Dreher. Process of manufacturing double salts of titanic acid and oxalic tartaric acid, and of oxalic lactic acid respectively, capable of neutralisation. Nov. 16.

Complete Specifications Accepted.

1900.

17,053. P. Naef. Process and apparatus for treating materials, such as bicarbonate of soda and other materials for drying, calcining, or distilling them. Oct. 30.

19,326. L. Alpe. Composition or flux for use as a substitute for borax. Nov. 6.

21,214. D. de Vulitch and J. d'Orlowsky. Process of and apparatus for the production of calcium carbide. Nov. 13.

23,811. J. G. Lorrain.—From G. Thomson, United States. Treatment of liquids containing copper and the like. Nov. 20.

1901.

276. G. M. Vis. Purification of brine. Nov. 13.

1385. O. Imray.—From Farbwerke vormals Meister Lucius und Brüning, Germany. Manufacture of sulphuric anhydride by the contact process. Nov. 13.

VIII.—GLASS, POTTERY, AND ENAMELS.

APPLICATIONS.

20,643. C. Berhenke. Process and apparatus for drying bricks and other earthenware, or ceramic products. Complete Specification. Oct. 15.

21,158. T. W. Simpson. Improvements in or connected with machines for manufacturing glass bottles and the like. Oct. 22.

21,846. L. Grote. Improvements in or relating to machines for making glass bottles. Oct. 30.

22,577. B. J. B. Mills.—From A. Bocuze, France. Mould for glass works. Nov. 8.

COMPLETE SPECIFICATION ACCEPTED.

1900.

21,226. A. E. Brown. Drying of earthenware articles such as bricks, tiles, pipes, terra-cotta pottery, clay, or the like, or other articles, such as timber, &c. Oct. 30.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

APPLICATIONS.

20,891. S. Höyer-Ellefsen. Improvements in and relating to fire-proof floors and the like. Complete Specification. Oct. 18.

21,669. A. Steel. Novel process for re-converting or utilising discarded, broken, or old plaster of Paris moulds, objects, or ornaments. Oct. 29.

21,837. A. L. Schubert. Improvements in process of producing lime or cement and combustible gases. Oct. 30.

22,314. C. von Forell. A process and apparatus for the preparation of Portland cement from blast-furnace slag or cinder. Complete Specification. Nov. 5.

22,601. J. S. Rigby. Maturing Portland cement. Nov. 9.

23,162. H. E. Mason. A new or improved refractory material for use in substitution for ordinary fire-clay and fire-clay compounds, and the like. Nov. 16.

COMPLETE SPECIFICATIONS ACCEPTED.

1900.

21,226. A. E. Brown. *See* Class VIII.

1901.

3101. F. Howett. Artificial stone, in situ pavements, floors, walls, ceilings, and the like. Nov. 6.

10,084. S. E. Boivie. Process for the manufacture of artificial stone. Nov. 6.

15,402. G. Feyerabendt. Method of preserving wood by treating it with natrium aluminate. Oct. 23.

16,640. O. Hertwig and E. Liebaug. Manufacture of artificial marble and the like. Nov. 6.

17,651. P. A. Newton.—From The New Jersey Wire Cloth Company, United States. Fireproof constructions and method of making the same. Nov. 6.

X.—METALLURGY.

APPLICATIONS.

20,507. E. H. Hopkins. An improved method of condensing zinc. Oct. 14.

20,566. E. Knudsen. Process and apparatus for smelting and concentrating unroasted sulphide ores. Complete Specification. Filed Oct. 11. Date applied for March 14, 1901, being date of application in Norway.

20,657. H. Wachwitz, L. Sattler, and M. Dünkelsbühle Improvements in or relating to the manufacture of plate metals. Complete Specification. Oct. 15.

20,703. R. F. Macfarlane. Process for recovering iro and copper from copper works slag. Oct. 16.

20,875. E. C. Furby and G. Franklin. Non-corrosi metal. Oct. 18.

21,017. W. M. Cranston.—From The American Copp Mining and Extraction Company, United States. Improve method or process for obtaining copper metal from coppe bearing ores. Oct. 19.

21,019. C. G. P. de Laval. Improvements in or appe taining to the distillation of zinc from material containi the same. Filed Oct. 19. Date applied for April 19, 190 being date of application in Sweden.

21,097. C. Rogers and A. M. Oswald. Improved proce for the extraction and recovery of zinc from sulphide or or tailings. Complete Specification. Oct. 21.

21,176. H. H. Lake.—From Hawley Down Draft Furna Company, United States. Method of and apparatus f melting and treating metals. Complete Specificatio Oct. 22.

21,257. J. Baxeres de Alzugaray. Improvements in an connected with the manufacture of metallic alloys. Oct. 2

21,377. J. Radcliffe. *See* Class II.

21,424. H. Brandenburg. A process for recoverin metals and metallic compounds from materials containi metals, and particularly from residues. Complete Speci cation. Oct. 25.

21,445. O. J. Steinhart, J. L. F. Vogel, and C. F. Clau Improvements in obtaining tin, antimony, and arsenic fro complex sulphide ores. Oct. 25.

21,471. E. Young. Improvements in the utilisation waste products for the manufacture of iron and stee Oct. 25.

21,481. E. Meininghaus. Improvements in the proce of making iron and steel, and in apparatus used therei Complete Specification. Oct. 26.

21,738. J. F. Duke. Improvements in alloys. Oct. 29

21,940. D. Reynolds. Process for the production steel direct from the ore. Complete Specification. Oct. 3

22,130. W. S. Rawson and R. D. Littlefield. Improve ments in refining metals and apparatus for that purpo Nov. 2.

22,233. P. M. Justice.—From C. Davis, United State Improved method of treating iron and steel. Complet Specification. Nov. 4.

22,334. W. Stubblebine. Improvements relating t metallurgical furnaces. Complete Specification. Nov. 5.

22,387. F. Ray and S. Gregory.—From C. Wessel United States. Improvements in or relating to the refinin of spelter. Nov. 6.

22,549. W. L. Wise.—From R. McKnight, United State Improvements in the extraction of gold from refractor ores. Nov. 8.

22,554. J. G. Lorrain.—From G. Thomson, Unite States. A new or improved process of making alloys, an products of the said process. Nov. 8.

22,730. H. Johnson and G. W. Frier. Improvements i the process of manufacturing steel. Nov. 11.

22,753. H. J. Haddan.—From the Meteorit Gesellscha G. m. b. H., Germany. A new or improved process fo improving the quality of aluminium. Complete Specifica tion. Nov. 11.

22,927. E. H. Hopkins. An improved method of con densing zinc. Nov. 13.

23,060. W. Pruszkowski. Improvements in the manu facture of steel. Complete Specification. Nov. 14.

Complete Specifications Accepted.

1900.

14,291. E. L. Graham. Process for the disintegration, separation, and concentration of metals from their ores. Nov. 13.

15,166. H. F. Kirkpatrick-Picard. Treatment of slags and by-products containing zinc. Oct. 30.

18,669. G. W. Hinckley. Roasting iron compounds. Oct. 30.

19,273. T. Barton and T. B McGhie. Process for the dezincing of zinc desilverised lead. Oct. 30.

19,326. L. Alpe. *See* Class VII.

19,592. E. M. Bradford. Process for the recovery of tin from slag. "hardhead," or other by-products of the smelting of tin ore or manufacture of tin. Nov. 6.

20,513. A. Simon. Manufacture of iron. Nov. 6.

20,702. T. A. Irvine. Extraction of copper by the wet method. Nov. 20.

20,894. H. Goldschmidt. Process for welding materials. Nov. 20.

21,552. A. J. Boult. From E. Goldschmid, Germany. Production of steel. Oct. 30.

22,554. E. H. Hopkins. Treatment of complex ores. Nov. 20.

23,315. A. Reynolds. Converters. Nov. 13.

1901.

788. W. W. Slater and J. Galloway. Economical treatment of auriferous matters. Nov. 20.

6323. A. J. Lustig, L. Kahn, and I. Lehman. Apparatus for use in casting ingots. Oct. 23.

10,705. A. G. Betts. Coating of aluminium or its alloys. Nov. 13.

13,867. M. Ruthenburg. Methods of and apparatus for agglomerating comminuted ores and concentrates. Oct. 23.

17,639. F. C. Crean. Manufacture of iron or iron alloys. Oct. 23.

17,852. S. F. Pierce. Heat-producing devices for the smelting of ores and the fusing of minerals in furnaces. Nov. 6.

19,150. J. Mactear. Machine for treating alluvial deposits for the extraction of metals and minerals therefrom. Oct. 30.

19,403. A. Manhardt. Process for producing an aluminium alloy. Nov. 6.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

Applications.

20,845. R. B. Sangster. Improvements in electrical storage cells or accumulators. Oct. 18.

20,945. The Cowper-Coles Galvanising Syndicate, Ltd., and S. Cowper-Coles. Improvements in means to be employed in the electro deposition of metals. Oct. 19.

21,285. L. Bristol. Improvements in electric batteries. Oct. 23.

21,294 A. Tribelhorn. Improvements in electric accumulator batteries. Complete Specification. Oct. 23.

21,342. M. A. Codd. Improvements in dry cells. Oct. 24.

21,362. C. T. J. Oppermann. Improvements in secondary batteries. Oct. 24.

21,649. L. Roselle. Improvements in and in connection with accumulator plates. Oct. 28.

21,915. A. Philip. Improvements in the electro deposition of metallic copper. Oct. 31.

21,942. P. Nauhardt. Process for the electrolytic treatment of tin, and an apparatus therefor. Complete Specification. Oct. 31.

22,303. P. Marino and G. Marino. Improvements in and relating to secondary batteries. Complete Specification. Nov. 5.

22,482. J. Wetter.—From H. Bremer, Germany. Improved process or processes for coating or impregnating conducting materials, such as iron, with minute particles or other materials, such as carbon, by means of electric currents. Nov. 7.

22,767. A. E. Greville. Improvements in primary batteries. Nov. 11.

23,215. V. Cheval and J. Lindeman. Improvements in electrical accumulators. Complete Specification. Filed 16 Nov. Date applied for, 22 April 1901, being date of application in Belgium.

Complete Specifications Accepted.

1900.

19,072. G. J. Gibbs. Electrical accumulators. Oct. 23.

23,310. The British Power Traction and Lighting Company, Ltd., and G. J. Gibbs. Electrical accumulators. Oct. 30.

1901.

294. M. M. Blair. Galvanic cells or batteries. Nov. 13.

2853. G. W. Johnson.—From Société Paul Chapuy and Co., France. Electric batteries. Nov. 20.

12,974. A. F. Madden. Apparatus for making secondary battery plates. Nov. 6.

13,048. A. Tribelhorn. Electrodes for accumulators. Nov. 13.

15,816. R. M. Lloyd. Storage batteries, and alarms therefor. Nov. 13.

15,819. R. M. Lloyd. Storage batteries, and ventilation thereof. Nov. 13.

16,128. A. Tribelhorn. Electric accumulator batteries. Nov. 13.

16,187. A. Lessing. Cells of primary batteries. Oct. 23.

19,068. W. S. Henneberg and E. C. H. Pape. Process for electrolytically precipitating and simultaneously amalgamating metals. Nov. 20.

XII.—FATS, OILS, and SOAP.

Applications.

20,803. S. H. H. Barratt and The United Asbestos Company, Ltd. An improved waste oil purifier. Oct. 17.

21,229. J. B. Scammell and E. A. Muskett. Improved process for solidifying and toughening oils. Oct. 23.

Complete Specification Accepted.

1901.

19,186. J. Widmer. *See* Class XVII.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, Etc.

Applications.

20,878. C. L. Boiron and H. Bourdoin. Improvements in the manufacture of india-rubber goods or articles. Oct. 18.

20,789. C. L. Boiron and H. Bourdoin. New or improved process for the treatment of waste or old india-rubber material. Oct. 18.

20,889. L. Grote. An improved process of manufacture of a non-hygroscopic cohesive medium or cement for binding pigments or other pliant or mouldable substances. Oct. 18.

21,526. E. G. Bertrand. Improved paint or protective composition. Oct. 26.

21,546. B. J. B. Mills.—From International Chemical Company, United States. Pigment and process of manufacturing same. Complete Specification. Oct. 26.

21,914. T. A. Cunningham. New protective composition paint. Complete Specification. Oct. 31.

21,976. F. Ellershausen. Improvements in the manufacture of cadmium and zinc pigments from substances containing these metals. Oct. 31.

22,201. H. H. Lake.—From Vereinigte-Gummiwaaren-Fabriken Harburg-wein vormals Meiner J. N. Reithoffer, Germany. Improvements relating to the manufacture of rubber-sponge. Complete Specification. Nov. 4.

22,295. C. A. Luck and A. G. Luck. Improvements in bottles or pots for spirit varnish, knotting, or the like. Nov. 5.

22,758. A. Combanaire and J. de la Fresnaye. Improved process and apparatus for the purification of gutta-percha. Complete Specification. Nov. 11.

23,228. J. C. Roberts. An improved composition or compound for use as cement, paint, or enamel. Nov. 16.

Complete Specification Accepted.

1900.

21,061. W. Ward. Quick-drying liquid cement paint for the coating of bottoms of iron and steel vessels, and other submerged surfaces, for the prevention of corrosion and fouling. Nov. 20.

XIV.—TANNING, LEATHER, GLUE, and SIZE.

Applications.

20,535. E. J. A. Köster. Improvements in the production of chrome leather. Oct. 14.

21,863. M. Hönig. Improvements in the manufacture of tanning extracts. Complete Specification. Oct. 30.

22,062. W. H. Philippi. Improvements relating to the tanning of hides and skins. Nov. 1.

22,576. M. P. Hatschek. Improvements in the treatment of tanning liquors or extracts. Complete Specification. Nov. 8.

22,849. W. P. Thompson.—From A. Wünsch, the Firm of Herkommer und Bangerter, and the Firm of A. Oesinger Company, Germany. An improved chrome tanning process. Complete Specification. Nov. 12.

Complete Specifications Accepted.

1900.

20,612. C. Brandt. Process of quick tanning. Nov. 20.

1901.

19,542. R. Croasdale. Process for treating raw hide. Nov. 13.

XVI.—SUGAR, STARCH, and GUM, Etc.

Applications.

21,842. J. Robins. New or improved process and apparatus for cooling sugar-syrup. Oct. 30.

21,985. F. Hlavati. Improvements in the process of extracting sugar from beetroot and sugar-cane juices, and other fluids. Complete Specification. Oct. 31.

Complete Specifications Accepted.

1900.

18,958. M. Lambert. Crystallisation process, especially applicable for use in the manufacture of sugar. Oct. 30.

20,897. E. Casper. Centrifugal apparatus for treati raw sugar. Nov. 20.

20,898. E. Casper. Drums for drying sugar. Nov. 20

20,901. E. Casper. Apparatus for treating raw suga Nov. 20.

23,508. J. C. F. Lafeuille. Apparatus for the mouldi and centrifugal treatment of sugar. Nov. 20.

XVII.—BREWING, WINES, SPIRITS, Etc.

Applications.

20,490. B. T. Howard. Improvements in and connect with presses used in the manufacture of cider, perry, a the like. Oct. 14.

21,824. A. J. Boult.—From J. G. Dornig, Germany. new or improved manufacture of alcohol. Oct. 30.

22,116. C. E. Brunt. Improvements in the manufact of yeast. Nov. 2.

22,135. D. Wickham. Improved apparatus for simult neously cooling or chilling and gasifying beer and oth liquids or beverages. Nov. 2.

22,181. R. C. Wild. Improvements in the manufactu of opodeldoc or solidified spirit. Nov. 4.

22,928. F. Wrede. Process of and apparatus for co verting brewers' yeast into bakers' yeast. Nov. 13.

Complete Specifications Accepted.

1900.

20,855. B. M. Drake and J. M. Gorham. Apparatus f cleansing casks. Nov. 20.

1901.

377. A. Méyer. Vessels for mashing and fermenti purposes. Nov. 13.

931. B. Fischer. Apparatus to promote the germinati of malt. Nov. 20.

19,186. J. Widmer. Packing of solidified spirits, mine oils, or their products of distillation. Nov. 20.

XVIII.—FOODS, SANITATION, Etc., and DISINFECTANTS.

Applications.

A.—Foods.

21,717. G. G. Wolff. A new or improved food produ and process for manufacturing the same. Oct. 29.

21,737. J. H. Hooker. Substances from milk. Oct. 29

22,336. D. J. Edmonds and W. Weddel.—From D. R. Galbraith, New Zealand. Improvements relating to t treatment of milk, cream and butter. Nov. 5.

22,875. W. C. C. Pakes and W. H. Barnes. Apparat for sterilising milk or other liquids. Nov. 12.

23,141. L. N. Schlarb. Improvements in processes f curing meat. Complete Specification. Filed 15 No Date applied for 3 June 1901, being date of application i United States.

B.—Sanitation ; Water Purification.

21,316. R. Malabar. Improvements in and connecte with the purification of sewage, or other foul or impu liquids. Oct. 24.

21,746. J. E. C. I. Putzeys. Improved means of a apparatus for purifying water. Oct. 29.

21,856. W. P. Thompson.—From Maschinenbau Actie gesellschaft vormals Beck and Henkel, Germany. A improved process for treating the substances deposite from sewage water and the like. Oct. 30.

22,142. C. A. Day.—From Staubschutz Gesellschaft mit beschränkter Haftung, Germany. Improvements in the treatment of offals. Nov. 2.

22,151. A. J. Liversedge. Improvements in appliances for the destruction of refuse and the recovery of useful products therefrom. Nov. 4.

22,923. F. P. Candy. Improvements in apparatus for use in or in connection with the purification of sewage and polluted waters. Nov. 13.

C.—Disinfectants.

21,074. V. I. Feeny.—From La Société Anonyme des Etablissements Geneste Herscher et Cie., France. Apparatus for disinfection by the evaporation of solutions, such as formic aldehyde. Complete Specification. Oct. 21.

23,144. F. Reschke. An improved process for manufacturing an antiseptic. Nov. 15.

Complete Specifications Accepted.

A.—Foods.

1900.

22,761. J. A. Timmis. Manufacture of food. Nov. 20.

22,905. A. Pellerin. Manufacture of margarine. Oct. 30.

1901.

7326. F. C. Kullak. Preservation of foods and media therefor. Oct. 23.

B.—Sanitation ; Water Purification.

1900.

19,315. H. Peck. Destructor for human excreta. Oct. 30.

1901.

497. R. Orchard and C. E. Fox. Purification or sterilisation of water. Nov. 13.

C.—Disinfectants.

1901.

508. A. Straudh. Disinfectant compound known as "Lettubrin." Oct. 30.

XIX.—PAPER, PASTEBOARD, Etc.

Application.

22,662. J. N. Goldsmith and The British Xylonite Company, Ltd. Improvements relating to the manufacture of celluloid. Nov. 9.

Complete Specifications Accepted.

1901.

21,150. C. K. Graham and The British Uralite Co., Ltd., Manufacture of paper, cardboard, and the like, and apparatus or machinery therefor. Oct. 23.

23,379. D. N. Bertram and S. Milne. Strainers for treating pulp. Nov. 20.

1901.

17,624. F. C. Crean. *See* Class I.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

Applications.

20,550. G. W. Johnson.—From Kalle and Co., Germany. The manufacture and production of cinnamyl-quinine hydrochlorate. Oct. 14.

21,077. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. *See* Class IV.

21,295. J. Rother. A process for producing a powder from alsol sublimate, sozojodol, quicksilver, and veratrine. Complete Specification. Oct. 23.

21,635. G. W. Johnson.—From The Vereinigte Chininfabriken Zimmer and Co., Germany. The manufacture and production of carbonic acid ethers of the dicinchona alkaloids. Oct. 28.

21,758. O. Mierisch and O. Eberhard. Improvements in processes for making milk extracts resembling meat extracts. Complete Specification. Oct. 29.

21,768. F. J. Reichert and C. L. J. J. Heydemann. A method and apparatus for the preparation of an extract of coffee. Oct. 29.

21,838. A. C. McLaughlin. Improvement in the process of making ichthyol sulfonate of ammonium. Oct. 30.

Complete Specifications Accepted.

1900

22,214. G. B. Ellis.—From Société Chimique des Usines du Rhône (anciennement G. P. Monnet et Cartier, France. *See* Class IV.

22,328. W. L. Wise.—From Knoll and Co., Germany. *See* Class IV.

22,887. B. Willcox.—From The Badische Anilin und Soda Fabrik, Germany. Oxidation of aromatic hydrocarbons and their derivatives. Nov. 20.

23,507. O. Imray.—From The Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of neutral soluble silver compounds. Nov. 20.

XXI.—PHOTOGRAPHY.

Applications

21,154. J. W. T. Cadett. Improvements in machinery for coating photographic papers and films with emulsion. Oct. 22.

21,245. W. A. C. Selke. An improved process of photosculpture. Complete Specification. Oct. 23.

22,390. W. N. L. Davidson. Improvements in cinematograph apparatus for production of pictures in natural colours. Nov. 6.

22,727. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in the manufacture or production of photographic plates and papers. Nov. 11.

Complete Specification Accepted.

1901.

14,510. L. Drefus. Method of photography, and apparatus therefor. Oct. 23.

XXII.—EXPLOSIVES, MATCHES, Etc

Applications.

20,755. J. Führer. An improved safety detonating composition as a substitute for preparations of fulminate of mercury. Complete Specification. Oct. 16.

21,517. W. Frost. Machines for dipping and heading matches. Oct. 26.

21,621. Safety Explosives, Ltd., and H. A. Thiersch. Improvements in explosives. Oct. 28.

21,660. W. J. Sollas. Composite safety match. Oct. 29.

21,708. M. Buckmaster. An improved powder. Oct. 29.

22,965. A. T. Cocking and Kynoch, Ltd. Improvements in and relating to explosives. Nov. 13.

22,966. A. T. Cocking and Kynoch, Ltd. Improvements in and relating to explosives. Nov. 13.

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1900.

19,216. A. J. Fredrikson. Wax matches, and machinery for manufacturing the same. Oct. 30.

19,773. C. H. Curtis and G. G. André. Manufacture of gunpowder. Oct. 23.

20,799. R. Kändler. Process for the manufacture of a safety explosive resembling dynamite. Oct. 30.

1901.

984. C. H. Curtis, C. L. Watson Smith, D. J. Metcalfe, A. C. Pearey, and A. F. Hargreaves. Explosives. Nov. 6.

16,509. H. H. Lake.—From F. C. Dininny, jun., United States. Match-making machinery. Nov. 20.

PATENTS UNCLASSIFIABLE.

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1900.

18,188. P. Naef. Treatment of solid material with gas, especially applicable for catalytical reactions. Nov. 20.

18,191. P. Naef. Treatment of solid material with gas, especially applicable to catalytical reactions. Nov. 20.

1901.

14,420. J. Philipps, H. Lebel, and R. Grimoin-Sanson. Fabric or material. Oct. 30.

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THE JOURNAL

OF THE

Society of Chemical Industry.

A MONTHLY RECORD

FOR ALL INTERESTED IN CHEMICAL MANUFACTURES.

[o. 12.—Vol. XX.]

DECEMBER 31, 1901.

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Thursday, Feb. 27th, 1902:—
Mr. Wilton P. Rix. "Preparation and Behaviour of Insolub Frits for Pottery Glazes."

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e, the undersigned Members of the Society of Chemical Industry, hereby propose
(Candidate's Name in full) ....
as a fit and proper person to become a Member of the Society.
r Names only of Members recommending the Candidate. } ....
....
d I, the said Candidate for Membership, hereby declare that if elected I will do my best to support the Society, and will observe its Bye-laws.
gnature of Candidate..
ddress to which the Candidate wishes the Society's publications to be sent, and which is to be entered in the Society's Register. } ....
....
rofession or Business Occupation ....
ate..............................

(*Extract from Bye-laws—Rules* 27, 29, *and* 30.)

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THE JOURNAL OF THE SOCIETY.

In order that members may be supplied with information t as early a date as possible, the Council has ordered that e Journal shall be issued twice a month, commencing anuary 1902, and that it shall contain abstracts of French d United States, as well as British, patents.

SUBSCRIPTIONS FOR 1902.

Members are reminded that the subscription of 25*s.* r 1902, payable on January 1st next, should be sent in ood time to the Hon. Treasurer (Mr. Samuel Hall), in rder to ensure continuity in the receipt of the Society's ournal. Any changes of address to appear in the new ist of Members now in course of preparation should reach e General Secretary not later than January 15th, 1902.

CHANGES OF ADDRESS.

When notifying new addresses, members are requested to rite them distinctly, and state whether they are temporary r permanent. Multiplication of addresses is also to be voided as tending to create confusion. When sending bscriptions, the use of the form attached to the application elps in the verification of addresses, on which the safe elivery of the Journal depends.

COMMUNICATIONS.

Authors of communications read before the Society, or any of its Local Sections, are requested to take notice that under Rule 43 of the Bye-laws the Society has the right of priority of publication for three months of all such papers. Infringement of this Bye-law renders papers liable to be rejected by the Publication Committee, or ordered to be abstracted for the Journal, in which case no reprints can be furnished to the author.

ARSENIC COMMITTEE.

The Joint Committee of the Society of Chemical Industry and the Society of Public Analysts will present their report at the meeting of the London Section on January 6, 1902, and at the next meeting of the Society of Public Analysts.

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Meeting held on Monday, December 2nd, 1901.

MR. OTTO HEHNER IN THE CHAIR.

THE LEMON OIL INDUSTRY.

BY HERBERT E. BURGESS, F.C.S., AND J. F. CHILD.

After giving an account of the early history and uses the lemon, the authors went on to say:—

The two principal lemon-growing districts now are Sici and the Riviera, but the Tyrol, Spain, Portugal, and th countries on the south coast of the Mediterranean al supply a very considerable quantity of the fruit.

The climate for the cultivation of the lemon should moist and sheltered, and the soil naturally drained. Th cultivated trees of Sicily demand such an amount of moi ture as can be obtained only at the mountain slopes, and th structure of the mountains is peculiarly favourable to th end. The loose stones of which they are mostly compos absorb the rain water through their innumerable pores an fissures, and afterwards allow it to swell forth in sprin lower down. In this way the irrigation, which is absolute indispensable for the members of the citron tribe during th dry season, is obtained.

The whole north and east coast, from the Bay of Castel round by Messina to Avola, is an almost endless successi of orchards. In the interior of Sicily, practically no lemo or, indeed, other trees are cultivated.

A young lemon tree will begin bearing when five yea old, and will then produce about 200 lemons. When 15 20 years old it will average 1,000 fruit a year, and full grown tree will produce from 3,000 to 5,000. A lemo tree can be made to flower early by suitable irrigation, an so bear fruit (the summer crop), which is nearly a exported, and fetches high prices, but it is said, however, be detrimental to the tree, and not to be indulged in to many times in succession, the trees being allowed to tak their natural course, and to produce fruit ripening December.

The cultivation of the lemon and production of it essential oil is probably the chief revenue-bearing industr of Sicily. In compiling their commercial statistics th Italian Board of Trade do not specify the lemons separatel from the oranges, and there is no reliable information as alue of the industry from the exports, but the extent ie industry in Sicily may be gathered from the statistics ie export from the two principal towns, viz., Palermo Messina.

alermo exported, in 1899, oranges and lemons, 56,853,720 . Out of this amount there were imported to the ed Kingdom, 11,018,470 kilos. In 1898 Palermo orted 51,759 kilos. of essential oils, and in 1899, 72,620, ncrease of 40 per cent. In 1899, of raw lemon juice, 520 kilos.; citrate of lime, 301,380 kilos. Messina orted, 1899, oranges and lemons, 59,809,682 kilos.; of ntial oils, 363,312 kilos.; citric acid, 111,070 kilos.; te of lime, 1,060,000 kilos.; concentrated lemon juice, 7,719 kilos. Catina exported, in 1899, 53,451 tons of ges and lemons, valued at £250,316.

lthough Sicily and the Riviera are the chief producing icts of the lemon, there is apparently no good reason our own colonies should not encourage the cultivation is fruit. Australia has for many years supplied its requirements in oranges and lemons. The lemon tree also been cultivated in New South Wales, Paramatta, ida, California, and Jamaica, with varying success. James Neish, in an article in the Journal of the aica Agricultural Society, July 1901, in speaking of partial failure to grow lemons in that island, says: ere is no reason why this discouraging episode should r others from a similar attempt if carried out on better , and, in point of fact, the cultivation of lemons has recently attempted in the island, but on a smaller than at first." There are to be seen, in the galleries ie Imperial Institute, samples of lemon, Seville orange Tangerine orange oils, which have been actually essed in Trinidad, Dominica, and Jamaica. The t Indies supply us with the majority of limes and oil. Why should they not supply us in like manner lemons?

he extraction of the oil from the fruit differs from the l method pertaining to essential oils, inasmuch as the rity of such oils are obtained by distillation processes; of lemon oil is made almost exclusively by expressing rind of the nearly ripe fruit. There are two methods ted for this purpose. First, the scorzetta, in which the ons are cut in halves, and then pulped by girls with the of a peculiar scoop. An experienced worker, by rapid s of the spoon ejects the pulp from the rind, at the rate 4 halves per minute. After the lemons are pulped, the is allowed to soak in water from 2—4 hours. This of the process is of great importance, as, in the ing, the rind absorbs water, and becomes tough and le—a characteristic of great importance to the rind-ser. The halves are then passed on to men who do pressing. They pick them up, one at a time, with the t hand, and let the half lemon-rind fit the fingers like a gently pressing it against a sponge held in the left d. The sponge, when saturated, is squeezed into an hen vessel, and the water allowed to separate from the The oil so obtained is filtered, and put into large er bottles, ready for exportation. The only difference he other process, viz., the taglio-in-tre, is that the lemon ut into three longitudinal pieces in such a way that e is practically no acid pulp left in the rind. The ess of expression is the same as in the scorzetta pro-. Of recent years a machine has been introduced into c factories, but the general opinion is that the hand-ressed oil is cheaper and better in all respects, and for this on several firms who had introduced the machines their factories are stated to be now abandoning them manual labour. This machine must not be confused the Bergamot one, which is practically a grinding mill taking off the outside rind and so breaking the oil cles, but is one which carries out the Scorzetta process, requires only two girls to work it. It is possible that ome of our colonies, where the expense of male labour ht be a drawback to the profitable manufacture of this such a machine would solve the difficulty, although in ly, where men's labour is so cheap, the use of the hine offers no advantage.

s regards the yield of oil, 110 kilos., or, say, about lemons will yield from 14—16 ounces. A man working by the Scorzetta process will cut 12,000 lemons a day, and his companion will press 3,000, and for this work they will each get $2\frac{1}{2}$ lires *per diem*, equal in our money to 1s. 10*d*.

Constituents of the Oil.—Up to the present time the following substances have been reported to be present in oil of lemon:—Pinene, phellandrene, limonene, citral, octyl and nonyl aldehydes, geranyl acetate, geraniol, methyl anthranilate, citronellal, citraptene, and a resin.

Limonene, citral, geranyl acetate, geraniol, and citronellal are all well-known substances, and their chemical and physical constants can be found in most text books, but we would draw attention to the aldehydes, nonyl and octyl—as these have only quite recently been shown to be present by one of us—*see* "Proceedings of the Chemical Society," 1901, No. 240. These aldehydes, though present in very small quantities, play, in our opinion, a most important part in the aroma of this oil. The crystalline body, and a detailed account of how it is obtained, can also be seen in the "Proceedings of the Chemical Society," 1901, No. 240. Although a similar substance has been obtained by Crismer, yet the interesting feature about it is its method of isolation by means of acetone.

Quite recently we have been able to prove the presence of the terpene, lævo-pinene, also another terpene which we have not yet been able to identify, owing to the very small quantity. We are still working on the subject. The pinene had the following constants:—Boiling point, 154° C. at 752 mm.; sp. gr., 0·859 at 15° C.; rotation, − 7° 30′; refractive index, 1·4678, at 15·5° C.; nitrosochloride, m. pt., 100° C.: hydrochloride, m. pt., 124° C.; although the rotation and gravity of these are not what are generally given for pinene, owing to the smallness of quantity we were unable to purify it any further, but we think the very characteristic hydrochloride is quite sufficient to prove the identity of this terpene with pinene.

Had it not been for Dr. Young's pear-shaped dephlegmator with 12 bulbs, possibly this would never have been isolated. The fractionation from an ordinary distillation flask is quite useless. Messrs. Schimmel have been unable to find any pinene in oil of lemon, even on fractionating large quantities, but to be quite certain that this pinene did not get into the oil by illegitimate means, we carefully fractionated some oil that one of us actually saw pressed in Palermo, and we were able to identify this same terpene, so that pinene is apparently a natural constituent of the oil.

The resin was obtained by dissolving the residue, left after the distillation of lemon oil, in hot acetone, which has the property of taking up the resin as well as other matters in the oil, but on cooling the resin is thrown out as an amorphous powder while the other substances remain dissolved. One or two treatments of this kind will produce a fairly clean sample. So prepared, it gives a melting point of 64°—67° C. Of the many substances that have been said to be present in oil of lemon, we have been unable to confirm citronellal and phellandrene.

Examination of the Oil.—For the examination of lemon oil as to its genuineness, the determination of its specific gravity, optical rotation, and citral content, combined with the rotation after distilling the first 10 per cent., are usually considered sufficient, but we have found that these determinations alone are by no means adequate to detect adulteration, as we shall endeavour to show later.

The specific gravity given in most text books, including the British Pharmacopœia, is 0·857—0·860 at 15° C., but in our opinion, 0·857 is too high. We should suggest 0·856—0·859, as 0·860 is seldomed obtained, 0·856 being quite an ordinary gravity for an undoubtedly genuine oil. The gravity varies according to the season when the fruit is pressed, and is always found to be higher late in the season than in the earlier part. An explanation of this may be that as the lemons are left on the tree to ripen, they lose part of their terpenes. The flavoured portion remains in the lemon, and being less volatile and of considerably higher gravity than the terpenes, increases the gravity of the oil.

Mr. Jacob, German consul at Messina, says, "I had hitherto always found that the gravity of this essence varies from 0·857 to 0·86., the last named figure not being very frequent. I find that all lemon oil of last season had a very low specific gravity, and that the gravity of 29 samples varies from 0·8536 to 0·8588, and does not exceed the last-named figure." Messrs. Fratelli de Pasquale and Co. state: "All the lemon oils we have ever examined have always given us a specific gravity under 0·858, 0·8575—0·8577 being the normal. We have never examined or heard of any oil having 0·860, and we are sure no regular lemon oil has ever existed giving the said character, and this year's crop especially was of high rotation, and of a low specific gravity." Undoubtedly this season's oil has been of a lower gravity than previously.

Optical Rotation.—The rotation was taken in a tube 100 mm. long, by means of a polarimeter employing the sodium light. A variation of temperature between 15° and 20° makes only a slight difference, and for all practical purposes may be ignored. We have found that a range of a_D + 58° to + 63° is quite compatible with a genuine oil. At the earlier part of the season an oil may have a rotation of 68°, but, of course, such an oil is not usually met with on the market, as it would all be bulked with oil of a lower rotation. The rotation also varies considerably for the district in which the fruit is grown.

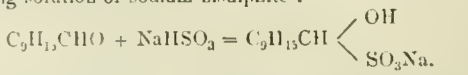
Refractive Index.—We have found a determination of the refractive index to be of considerable value in the examination of this oil, as in many others. Much has been said and written about the worthlessness of such a constant in essential oil analysis. This may be true of some oils, but it by no means bears out our experience in the case of lemon oil. Where one has a range of 1·4733 to 1·4830, or say 7 in the third place of decimals, and where 90 per cent. of the oil has a low refractive index, and the other 10 per cent., a very high one, we maintain, and have found, it to be a very useful constant. There is one important reason why probably the refractive index has not found favour and use among workers in essential oils, viz., that the temperature at which the observations have been made has in many cases not been recorded, and so a comparison is impossible. We at first found this a serious drawback. Another reason has been the difficulty of getting a suitable instrument which is quick and reliable. The difficulty and tediousness of determinations by the hollow prism method are well known. After trying many instruments, we have found the Abbé Refractometer the most suitable for this kind of work.

With regard to the rotation of the first 10 per cent. distillate, the British Pharmacopœia, 1898, directs that "if 100 volumes be fractionally distilled, the 10 volumes first collected should not produce a rotation differing by more than two degrees from that produced by the original oil." This is, in our opinion, incorrect and absolutely worthless, as all oils of undoubted purity give a greater difference than two degrees. This we have proved conclusively, both in the laboratory and on a manufacturing scale. We quite recognise that the rate of distillation, length of distilling head, and temperature of the distilling bath play an important part in the nature of the distillate.

Citral Content.—The next determination, that of citral, is in some respects the most important, and at the same time the most difficult. The strength (not flavour) of lemon oil is in a large measure due to the amount of citral present; but the fineness of aroma is due to the alcohols and esters present, and, as we have previously stated, to the other two aldehydes.

There are three methods generally employed, viz.:—

(1) By the addition compound formed on shaking with a strong solution of sodium bisulphite:—

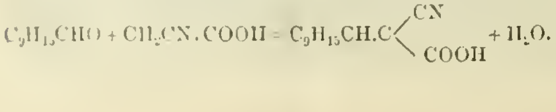


$$C_9H_{15}CHO + NaHSO_3 = C_9H_{15}CH\begin{cases}OH\\SO_3Na.\end{cases}$$

(2) By the formation of an oxime with hydroxylamine in alcoholic solution and estimation of the amount used by titration of the unused hydroxylamine:—

$$C_9H_{15}CHO + H_2NOH = C_9H_{15}CH:NOH + H_2O.$$

(3) By the condensation compound formed with cyanacetic acid in alkaline solution:—



$$C_9H_{15}CHO + CH_2CN.COOH = C_9H_{15}CH.C\begin{cases}CN\\COOH\end{cases} + H_2O.$$

(4) By the formation of a soluble sulphonic acid sodium-sulphite, using phenolphthaleïn as an indicator:

$$C_9H_{15}CHO + 2\ Na_2SO_3 + 2\ OH_2$$
$$= C_9H_{17}(NaSO_3)_2COH + 2\ NaOH.$$

(1) *The Sodium Bisulphite Method*, as directed in books, is not to be recommended, and a strongly solution should be avoided. A 40 per cent. solution sodium metabisulphite is most convenient. The metho as follows:—To 25 c.c. of lemon oil add 75 c.c. of 40 cent. sodium metabisulphite solution and 25 c.c. of sod sulphite (made by exactly neutralising the sodium bi phite solution with a 10 per cent. solution of sod hydrate) in a suitable flask. (*The Analyst*, August 19 The temperature is then raised to about 70° C., and solution thoroughly shaken for one hour. We find that addition of sodium sulphite is indispensable, owing to fact that it forms a soluble sulphonic acid compo and a clear meniscus is thus obtained. The oil is raised into the measuring burette, and the diminutio volume gives the amount of total aldehydes. A correc must be made for the solubility of the terpenes in solut We subtract from the reading 0·35 c.c., but recomm each worker to determine this correction for himself.

This method may also be used for solutions contai high percentages of citral, but using from 5 to 20 c.c., measuring in a Hirschsohn flask or modification of it.

(2) *Hydroxylamine Method.*—A freshly prepared a holic solution of hydroxylamine hydrochloride is u containing one gram of hydroxylamine-hydrochloride 20 grms. of 80 per cent. alcohol. 10—12 c.c. of solution are diluted to 250 c.c., and 25—50 c.c. are titr for hydroxylamine in the usual manner, with N/10 sod hydrate solution, using first methyl orange and t phenolphthaleïn as indicators.

A second equal amount of the strong hydroxylam hydrochloride solution is mixed with a weighed quantit lemon oil, and diluted with absolute alcohol until a c solution is obtained. After the addition of 0·5 grm sodium bicarbonate, the mixture is introduced into a 150 flask and heated on the water-bath for 45 minutes und reflux condenser. After cooling, the product is washed a 250 c.c. flask with distilled water, care being ta to wash out the condenser as well as the flask. A thoroughly shaking out, the watery layer is adjusted 250 c.c., and 25 c.c. pipetted off. For a determination the unused hydroxylamine in this, one drop of met orange is added and then diluted hydrochloric acid cautiously run in from a burette until a faint rose colou developed. The colour is then titrated back with N sodium hydrate solution, phenolphthaleïn added, and titra continued until the development of a rose colour. difference between the blank and the experiment will be amount of hydroxylamine used, and the percentage may calculated by the following formula:—$C = \frac{1{\cdot}52 \times A}{G}$, wh C = the percentage of aldehyde, A = number of c.c. N/10 sodium hydrate solution used, and G = weight of taken. This is, in our opinion, an excellent method if only knows the approximate percentage of citral pres If known, the correct quantity of hydroxylamine and sodi bicarbonate can be added, when good results may obtained. The method as we have described it ab gives good results with lemon oils.

(3) The procedure in this case, as suggested by Pa is as follows:—200 c.c. of the oil are concentrated to 25 in a Wurtz flask under a pressure which should not exc 15 mm. The 175 c.c. of terpenes contain a little citral, the quantity is so small that it may be neglected. 10 c.c the residue, of which the specific gravity is known, shaken with a solution of 5 grms. cyanacetic acid 5 grms. ordinary KOH in 30 c.c. water in a small absorpt flask with a long graduated neck, and the non-absor residue read off as usual. (The specific gravity of citra so near that of the concentrated oil used that it may taken as identical.) In our opinion this method is pr tically useless, as it is impossible to read the menis owing to resinous and slimy matter. Messrs. Schim have pointed out this same difficulty. We have found th

the residual oil be steam-distilled, it is possible to get a irly clean meniscus, and it might be worth while for yone wishing to use this method to adopt our suggestion. nyhow, it is a long and tedious process, and we fail to see y advantage in it. The readings are invariably too high, d this is not surprising when commercial citral, contain- g 84 per cent. of aldehyde, gives 100 per cent. by this ethod. Another obvious disadvantage is having to use a ncentrated solution.

(4) Professor Tiemann, in his elaborate work on the lehydes of lemon-grass oils has, among other important actions, shown that if citral be agitated with a neutral lution of sodium sulphite, a sodium salt of the sulphonic id results, as shown by the above formula. By taking vantage of the sodium hydrate formed by this reaction, have used phenolphthaleïn as an indicator to show when the citral has been combined; and the fact that the ove sodium salt is quite soluble, has, in our opinion, made e estimation of citral both accurate and simple. The ethod we have adopted is as follows:—A saturated lution of sodium sulphite is prepared, and, if acid, is utralised with a solution of sodium hydrate until a faint nk colour is permanently maintained with phenolphthaleïn. 50 c.c. of such solution 25 c.c. of the oil are added, and o drops of an alcoholic solution of phenolphthaleïn. e whole is then heated on a water-bath to nearly boiling int, constantly shaking. A deep red colour almost at ce appears, which shows that the action has commenced. few drops of sulphurous acid are then cautiously added, d this is continued until no further colour is produced ter a further addition of SO_2. The oil is then measured described in the first method. The obvious advantage this method is that the end of the reaction may be certained to a certainty, while the above bisulphite method pends on the continual shaking for a period of not less e hour.

Table 1 shows a comparison of these various methods.

TABLE 1.

Showing Comparison of the Four Methods for Determination of Citral.

Nominal Percentage of Citral in Lemon Terpenes.	Sodium Bi- and Mono-sulphite. I.	Hydroxylamine. II.	Cyanacetic Acid. III.	Sodium Sulphite. IV.
2·5	2·2 (2·1)	2·6 (2·4)	..	2·2 (2·1)
5·0	4·4 (4·2)	5·0 (4·8)	..	4·0 (4·2)
7·5	6·5 (6·3)	7·1 (7·2)	..	6·4 (6·3)
10·0	8·6 (8·6)	9·6 (9·6)	..	8·4 (8·6)
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
ommercial citral.......	84	..	100	84
erpeneless lemon oil ...	46·5	46·6	62	45·5
emon-grass oil.........	75	..	97	75

The figures in brackets show the calculated citral present.

Our conclusions with regard to these various processes re that the bisulphite with sulphite (No. 1) and the ulphite (No. 4) are the two most reliable, and give almost eoretical results if carried out on the lines we have ggested.

The percentage of citral in lemon oil is certainly not —8 per cent., but much nearer 4 per cent. We have hown elsewhere that 7—8 per cent. is a highly improb- bie figure, and our latest investigations confirm our pinion. Still, if a genuine oil, having a gravity of 0·860, an be obtained, then 7—8 per cent. would be quite reason- ble, but such oils are not easily obtainable, though a small uantity of such oil was recently submitted to us, which did ontain 7·4 per cent. of citral.

Adulteration.—The following are the chief adulterants:— emon terpenes, turpentine, lemon grass citral, and, less ommonly, distilled lemon oil, cedarwood oil, and stearin. he Italians are as great offenders in this direction as our wn merchants. In many cases a considerable amount of cientific knowledge is shown in the preparation of these ophisticated oils, and a great deal may be accomplished by means of a specific gravity balance and a polariscope. Of these adulterants the most frequent and the most difficult to detect are the lemon terpenes obtained during the manufacture of terpeneless oil.

A few figures that we obtained from the British Consul for Sicily and the German Consul at Messina will show to what a serious extent this adulteration goes on at the actual centres of production. There were imported into Palermo, of turpentine:—

——	1900.	First half of 1901.
	Kilos.	Kilos.
United Kingdom	505,000	..
France	70,000	30,000
Russia.................................	132,000	80,000

Messina imported lemon- and orange-oil terpenes, in 1900, 843 kilos from England and 4,205 kilos. from Germany; as well as 4,982 kilos. of French and 25,064 kilos. of American turpentine.

Besides the quantity of terpenes imported, there are in Sicily annually worked up into terpeneless oil about 4,000 lb. of lemon oil. This would give about another 3,600 lb. of terpenes.

These figures show that Sicily uses about 15,745 lb. of terpenes and 605,101 lb. of turpentine yearly.

We have been unable to make any comparison between the amount of turpentine used in Sicily and other purely agricultural islands, like the Isle of Wight, but this enormous importation of turpentine is very suspicious, because there exists no legitimate purpose for which it can be used in the quantities imported. It cannot be employed in manufactures, because there are none in Sicily, and it cannot be used in any art, unless it be the art of adulteration. The large quantity of terpenes also imported into Sicily is more suspicious still, because for this there exists no reason whatever, save a dishonest one; there being no purpose for which it can be used other than that of sending it back to this country, plus a small amount of new oil.

Of these adulterants, the lemon terpenes are the most difficult to detect, chiefly for the reason that natural oil consists of about 90 per cent. of such, and so a considerable amount may be added without altering the constants of an oil to any appreciable extent. Turpentine is still used, but not to so large an extent as formerly. It may easily be detected on distilling and examining the rotatory power of the first 10 per cent. of distillate, which would have a much lower rotation than the original oil. Citral from lemon grass oil is a very common adulterant, and is always added to bring up the strength of an oil adulterated with terpenes. Even the purest commercial citral has a distinct and unpleasant smell, resembling lemon grass oil. Stearin is alleged to be used for increasing the gravity of an oil. We have never found any oil so adulterated, and should think it highly improbable that such adulteration is practised. Distilled lemon oil would have practically the same effect as the addition of terpenes.

A Scheme for the Examination of Lemon Oil:—

(1) Determination of the sp. gr. at 15° C.
(2) " " opt. rot. in 100 mm. tube.
(3) " " ref. index at 20° C.
(4) " " citral content, 25 c.c. (total aldehydes).
(5) Fractional distillation.

The following is the method of distillation we adopt, and, if carried out carefully, will show any adulteration.

One hundred c.c. of the oil to be examined are put into a distilling flask having three bulbs blown in the neck, and fitted with cork and thermometer. This is connected up to a condenser with a suitable receiver having two vessels graduated at 10 c.c. and 80 c.c. A Brühl's apparatus answers the purpose very well. The whole is exhausted, and a pressure of not more than 15 mm. should be obtained. The flask is then gently heated by means of an oil bath. The first 10 c.c. should not take less than seven minutes to distil. The next vessel is put into position, and the distillation continued until 80 c.c. have distilled over. The pressure is then relieved, and the residual oil in the flask is distilled over with steam. The quantity so obtained should be carefully noted. The three fractions are examined by the polariscope and refractometer. (NOTE.—We have used the Zeiss form of instrument for this purpose, as being one that most analytical chemists have, and a comparison of results is thus facilitated.)

The following is a typical distillation :—

No. of c.c.	Time of distilling.	Pressure.	Boiling Point.	Rotation α_D	Zeiss at 20° C.
	Mins.	mm.			
10	7	14	64	+ 55° 30′	72·0
80	36	13	71	+ 70° 40′	72·4
7·5	..	..	..	+ 10° 56′	82·5

Table 2 gives the results of five pure oils by this method

TABLE 2.

A Comparison of various Types of Lemon Oil, all of undoubted Purity.

—	Particulars of Oils.	Physical Constants of Original Oils.	Distillation. No. of c.c.	Distillation. Rotation α_D in 100 mm. Tube.	Distillation. Zeiss Readings.	Citral content of 3rd fraction.
						Per Cent.
I.	Genuine oil of good quality. (Messina.)	Sp. gr. = 0·857	10	+ 55° 30′	72·0	42
		Rotation = + 63° 12′	80	+ 70° 49′	72·4	
		Ref. index = 1·4755	7·5	+ 10° 56′	82·5	
II.	Genuine oil (Palermo). Not typical.	Sp. gr. = 0·857	10	+ 54° 6′	72·2	35
		Rotation = + 61° 27′	80	+ 67° 45′	72·4	
		Ref. index = 1·4757	7·5	+ 19° 13′	81·5	
III.	Genuine oil of very high gravity.	Sp. gr. = 0·862	10	+ 50° 41′	72·0	64
		Rotation = + 58° 30′	80	+ 67° 16′	72·7	
		Ref. index = 1·4771	7·0	− 6° 0′	99·6	
IV.	Genuine oil of high gravity.	Sp. gr. = 0·860	10	+ 50° 6′	72·2	64
		Rotation = + 61° 36′	80	+ 68° 43′	72·6	
		Ref. index = 1·4769	7·0	− 3° 20′	88·6	
V.	Genuine oil, new crop, 1901.	Sp. gr. = 0·858	10	+ 51° 47′	71·8	40
		Rotation = + 61° 28′	80	+ 69° 2′	72·3	
		Ref. index = 1·4754	7·0	+ 8° 14′	81·9	

100 c.c. of oil taken in each experiment.—Zeiss readings (Butyro-refractometer) corrected to 20° C.

No. 1 is a very typical oil of last season's pressing.

No. 2. An oil expressed in Palermo, and of undoubted purity, being pressed, coppered, and sealed in the presence of one of us (Child).

No. 5. A new oil of good quality and freshness.

No. 3 and 4. A genuine oil of very high quality, and only very exceptionally met with.

TABLE 3.

Showing Oils adulterated with Terpenes, Turpentine, and Citral

—	Particulars of Oils.	Physical Constants of Original Oil.	Distillation. No. of c.c.	Distillation. Rotation α_D in 100 mm. Tube.	Distillation. Zeiss Readings.	Citral content of 3rd fraction.
						Per Cent.
I.	Lemon oil, 90 per cent. Turpentine, 10 per cent.	Sp. gr. = 0·858	10	+ 45° 48′	69·6	34
		Rotation = + 57° 45′	80	+ 64° 56′	71·6	
		Ref. index = 1·4752	8·0	+ 18° 25′	81·2	
II.	Lemon oil, 90 per cent. Lemon terpenes, 10 per cent.	Sp. gr. = 0·856	10	+ 56° 21′	71·6	34
		Rotation = + 64° 2′	80	+ 71° 37′	72·1	
		Ref. index =	7·5	+ 18° 19′	81·2	
III.	Lemon oil, 80 per cent. Turpentine, 20 per cent.	Sp. gr. = 0·859	10	+ 40° 9′	68·1	32
		Rotation = + 53° 1′	80	+ 59° 5′	71·1	
		Ref. index = 1·4741	8·0	+ 22° 41′	81·0	
IV.	Lemon oil, 75 per cent. Terpenes, 23 per cent. Citral, 2 per cent.	Sp. gr. = 0·857	10	+ 53° 50′	71·9	52
		Rotation = + 62° 56′	80	+ 70° 30′	72·4	
		Ref. index = 1·4753	7·5	+ 13° 3′	83·6	
V.	Lemon oil, 50 per cent. Terpenes, 46 per cent. Citral, 2 per cent. Cedar wood oil, 2 per cent.	Sp. gr. = 0·856	10	+ 53° 24′	71·8	34
		Rotation = + 62° 5′	80	+ 70° 15′	72·5	
		Ref. index = 1·4753	7·5	+ 5° 12′	99·5	
VI.	Distilled oil.	Sp. gr. = 0·855	10	+ 58° 16′	72·1	9
		Rotation = + 63° 0′	80	+ 70° 10′	72·8	
		Ref. index = 1·4751	9·0	+ 15° 5′	89·1	

100 c.c. of oil taken in each experiment.—Zeiss readings (Butyro refractometer) corrected to 20° C.

Table 3 shows the effect of terpenes, turpentine, and citral. The oil used for making these mixtures is in each case No. 1 in Table 2.

No. 1 shows an increased gravity, which is always the case with oils adulterated with turpentine. The difference between original rotation and the first 10 per cent. is 12°, whereas in pure oils it should be from 7° to 8°.

The Zeiss number for the first fraction is about three lower than for a genuine oil, and the citral content of the third fraction shows 34 per cent. instead of 42 per cent.

No. 3. Similar differences are shown, but in a more rked degree.

No. 2 oil shows a rather high rotation, and the third ction at once points to addition of terpenes, the rotation ng high and the refractive index low. The citral ntent is also lower than that of a good oil.

No. 5. This oil has constants closely resembling that of atural oil, but the third fraction, which has a rotation + 5° 12′, shows on comparing it with a genuine oil, it whereas the Zeiss number should be 82·5, that of the alterated oil is 90·5, and, therefore, the rotation should *minus* not *plus* 5.

Terpeneless Oils of Lemon.—We do not propose to cuss the manufacture of terpeneless oils of lemon. We ll confine ourselves to the properties and examination such oils; but it will not be out of place to give some sons why these terpeneless oils have found such favour ong mineral water manufacturers of late years. First, non oil contains roughly 90 per cent. of terpenes; in the sence of fruit acids these readily oxidise, and soon velop a smell and taste of turpentine. This, of course, is serious objection to the use of natural oil, whereas, if se terpenes are removed, as in the case of terpeneless s, there is nothing to deteriorate or change. Second, most important advantage is its solubility, which has reased in a similar proportion to its concentration, say, m 12 to 20 times. This enables the mineral water ker to obtain a bright and clear drink instead of the muddy mixtures one often sees in waters prepared from natural oil. The relative yield of terpeneless oil is from 4 to 6 per cent., depending on the gravity of the natural oil used. The price should not be relatively higher, as the cost of manufacturing this article is, to a large extent, counterbalanced by the sale of the unused terpenes. These, as we have shown, find their way back to Sicily, and it is one of the worst worries of the works chemist to see that these identical terpenes, plus a small percentage of new oil, do not return to him as genuine oil of lemon. It is regrettable, in our opinion, that the Sicilian authorities do not see their way clear to prohibit the import of these terpenes, or impose a duty on them sufficient to make such adulteration unprofitable.

The failure of the Sicilian authorities to take measures to suppress these frauds is a danger to the essential oil trade of Sicily. Lemons are being cultivated in many of our colonies, and Sicily has no secure monopoly of the lemon trade.

For the examination of this class of oils a determination of the specific gravity, rotation, refractive index, aldehydic content and solubility, and in some cases, a determination of esters and alcohols after the removal of citral, is in most cases sufficient.

These constants are determined under the same conditions as in lemon oil.

On referring to Table 5, it will be seen that the specific gravity does not vary two in the third place of decimals, so that 895 to 899 may be safely given as the limits. In the third column is the optical rotation. This should not vary yond the limits of −5° to −8°·30′. A rotation of less an −5° would indicate the presence of terpenes. On the ner hand, a greater minus rotation would show that some the earlier and sweet-scented fractions have been left t. It is of great importance when considering this ctor that the next column be examined, as here will be und the refractive index which will indicate both the esence of terpenes and added citral in a clumsily ulterated oil. The limits for refractive index may be ven as 1·4810 to 1·4822.

TABLE 5.

Showing a Comparison of various Terpeneless Oils of Lemon.

o. of nple.	Specific Gravity at 15° C.	Optical Rotation α_D, 100 mm.	Refractive Index.	Per Cent. of Aldehydes.	Refractive Index of Non-aldehydes.	Rotation of Non-aldehydes.	Solubility Number.	Calculated Refractive Index of Aldehydes.	Remarks.
I.	0·897	− 8° 19′	1·4818	43	1·4781	− 14° 12′	5·8	1·4886	Genuine terpeneless oil.
II.	0·896	− 6° 28′	1·4816	46	1·4783	− 11° 35′	5·7	1·4854	Ditto.
II.	0·898	− 8° 6′	1·4812	47	1·4778	− 14° 40′	5·9	1·4850	Ditto.
IV.	0·897	− 7° 54′	1·4820	47	1·4790	− 13° 37′	6·0	1·4854	Ditto.
V.	0·897	− 4° 35′	1·4833	32	..	..	..	..	Oil made from an old lemon, oil adulterated with turpentine.
VI.	0·897	− 7° 30′	1·4807	59	1·4763	− 18° 19′	9·2	1·4837	Celebrated German make, best quality.
VII.	0·900	− 6° 24′	1·4816	65	1·4773	− 17° 0′	10·0	1·4837	Ditto second quality.
III.	0·897	− 1° 36′	1·4867	83	1·4819	..	13·3	1·4876	Commercial citral.
IX.	0·896	− 1° 20′	1·4836	80	1·4787	..	16·5	1·4848	So-called terpeneless lemon grass oil.
X.	0·898	− 4° 40	1·4820	58	1·4769	..	8·8	1·4839	An attempt to imitate No. VI.
Va.	0·897	− 5° 50′	1·4808	52	1·4776	..	7·8	1·4837	Terpeneless lemon oil used in No. X.
XI.	..	..	1·4860	90	..	..	21·2	..	Citral used in No. X.

Note.—All refractive indices corrected to 20° C.

The percentage of total aldehydes should not be greater an, say, 50 per cent., or less than 40 per cent., when termined by either the sulphite or a combination of sulphite and sulphite methods, Nos. 1 and 4, as eviously described. Anything above 50 per cent. would ggest addition of lemon grass citral.

The unabsorbed portion should always have a greater inus rotation than the original oil.

As regards solubility, the usual method of determining is, *i.e.*, by observing the solubility in alcohol of definite rength is of little practical value to the essence maker, no requires to know the quantity of the weakest spirit at will dissolve a given quantity of oil. To ascertain is we have adopted the following method:—

Take 1 c.c. of oil, to which add 20 c.c. of 94 per cent. alcohol. Distilled water is run in from a burette until a permanent milkiness ensues. The number of c.c. of water used is what we term the "solubility number."

We have added a column giving the calculated refractive index of the absorbed aldehydes. This is only of value to show when a so-called terpeneless oil is only a mixture of partly concentrated lemon oil and lemon grass citral. Idris has shown such adulteration to be quite common. ("Proceedings of the Pharmaceutical Conference," 1899.) Referring to No. 6 oil on the table, an oil prepared by a well-known German maker, it will be seen at once that the percentage of total aldehydes is something like 12 per cent. higher than generally pertains to oils of other makers. On the other hand, the calculated refractive index of the aldehydes shows a difference of 0·0013. No. 7, an oil by the same maker, but about 25 per cent. cheaper, contains 6 per cent. more aldehyde than the better quality oil. Undoubtedly this addition must be due to lemon grass citral, and yet the calculated refractive index of the aldehydes remains the same. We investigated this matter, and fractionated 500 c.c. of oil, No. 4 in Table 4., and found, by rejecting Nos. 1 and 11—15, we obtained an oil as shown by No. 4*a*, which gives a calculated refractive index the same as Nos. 6 and 7. No. 10 shows an oil, to every 100 c.c. of which 10 c.c. of citral have been added. This mixture conforms in a satisfactory manner with No. 6. In fact, with but slight alteration in the mixture of fractions for No. 4*a*, an exact imitation could be obtained.

TABLE 4.

Showing Fractionation of 500 c.c. *Terpeneless Oil of Lemon No.* 4.

Number.	Quantity in c.c.	Rotation an. 100 mm.	Refractive Index. [N]$_D$, 20° C.	Solubility No.	
I.	17	+ 12° 11′	1·4773	7·5	
II.	21	+ 11° 12′	1·4782	7·7	*
III.	32	+ 4° 24′	1·4790	7·9	*
IV.	32	− 1° 38′	1·4800	8·2	*
V.	32	− 5° 27′	1·4805	8·2	*
VI.	30	− 7° 6′	1·4809	8·2	*
VII.	28	− 8° 12′	1·4813	8·2	*
VIII.	16	− 9° 9′	1·4817	7·8	*
IX.	48	− 9° 43′	1·4819	7·4	*
X.	48	− 10° 41′	1·4820	7·1	*
XI.	30	− 11° 34′	1·4819	6·8	*
XII.	40	− 13° 4′	1·4817	6·4	
XIII.	32	− 15° 45′	1·4815	5·7	
XIV.	23	− 20° 22′	1·4815	4·9	
XV.	16	− 27° 30′	1·4828	4·1	

We have to express our thanks to the proprietors of the London Essence Co., in whose laboratories our investigations have been carried out, and to Mr. T. H. Page, B.Sc., our assistant, for valuable and careful analytical work in connection with this paper.

DISCUSSION.

Mr. E. J. PARRY said that he regarded the paper as especially interesting, inasmuch as it recorded not merely laboratory experiences, but a study of the oils in their native purity on the spot. To accept the facts put forward by the authors would be to upset a great many preconceived ideas on the subject of lemon oil. It seemed to him that a number of the authors' deductions from the analytical point of view had their origin in the fact that they had examined oils of abnormally low specific gravity. They considered 0·857 to 0·860 high, and perhaps it was so at the present; for, in a season like the present one, very few oils went above it, and the general average was so low that it was not safe to base any deductions on the examination of oils from 0·857 to 0·858. The gravities down to 0·853 of this year were strongly indicative of lemon terpenes, of which the production was much more than the figures in the paper indicated. He knew of five makers whose factories were in regular work, and another was about to start. In Sicily the terpene fetched as much as 2*s*. 6*d*. per pound when lemon oil was dear, or very nearly the price of the lemon oil; and in addition to being re-imported to England, it was used as an adulterant of bergamot oil. Then the maximum figure of 0·858, only represented this year's samples and must not be noticed seriously. He had repeatedly examined samples of Messrs. Fratelli de Pasquali's oils with gravities of 0·860 to 0·862. Consequently, the authors' statement that they had never seen an oil of over 0·858 was inexplicable. Schimmel (2) gave as the average gravity 0·857 to 0·863. Of course the latter figure was but rarely met with, but oils of 0·861 were, in normal years, common in the market. The standard of the British Pharmacopœia was clearly absurd, because one met with pure samples, having a difference figure, for the rotation, of 4 to 5. The authors had passed over the fact that Crismer had isolated the crystalline body referred to, and Dr. Schmidt had examined it and identified it with Tilden's limettine. Neither did they make any mention of linalyl acetate, nor to the previous discovery of pinene by Tilden, who had shown that it was present in this oil. Schimmel had experimented and found only 0·016 per cent. distilling below 170°, and this had none of the characters of pinene; therefore, either Tilden's sample was adulterated or Schimmel had failed to discover a body conclusively proved to be present. It seemed hardly possible that in fractionating 50 kilos. they could pass over more than the merest trace of pinene: was pinene, therefore, a regular or only an occasional constituent of the oil? He took it that the crystalline body that the authors had prepared was clear evidence of its presence. The important point was the estimation of citral in the oil. The cyanacetic acid method to which reference has been made was due to Tiemann. It gave a very cloudy reading, but if an accurate estimation was required, he contended that after steam distillation this method was the most correct. It seemed to have escaped the authors' notice that one could not completely extract citral by bisulphite of sodium except with great difficulty. Tiemann pointed out that it required three shakings before one could get the last traces out. In a special sample of lemon grass oil the cyanacetic method left 18 per cent. of non-absorbable residue, but not a trace of citral. By the ordinary bisulphite method he only absorbed 76 per cent., which contained a large quantity of citral. In the case of lemon oil with only 6 per cent. it would be much more difficult to take out the last traces; indeed Tiemann's method showed that one could not easily get it out with bisulphite of soda. With regard to the refractive index, as the authors had pointed out, much adverse criticism had been passed on it. One point to be observed was that one could get no further information by it than by the polarimeter; and a polarimetric examination would give far safer indications to work on. The authors' last point was the terpeneless oil of lemon. The inference that he drew from that table was that the special sample, of German make, was not a genuine terpeneless oil, but was one with added citral. He had known a sample of this oil contain 62 per cent. of citral as against 59, and had personally prepared samples with 60 per cent. He, therefore, could not accept the authors' statement as to the amount of citral in terpeneless oil of lemon.

Mr. A. C. CHAPMAN said that chemists who worked in the laboratories of essential oil factories on large quantities of material, as the authors had, were at an advantage as compared with chemists working in other laboratories, as they could isolate and establish the identity of compounds, which would be impossible when working on a smaller scale. The authors of this paper had taken full advantage of their opportunities in this respect as they had recognised two new compounds and had further established the existence of pinene in certain samples. The aldehydes of which they had spoken were especially interesting, because they added two to the comparatively short list of fatty compounds known to exist in essential oils. With regard to pinene, its existence was affirmed years ago, then denied, and it was now conclusively proved by the authors to exist in certain samples at least. The sample of mixed aldehydes which was passed round had a strong lemon smell. Had the authors had an opportunity of comparing it with samples of the synthetic aldehydes? Then, these bodies underwent, as was well known, rapid transformation when exposed to the air, and he would like to know whether there had been any failure to obtain them from old samples of oil. Also what influence the acids formed by their oxidation had on the flavour and smell of the oil. The authors had brought a somewhat scathing indictment against the Italians in general and the Sicilians in particular, in regard to immorality in their dealings with lemon oil. Their position was, he thought, a somewhat peculiar one. The essential oil distiller was, in fact, the manufacturer of the very product he most feared as an adulterant, and Mr. Burgess had pointed out that the cost of the terpeneless oil need not be relatively more than the cost of the original oil, because of the value of these terpene by-products. The terpeneless oil makers were, therefore, in the position of being the suppliers of the adulterant they most feared, and they sold it apparently in the hope that their own chemists would be clever enough to prevent its return to their own works masquerading as lemon oil. The only proper course was to get rid of this product altogether, and thus remove much responsibility from the shoulders of their own chemists and much temptation from the path of the "guileless Sicilian." The apparatus referred to had been devised by Mr. Burgess and himself, not with reference to any particular method of estimating citral, but to confer greater accuracy on absorption processes in general. If the sulphite method had any value, then by using this piece of apparatus, a uch greater degree of accuracy could be obtained. And hat brought him to a point which had been raised by Mr. Parry. He had said that the citral could not be xtracted unless the solution had three or four shakings, nd with this he quite agreed, but with the Hirschsohn ask the proper amount of shaking could not be given, hilst with this apparatus it could. He was glad to hear Mr. Parry say that he considered 8 per cent. of citral in emon oil too high; but he must dissent from one of his emarks, namely, the alleged inability of the sodium isulphite method to give good results. Mr. Burgess and imself had independently prepared solutions of pure itral in pure distilled lemon terpenes. His own results atisfied him that by the use of the new apparatus and ufficient bisulphite he could get figures closely in accordnce with the amount which had been added. At that ime he hoped to undertake himself a critical examination of some of these processes for the estimation of citral; but Messrs. Burgess and Child had followed the matter up, nd he thought that their results had abundantly justified heir work, and would be of great value to all who were nterested in the chemistry of lemon oil.

Dr. J. Lewkowitsch desired to raise a point not irectly connected with the paper, but still of interest to users of the Zeiss apparatus. In Tables 2, 3, 4, and 5 the efractometric constants were expressed differently; the imits of the Zeiss butyro-refractometer were evidently eached in the case of the oils in Tables Nos. 4 and 5; in act the butyro-refractometer figures would have been much over 100. He would like to enlist the sympathies of the uthors of this paper to help to induce the maker to construct a butyro-refractometer which would show higher efractions to cover such cases as tung oil and rosin oils. At present, chemists who possessed the butyro-refractometer were obliged to buy two instruments instead of one.

Mr. J. F. Child, in reply, said that with reference to Mr. Parry's remarks on the pure samples of lemon oil, he time of year when collected and the districts in which hey were gathered would be important factors. Those collected by himself were obtained about the middle of December of last year. Mr. Parry had spoken of the use of terpene for the adulteration of bergamot oil. This he doubted, because around Reggio the lemons were of a round character, and were ground in the bergamot machine, and the oil so obtained was used to adulterate, not the terpenes obtained from lemon oil. With regard to the sp. gr. 0·860 to 0·862, his Company had made offers to the principal Sicilian firms for supplies at these gravities and were unable to obtain any. With reference to the distilling the first 10 per cent. of the oil, it must be understood that the shape of the flask and the temperature of the oil bath were important matters. They had adopted this form of flask from Schimmel's books, but had enlarged it so as to suit the 100 c.c. distillation. Mr. Parry seemed somewhat sceptical as to the presence of pinene, but he would like to point out that without the pear-shaped fractionating head of Dr. Young, it would have been impossible to separate pinene from the lemon oil terpene.

They had never recommended the bisulphite, *i.e.*, the acid bisulphite, process, because one could only get the so-called addition compound which, it was true, would, on heating, decompose into citral and a sulphonic acid; this citral might again be taken up if the shaking were continued, but it made the method unreliable. They had recommended the addition of sulphite, which formed the soluble compound. This made the method identical with the sulphite and bicarbonate, and the specially recommended sulphurous acid and sulphite ones. A great advantage in this latter method was, as had been shown, that the indicator being present showed distinctly the beginning and end of the reaction. The bisulphite, bicarbonate, and sulphurous acid in the presence of sulphite were simply used to neutralise the sodium hydrate formed, and thus prevent the decomposition of the compound. With regard to taking up all the citral in the first shaking of the latter process, using their method, they had some citral made from the terpeneless lemon oil, the unabsorbed portion of which they had treated with bisulphite. A small amount of compound was formed, which was washed and decomposed. The little drop before the meeting represented the aldehyde obtained. The refractive index of that sample was 1·1601; it was a mixture of the two new aldehydes, and could not contain much, if any, citral. They always recommended that the refractive index should be taken in conjunction with the rotation, as it was not a sure guide by itself. With regard to citral in terpeneless oil of lemon, Mr. Parry claimed to be able to make a concentrated lemon oil containing a higher percentage than that obtained by Mr. Burgess and himself. So could they by fractionation, but to do so they would have to reject other important flavouring portions. He had there a sample of the unabsorbed oil from a terpeneless oil such as he had spoken of, which, if examined, would be found to have a very fine flavour. It had high refractive index, and a minus rotation, showing that the presence of terpenes could not exist to any appreciable extent. They had examined it for the amount of esters and alcohol (calculated as geraniol and geraniol acetate). The figures given left a considerable portion unaccounted for, and they were still investigating this matter. As a proof that lemon oil did not generally contain more than 4 per cent. of citral, Mr. Parry's own method might be taken. He had himself recommended a method for the estimation of citral in lemon oil in which he first concentrated the oil by fractionation. They themselves had, both on a manufacturing scale and in the laboratory, concentrated considerable quantities of lemon oil. They had never been able to obtain more than from 4 to 6 per cent. of flavouring matter which did not contain more than 50 per cent. of citral. The terpenes on examination only gave very small quantities of the new aldehydes of a very low refractive index showing absence of citral. Calculating this back, it would be seen that this method gave from 2 to 3 per cent. of citral for lemon oil.

A question was asked as to dispersion. They had taken it for several oils, but had not found it of much value, and it made the operation a long and tedious one. They had neglected it, though he thought that in some cases it might be of great importance.

They had not yet prepared the synthetic aldehydes, but recognised the great importance of doing so, and hoped shortly to continue the investigation of these aldehydes, more particularly the polymerised form, which should be of great scientific as well as commercial interest. They had examined many lemon oils, and had always been able to obtain these aldehydes from them, and therefore believed them to be a natural constituent of the oil. On the other hand, they had not examined very old oils, but did not think the aldehydes oxidised so readily as Mr. Chapman has stated. With regard to the lemon terpenes, the only reply seemed to be that it was against the principles of every manufacturing chemist to unnecessarily waste any of his bye-products, and while there was such a demand for these terpenes, they would continue to fetch comparatively high prices. The authors, themselves, would not care to suggest to their employers the remedy proposed by Mr. Chapman. If the Sicilian authorities stopped the importation of these terpenes, then the chemist would have to find other uses for them, and he would not have far to seek. One of their objects in bringing this communication before the Society was to show a method of detecting such adulteration.

Manchester Section.

Meeting held on Friday, December 6th, 1901.

DR. H. GROSSMANN IN THE CHAIR.

VANADIUM: ITS EXTRACTION AND USES.

BY H. PROCTER SMITH, F.C.S.

The attempts which have recently been made to use metallic vanadium for various purposes have created considerable interest in the metal, and a consideration of the methods adopted for its separation and the effects it produces from one who has had considerable experience may not be unwelcome.

The metal has a most interesting history; originally discovered by Del Rio in the lead ores of Zimapan, Mexico, and named erythonum, and discredited by Collet Descobla in 1805 as an impure oxide of chromium, it was rediscovered in 1830 by Sefstra, in the celebrated iron of Taberg in Sweden, and named vanadium.

In the same year Wohler confirmed Del Rio's discovery, and Sefstra handed over his research and materials to Berzelius, who made an extensive investigation and classed it with chromium and molybdenum. Finally the metal of Berzelius was shown by Roscoe to be a nitride or an oxide, according to the method of preparation, and that it belonged to the antimony group of the nitrogen family. Up to the present its application has been principally confined to the preparation of vanadium compounds for colouring purposes.

The metal occurs principally as vanadates of lead and copper, lime and alumina, the two former being the chief sources of the metal.

Vanadium is a silvery white metal of very high melting point, about 2,000° C., and low specific gravity of 5·5. When heated in oxygen it takes fire and forms the pentoxide V_2O_5. It ignites in chlorine forming the tetrachloride, and on heating in nitrogen is converted into the mono-nitride.

Hot hydrochloric acid is without action on the pure metal, but hot sulphuric acid dissolves it, forming a yellow solution, and nitric acid readily dissolves it, forming a deep blue solution. There are five oxides of vanadium, analogous in composition to the oxides of nitrogen; of these the highest member of the series, the pentoxide, is the most stable, and is obtained by the action of nitric acid upon any of the lower oxides. Chlorides, oxychlorides, a bromide, oxybromides, and sulphides of the metal are also known.

The preparation of the metal in a pure state is attended with many difficulties owing to the readiness with which it oxidises at or above redness in air or water-vapour, and in the process to be described the extraction of *pure* vanadium has not been attempted so much as the extraction of the metal in alloy with iron, of which the ore contains some quantity. The ferro-vanadium thus obtained is intended to be used in steel making, it being long known that the presence of vanadium in wrought-iron increases its ductility in a remarkable manner.

Process.—The ore treated was an impure vanadate of lead from Spain. The process may be divided into two chief portions, thus:—(1) Treating the ore for the separation of lead and preparation of a precipitate containing the iron and vanadium as oxides. (2) The reduction of the mixed oxides to the metallic state forming a ferro-vanadium alloy.

If it is desired to obtain the pure metal, this can be done by treating the oxides of vanadium and iron in such a manner as to separate the two metals before reduction.

The process is at present by no means perfect, but very satisfactory results and yields have been obtained, and with further experience and practice there is no reason why it should not become a success. The chief difficulty in obtaining vanadium or alloy of iron and vanadium from the oxide is owing to the exceedingly high melting point of the metal, the difficulty of reduction, and, as before stated, the tendency of the metal to oxidise and pass into the slag.

Ore.—The ore is of a very friable nature and crushes easily. It varies from light yellow to brown in colour, and is associated with galena, veins of the two minerals running side by side. From the analysis appended below it will be seen to consist of vanadate of lead with silica, oxide of iron, lime, manganese oxide, &c.

The ore is first crushed to a fineness such that it will pass through ⅛-inch mesh sieve, and fused with bisulphate of soda or potash. For this purpose the residue from the "nitre pots" of the sulphuric acid manufacturer may be very conveniently and economically used. This residue consists of bisulphate of soda or potash with a varying quantity of free sulphuric acid, and is known commercially as "nitre cake." This fusion may be effected in an iron vessel similar to a Pattinson de-silverising pot or in a small reverberatory furnace with a good hard sand bottom and a large tapping hole. In practice I have found the latte furnace to give good results if worked carefully and an taking one of this type as an example. The proportion o "nitre cake" to ore depends of course on the compositio of the latter, but with some similar to that of analysi given—2 parts of nitre cake to 1 part of ore—give the best results.

Vanadium Ore.

	Per Cent.
Lead oxide	34·15
Lead sulphide (galena)	1·43
Vanadic acid (V_2O_5)	11·49
Iron peroxide	14·64
Silica	35·67
Manganous oxide	0·77
Lime	0·32
Zinc oxide	0·62
Carbonic acid	0·42
Molybdic acid	trace
Silver	3½ oz.
	99·51

The "cake" is thrown into the furnace, which is closed until the "cake" has almost melted, and the ore then added as rapidly as possible and the whole mass thoroughly mixed and agitated. A violent effervescence at first takes place, which soon subsides, and as the mixing of the fusion is continued it gradually thickens and is ready for tapping out. With charges of about 1 cwt. of ore and 2 cwt. of nitre cake and a moderate heat, it takes from 20 minutes to half an hour. Too high a temperature must be carefully avoided, as in that case the mass thickens too rapidly and does not allow the molten bisulphate sufficient time to thoroughly attack the ore. When decomposition is complete the tapping-hole of the furnace is cleared and the molten material either run into thin cakes on the floor or run into an iron or copper ladle, and then cast into thin cakes on a level surface. The cooled mass presents a lemon to orange yellow appearance and is very deliquescent, turning in the course of a few hours quite green on the parts exposed to the air, and by gradually absorbing more moisture, becomes white.

This "fusion cake" is crushed preparatory to its treatment with water. This is accomplished by a pair of rolls, being reduced to such a size that it can pass through a ¼-inch sieve.

Lixiviation.—The crushed "fusion cake" is put into a stout wooden vat, water added, and metallic iron in some form or other—a convenient form for this is old boiler plates, which may be suspended in the liquid by means of stout copper wires. The water, in order to facilitate the lixiviation, is heated by blowing steam through, and the whole is kept well stirred for 3 to 4 hours.

The contents of the vat now present a greenish-white appearance, which, on allowing to stand for from 4 to 6 hours, separates into a heavy white precipitate, leaving a clear solution of varying colour from dark green to blue. This is siphoned or steadily pumped into another vat, leaving behind the heavy white sediment. The action of the bisulphate of soda during the fusion appears to be to convert the lead, vanadium, iron, &c., into sulphates.

The vanadium sulphate combines with the sodium sulphate forming $Na_2SO_4 + (VO)_2 (SO_4)_3$, the yellow mass previously referred to. $VO.OH.SO_4$ is also present and probably some HVO_3.

Treating with water, owing to the insolubility of lead sulphate, forms a very ready means of separating that metal. The insoluble precipitate left behind contains therefore all the lead as sulphate, almost all the silica, and any undecomposed ore which might be present. The clear solution siphoned over contains sulphates of the vanadium and iron and any manganese present, together with traces of silica.

The purpose of putting the scrap-iron into the vats during lixiviation is to reduce any vanadium present as vanadate to the vanadic salt. A little of the vanadium generally appears to be present in this state, and if allowed remain so would not, in the subsequent precipitation with ustic soda, come down completely and hence be lost.

To the clear siphoned liquid is now added, in small antities at a time, a solution of caustic soda (a 25 per nt. solution forms a very convenient strength) when a ack or grey precipitate is thrown down. The addition of da is continued till a drop of the filtered liquid, brought to contact with a drop of weak caustic soda solution on white porcelain tile, remains perfectly clear, showing that ecipitation is complete.

The precipitate contains the iron and vanadium as drated oxides and requires filtering. This is done by imping into a filter-press, and, as the precipitate is of a ry bulky gelatinous nature, it is necessary to pump it ry slowly, and, in order to obtain full cakes and orough washing of the precipitate, the frames to contain e cakes should not be more than half or three quarters of inch thick. The clear filtrate coming from the press nsists chiefly of a solution of sulphate of soda. It may tested for vanadium, which would probably be present sodium vanadate, by acidifying a little with hydrochloric id and then adding some hydrogen peroxide, when a red loration is produced by the presence of only minute aces of vanadium. This coloration is probably due to e formation of a hexavanadate. The precipitate in the ess requires washing until the wash waters are free from y soluble sulphates, which can be tested for from time to me with a solution of barium chloride. As the washing oves a somewhat lengthy operation, many experiments ve been made with a view to reduce this time, and nsequently oxides have been prepared containing varying antities of soda salts.

The precipitate when taken from the press is emptied to shallow iron trays. It has a greenish-black appearance hich very rapidly turns to a brownish-yellow owing to the idation of the precipitated oxides of vanadium and iron the pentoxide and peroxide respectively. The trays e put into an oven and dried. As the precipitate, under e best conditions of filtering and washing, contains 0 per cent. of moisture, the fuel and time spent in drying e very considerable for only a small yield of dry ide.

The resulting oxide, if thoroughly washed, is a black mpact brittle material having about the following mposition when dried.

	Per Cent.
Vanadic oxide (V_2O_5)	18·0
Iron peroxide	77·5
Silica	1·4
Moisture loss, &c.	3·2

A similar oxide produced by only three hours' washing, n drying analysed as follows :—

	Per Cent.
Vanadic oxide (V_2O_5)	17·7
Iron peroxide	57·5
Silica	1·3
Moisture	6·1
Soda salts (soluble in water)	17·2

This oxide had a reddish-brown appearance, and in rying crumbled into a fine powder, which appeared to bsorb moisture from the atmosphere.

Reduction.—The result of reducing the above oxide is to roduce an alloy of iron and vanadium.

It may be reduced in two ways :—(1) By means of carbon nd aluminium in an electric furnace. (2) By means of inely divided aluminium alone.

(1) *In Electric Furnace.*—The following description nd sketch (Fig. 1) will give an idea of the furnace used.

A is a plumbago crucible, standing on an iron plate, B, which is connected to the negative pole. C a brass lectrode connected to the positive pole and containing a arbon rod D. This is suspended from pulleys and ounterpoised by weight E, and can be thus lowered or aised to make or break the electric arc at will. F, pipe to arry away fumes, &c., this can be connected to a flue G, connected with a stack. H a wooden screen covered with sheet iron to protect it from the heat and containing a glass window J of claret coloured and dark green glass. Behind this the operator can stand to observe the progress of the reduction, and still be protected from the heat, and any molten particles ejected during the reaction.

After a great number of trials with varying proportions of the vanadium and iron oxide, charcoal and aluminium, as well as the addition of other materials, in order to obtain most perfect reduction and a more fluid slag, I adopted the following mixture as giving the best results.

	Parts.
Dried oxide	8
Powdered wood charcoal	2
Aluminium (in small pieces)	1

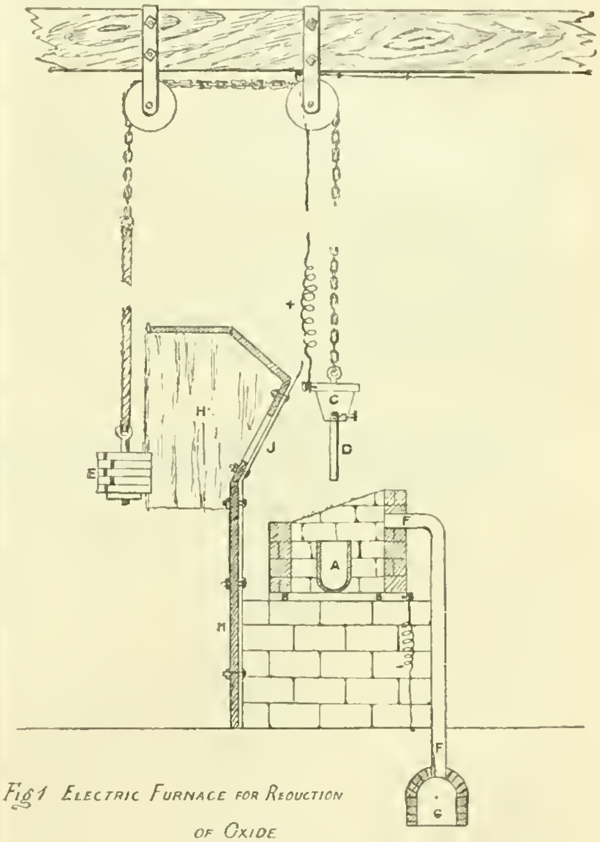


Fig 1 Electric Furnace for Reduction of Oxide

The oxide and charcoal are intimately mixed together, and after striking an arc in the crucible are slowly added in small quantities at a time, care being taken not to break the arc, otherwise difficulty will be found in establishing it again. The mixture under the heat of the arc decreases much in bulk and gradually fuses, and when in a fused state the aluminium is added in pieces one at a time. After each addition, a violent reaction occurs, evolving much light and heat, and occasionally a little of the molten material is ejected from the crucible. This is especially noticeable if there is a large proportion of soda salts present in the oxide. After all the aluminium has been added, and the reaction appears to have finished, the arc is broken and the crucible allowed to cool. A crucible can seldom be used more than once, as it is much burnt away, and if the arc has not been kept quite in the centre of the pot, it is probable that a hole will have been made in the crucible somewhere.

On breaking the crucible, a button of metal is found in the bottom, weighing about one-third as much as the oxide used. It is fairly brittle, has a fine white granular fracture (very like that of ferro-chrome) and has approximately the following composition:—

	Per Cent.
Vanadium	16·0
Iron	70·0
Silicon	2·0
Aluminium carbon, &c.	12·0

On the top of the button is a thin layer of grey metal which in a short time crumbles to a grey powder. It contains a considerable quantity of aluminium, but I have not had an opportunity for further examination. The slag is greenish-grey to black in colour and crystallises in black plates. It is extremely hard, and some varieties of it scratch glass easily. I have not fully examined any of the slag, but it contains a certain amount of vanadium and iron as well as a large quantity of alumina. When the oxide to be reduced contains soda salts, *i.e.*, chiefly sulphate of soda, this is evidently reduced to a sulphide and an odour of sulphuretted hydrogen is perceived from the slag on standing in a damp place.

(2) *By means of finely divided Aluminium.*—Goldschmidt pointed out in a paper, read some time ago, that by the great heat evolved in burning aluminium to the oxide, the reduction of some of the most refractory oxides containing metals of high melting points might be effected, especial attention being drawn to the reduction of such oxides as Cr_2O_3, WO_3, &c. Vautin patented a process for the reduction of lead and preparation of aluminium sulphide from pure galena by burning a mixture of galena and aluminium. In a paper read at the Iron and Steel Institute's meeting last year, the heat produced by burning aluminium and oxide of iron was used as a means of heating pieces of metal for the purpose of welding.

This reaction can be used in the reduction of the mixtur of iron and vanadium oxides to the metals; the intens heat developed being also sufficient to melt the allo produced and allow it to run and form a button under th slag.

The method adopted was as follows:—

A large fireclay (or plumbago) crucible was lined wit calcined magnesia, which was moistened and pressed i tightly with wooden rammers, the crucible being allowed to dry thoroughly before using; the thickness of the lining being from half to three-quarters of an inch.

The crucible A (see Fig. 2) should stand on a layer o charcoal, some firebricks be built up around it, and the space between crucible and bricks filled in with small pieces of coke. This is in order to keep any cold draughts as much as possible away, otherwise the crucible may crack and part of the material would be lost. At one side or above the crucible, a funnel-shaped hopper B, made of sheet iron, is placed, in which is stored the reduction mixture of oxide and finely granulated aluminium. It is closed by a ball C, attached to a chain D, and can be raised to allow more mixture to run into the crucible. Dense fumes are given off during the operation and it is necessary to have some means of *rapidly* removing them, for which purpose a large sheet iron hood E, connected to a flue F attached to a chimney stack, is provided.

An oxide of the following composition was obtained from the earlier processes—

	Per Cent.
Vanadic oxide	16·6
Iron oxide	58·2
Silica	1·0
Moisture	5·6
Soda salts	18·2

It was then mixed with granulated aluminium in the following proportion:—oxide, 15 lb.; granulated aluminium, 4½ lb. The prepared crucible was placed in position and half filled with this mixture, the remainder being put into the hopper. The ignition of the material is one of the most difficult parts of the operation, as a very high *initial* heat is required to start it. For this purpose about 10 grms. of a deflagrating mixture of sodium peroxide and metallic aluminium or magnesium is required of about the following proportions:—sodium peroxide, 23 parts; aluminium dust, 5 parts. This mixture must be made just before use owing to the deliquescent nature of the sodium salt.

The "ignition mixture" is placed in a cone-shaped heap on the top of the "reduction mixture" in the crucible and ignited by means of a red hot iron bar. This ignites the whole mass and flames and dense fumes are evolved from the crucible. As soon as the reaction subsides a little, the feeding in of the reduction mixture is commenced from the hopper by means of the ball and chain, and arranged so as to run into the crucible in a small but continuous stream. The whole crucible presently becomes white hot and a pair of blue spectacles is required to conduct the operation. The contents are now in a violent state of ebullition, and occasionally small quantities of the molten material are ejected from the crucible. When the hopper is empty the crucible is allowed to cool, and on inverting, the fused mass of metal and slag can be turned out. The crucible may, after relining with magnesia, be used for future operations. The time taken in this operation is five minutes, and this may be taken as the average time for a similar quantity. It is therefore a great saving of time when compared with the electric furnace reduction.

On breaking the fused mass a brittle metallic button is obtained from the bottom. It is very easily broken, and in appearance crystalline,

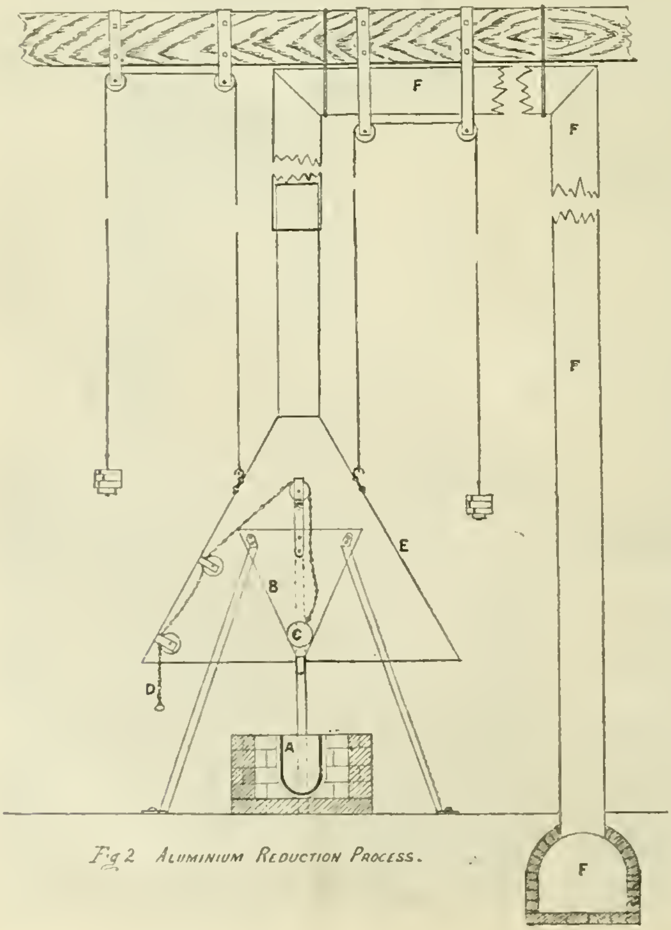


Fig 2 Aluminium Reduction Process.

milar to antimony, but has a slightly yellower lustre, ad is of the following composition :—

	Per Cent.
Vanadium	14·9
Iron	58·1
Aluminium	26·0
Silicon	1·3

The slag, which comprises more than two-thirds of the nass, is black in colour, of a glassy nature and filled with oles. It is exceedingly hard and scratches glass.

Uses.—The alloy of vanadium and iron is used in steelnaking in the same manner as ferro-chrome, ferro-nickel, tc., and quite as much care is required as in adding hromium to steel, owing to the ease with which vanadium s oxidised.

The following experiments with vanadium steel were nade by Professor Arnold, of Sheffield.

A sample of tool steel of the following composition was nade :—

	Per Cent.
Carbon	1·20
Silicon	0·26
Sulphur	0·02
Phosphorus	0·02
Manganese	0·07
Vanadium	0·53

Also another, similar to the above, but containing *no anadium* and *only* 0·07 *per cent. silicon.*

The following results were obtained on mechanically esting the steels :—

—		With Vanadium.	Without Vanadium.
ensile strength	tons per sq. in.	72·42	62·50
lastic limit	„ „	50·75	35·70
longation	per cent. in 2 in.	6·25	8·00
eduction of area	per cent.	5·90	7·80

Here, although the tensile strength and elastic limit of the steel was much increased, the ductility was *apparently* a little lecreased. Also, on testing a sample of the hardened vanadium steel against a tungsten steel, containing 1·2 per ent. carbon and 3·0 per cent. tungsten on hard chilled white iron, the vanadium steel when tempered to a deep straw was equal to the quenched and untempered tungsten steel.

Other experiments have shown that malleable iron was affected as below :—

—	Tensile Strength.	Elongation.
	Tons.	Per Cent.
Malleable iron	21·5	19
Ditto + 0·50 per cent. vanadium *forged bar*	39·0	12
Ditto + 0·50 per cent. vanadium *annealed*	33·7	32

Mild steel containing vanadium gave the following results :—

—	Tensile Strength.	Elongation.
	Tons.	Per Cent.
Original steel	30	17
Ditto + 1·0 per cent. vanadium	61	14
Ditto + 1·0 per cent. vanadium *annealed*	45	20

Vanadium thus considerably increases the tensile strength in steel, and, when annealed, gives an increased ductility; the experiments thus proving that vanadium steel is exceedingly hard when hardened, and very soft when annealed. It should prove of great service in the manufacture of armour-plates, ordnance, armour-piercing shells, tools, &c.

Estimation of Vanadium.—This paper would not, I think, be complete without giving an easy, quick, and reliable method of estimating vanadium in ores or alloys.

In Ores containing Lead, Copper, Iron, &c.—Sufficient of the ore is dissolved, so that about 0·05 grm. of metallic vanadium is present, in a small quantity of concentrated hydrochloric acid. It is diluted to about 250 c.c. with cold water and sulphuretted hydrogen passed through until no further precipitate comes down. It is then allowed to settle, filtered, and the precipitate redissolved in a small quantity of nitric acid and evaporated until most of the acid is expelled. It is then diluted and sulphuretted hydrogen again passed until precipitation is complete. The precipitate is then filtered and washed with water. The two filtrates are combined and evaporated to dryness in a large platinum crucible. This contains all the vanadium and iron, the precipitate consisting of copper, lead, &c.

If lead only is present, it may be separated by evaporating the hydrochloric acid solution of the ore with sulphuric acid, diluting, and allowing to stand to precipitate and settle the lead sulphate and filtering. The filtrate contains all the vanadium and iron, and is evaporated to dryness, as far as possible, in a platinum crucible, as above.

The dry mass is then fused, with an excess of a fusion mixture of two parts of sodium carbonate (dry) and one part nitre, for 20 or 30 minutes, care being taken to regulate the flame so as to prevent the mass frothing over the sides of the crucible. When cool it is extracted with hot water, filtered through a double paper into a large flask, and precipitate washed with hot water. The filtrate is slightly acidified with dilute sulphuric acid and warmed very gently to expel most of the nitrous fumes. When this is done cold water is added until bulk is about 400 c.c., and about 3 grms. of crystallised sulphite of soda. When dissolved, the contents of the flask are heated slowly to boiling, until no smell of sulphur dioxide is evolved. It is then titrated, while hot, with a $N/20$ solution of permanganate of potash until a faint pink tinge is *permanent for half a minute.* During the boiling and titration of the solution care must be taken to keep dust or any kind of organic matter out, otherwise the vanadium will be reduced to a lower oxide, and thus give results too high.

As a partial check on a titration, the titrated solution may be again reduced by a fresh quantity of sodium sulphite and boiled until free from SO_2, and permanganate added. This should agree within 0·10 c.c. with the former one.

In Alloys such as Ferro-vanadium Steels, &c.—Sufficient quantity to contain about 0·05 grm. vanadium is dissolved in just sufficient hydrochloric acid, oxidised with potassium chlorate, evaporated in a platinum crucible, fused with fusion mixture and treated as in the former case.

The reactions which occur are as follows:—The vanadium, after fusion with fusion mixture containing nitre, is converted in a soluble vanadate, and thus separated from the iron. This on acidifying with sulphuric acid and treatment with sulphite, is reduced from the pentoxide of vanadium (V_2O_5) to the tetroxide (V_2O_4), and on adding the permanganate of potash is again oxidised to the pentoxide.

$$2KMnO_4 + 5V_2O_4 + 3H_2SO_4$$
$$= K_2SO_4 + 2MnSO_4 + 5V_2O_5 + 3H_2O.$$

Thus, 102·5 *grms. vanadium* require 16 *grms. oxygen.*

∴ 102·5 *grms. vanadium* are equivalent to 112 *grms. iron.*

∴ *Iron value* of *permanganate* × 0·914 = *vanadium value.*

The titration is a beautiful reaction and remarkably sensitive, gradually passing from purple, through blue and green, to yellow, when one drop of permanganate in excess turns it pink.

Aluminium may be used for the reduction, but the vanadium is then reduced to the trioxide. Zinc reduces it to the dioxide, requiring of course different factors for the permanganate.

In bringing this paper to a close, I must tender to Mr. E. L. Rhead, of the Technical School, Manchester, my heartiest thanks for the valuable suggestions he has made and the help he has given me in revising the paper. Also to Mr. E. Coles, of Llanelly, for making the drawings to illustrate it.

DISCUSSION.

Dr. GROSSMANN said that it was of importance that the study of those elements which were considered rare should not be neglected, because what was considered a rare element now might become a comparatively common element by some fortunate discovery of new deposits. Many of the rare elements had important properties, which would be of great value if the sources of their supply were more abundant, and one of the most interesting of the rare elements was certainly vanadium. It was many years since he worked on vanadium himself, but if he remembered right, the test with permanganate which Mr. Procter Smith proposed was not a new one, but had been used for a long time. He regretted the absence of data from which the yield on a given quantity of raw material could be calculated. As far as he could follow the results given, the loss in vanadium seemed to be very large.

Dr. GERLAND said that the alloy produced by the author's process must necessarily contain much impurity, probably in sufficient quantity to affect the properties of the vanadium-iron. The reduction of the precipitate containing 17 per cent. of sodium sulphate required much aluminium, and the sodium sulphide produced would cause a considerable loss in vanadium. The estimation of vanadium with permanganate had been described by himself (Ber. 1877, 1513 *et seq.*). Vanadium, though widely distributed, occurred usually in very small quantities, whilst large deposits were extremely scarce. Brown and yellow iron ores often contained it; in fact, Sefström discovered it in Swedish iron in 1830. Some sixty years ago a blast furnace near Homburg, in Hesse-Cassel, was fed with pisolitic iron ore (stated to contain 1 per cent. of vanadic acid) and charcoal, producing good iron, in which no vanadium was ever found. About 1 per cent. of it had recently come within his own experience in a specimen of coal from the Cordilleras of Chile; and a number of stray examples were to be found of its cropping up in many other materials, such as clay and bricks.

Sir Henry Roscoe's paper in the Proceedings of the Royal Institution, Feb. 1868, mentioned Alderley Edge as the source of the raw material for his vanadium research. It actually came from Mottram St. Andrews, about four miles from Alderley Edge. A Keuper sandstone of light colour, much lighter than that from Alderley, was to a small extent impregnated with copper. This was also worked by the Alderley Edge Copper Mining Co., and consisted of carbonate and arseniate. For the extraction it was mined, crushed, and digested with hydrochloric acid, and the solution separated and treated with scrap iron to precipitate the copper.

Hard by this greenish-speckled rock was a white soft sandstone with numerous small black specks, containing small quantities of cobalt, nickel, and a little copper. To extract these the crushed ore was moistened on his (the speaker's) advice with the iron liquor from the treatment of the copper ore, and furnaced at a low heat. The resulting sand was then washed with water, which dissolved out the cobalt, nickel, and copper chlorides. On carefully neutralising the solution with chalk, a brown deposit, consisting principally of ferric hydroxide, with a small amount of vanadiate, was produced. This precipitate accumulated for a long time, but was watched all along with much interest.

The late Mr. Down, manager of the Alderley Edge Mining Co., about this time handed him a sample of ore from a new locality, Harmer Hill, near Shrewsbury, showing groups of dark green crystals, which were recognised as vanadiates of lead and copper. These promised to be a more convenient source for the element, and a promising one, as the quantity of the deposit seemed to be large.

The deposit of the new mineral near Shrewsbury was several times visited by him, and he brought back a quantity of the ore for examination, and separated from it, in addition to the vanadium, a group of rare earths, which he considered to be new. Prof. Bunsen, his revered teacher, kindly examined a small sample spectroscopically and also pronounced them new. A short address on them, and on the ore, was delivered by himself at the Liverpool Meeting of the British Association in 1871.

Some time afterwards, Mr. Mellor, of the Magnesium Metal Company at Patricroft, acquired the Shrewsbury deposit, and this, he believed, formed the principal raw material for all the vanadium compounds they made. The mine gave out sooner than was expected, and had been filled up long since. This, then, was the first and only venture for working vanadium ores on something like a manufacturing scale. Mr. Mellor very kindly offered him the refuse for extraction of the new earths, but he had meanwhile accepted an engagement with Messrs. F. Steiner and Co., and had little time to attend to it. Altogether about 4 to 5 grms. were collected; but this quantity proved insufficient for an exhaustive examination, especially as it appeared to be a mixture of at least three elements.

The use of vanadium must be very limited. The largest amount seemed to have been consumed by the calico printers and dyers for aniline blacks, and in this application it had to compete with copper and cerium compounds. He had discovered meta-vanadic acid in 1877 (Ber. **9**, 872), and obtained it in microscopic scales of a beautiful orange-yellow colour, like mosaic gold, with a fine lustre and great permanency, but found no appreciation for it. Vanadium, however, formed a number of compounds with such varying properties that some of them would probably be found of technical value. He had also worked on the sulphates, corresponding to the three oxides, of which the two latter were already known.

In 1871, 32*l.* per lb. was offered to him for ammonium vanadiate, but since the Magnesium Metal Company had taken up the extraction, the price had come down to under 1*l.* per lb. If, however, a demand should arise, new sources were sure to be discovered, and, considering the rapid way thorium material had been procured as soon as there was a demand for Welsbach mantles, they might expect an ample supply of vanadium ore to be forthcoming.

Newcastle Section.

Meeting held on Thursday, November 28th, 1901.

MR. W. L. RENNOLDSON IN THE CHAIR.

THE ACTION OF LIGHT ON COLOURED BRASS LACQUERS.

BY HARRY SMITH, F.I.C.

POLISHED brass speedily tarnishes when exposed to the air, especially in places where coal gas is burned. The discolouration may be prevented by the application of lacquer to the metal surface, and a great variety of articles are protected in this manner.

Lacquer for brasswork is known as "hot" or "cold" lacquer, according to whether it is applied to the heated metal or not. "Cold" lacquer made from a solution of nitrocellulose is sometimes used, and is spread upon the cold metal with a brush as in ordinary varnishing.

"Hot" lacquer is very largely employed, and in this process the fluid is gently and repeatedly brushed over the heated surface of the metal until a sufficiently thick and durable coating is obtained. The art of "hot lacquering" is not easily acquired, but very beautiful results are obtained by skilful workmen; the temperature to which the brass must be heated, and the time which must elapse between successive coatings are points which require careful attention, otherwise the last applied layer may dissolve and remove some portion of the previous coat, producing a streaky uneven appearance. The experiments which I am about to describe were made with "hot" lacquers, but would also apply to the process of cold lacquering.

Brass lacquer is usually a solution of seedlac in methylated spirit. Other resinous bodies are sometimes used with seedlac, such as mastic and sandarac, but seedlac is the essential ingredient, as it produces an exceedingly hard and tough coating upon the metal. It is necessary to use a good quality of seedlac, which should be fresh, old lac is apt to produce a brittle film and will not adhere to the brasswork with the proper tenacity. When the lacquer is applied to the heated brass, alcohol is first driven off and then the seedlac fuses, producing a hard lustrous film upon the surface of the metal.

Brass lacquer is sometimes made almost free from colour to preserve the original appearance of polished brass, but it is generally coloured so as to produce a golden or coppery tint, in fact, the colour may vary from the palest lemon yellow to a deep claret. The colouring matters which are usually employed for this purpose are of vegetable origin, such as saffron, turmeric, dragon's blood, sandal or sanderswood, and gamboge, these colouring matters are preferred to those derived from coal tar as they are supposed to be of a more permanent nature. In order to determine to what extent this belief is founded on fact, I have lacquered a number of brass tubes, in some cases the lacquer was tinted with vegetable colouring matters and in others with aniline colours. The lower half of each tube was then wrapped in several layers of black paper to protect that portion from the action of light, and the tubes were placed under a skylight with an east aspect, thus they received the diffused light from the sky, and the direct rays of the sun until a little after noon each day. The brass tubes were exposed in this way from November 3, 1900, until the last day of September 1901, and as the summer of 1901 has been unusually fine and sunny, these severe conditions have produced some very striking effects on the colouring matters which were employed.

The lacquers were made by first dissolving the colouring matter in the methylated spirit and then adding the seedlac, mastic, and sandarac, the total weight of the three latter amounted to 8 per cent. of the whole. After gentle shaking for 24 hours the liquid was decanted from the insoluble residue (which is very large in the case of some of the vegetable colouring matters), and the lacquer was then allowed to settle until perfectly clear and fit for use. In the following tables only the percentage of colouring matter is stated, for the sake of clearness, it must be understood that this includes the woody fibre and other inert substances in the dyestuff.

Experimen	Weight per Cent.	Colouring Matter.	Appearance.	
			Before Exposure.	After Exposure.
32	1·02	Turmeric	Pale lemon yellow.	Colour entirely gone, considerably blackened.
2	1·65	"	"	"
3	3·30	"	Deeper lemon yellow.	"
31	8·18	"	Golden yellow	"
30	16·36	"	Deep gold....	"
26	2·45 0·82	Turmeric ... Sandalwood.	Red gold.....	Colour entirely gone, slightly blackening.
34	6·13 1·02	Turmeric ... Sandalwood.	Copper.......	"
33	4·09 2·04	Turmeric ... Sandalwood.	Copper.......	"
29	2·45 0·6	Turmeric ... Saffron	Pale lemon yellow.	Colour entirely gone, considerably blackened.
41	6·13 1·02	Turmeric ... Dragon's blood	Red gold.....	Greatly faded, and slightly blackened.
40	2·04 1·02	Turmeric ... Dragon's blood	Pale Copper..	"
5	0·4	Saffron	Palest golden yellow.	Colour entirely gone, considerably blackened.
13	0·5	Sandalwood..	Palest copper.	Colour gone, no blackening.
14	1·3	Sandalwood..	Pale copper ..	Colour gone, no blackening.
36	4·09	" ..	Deep copper..	"
35	8·18	" ..	Deep ruby....	A little paler.
24	0·32 0·6	Sandalwood. Metanil yellow	Red gold	A little paler.
37	2·04	Dragon's blood	Deep red gold	Much paler.
38	4·09	"	Deep copper .	"
39	8·18	"	Deepest copper	"
25	0·6 0·34	Dragon's blood ..... Metanil yellow	Red gold.....	A little paler.
19	0·17	Metanil yellow	Greenish-gold	Faded.
20	0·7	"	Gold.........	"
8	0·4	Annatto	Palest gold ..	Brownish black.
9	1·25	"	Pale gold	Black, greenish metallic lustre.
11	0·4	Gamboge	Pale gold	Scarcely perceptible fading, no darkening.
12	1·25	"	"	"
15	0·17	Auramine	Greenish-gold	Faded.
16	0·34	"	Gold.........	"
21	0·17	Primrose.....	Pale greenish-gold.	Faded.
22	0·68	"	Greenish-gold	"

If we summarise these results, we find :—

1. That the vegetable colouring matters, Turmeric, Sandalwood, Saffron, Dragon's Blood, and Annatto, all fade completely when exposed to sunlight.

2. That Turmeric, Saffron, and Annatto also turn the lacquered brass black when it is exposed to sunlight.

3. That the aniline colours, Metanil Yellow, Auramine, and Primrose, are more suitable for colouring yellow lacquers than Turmeric, Saffron, and Annatto, because they do not turn the brass black.

4. That Dragon's Blood is more suitable for copper-coloured lacquer than Sandalwood, because it does not fade so quickly or so completely.

5. That Gamboge is more suitable for the manufacture of yellow and golden lacquers than Metanil Yellow, Auramine, Primrose, Turmeric, Saffron, and Annatto, because it scarcely fades at all, and does not blacken the brass.

Mr. W. M. Jones read a "Note on a peculiar Blackening of a Chrome-Yellow Pigment."

New York Section.

Meeting held on Friday, November 22nd, 1901.

DR. V. COBLENTZ IN THE CHAIR.

THE MANUFACTURE OF NITRIC ACID.

PART II.

BY C. W. VOLNEY, PH.D.

(See this Journal, June 1901, 544—546.)

To ascertain the influence which a vacuum of 600 mm. has on the mixture of concentrated sulphuric acid and sodium nitrate, I repeated the experiment recently described* under vacuum indicated by 610 mm. to 650 mm., or under absolute pressures of 150 mm. to 110 mm. Table 1 gives the observations which were made during the reaction in the retort and distillation of the acid. Reviewing the temperatures, we find that the decomposition of the nitrate under 110 mm. pressure occurs also in two phases; the first phase represents the reaction of free sulphuric acid on the nitrate, which takes place at about 74° of the salt mixture; the second phase shows the reaction of the sodium polysulphate on nitrate, occurring at about 85°. We see that during the first phase the temperature of the oil-bath shows below 100°, and during the second phase up to 145°.

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* This Journal, June 1901, 544—546.

TABLE 1.

Time.	Temp. of Oil Bath.	Temp. of Salt Mixture.	Temp. of Distilling Acid.	Indicated Vacuum.	Pressure.	Remarks.
A.M.	° C.	° C.	° C.	mm.	mm.	
10.0	13·5	18	11	610	150	No reaction.
11.0	21	21	14	610	150	„
11.30	13·5	20	12	630	140	„
P.M.						
12.7	16	20	15	630	130	„
1.0	18	17	12	630	130	Heat applied.
1.7	32	18	29	650	110	Reaction commences; gas develops.
1.19	66	35	22	650	110	Distilling acid shows.
	72	54	22	650	110	„ „
	76	55	22	650	110	Foaming in retort.
	83	68	23	650	110	Boiling, &c.
	95	73	24	650	110	Distilling.
1.28	102	74	24	650	110	Much foaming; fire lessened.
1.30	102	74	24	650	110	Distillation free and regular.
1.34	101	74	24	650	110	Salts molten and boiling.
.40	99	74	24	650	110	Heat increased.
	100	78	28	650	110	Distillation lessens; heat increased.
1.50	122	80	28	650	110	Slight show of yellow vapours, which ceases.
1.55	128	83	28	650	110	Foaming again.
2.0	140	86	28	650	110	„ „
2.5	149	86	28	650	110	Salt mass thickens: distillation lessens.
2.10	145	85	27	650	110	„ „
2.15	140	96	27	650	110	Salt mixture quietly flowing
2.20	130	100	24	650	110	Distillation lessens.
2.25	128	101	23	650	110	„ ceases.
2.30	128	101	23	650	110	„ „

It is remarkable that the distilling vapours of the monohydrate during both phases show a boiling point lying below 30°. And it may be stated, as a general result of these observations, that under an indicated vacuum of 650 mm. or 110 mm. pressure the decomposition of the sodium nitrate by sulphuric acid is performed by an outside application of heat below 140°, the distilling acid going over below 30°. It follows that under such conditions a monohydrate of almost absolute strength and purity could be produced. The difficulties which necessarily would attend the practical working of such a process cannot be under-estimated. The evils which attend the use of concentrated sulphuric acid culminate in the foaming, which frequently gets beyond all control, so that a part of the contents in the retorts are run into the coolers or receivers. As already stated, the inventors of the vacuum process have had recourse to the use of sulphuric acid of 60° Bé., instead of the concentrated acid; and as the resulting nitric acid shows a strength of only about 40° Bé., a redistillation from concentrated sulphuric acid is necessary, if an acid of higher specific gravity is wanted.

But with the use of sulphuric acid of 60° B. the process in the retort is not the same as when concentrated acid is used; and as there appears to be no clear reference to this fact in the literature of the subject, the following references to experimental work may serve to explain it. The change in the process is evidently due to the introduction of water into the reaction; the acid of 60° B. containing about 20 per cent. of water. Reference has been made to the action of the concentrated sulphuric acid on sodium nitrate in two phases.* In the first phase the free sulphuric acid acts on the nitrate, forming a trisulphate, $NaH_3, 2SO_4$; in the second phase this trisulphate decomposes the remaining nitrate with formation of "bisulphate"—

$$NaH_3, 2SO_4 + NaNO_3 = HNO_3 + 2NaH, SO_4.$$

As has been shown, this reaction requires the higher temperature, under 760 mm. pressure and *in vacuo*; and, as the anhydrous trisulphate forms at that higher temperature an oily liquid, the excessive foaming, repeatedly observed, is entirely owing to the state of this salt. But this trisulphate, on addition of water, dissolves at once into disulphate and hydrated sulphuric acid—

$$NaH_3, 2SO_4 + H_2O = NaH, SO_4 + H_2SO_4, H_2O.$$

By the use of an acid of 60° B., or in consequence of the water in that acid, the decomposition of the nitrate in the retort is performed at once with formation of the "disulphate" at a lower temperature, and with less foaming than attends the reaction of trisulphate.

The process referred to needs experimental verification; and for this reason, as well as for comparison between the distillation of the mixture of sodium nitrate and sulphuric acid of 60° B., I have treated equivalent quantities of the same, 85 parts sodium nitrate, and 120 parts sulphuric acid of 60° Bé. in the previously described apparatus and manner. Table 2 shows what was absorbed during the distillation under atmospheric pressure, together with the temperatures of oil-bath, or the heat applied to the retort, the temperature of the contents of the retort and that of the distilling acid.

Table 3 shows, in addition to the same observation, the indicated vacuum and corresponding pressures under which the distillation takes place.

TABLE 2.

Distillation of Sodium Nitrate and Sulphuric Acid, 60° B., under Atmospheric Pressure.

Time.	Temp. of Oil Bath.	Temp. of Salt Mixture.	Temp. of Distilling Acid.	Remarks. 755 mm. pressure.
P.M.	° C.	° C.	° C.	
1.55	17	16	17	No reaction.
3.0	20	16	17	Heating commences.
	45	23	..	No reaction.
	70	40	25	„
	105	63	60	Gas develops; reaction commences.
	115	63	60	Gas develops steadily,
3.18	126	81	..	„ „ rapidly.
	..	85	68	Distillation; no foaming.
	130	89	70	„ „
	136	92	72	„ „
	144	95	74	Contents of retort boil: distillation.
	..	..	75	Violent boiling.
	..	..	76	„
	146	113	103	Distillation good.
3.30	..	118	111	
	150	120	118	Distillation rapid; contents of retort boil quietly.
3.35	156	120	118	„ „
3.40	154	121	118	Distillation steady.
3.46	154	121	119	„
4.0	154	123	118	„
4.10	154	123	118	„
4.15	160	125	103	Distillation lessens.
4.30	150	125	98	„
4.45	150	126	78	Distillation ceases.

Note.—Throughout the operation the fire was not lessened, but steadily kept up.

Reviewing the results of these distillations, we find that in the operation under atmospheric pressure the greatest portion of the acid distils at about 118°, the contents of the retort showing thereby a temperature of 121°; and that under a pressure of 120 mm. the same acid distils at 74°, and the retort contents showing thereby 78°. In both cases the remaining salt cake consists of sodium bisulphate with water of crystallisation.

The observations show also that the distillation under 755 mm. pressure produces no foaming, and can be smoothly carried out; and that the foaming, which occurs under 120 mm. pressure, does not interrupt the work.

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* Journal of the American Chemical Society, xxxiii.

TABLE 3.

Distillation of Sodium Nitrate with Acid of 60° B. in vacuo.

Time.	Temp. of Oil Bath.	Temp. of Salt Mixture.	Temp. of Distilling Acid.	Indicated Vacuum m.	Pressure.	Remarks.
NOON.	° C.	° C.	° C.	mm.	mm.	
12.0	13	13	14	..	770	No reaction.
PM.						
1.0	16	14	14	506	165	„
1.35	16	14	14	650	120	Some gas bubbles, probably air, escapes.
1.45	43	17	14	650	120	Heat applied.
	65	22	16	650	120	Reaction commences.
	84	24	16	650	120	Gas develops.
	95	28	..	650	120	More gas develops.
2.0	96	33	..	650	120	„ „
	120	37	23	650	120	„ „
	126	40	..	650	120	„ „
2.7	133	57	24	650	120	Gas develops fast; liquid foams: not rising much.
	..	65	..	650	120	
	147	71	..	650	120	.. ..
	..	77	40	650	120	Foaming, rising.
	153	84	..	650	120	Violent boiling; distillation good.
	156	85	..	650	120	
	163	87	50	650	120	.. ..
2.20	164	87	72	650	120	Distillation good.
2.25	167	88	74	650	120	Foaming and boiling, not rising too high.
2.30	167	79	74	650	120	
2.34	167	77	74	650	120	Foaming less; salt boiling: distilling.
2.45	163	77	74	650	120	
2.50	163	77	74	650	120	Salts separating on bottom of liquid; distilling; boiling, not foaming.
2.55	163	76	74	650	120	
3.0	164	76	74	650	120	
3.15	176	76	74	650	120	Distillation lessens.
	178	78	63	650	120	„ ceases.
4.20	180	79	50	650	120	

The produced acid shows no difference in quality or quantity, and has a sp. gr. of 1·38 = 39·8° Bé. at 21° C.

The decomposition of sodium nitrate *in vacuo* by concentrated sulphuric acid thus takes place at such a low temperature, that a pure monohydrate of nitric acid is produced, and this vacuum is especially serviceable in the second phase of the process (see *ante*). With an acid of 60° Bé. a distillation *in vacuo* offers less advantage over distillation under atmospheric pressure, as the water present in that acid effects the decomposition with formation of bisulphate at sufficiently low temperature to prevent any serious decomposition of nitric acid of the concentration obtainable by the operation.

The redistillation of the weaker nitric acid over concentrated sulphuric acid tends, undoubtedly, to considerable increase in cost, and the promoters of the different methods of manufacture are making claims to advantages which, in either case, will have to be ascertained by the practical manufacturer to be fully appreciated.

The experimental work detailed above will also explain the principles upon which certain other proposed improvements in the manufacture of nitric acid are based.

R. E. Chatfield* proposes to make strong nitric acid by distilling one molecule of sodium nitrate with two of concentrated sulphuric acid, at temperatures between 100° and 130° C. This reaction affords the trisulphate and nitric acid, which can be distilled even below 100°, and a strong pure monohydrate is produced. It is difficult, however, to see how this process can carry a patent.

The chemical works "Rhenania"† add to the hot bisulphate in the retorts appropriate quantities of sulphuric acid of 60° Bé, and then the necessary quantity of sodium nitrate. This is with a view to transform the bisulphate into polysulphates, and then reconvert it into bisulphate by the aid of the sodium nitrate, thus enabling them to distil highly concentrated nitric acid. As they propose to do this without letting the retorts cool down, they claim the advantages of continuing the operation in heated retorts and the use of the dilute sulphuric acid.

As the polysulphate does not form so long as water is present, this process would appear to furnish only bisulphate and free sulphuric acid, as any polysulphate in the retort would be transformed into bisulphate and sulphuric acid on the introduction of acid of 60 Bé. The free acid would then decompose the freshly added nitrate, and nitric acid would be distilled from the mixture, so that any saving would seem to arise from using the heated retorts over again.

I have no data on which to form an opinion of this process in practical working. It would seem to require a special method of opening and closing to enable the sulphuric acid and nitrate to be introduced into the hot retorts.

In former times, when smaller retorts were used, and when there was not much need of highly concentrated and pure nitric acid, and when a charge consisted of only 200 or 300 pounds of nitrate, it was customary to continue the distillation until a neutral sulphate remained as nitre cake, the amount of sulphuric acid being calculated for the forming of the neutral salt only. As a result, the nitric acid was very impure, red, and seldom of great strength.

This practice is now, I believe, universally abandoned, as the nitric acid of to-day is the more valuable article. It appears from the following, however, that in some cases the acid sulphate, resulting in the usual, regular manufacture of nitric acid as retort residue, is still used for the production of neutral sulphate and nitric acid.

For this purpose the Netherfields Chemical Works, Glasgow, advise me of the process which they use at their works* for the manufacture of neutral sulphate and strong nitric acid. Mr. William Garroway, the inventor, states that the process has been in operation for the last three years with satisfactory results. The acid sulphate or bisulphate, resulting from the manufacture of sulphuric or nitric acid, is mixed with appropriate quantities of sodium nitrate and heated in a properly constructed retort oven, and when at a proper temperature a spray caused by an air-blast and weak nitric acid is blown over the salt mixture, so that the gases—nitrogen oxides—are thereby mixed with water-gas and atmospheric air. By conducting these gases through a series of condensing tubes and regenerating towers, the description of the process states that ultimately the strong 96 per cent. nitric acid can be run off for use.

The neutral sulphate remaining from this operation furnishes nitre cake, which Mr. Garroway's analysis shows to have 98·36 per cent. of sulphate and, practically, no impurities.

TINFOIL AND BOTTLE CAPS MANUFACTURE.

BY RAFAEL GRANJA.

Tinfoil.—The size or fineness of tinfoil is expressed by the number of square inches covered by one pound of foil. The three principal varieties of tinfoil are pure tinfoil, composition foil, and German foil.

The pure tinfoil contains tin exclusively, while composition foil contains a core of lead in the middle covered on both sides by a thin coat of tin. To recognise those two foils, a drop of nitric acid is put upon the sample examined. If pure tin, metastannic acid is formed instantaneously, and a white spot appears; if composition, the coat of tin is also attacked, but the layer of metastannic acid is so thin that the lead will show through it, thus presenting a black spot.

For the making of pure tinfoil the tin is first melted in cast-iron pots, and cast into slabs of about 19 by 13 and 1 in. thick. Those slabs are cooled and then passed through the breaker. The breaker is a large rolling mill of the ordinary pattern. By successive passages and reducing each time the space between the rolls, the slab of tin is transformed into a sheet having little more than the original width, a thickness of about $\frac{1}{16}$ in. and a length of about 25 ft. This sheet tin is wound tightly upon a spool which is then brought to the roller mill.

C is the spool supported by bracket D. S is a tank containing soapsuds which flow on the sheet of tin and prevent its sticking to the rolls. A is the reel on which the foil is wound as it comes out of the rolls. The pressure between the rolls is regulated by a lever L, which the workman can handle with one arm while he winds the foil with the other.

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* R. E. Chatfield, Eng. Pat. 16,512, 1891.

† Ger. Pat. 166,962, March 8, 1898.

* Private communication from Mr. William Garroway, Glasgow, August 6, 1901.

While the pressure between the rolls is one of the elements which determine the thickness of the foil, no very thin foil could be produced unless another element were added, which is a high tension of the sheet between the spool and the rolls. In order to obtain it a screw W presses on the brass rim of the spool, and while the rolls draw the tin the resistance created by the screw holds it back. A reluctance so to speak, of the tin to go through the rolls is thus created, and the thinness of the foil is increased. A third element also comes into play, which is the heat developed by the high friction of the bearings. Under its influence, the parts of the rolls which are nearer to the bearings become hotter than the middle parts and consequently expand more. If the rolls were perfectly flat, they would tend to become concave, the pressure between them would be less in the middle than on the ends, and a foil wavy and undulated on the edges would be produced. In order to avoid this defect, the rolls are ground slightly convex, so that when they have taken their normal expansion they will be perfectly flat, and the pressure even, all along the line of contact.

Fig. 1.

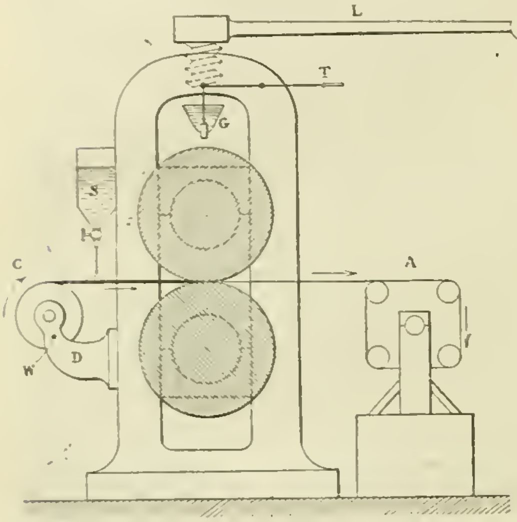
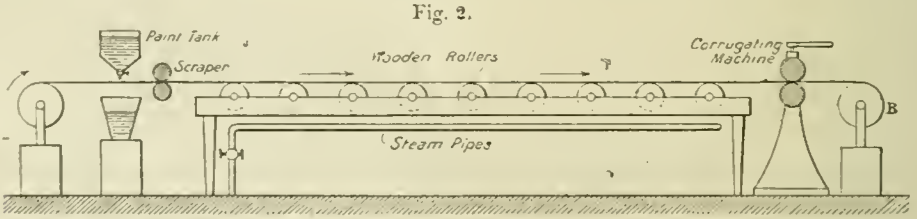


Fig. 2.



In order to control still better such evenness of pressure a gutter, G, filled with cold soapsuds is suspended above the rolls. The bottom of this gutter is perforated with small valves which are manœuvred by touches, T, each valve having its touch so that the whole resembles a piano keyboard. If a line of waviness is noticed at any time in the foil coming out of the rolls, the workman plays on one or several touches above that line, the valves are opened, cold water trickles over that part of the rolls which was too hot, cools it, and smoothness is restored.

For the making of composition foil, an ingot of lead is first broken to a thickness of about $\frac{1}{2}$ in., and a length of 3 ft. It is then sandwiched between two sheets of tin about $\frac{1}{8}$ in. thick, when the whole is passed through the rolls of the breaker at high pressure. The three sheets are thereby welded into one, the lead being in the middle and the tin on both faces. This composite sheet is then passed through the breaker, wound on spools, and rolled as with pure tin foil.

Foils of pure tin can be rolled up to 10,000 sq. in. per lb. and composition to 7,000, but with German foil as high as 14,000 can be reached. This German foil is made of tin alloyed with a few per cent. of foreign metals. The composition of the metal is supposed to be a secret. This foil is readily recognized by its special thinness, which equals that of tissue paper, and by its appearance, being bright on one side and dull on the other. The ingots of metal for German foil are first broken, and the resulting sheet tightly wound upon the spools. Then 2 spools are set together behind the rolling mill, and the 2 sheets are passed at once through the rolls. Two sheets of pure tin would weld under those circumstances, but the composition of the metal is such that it will not weld. To further prevent welding, soapsuds are injected between the 2 sheets of metal as they enter the rolls. As 2 sheets are fed to the mill, two foils come out of it, and as 7,000 can be obtained for a single foil, 14,000 can be reached with 2. The faces of the foils which were in contact with the rolls are bright, while the internal faces are dull.

Those different qualities of tin foil as they come from the rolling mill need only to be folded, piled up, pressed, and cut to the desired size, to be made into a saleable article. However, further work may be demanded, for instance, painting, corrugating, and printing. For the painting, the foil is wound on a drum and passed on a long table of wooden rollers, provided with steam pipes, which promote quick drying of the painted foil. Varnish of the desired shade dissolved in fusel oil is caused to flow on the foil at the head of the table, and is spread evenly by a rubber scraper. The foil then progresses slowly to the other end of the table, which it reaches in a dry condition, the fusel oil having all evaporated, and it is wound on a second drum. If corrugating is desired, the corrugating machine is interposed between the drum B and the drying table.

The corrugating machine is composed essentially of 2 rollers, 1 made of steel, and engraved, and the other made of compressed paper. Smooth foil passed between those 2 rolls will come out corrugated. Finally the foil may be printed, which is done by passing in the last resort through a printing press as if it were paper.

Bottle Caps.—For the manufacture of bottle caps, a composite sheet is first rolled having a core of lead, and on each face a coat of tin hardened by 1 per cent. antimony. From 3 to 6 of these sheets are passed through a first punching and stamping machine. The bunches of caps thus produced are then passed in a series of stamping machines, the shape of dies and matrices being such that the sides of the caps are drawn more and more, while the heads of the caps remain nearly unchanged.

Under the pressure and friction the caps would weld into one, but the 1 per cent. antimony is sufficient for preventing such occurrence. The bunches of caps having thus acquired their shape, they are taken in hand by girls who pick the caps apart, a tedious and delicate work. The caps are then polished on a small lathe with an ivory tool, dressed and cut, painted, and stamped if desired.

Nottingham Section.

Meeting held at Derby on Tuesday, November 26th, 1901.

MR. L. ARCHBUTT IN THE CHAIR.

ROSIN GREASE.

BY L. ARCHBUTT, F.I.C.

Rosin grease is made by stirring together rosin oil and slaked lime. One method of preparation consists in stirring the rosin oil with about three-fourths of its weight of slaked lime made into a cream with water. The mixture rapidly solidifies, expelling the superfluous water, which is run off, and the grease is then diluted by gradually stirring in a further quantity of oil, until the desired consistency is attained. The oil used for diluting may be rosin oil, petroleum oil, or neutral coal tar oil ("grease oil"). Grease is also made by mixing dry slaked lime with rosin oil, without water, also by mixing the lime with mineral or coal tar oil, and adding the rosin oil afterwards. Cheap greases are thus prepared, which are used to lubricate the iron axles of colliery trucks and ordinary road vehicles.

The formation of rosin grease has been attributed to a supposed property possessed by the unsaturated hydrocarbons contained in rosin oil of combining directly with lime and other bases (see Mills' "Destructive Distillation," 4th Edit., 1892, p. 97). This, however, is not the true explanation. Crude rosin oil invariably contains a considerable percentage of resin acids (undecomposed colophony), which have distilled over with the hydrocarbons, and it is the combination of these acids with the lime, forming a soap when the rosin oil and the lime are stirred together, which is the real cause of the formation of rosin grease. Refined rosin oil, which has been freed from resin acids, is incapable of forming a grease with lime; on the other hand, the larger the percentage of resin acids contained in the crude rosin oil, the stiffer the grease which can be formed. This was proved by the following experiments.

The percentage of resin acids in three samples of commercial rosin oil was determined by dissolving a weighed quantity of each oil in ether, shaking out with soda, and weighing the resin acids recovered from the soda solution. The following results were obtained :—

Description of Rosin Oil.	Resin Acids.
	Per Cent.
"Pale refined"	0·14
"Medium"	5·80
"Hard-run"	21·30

The acids extracted from each sample were quite hard and brittle.

20 grms. of each of the above oils were stirred with about 45 c.c. of a cream of lime, containing about 15 grms. of slaked lime. The mixture made with the "pale refined" oil containing only traces of resin acids, did not perceptibly thicken on stirring, and formed no solid grease on standing, emulsified when stirred, but separated into its constituents when left undisturbed. Both the other mixtures set. The "hard-run" oil gave a much harder and more solid grease than the "medium" oil; the former grease when pressed between folds of blotting paper, gave a fairly hard cake, that from the latter squeezed out and spread over the paper in a layer of buttery consistency. Very much less lime than the above suffices to solidify the oil. Thus 10 grms. of the "hard-run" oil referred to above were mixed with 0·75 grm. of lime cream, containing only 0·25 grm. CaO, or not much more than enough to neutralise the resin acids present. This mixture was stirred for five minutes and then left. The lime readily mixed with the oil, forming a thick creamy emulsion, which did not separate on standing. The emulsion gradually thickened, and in three days was a stiff paste, which gradually got stiffer. 10 grms. of the same oil were next stirred with 3·0 grms. of lime cream, containing 1·0 grm. CaO, or about 4½ times the amount necessary to neutralise the resin acids. This mixture set hard in about five minutes, and could then be lifted, bottle and all, by means of the stirring rod. Another mixture containing 0·5 grm. CaO, or rather more than twice the quantity necessary to neutralise the acids, set in about 20 minutes.

Some of the same "hard-run" oil was purified in the laboratory by dissolving in ether, extracting the acids by shaking with soda, and then recovering the neutral oil by evaporating off the ether. With the oil thus purified, all attempts to form a grease with lime failed. The neutral rosin oil, freed from the resin acids, showed no tendency to emulsify with the cream of lime, and on standing they soon commenced to separate. These mixtures have been kept in stoppered bottles for eleven months, and have occasionally been stirred and vigorously shaken together, but, as you see, the contents of the bottles are quite fluid, and show no tendency even to form permanent emulsions.

The formation of a grease with lime is, therefore, not due to a property possessed by the hydrobarbons of rosin oil. It is due to the accidental presence of free resin acids in crude rosin oil.

Discussion.

Dr. J. Lewkowitsch wrote that, naturally, neutral rosin oil, free from acids, could not combine with lime. As the author had pointed out, the combination existed merely between the rosin acids and the lime, and the soap so formed possessed—in consequence of its physical condition—in a high degree the power of occluding, or if one liked to call it so, of emulsifying and consequently holding firmly combined, a large amount of neutral rosin oil. The soda soap possessed the same property to a high degree, as was well known to refiners of rosin oil; but since the soda soap was soluble in water, the emulsion could be readily broken up, and hence refining by means of caustic soda was a feasible technical process. It was well known that for the making of rosin grease unrefined oils were used as they come from the still, and as he could state from practical experience, such oils contained any proportion of rosin acids up to even 50 per cent.

Mr. R. M. Caven thought that Mr. Archbutt had made it quite clear why distilled rosin oil formed a grease with alkalis. He was astonished that the statement could be made that turpentine formed a compound with calcium hydroxide. There was evidently nothing in the nature of turpenes or other hydrocarbons which permitted them to unite with bases.

Mr. F. J. R. Carulla, in allusion to the use of resin spirit for varnish making, and the variations in the solidification period mentioned in the paper, asked whether there was any remedy for non-drying varnishes. He recently had occasion to use a varnish that had been bottled for 25 years and kept well stoppered. It was originally a quick drying varnish, but now dried very slowly. Was this due to some molecular change, and, if so, could its original nature be restored?

Mr. Archbutt, in reply to Mr. Carulla, said that the drying of varnishes was an obscure subject which had very little connection with his paper. A good deal depended upon the condition of the surface to which the varnish was applied, as well as upon atmospheric conditions. Some varnishes lost their drying power with age.

Journal and Patent* Literature.

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* Any of these specifications may be obtained by post by remitting 8*d*.—the price now fixed for all specifications, postage included—to C. N. Dalton, Esq., Comptroller of the Patent Office, Southampton Buildings, Chancery Lane, London, W.C.

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I.—PLANT, APPARATUS, AND MACHINERY.

Engine: The Waste-Heat Auxiliary ——. F. H. Mason. Consular Repts., Aug. 13, 1901, 358—365.

It is a well known fact that a large proportion of the energy delivered to any type of steam engine by its boiler is lost in the exhaust; in any case, there is a dead loss of 80° F. of temperature fall, *viz.*, the difference between the temperature of the condenser (140° F.) and that of the circulating water (60° F.). The waste-heat auxiliary engine devised by Prof. E. Josse, Royal Technical High School, Charlottenburg, Berlin, utilises this heat for evaporating a liquid which boils at a much lower temperature than water. On account of its viscosity, its lubricating qualities, and ease of pressure control at the temperatures in question, liquid sulphur dioxide has been adopted; at 140° F. and 60° F. its vapour pressures are 156 and 41 lb. per square inch respectively. The SO_2 is evaporated by the exhaust steam in an "atomiser," and, after doing work in the cylinder of an engine adjacent to the main steam engine, escapes into a condenser, from which it is pumped back into the "atomiser." The whole apparatus must be air- and water-tight, and be capable of resisting a pressure of at least 150 lb. per square inch.

Tests on a waste heat engine utilising the energy of the exhaust of a 150-H.P. Görlitz triple-expansion steam engine, delivered an additional energy of 34·2 per cent. of that of the main engine, *i.e.*, reduced the steam consumption per indicated horse-power hour from 11·2 to 8·36 lb.

A similar engine of 175 H.P. has been put in operation at the Berlin Electrical Works, Markgrafen Strasse, which adds 11·7 per cent. of the working energy of the compound steam engine from the exhaust of which it derives its energy. The nett cost of the engine was 49,700 marks, a gas plant of equal power costing 47,625 marks—a difference so slight as to be negligible in the face of the great economy.

— J. W. H.

PATENTS.

Gases from their Mixtures; Method of and Apparatus for the Separation of ——. R. P. Pictet, Geneva, Switzerland. Eng. Pat. 19,254, Oct. 27, 1900.

The patentee describes minutely the application of his invention in separating the constituent gases of air, but states that it may be used for separating other mixtures, or for separating solid, liquid, or compressed carbonic acid from air to which chimney gases, &c., may be added. In the separation of air, the following processes and arrangements are adopted, *viz.*:—(1.) The air is filtered, compressed, and freed from water. (2) The dry and compressed air is cooled to the temperature of liquefaction, namely, about − 194 C. (3) The condensed and liquefied air is filtered, to remove the solid carbon dioxide which it holds in suspension. (4) The filtered liquid air is evaporated again to separate, first, the more volatile constituent, nitrogen, and afterwards the less volatile constituent, oxygen. (5) The evaporation of the liquid air is utilised for the liquefaction of the compressed air to be separated into its constituent gases. (6) An automatic arrangement enables the pressure of liquefaction to be regulated, to ensure a continuous working of the apparatus. (7) An arrangement, which does not need attention when once adjusted, permits the separated nitrogen and oxygen to leave the apparatus in such condition as to have the required commercial or industrial value, and also permits the escape of mixtures of gases too nearly resembling atmospheric air. The first filtration of the air is preferably effected through cotton wool placed between two perforated plates, through which the air also passes. After compression of the air, water is removed. The exchanger and liquefier contain respectively corresponding numbers of sections and trays or troughs, the gas produced in each tray or trough of the liquefier being led through the whole length of the channel of the corresponding section of the exchanger, so as to abstract heat from the gaseous mixture to be cooled and liquefied. In the liquefier, the liquefied gaseous mixture is made to pass from tray to tray, to be gradually evaporated and fractionally distilled. The gas outlets of the exchanger are provided with valves or sluices, enabling the collection, in varying degrees of purity, of the separated gases, and the discharge of gases which it is not desired to collect, to be effected without interference with the flow of the liquefied gaseous mixture in the liquefier. The solid carbonic acid is removed by one or more filters, arranged in conjunction with the liquefier, so as not to interrupt the process. Each filter consists of a chamber containing partitions, with cotton wool, filter paper, or the like, interposed (see also this Journal, 1901, 985).—R. A.

Fluids [Milk, &c.]; Apparatus for Equalising the Temperature of ——. T. T. Sabroe, and H. J. T. Hansen, both of Aarhus, Denmark. Eng. Pat. 13,128, June 27, 1901.

This apparatus is stated to be especially applicable for the treatment of pasteurised milk, which, when taken from the pasteurising apparatus, requires to be reduced in temperature before it is conveyed to the cream separator, the object of the apparatus being to employ the heat abstracted from the pasteurised milk to warm the cold milk delivered to the pasteurising apparatus. The apparatus consists essentially of a central plate of corrugated or other suitable form, and having a liquid passage or conduit on each side of it. The two liquids are delivered at the top, on opposite sides of the plate, and are collected separately at the bottom without being mixed.—R. A.

Separating Mechanical Admixtures from Liquids, an Apparatus therefor. E. Füllner, Silesia, Germany Eng. Pat. 19,237, Sept. 26, 1901.

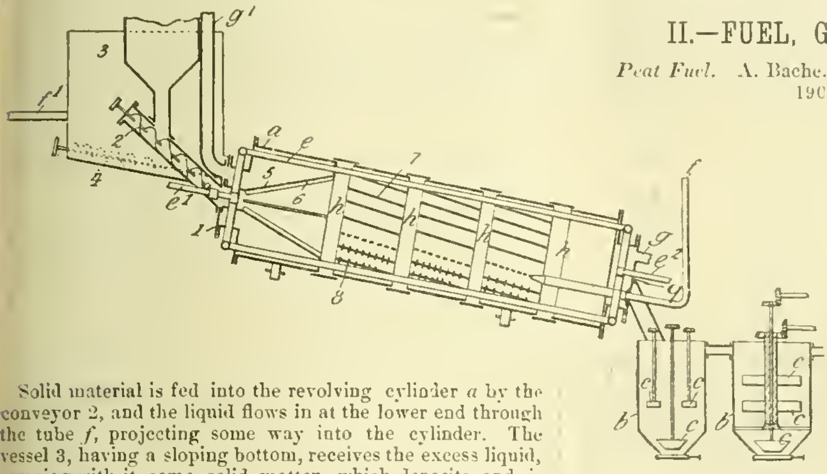
The separation is effected by means of an endless filte cloth, which is carried round a perforated drum rotating i the liquid to be purified. The drum is open at one or bot ends, at the deepest point of which its interior is in fre communication with the outside of the liquid-containin tank, through a perforation in the wall of the latter The liquid, by its natural hydrostatic pressure, passe through the filter cloth and the perforated drum-casin into the interior of the drum, and deposits its admixtures o the slowly moving filter cloth, which then passes through scraping apparatus, while the clarified liquid is discharge through the open ends of the drum. When the liquid to b purified contains little or no fibrous constituents, fibrou materials, such as cellulose, &c., are added to it, to for a fibrous coating on the filter cloth, and so assist th clarifying action.—R. A.

Evaporating or Concentrating in vacuo; Apparatus fo ——. J. B. Alliott, and J. McC. C. Paton, both Bloomsgrove Iron Works, Nottingham. Eng. Pat. 21,571 Nov. 28, 1900.

Evaporating or concentrating vessels, whether used singl or in multiple effect, are constructed with their covers an an adjacent section of their vapour pipes detachable fro the apparatus and from each other, so that these parts can be removed for the purpose of cleansing the apparatus from deposits, &c. Clean parts may also be substituted for those removed. The joints of the removable parts may be provided with a suitable packing. When a multitubular heating drum is employed in the apparatus, it is secured by a single central bolt, and can be withdrawn when the bolt is released and the cover removed. The drum may be seated on a suitable packing, and be connected with a steam or vapour inlet. An air or ammonia pipe extends from beneath the drum nearly to its top.—R. A.

Liquid and Gas; Process and Apparatus for Treating Materials with ——. P. Naef, New York, U.S.A. Eng. Pat. 17,051, Sept. 25, 1900.

The form of apparatus shown is adapted for the extraction of gold from ores by cyanide or chlorine; but is also applicable for the extraction of glue from bones, the manufacture of bicarbonates, and for heating and cooling such fluids as beer, in presence of a suitable gas.



Solid material is fed into the revolving cylinder *a* by the conveyor 2, and the liquid flows in at the lower end through the tube *f*, projecting some way into the cylinder. The vessel 3, having a sloping bottom, receives the excess liquid, carrying with it some solid matter, which deposits, and is returned to the cylinder by the conveyor 4; *f'* is the liquid-outlet pipe. Heating or cooling liquid is passed through the pipes *e*, *e'* being the inlet and e^2 the outlet. A conical funnel, 5, having rims, 6, arranged on helicoid lines, receives the sediment from the vessel 3. The partitions, 7, are in sections, and are perforated, corrugated, or of wire gauze, arranged in an inclined position, to facilitate lifting the material through the liquid, so as to expose it to the action of the vapour or gases. When radial partitions are used, they are bent so as to move the material, and do not run in the direction of the axis. Vapour or gas is admitted by the tube *g*, and has outlet at *g'*. When the rotation of the cylinder is arrested, the sludge is permitted to flow into the settling tank *b*, provided with stirrers, and having a valved bottom, and communicating with other vessels. The sludge may be run alternately into different settling tanks, the supernatant liquor be withdrawn for return to the cylinder, and water for lixiviation be added in its place.

In the application of the apparatus in the manufacture of bicarbonate, this is dissolved by aid of heat in presence of carbon dioxide; the liquor is settled in a continuous manner, and is then passed through another cooling cylinder, into which the gas is also passed. The apparatus is stated to offer special advantages in the treatment of beer, which may be first cooled in presence of air and afterwards replaced by carbon dioxide. There are 85 claims.—E. S.

Pulverising and Separating Mineral and other Substances; Machinery or Apparatus for ——. C. W. Kitto and H. H. Kitto, both of Acton, Middlesex. Eng. Pat. 20,040, Nov. 7, 1900.

The apparatus is of the type in which the pulverising is effected by a ball impelled around a circular path or track by a pair of rotary discs, the discs being driven from a common shaft which extends co-axially through the discs and the path or track. The discs are held upon longitudinally adjustable dome bearings by springs, which do not encircle the shaft as usual, but are disposed, at suitable distances apart, around it, the arrangement being such as to enable the discs to be brought closer together, to compensate for the wear of the ball, without removing the shaft. Bolts are passed through each disc and bearing, and, in conjunction with the springs, serve to hold the discs evenly on their bearings, and to facilitate the relative adjustment of the discs. Each bearing is carried by, but is separate from, a longitudinally adjustable clutch sleeve, rotating with the driving shaft, and can be adjusted for wear or renewed, without dismantling the apparatus. The casing of the apparatus is made of boiler plate, &c., bent to the form of the path or track, and is caused to grip the latter by drawing the edges of the plate together. The driving discs are provided with beaters or distributors, which tend to throw the material from the bottom of the casing towards the ball path, and the driving shaft, with the ball and discs, has some freedom of movement longitudinally under the control of springs.—R. A.

II.—FUEL, GAS, AND LIGHT.

Peat Fuel. A. Bache. Proc. Inst. Civil Eng. 147, 1900—1901.

The author gives an account of the views of various Scandinavian writers on the use of peat as fuel. The peat bogs of Sweden are estimated to be equivalent to 3,000,000,000 tons of coal. In almost all furnaces peat can be substituted for coal and for 10 years, in Martin-steel and glass furnaces, brick and tile kilns, &c., this has been done. The lowest price of coal in Sweden is 16*s.* 8*d.* per ton, the equivalent price of peat being 9*s.* 3*d.* At Haarlem, in the province of Holland, the peat bog lies below the level of the sea, and is worked by floating excavators; these excavators draw 1 ft. of water, and deliver the kneaded peat at the rate of the equivalent to 100—200 tons of air-dried peat (25 per cent. of water) per day, to the drying floors, at a cost of 3*s.* per ton; the peat is spread out in a layer 2 ft. thick, which subsides in two days to less than half that thickness. It is then cut up into blocks 3 ins. × 3 ins. × 5½ ins., which are placed on end. Peat briquettes have been made at Ironowka, near St. Petersburg, for the past 10 years; the peat mull is crushed between rolls, sifted through sieves of 0·1 in. mesh, and conveyed to the drying chamber, where the proportion of water is reduced to from 15 to 20 per cent. The drying chamber contains a series of cast-iron trays, one above the other, heated by exhaust steam; the mull is conveyed along these trays, being stirred at the same time, and is delivered finally to the press, the open-ended cylinder of which contains a sufficient number of briquettes to provide enough friction to allow of the pressure required. To make good and durable briquettes, the peat must contain 18 per cent. of water. The heating power of such briquettes is probably one-third greater than air-dried peat, and the cost of manufacture is twice as great. They have the advantages of being easily stored and of withstanding moisture; they can be stacked out of doors without cover. The coking of peat does not yield such valuable residual products as is the case with wood. Air-dried peat containing 25 per cent. of water, yields 40 per cent. of peat charcoal; its calorific power is, before coking, 6,300 B.T.U. per lb., after coking, 5,040 B.T.U.; there is thus a loss of 20 per cent. of heating value. Peat powder so thoroughly dried as to expel the combined water, has proved to be a good fuel at Jönköping, and has the same evaporative power as coal. The special difficulty of employing peat charcoal for iron smelting has been its friability; it also occasionally contains phosphates. The principal by-products are recovered in the following percentages on the dried peat at the Stangfjord Electro-Chemical Works:—Creosote oil, 4 per cent. (2*l*. per ton); ammonium sulphate, 0·4 per cent. (8*l*. per ton); acetate of lime, 0·6 per cent. (6*l*. per ton); wood spirit, 0·2 per cent. (35*l*. per ton). At the Trent Valley Peat Fuel Works, Kirkfield, Canada, the peat is raised by a dredger and conveyed to the works, where it is filled into bags of coarse felt, 6 ft. × 6 ft. 4 ins., which, a dozen at a time, are squeezed by a hydraulic press at a pressure of 4,000 lb. per sq. in.; the press takes 8 tons at a time, the operation lasting 12 minutes. The pressed stuff then passes through a crushing machine, where all the larger pieces of peat are broken up and fed into the upper end of a sloping cylinder, 5 ft. in diameter and 30 ft. long, which slowly revolves, and terminates at its lower end in a firing chamber, wherein the temperature is about 1,500° F. (? 500° F.). The yield is about 3 tons of dried peat per hour. The dried peat contains 12 per cent. of moisture, and is finally compressed into cylinders 1½ ins. × 1½ ins. The cost is reckoned at 6*s*. 5*d*. per ton, including royalty. A ton of peat yields 160,000 more British thermal units of heat if first coked and burnt as peat charcoal than if burnt direct as peat. The relative composition of peat charcoal and peat is given by Mr. Tylvad as follows:—

——	Peat.	Peat Charcoal.
Carbon	42·7	76·5
Hydrogen	4·0	3·5
Oxygen	27·4	11·9
Nitrogen	1·6	1·3
Water (absorbed)	21·9	2·0
Ash	2·4	4·6

The flues and combustion chambers for boilers, &c. should be increased 8—27 per cent. over the usual dimensions for coal, when intended for burning peat. Peat charcoal yields excellent gas for lighting and heating; that from peat itself is too largely mixed with carbon dioxide to be of service for gas engines.—J. W. H.

Furnace Combustion; Phenomena of ——. O. Boudouard.
Bull. Soc. Chim. 1901, **25**, [18], 833—840.

The author has studied the conditions controlling the reaction $2CO \rightleftarrows CO_2 + C$ in the gas producer, the blast furnace, and the cupola. In the producer, where the object is to convert the whole of the carbon into carbon monoxide, experiments described in this and previous papers (this Journal, 1899, 278, 279, 498, 742) point to the following as the best conditions:—A high temperature; the reduction of carbon dioxide by carbon begins at about 550° C., and is only complete at 1,000° C.; a porous fuel in a finely divided state and a very slow stream of air and gas. In the blast furnace, where the reduction of oxide of iron is effected by carbon monoxide, and part of the carbon dioxide formed is again reduced to carbon monoxide by the fuel, any of this gas escaping from the furnace represents so much fuel wasted. Here, again, temperature, porosity, and draught are the important factors. Peculiar deposits of carbon (containing a small percentage of iron) found in the furnace are attributed to the decomposition of carbon monoxide into carbon dioxide and carbon by long and quiet contact with oxide of iron at comparatively low temperatures (300°—400° C.). Such deposits, forming in fissures, joints, and pores of the furnace wall wherever there are particles of iron oxide, eventually destroy the structure. In the cupola, where the fusion of metal, not reduction, is the object in view, complete combustion of carbon to carbon dioxide must be aimed at, and reduction of carbon dioxide to carbon monoxide avoided. The conditions therefore are, a dense fuel in large pieces exposing the smallest possible surface, a quick draught to lessen the time of contact of the carbon dioxide with the carbon, a low air pressure and much divided stream, and a rapid cooling of the carbon dioxide formed. A hot-air blast is detrimental.—T. A. L.

Gas; Modern Practice in the Manufacture and Distribution of ——. H. E. Jones. Proc. Inst. Civil Eng. 1901, **146**, [4], 1—27.

The author first refers to recent important improvements in the consumption of gas, and then treats of the whole subject of the manufacture and distribution of gas under the following headings. Labour-saving machines; residuals; enrichment of gas; capital expenditure in gas undertakings; works of manufacture; distribution. The paper is accompanied by seven diagrams.—A. S.

Acetylene; Dissolved ——. M. Fouché. La Nature, 1901, 289. Proc. Inst. Civil Eng. 1901, **146**, [4], 68.

Claude and Hess (this Journal, 1897, 524) have found that at a pressure of 10 atmospheres, 1 litre of acetone will dissolve 240 litres of acetylene gas, with a slight increase in volume, and that the solution is non-explosive (see also this Journal, 1897, 787, 788). When using the dissolved acetylene for illuminating purposes, the pressure is reduced from 10 atmospheres to that of a column of 2 or 3 inches of water, by means of a special reducing valve attached to the iron cylinders in which the solution is distributed for consumption. The gas is forced through a dry meter, with a manometer attached, and is consumed in a special burner. In the original, the various types of cylinders are described and illustrations are given of the apparatus.—A. S.

Air Carburetted with Benzol in Fischer's Apparatus; Behaviour of ——, *and the Limits of Explosion of Admixtures with Air.* F. Ulzer. Mitt. d. tech. Gewerbe-Museums, Vienna, 1901, **11**, [7, 8, 9, and 10], 158.

A measured quantity of the gas was passed through U-tubes placed in freezing mixtures, and the benzene which separated, was weighed. The initial temperature of the gas was 20° C., and the benzene always contained a small proportion of water.

Temperature.	Volume of Gas.	Weight of Benzene.	Weight of Benzene per 100 litres of Gas.
° C.	Litres.	Grms.	
0	109	11·10	10·18
− 5	111	12·85	11·57
−10	126	14·9	11·82
−20	157	20·05	12·77

A mixture of 74 volumes of carburetted air and 26 volumes of air, or of equal volumes of the two, is not explosive; whilst 72 volumes of carburetted air and 28 volumes of air, or 52 volumes of carburetted air and 48 volumes of air, form explosive mixtures.—T. A. L.

Naphthalene Stoppages [in Gas Plant]; Removal of ——. J. f. Gasbeleucht. 1901, **44**, [41], 756.

Sartorius, acting on Bueb's advice, used a Standard washer, having two compartments, charged with anthracene oil, for washing gas at Aschersleben, and found that this treatment completely prevented naphthalene stoppages, which had previously caused great trouble, especially at the inlet and outlet of the gasholder. But Bueb's further recommendation to use the anthracene oil, after removal from the washer, for diluting the tar in the collecting (hydraulic) main, proved a source of frequent blockages owing to thickening of the tar in the main itself and in the tar wells. This recommendation was disregarded, and the anthracene oil from the washer was run direct into the tar for disposal.

Rother had had less trouble from naphthalene stoppages at Spandau during the past winter than in previous years. He had brought into use during the winter a setting in which the ascension pipes were 2 metres longer than those hitherto used, and the hydraulic main consequently 2 metres higher. Since the use of this setting, naphthalene stoppages in the works had ceased, though stoppages occurred in a main laid under a bridge in the town. These were removed by evaporating crude xylene into the gas.—J. A. B.

Coal and Coke; Arsenic in ——. A. C. Chapman.
See under XXIII., *page* 1241.

Sulphur in Fuel; Determination of the Total ——.
R. Dubois.
See under XXIII., *page* 1241.

PATENTS.

Fuel; Manufacture of ——. P. R. de F. D'Humy, Liverpool. Eng. Pat. 19,087, Oct. 25, 1900.

Peat or other decayed vegetable matter is mixed with combustible binding materials in the wet state, and then heated "until a chemical separation of the carbon constituents of the mass has taken place." The mass is then pressed and cooled.—R. S.

Peat; Carbonisation of ——. H. Holm, Denmark. Eng. Pat. 20,893, Nov. 19, 1900.

An improvement on the process and apparatus described in Eng. Pat. 12,523, 1900 (this Journal, 793, 1901). In this case, the carbonising vapours ("smoke") travel in a closed circuit, being in one part of its circuit heated in a closed chamber, outside which fresh hot vapours from the generator constantly pass, while in the carbonising chamber its temperature is again reduced. Valves are provided which automatically act to admit more vapours into the circuit if the pressure diminishes, or to allow some to escape if the pressure increase.—R. S.

Peat; Treatment of ——. H. H. Lake, London. From P. Jebsen, Norway. Eng. Pat. 16,347, Aug. 14, 1901.

To make peat charcoal, the peat is carbonised in thin layers in vertical or nearly vertical retorts, each retort being provided with a central flue, so that the peat layer is heated from both inside and outside. The retorts extend downwards from the heating space into a cooling chamber, from which a discharge shoot opens into a lower room. Above the retorts there is a drying floor, heated by the gases leaving the heating chamber. These gases are caused to pass through zigzag channels under the floor.—R. S.

Fuel Briquettes, Blocks, or Pieces; Manufacture of ——. F. Chailly, New York. Eng. Pat. 17,863, Sept. 6, 1901.

The briquettes are formed from comminuted combustible material and an agglomerating substance or binder composed of a mineral containing calcium and an agglutinating viscous or gelatinous substance, or solution of such a substance, or a soluble silicate, or silicic acid. A special composition claimed, consists of a mixture of a comminuted combustible material, anhydrous gypsum, dextrin or starch, soluble silicates or silicic acid, and residues of mineral oils, commonly called black oil.—R. S.

Coke; Apparatus for the Manufacture of ——. J. H. Darby, Wrexham. Eng. Pat. 3586, Feb. 19, 1901.

To prevent the coke having a dark appearance, due probably to the combined action of air and water when cooling, a fixed or portable hood or cover is placed at the exit of the coke oven, and is provided with water jets for thoroughly drenching the coke while it is practically out of contact with the air.—R. S.

Gases of High-caloric Value from Low-caloric Fuel Material; Process for the Production of ——. A. J. Boult, London. From D. Turk and the Actien Gesellschaft "Lauchhammer," both of Riessa a/Elbe, Germany. Eng. Pat. 23,662, Dec. 27, 1900.

Gas from lignite, peat, or other material, which yields a large proportion of steam and carbon dioxide, is passed through carbonaceous fuel previously raised to incandescence by an air-blast, and the steam and carbon dioxide are thereby decomposed. The gases produced during the application of the air-blast to the carbonaceous fuel are not mixed with the gas.—J. A. B.

Gas Producers. W. J. Crossley, Manchester, and J. Atkinson, Marple, Cheshire. Eng. Pat. 19,377, Oct. 30, 1900.

A circular grate, leaving an annular opening for the escape of ashes, is revolved slowly, either continuously or at intervals, with the object of keeping the fuel in uniform condition. The air for combustion passes through the annular space between an outer shell and the lower part of the producer, to the grate opening, and thereby absorbs heat from the producer shell. The gas formed, passes away through a central internal pipe which extends downwards from the lid of the producer, and fuel is fed into the space between this pipe and the lining of the producer. Volatile constituents of the fuel are gasified by the heat from the effluent gas, communicated through the central pipe. A metallic lining may be employed in the producer at about the level of the mouth of this pipe, in order to conduct heat upwards to the fresh fuel.—J. A. B.

Gas Generators. P. A. Fichet and R. M. J. Heurtey, both of Paris. Eng. Pat. 16,356, Aug. 14, 1901.

The walls of the generator incline inwards at its lower part, and form a support for the fuel. At the top of the bed of fuel, air is admitted, and at the bottom there is a hollow cone, in which the gas formed, collects, and escapes by a lateral pipe. Below this cone is a hopper discharging on to a revolving or swinging plate, which is operated so as to discharge the slag or cinders into water contained within a closed casing surrounding the outlet hopper.—J. A. B.

A Fixed Gas for Lighting, Heating, or any other Purpose; Process and Apparatus for Making ——. E. B. Cornell, Philadelphia, and W. C. Alderson, Overbrook, Pa., both in U.S.A. Eng. Pat. 17,171, Aug. 27, 1901.

Steam is produced in a boiler, within the setting of which are retorts to which the steam and crude petroleum are admitted in regulated proportions. The retorts each comprise a core and annular space, through which the products circulate, and are thus brought into close contact with the hot outer walls. The outlet pipes are of smaller size than the inlet pipes to the retorts, with the object of retarding the escape of the gas, which is finally passed through condensing pipes to the gasholder. The retorts are maintained at a temperature of at least 1,800° F., whereby the steam is stated to be completely decomposed, and the gas formed to consist substantially of carbon monoxide, ethane, and methane. $1\frac{3}{4}$ lb. of crude petroleum to 1 lb. of steam are said to give good results.—J. A. B.

Blast-Furnace Gases, and Apparatus therefor; Impt. in Charging Motor Engines Worked by ——. B. H. Thwaite, London. Eng. Pat. 21,733, Nov. 30, 1900.

The gases are mixed, on their way to the engine, with an amount of air insufficient to produce a combustible mixture, the remainder of the air necessary for combination being drawn into the cylinder, by the suction of the piston, along with the gas and air already mixed. The first portion of air is admitted at the fan delivering the gas to the purifiers, &c., the supply being regulated by a suitable valve, which valve, in one modification of the apparatus, is controlled by governors actuated by a vane or wheel situated within the gas main and set in motion by the current of gas therein.
—C. S.

Gas; Apparatus for the Manufacture of ——. F. W. C. Schniewind, New York City. Eng. Pat. 17,510, Aug. 31, 1901.

The apparatus is intended for carrying out a method of gas manufacture for which an application for Letters Patent has been made. The method is an improvement on one protected under Eng. Pat. 10,588 of 1900 (this Journal, 1900, 814). A water-gas generator supplements the apparatus there described, and is provided with connexions and valves by which the water-gas is passed into the gasholder, which receives the richer gases produced in the retorts, while the producer gas, which is made intermittently with the water-gas, is mixed with the poorer gases which are used for heating the retorts. The illuminants, removed from the poorer gases by washing with oil, serve

to maintain the illuminating power of the mixture of water-gas and the richer gases from the retorts. Thus the employment of the water-gas generator greatly increases the bulk of gas obtained suitable for illuminating purposes.
—J. A. B.

Illuminating Gas and Coke; Manufacture of ——, and Apparatus therefor. O. Ruppert, Essen-Ruhr, Germany. Eng. Pat. 18,513, Sept. 16, 1901.

In order to improve the quality of the coke, the inventor carbonises coal in vertical retorts, in which the weight of the superincumbent coal prevents swelling of that below. In order to avoid reduction of the quality of the gas, as soon as the gas evolved is found to be poor in illuminants, it is no longer discharged into the condensers, but into a chamber which communicates with the passages for heating the retorts, where it supplements the supply of producer-gas. The construction of the settings of retorts, with the distributing chamber and heating passages, is described in detail by reference to diagrams.—J. A. B.

Washers for Producer or other Gases. C. Humfrey, Hartford, Cheshire. Eng. Pat. 22,644, Dec. 12, 1900.

In washers, each consisting of a chamber partly filled with water and provided with dashers for producing a spray, the invention consists in having pairs of dashers, the blades of which are curved in opposite directions, so that they throw up liquid towards one another and thereby produce an extremely intimate admixture of the washing liquid in the form of spray with the gas. The liquid tends to rise at the ends and to fall at the centre. To obviate this, extensions or side chambers are provided at the ends, and are connected with an extension at the centre, whereby the liquid is continually brought back to the centre, and the water remains practically level.—R. S.

Washing and Cleansing Gas from Ammonia and other Impurities; Apparatus for ——. R.W.B. Creeke, Fife, N.B. Eng. Pat. 5948, March 21, 1901.

In revolving brush scrubbers, instead of using cylindrical brushes having brushing fibres on the outer surface only, the gas being passed across the surface at right angles to the longitudinal axis of the cylinder, each brush has concentric rings of brushing fibres, and the gas is caused to pass along the outside surface of the brush in the longitudinal direction, and then back again through one of the annular passages, past an interior concentric cylindrical brush, or *vice versa*. A series of three such compound brushes is shown arranged in a tower, with suitable gearing for driving all the brushes from one shaft. A diagram also shows how twelve cylinders may be combined.—R. S.

Calcium Carbide; Process and Apparatus for the Production of ——. D. de Vulitch and J. D'Orlowsky, both of Paris. Eng. Pat. 21,214, Nov. 23, 1900.

The process consists in fusing a mixture of carbon and an excess of lime in an electric or other suitable furnace, and discharging the molten mass out of contact with the air, into a bath of a suitable hydrocarbon. The latter is decomposed into carbon and hydrogen, the former of which combines with the excess of calcium to form more carbide. The carbide combines, during crystallisation, with hydrocarbon, whereby the former is rendered capable of subsequently resisting the humidity of the air.—R. S.

Acetylene Gas; Apparatus for Generating ——. C. Busch, Paris. Eng. Pat. 10,183, May 16, 1901.

A carbide container, hermetically closed except at its base, which is perforated in order to admit water and allow of the escape of the gas formed, while retaining the lime, which serves to purify the gas, is placed within a bell, which dips into a vessel containing water. The bell is provided with a burner and tap, and an air-discharge cock.—J. A. B.

Acetylene; Apparatus for Generating ——. G. Belin, Brussels. Eng. Pat. 17,566, Sept. 2, 1901.

A generator containing carbide is connected by two passages—through the lower of which water enters and through the upper of which gas escapes—with the lower of two compartments of a vessel. The upper compartment serves as a water reservoir, and communicates with the lower by a pipe reaching nearly to the bottom of the latter. Water passes from the reservoir to the lower compartment until it reaches the inlet passage to the generator, whereupon the gas evolved, passes into the upper part of the lower compartment and forces water back into the reservoir, until the gas is drawn off for consumption.—J. A. B.

Vapour-burning Apparatus; Impts. in ——. A. Kitson, London. Eng. Pat. 20,210, Nov. 9, 1900.

The inventor claims: Incandescence-lighting vapour-burning apparatus, in which oil is vaporised in a horizontal or nearly horizontal tube enclosed in a casing, the vapour issuing from the tube, drawing air into a mixing chamber and forming therewith a combustible mixture, which is apportioned, by the aid of distributing appliances, to the main burner or burners above the vaporising tube, and to one or more auxiliary burners adapted to heat the vaporising tube, as by projecting flame underneath and along the same. The pipe conveying the combustible mixture to the burner is combined with a frame, provided with burners and so connected with the said pipe that it (the frame) can be moved so as to bring a mantle, mounted over any of the burners, into operative position during action, without more than a momentary interruption of the illumination.
—C. S.

Producer Gas Burners for Steam or other Boilers. C. Humfrey, Hilderstone, Hartford, Cheshire. Eng. Pat. 22,643, Dec. 12, 1900.

The burner is a combination of a number of tubes fixed into a tube plate and projecting into or towards the flue or other place to be heated, and of a surrounding chamber, the effect being to form a number of narrow passages in juxtaposition, through one set of which (*e.g.*, the tubes) the producer gas is passed, whilst the air is admitted through the other set, in order to facilitate admixture.—C. S.

Gas and Vapour Burners; Impts. in ——. A. Hayes, Salt Lake City, U.S.A. Eng. Pat. 5757, March 19, 1901.

The method claimed is for vaporising and burning hydrocarbon oils, by forcing them, in the state of fine spray, through a flame, mixing the resulting vapour with air to form a gas, and conducting this gas to a burner.

The apparatus consists of a mixing tube; means for forcing a fine stream or spray of oil into the mixing tube; means for maintaining a vaporising flame within the mixing tube, about the spray or stream of oil; means for supplying air above the flame to mix with the vapour generated from the oil; and means for supplying a fixed combustible gas to the mixing tube.—C. S.

Igniting Devices for Automatic Gas Lighting; Impts. in ——. W. P. Thompson, Liverpool. From A. Simonini, Brooklyn, U.S.A. Eng. Pat. 13,579, July 3, 1901.

The lighter comprises, in combination, a preliminary heater of platinum black; an igniter, consisting of a body of fibrous material surrounding the heater, the said body being impregnated with a solution of thorium nitrate, 99 per cent.; cerium nitrate, 0·98 per cent.; and rhodium chloride, 0·02 per cent.; and an intermediate heater, formed on the upper portion of the fibrous body by means of a solution of thorium nitrate, 99 per cent.; cerium nitrate, 0·8 per cent.; and rhodium chloride, 0·2 per cent., the last-named solution being applied in gradually decreasing quantity from the upper end of the fibrous body toward the lower end thereof.
—C. S.

Bunsen Burners; Impts. in ——. C. M. Kemp, Baltimore, and G. H. Denny, New York, U.S.A. Eng. Pat. 16,162, Aug. 12, 1901.

The claims include the combination, in a Bunsen burner, of a gas-supply tube and tapered valve thereon, with a cap threaded on the gas tube and provided, in the centre of its top, with a port through which the said valve projects; also a cylindrical sleeve fixed on the cap and extending nearly to the top of same; a burner tube, mounted on the gas tube, free to rotate on the same, and provided with air-inlet ports arranged opposite said valve; means for preventing the vertical movement of the burner tube; and a projection on the sleeve, extending into a vertical slot in the burner tube, which sleeve is snugly fitted into the burner tube, and serves, when raised and lowered, to diminish and increase the operative area of the air-inlet ports.—C. S.

Hydrocarbon Burners; Impts. in ——. R. G. Groves, Wolverhampton. From The Pan-American Light Co., New York, U.S.A. Eng. Pat. 19,799, Oct. 4, 1901.

The invention consists of a hydrocarbon lamp, provided, above the burner or burners, with a vaporiser comprising a number of superposed (substantially parallel) tubes, so arranged as to form a zigzag passage for the hydrocarbon, the inlet tube being farthest from, or least exposed to, the heat from the burner, in order to obviate the decomposition of the liquid hydrocarbon. The vapour outlet is arranged to discharge upwards into an upright mixer, for mixing it with atmospheric air drawn in by injection. The vaporising tubes decrease in diameter from below upwards, to allow for the expansion of the hydrocarbon and protect the incoming oil from the intense heat of the burner. The lamp has preferably two primary igniters, one for gas and the other for a combustible liquid, such as alcohol. In the latter case, the igniter consists of a tubular guide with ignition apertures, and of an interior sliding trough containing the igniting liquid and fitted with apertures which register with those in the guide tube. Some of the tubes of the vaporiser are fitted with devices for scraping off any accumulations of carbonaceous or other obstructive matter.—C. S.

Incandescence Mantles for Gas Lighting. O. A. Berend, London From J. R. Schauer, Weipert, Bohemia. Eng. Pat. 22,470, Dec. 10, 1900.

An incandescence mantle for gas lighting, made from fabric manufactured by a twill-knitting machine.—H. B.

Incandescence Bodies for Electric Glow Lamps. A. Just and R. Falk, Vienna. Eng. Pat. 22,599, Dec. 11, 1900.

There are claimed incandescence bodies composed of a mixture of zirconium, with zirconium oxide, without the addition of any other metals or oxides. The materials are moistened with water and pressed into moulds.—H. B.

Incandescent Gas Burners. The Portable Gas Fountain Syndicate, Ltd., Westminster. From J. Thovert, Lyons. Eng. Pat. 23,695, Dec. 24, 1900.

Inside the mixing tube of a Bunsen burner is arranged a disc with helically inclined blades (the device resembling a propeller), which cause the current of gas and air to sweep round and become more thoroughly mixed. To produce a still more perfect mixing of the gas and air, there may be arranged concentrically, at the lower end of the mixing tube, two annular ascending and descending passages, which cause the gases to take a zigzag course before passing up the mixing tube.—H. B.

Self-igniting Incandescent Gas-Lights. A. Rosenberg, Berlin. Eng. Pat. 23,701, Dec. 28, 1900.

When platinum solutions are applied to unburnt fabric, they generally spread over a greater surface than is desired. To obviate this, no aqueous solution is used, but a solution of an organic platinum compound in fatty or ethereal oils, similar to those used in the ceramic art for the production of platinum and gold lustres. Such solutions do not spread on the fabric.—H. B.

Electric Lighting, Heating, and Resistance Bodies; Manufacture of —— [*Nernst*]. W. Boehm, Berlin. Eng. Pat. 11,529, June 5, 1901.

The materials, such as the rare earths or alkaline earths, to be used in making the glow-bodies, are subjected to a very strong heat, such as that of the electric arc, to cause them to become as dense as possible. They are next finely ground, made into a paste, and formed into rods or other suitable shapes. By subjecting the formed bodies to the heat of the arc, they become coated with a glaze, and contract to the extent of about 20 to 30 per cent. of their diameter. It is preferable to fuse the ends of the bodies into a ball form in the electric arc, to still further increase their density and to give them a larger contact surface. The ends may first be coated with a difficultly fusible substance, and then fused in the electric arc.—H. B.

Burners for Oil Lamps having Incandescing Mantles. L. C. Nielsen, Copenhagen. Eng. Pat. 1585, Jan. 23, 1901.

The claim is for a ring or the like, which may be revolved, for regulating the air-inlet orifices as required.—H. B.

Incandescent Electric Lamps and Heaters; Manufacture of Filaments and other Conductive Bodies for ——. W. E. Sander, Berlin. Eng. Pat. 14,411, July 15, 1901.

There are used, as the bases of the filaments, the metals of the rare earths, such as thorium and zirconium, and of the alkaline earths, and uranium, and certain combinations of these metals, particularly the hydrogen and nitrogen compounds. The reduction of the oxides is effected by heating them highly, either *in vacuo*, in an atmosphere of neutral gas, or in the presence of hydrogen or nitrogen, along with a suitable reducing agent, such as magnesium. The metallic bodies are found in an amorphous form inside the retort; but at the same time gaseous products are formed, which can be deposited on heated articles suspended inside the retort. The solid products are made into a paste with cellulose solution, extruded into filaments, dried, carbonised in a neutral atmosphere, and then highly heated *in vacuo* or in a neutral atmosphere. In utilising the gaseous products, any suitable filament is suspended in an enclosed space, from which oxidising gases are excluded, the filament is caused to glow, and the gaseous bodies are introduced. These deposit themselves, with partial decomposition, first on the hottest parts of the body, so that the filament gradually acquires equal cross-section in all parts.—H. B.

Incandescent [Oil] Lamp Burners. A. Schapiro, Berlin. Eng. Pat. 19,502, Sept. 30, 1901.

This relates to burners of the circular wick type, in which the flame is regulated by moving up or down a cylinder situated within the inner wick-tube, so that the surface of the stationary wick, from which the oil is to evaporate, can be increased or diminished. The claim is for attaching the flame-spreader rigidly, by means of a rod, to the movable cylinder, so that as the latter moves up or down, the flame spreader moves with it.—H. B.

Incandescent Lighting; Bunsen Burners for use in ——. G. Ihle, Berlin. Eng. Pat. 19,247, Sept. 26, 1901.

To produce as perfect a mixing as possible of the gas and air, the mixing tube of an ordinary Bunsen burner is divided longitudinally into several separate parallel chambers, into which there open as many separate gas-nozzles leading from a common mixing chamber. The burner head is common to all the mixing tubes.—H. B.

Incandescent Gas Burners. J. Mallol, Birmingham. Eng. Pat. 19,776, Nov. 3, 1900.

Centrally within the burner head is fixed an inverted ribbed cone, which is heated by the flame and itself imparts heat to the stream of combustible gas passing up between the ribs. To prevent the flame from flashing back, a wire-gauze cone, surrounding the heating cone, is fixed within the burner head. The mantle support rises from a socket in the base of the heating cone. Air is admitted to the mixing tube from below, the air inlets consisting of perforations in a horizontal annular disc surrounding the gas inlet nipple.—H. B.

Candles and other Illuminants for Producing Effective Christmas Tree and other Illuminations, with Process for Manufacture of same. E. Oelbermann, Cologne-Ehrenfeld, Prussia. Eng. Pat. 19,286, Sept. 27, 1901.

The claims made are, the use of a very thin wick as compared to the cross section of the fatty substance, both being as free as possible from sodium, and incorporating with the fatty substance materials which will produce coloured flames. Metallic salts which are soluble in the fatty substance are used; those which, like barium and strontium, give scoriaceous products are not suitable, nor are those which give rise to small local explosions. For red the inventor employs lithium salts, and for green, salts of copper. —H. I.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Pyrogenetic Contact Reactions of Organic Compounds. W. Ipatiew. Ber. 1901, **34**, [14], 3579—3589.

The decompositions of organic compounds under the action of heat may be of two kinds: (1) Decompositions produced by the action of heat alone; (2) contact decompositions, produced by the action of heat, but necessitating the presence of some foreign substance, with which the vapours come into contact. According to the nature of the contact substance, these decompositions take place at lower temperatures, and the products vary, not only quantitatively, but even qualitatively.

The decompositions of anhydrous ethyl alcohol have been studied. The alcohol was boiled in a flask and the vapours passed through a hard glass tube contained in a furnace. The products passed through a large flask cooled with water, a reflux condenser, a coiled tube, then two receivers cooled by ice and salt, thence through bromine into a gasometer. Before the experiment the air was expelled from the flask by alcohol, and from the tube by carbon dioxide. The temperature was determined by a Le Chatelier's pyrometer in the middle of the tube. In order to obtain comparative results about 150 grms. of alcohol were always distilled over per hour.

Alcohol is decomposed to the extent of traces only at 700° C., at 800° C. the decomposition is more marked, and at 820°—850° C. it is considerable. In order to estimate the aldehyde produced, the contents of the first and second flasks were distilled, the distillate which passed over below 70° C. was diluted with ether, ammonia gas passed through, and the crystalline compound weighed. The increase in weight of the wash-bottles was added to the aldehyde so found. At 820°—830° C. about one-fifth of the alcohol destroyed is decomposed into ethylene and water, and four-fifths into hydrogen and aldehyde. About one-third of the aldehyde remains undecomposed; the remainder is further converted into methane and carbon monoxide. The higher the temperature the more aldehyde is produced, but also the more is destroyed. In a platinum tube a similar decomposition occurs, but apparently at a lower temperature.

In the presence of zinc in the form of rods at 620°—650° C., alcohol is decomposed principally into aldehyde (about 80 per cent. of the alcohol destroyed); the gases are very rich in hydrogen, and little ethylene is obtained. In the presence of zinc dust (purified, and dried at 150° C. in carbon dioxide) at 550° C. about half the alcohol is decomposed into ethylene, and half into aldehyde, which is then partially destroyed. Brass turnings at 650° C. produced principally aldehyde.

Ethyl ether requires a much higher temperature than alcohol for its decomposition; of 145 grms. distilled over zinc at 750° C., 33 grms. were decomposed, 10 grms. of acetaldehyde and 3 grms. of ethylene being obtained.

The author considers that the greater production of aldehyde by oxidisable metals (zinc) is explained by the following equations, in which "Me" = metal: $C_2H_5.OH = C_2H_4 + H_2O$; $Me + H_2O = MeO + H_2$; $C_2H_5.OH + MeO = Me + CH_3.CHO + H_2O$.—A. C. W.

Fluorene; Manufacture of ——. Actienges. f. Theer- und Erdöl-Ind., Berlin. Ger. Pat. 124,150, July 1900. Zeits. angew. Chem. 1901, **14**, [44], 1118. (See also Eng. Pat. 5047, 1901; this Journal, 1901, 796.)

This process for separating fluorene from the mixture of hydrocarbons in which it is contained is based on the observation that, when fused with caustic potash at about 280° C., fluorene forms a solid potassium compound:—$C_{13}H_{10} + KOH = C_{13}H_9K + H_2O$. When the melt is removed from the boiler, the potassium compound of fluorene settles down in the form of a brown mass, which quickly solidifies; this is separated from the upper layer of hydrocarbons, consisting principally of anthracene and phenanthrene, and is decomposed by treatment with water. The fluorene so recovered is then purified by distillation or by recrystallisation, and is employed for the manufacture of dyestuffs.—J. F. B.

Carbolic Acid; Determination of Crude ——. G. Schacherl.

See under XXIII., *page* 1251.

Carbolic Acid; Determination of Crude ——. F. Seiler.

See under XXIII., *page* 1251.

IV.—COLOURING MATTERS AND DYESTUFFS.

Benzylamine; Conditions of Formation of ——. Action of Ammonia on Benzyl Chloride. R. Dhommée. Comptes Rend. **133**, [17], 636—638.

The author has investigated the effect on the amounts of benzylamine, dibenzylamine, and tribenzylamine produced, by variations in the nature of the solvent, in the molecular weight of the solvent, the strength of the ethyl alcohol (when used as a solvent), the temperature, the proportion of solvent to a constant amount of ammonia, the proportion of ammonia to a constant amount of solvent, and the total amount of solvent and ammonia in a constant proportion to one another. The only really considerable influence is exerted by the last factor, and the author recommends using, with 100 grms. of benzyl chloride, 15 litres of alcohol containing 105 grms of NH_3 (*i.e.*, saturated with the gas). The materials are left in contact at the ordinary temperature for about five days; the yield is 42·6 grms. of benzylamine (with about 6 grms. of dibenzylamine and 1 grm. of tribenzylamine).—J. T. D.

Chromophoric Groups. H. Rupe and D. Wasserzug. Ber. 1901, **34**, [14], 3527—3531.

The authors have prepared from *m*-nitro-acetophenone, condensation products containing double linkings in different positions in the molecule with a view of determining their chromophoric effect and their influence when these products are combined with other radicles.

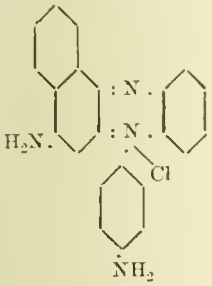
m-Nitrobenzylidene-m-nitro-acetophenone, $1.3.O_2N.C_6H_4.CH:CH.CO.C_6H_4.NO_2 1.3$, is best obtained by boiling together in alcoholic solution equimolecular proportions of *m*-nitro-acetophenone and *m*-nitrobenzaldehyde together with a few drops of soda lye. The condensation product crystallises from acetic acid in pale yellow needles melting at 210° C., insoluble in water, alcohol, ether, and light petroleum spirit, and soluble in acetic acid, acetone, benzene and chloroform. On reduction with stannous chloride and hydrochloric acid, the hydrochloride of the corresponding diamino compound is obtained. This yields a diacetyl derivative melting at 150° C. and crystallising in small white needles. The diamine gives a tetrazo compound which combines with various naphthol sulphonic acids and their derivatives, yielding direct cotton dyestuffs which, compared with the corresponding dyestuffs from benzidine, are redder in shade.

p-Dimethylaminobenzylidene-m-nitro-acetophenone is obtained by condensing *p*-dimethylaminobenzaldehyde and *m*-nitro-acetophenone in alcoholic solution with gaseous hydrochloric acid. The product crystallises from glacial etic acid in thin red needles melting at 165° C. It is paringly soluble in water and ether, more easily in glacial cetic acid, acetone and benzene, and dyes wool and silk golden-yellow colour. The corresponding amino compound obtained by reduction with stannous chloride and ydrochloric acid gives a diazo compound which, after ombination, yields dyestuffs giving bright shades on wool, ilk and tannined cotton.

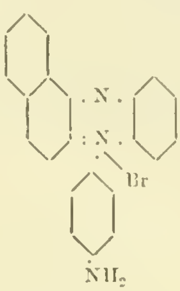
The condensation product 3.4-*dihydroxybenzylidene-m-itro-acetophenone*, obtained from protocatechualdehyde and nitro-acetophenone, forms small yellowish crystalline eedles from dilute alcohol, which melt at 217° C. The roduct is a strong mordant dyestuff, and gives orange hades on an alumina mordant, and a reddish-brown shade n chromed cotton or wool, which is particularly fast to oap. The effect of the presence of the nitro group is very arked; the condensation product from protocatechualdehyde and acetophenone only dyes chrome mordants a pale ellow. The nitro condensation product gives a diacetyl ompound melting at 179° C. and a diethyl derivative elting at 103° C.—T. A. L.

Rosinduline No. 14. F. Kehrmann and E. Ott. Ber. 1901, **34**, [12], 3092—3098.

HE six isorosindulines hitherto unknown contain the mino group in the phenyl nucleus attached to the azonium itrogen, and, with a view of completing the series, and nvestigating the effect of the introduction of the amino roup into this part of the molecule, two further isomerides ave been prepared. The starting point for No. 14 is .4′-diaminodiphenylamine, obtained from Nietzki and Witt's dinitrodiphenylamine, melting at 211°·5 C., by eduction with stannous chloride and alcoholic hydrochloric cid. The dihydrochloride of the base forms colourless rystals, which turn violet on exposure to light. On boiling this salt in alcoholic solution with 4-amino-1.2-naphthoquinone, condensation takes place, and on distilling off part f the alcohol, the dyestuff crystallises out on cooling. The ield of 13.6-diaminophenylnaphthophenazonium chloride (Ber. **31**, 3076; this Journal, 1899, 130)—



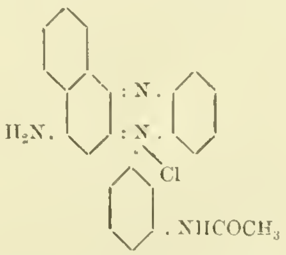
is about 65 per cent. of the theoretical. The product is stirred with acetic anhydride to a thin paste, and allowed to stand 24 hours at the ordinary temperature, when only the amino group in the phenyl nucleus is acetylated. The chloride of this substance separates from alcohol in large bronzy brick-red crystalline plates slightly soluble in cold water and alcohol. The dilute alcoholic solution has a strong brick-red fluorescence, whilst the solution in concentrated sulphuric acid is bluish-green. On boiling with acetic anhydride and sodium acetate, the diacetyl compound is obtained. The chloride of this product separates from alcohol in orange-yellow, greenish-golden, shining crystalline plates, and dissolves in concentrated sulphuric acid with a violet colour, becoming orange on dilution with water. The orange-red alcoholic solution does not fluoresce. The monacetyl compound described above, when diazotised in concentrated sulphuric acid solution, treated with alcohol and ferric chloride solution, yields an iron double salt, which is decomposed by washing with brine, giving acetylisorosinduline chloride. The salt is purified by dissolving in alcohol and precipitating with ether, and separates in golden-yellow crystalline plates, soluble in alcohol and water. The solution in concentrated sulphuric acid is dirty violet, becoming yellow on dilution with water. On hydrolysis with dilute sulphuric acid and precipitation with sodium bromide, a brownish crystalline powder of isorosinduline bromide No. 14 is obtained, having the formula—



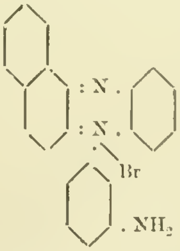
The product dissolves in concentrated sulphuric acid with a violet colour, becoming golden-yellow on dilution with water.—T. A. L.

Rosinduline No. 15. F. Kehrmann and P. Nüesch. Ber. 1901, **34**, [12], 3099—3104.

By boiling together in alcoholic solution 4.1.2-aminonaphthoquinone and 2.3′-diaminodiphenylamine with a drop of dilute hydrochloric acid, condensation takes place, and the resulting product is converted into the diacetyl compound. This, on boiling with hydrochloric acid in alcoholic solution, gives 6.12-diaminophenylnaphthophenazonium chloride, which, on treatment with acetic anhydride at the ordinary temperature, yields the monacetyl derivative—



from which the amino group can be removed by the diazo reaction. The product is converted into the bromide and then hydrolysed with sulphuric acid yielding 12-aminophenylnaphthophenazonium bromide—

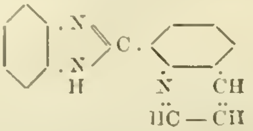


which separates from alcohol in dark yellowish-brown greenish metallic granules very sparingly soluble in water. The solutions are non-fluorescent and have a bitter taste. Concentrated sulphuric acid dissolves the product with a pure violet colour.

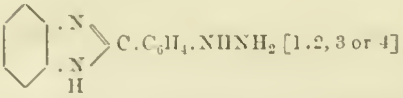
A comparison of the spectra of dilute alcoholic solutions of this product and of that described in the foregoing paper with phenylnaphthophenazonium shows that whilst the introduction of an amino group in the *m*-position (Rosinduline No. 15) has very little effect indeed, the presence of the same group in the *p* position increases the absorption of the less refrangible rays.—T. A. L.

β-Aminophenylbenzimidazoles; Comparison of the Three ——. *VII.* Bol. Miklaszewski and St. v. Niementowski. Ber. 1901, **34**, [12], 2958—2974.

In continuation of previous work on a new series of anhydro compounds, in which several derivatives of (β)-*o*-aminophenylbenzimidazols were described, the authors have prepared the isomeric (β)-*m*- and (β)-*p*-derivatives. The investigation of the azo dyestuffs herefrom has been indicated by Lauth, and undertaken, at any rate as regards the *p*-series, by F. Muttelet, so that the authors have confined themselves in the paper more particularly to two series of compounds, the quinobenzimidazoles—



and the hydrazinobenzimidazoles—



The aminobenzimidazoles are obtained by reducing the corresponding nitrobenz-o-nitranilides, and, with a view of characterising the three isomeric compounds, the authors have prepared the hydrochlorides and nitrates, acetyl and benzoyl derivatives, thioureas, azo dyestuffs and hydrazines, together with certain hydrazones, and also the quinobenzimidazoles. In general the aminophenylbenzimidazoles are colourless crystalline substances, insoluble in water, readily soluble in organic solvents. They have decided basic properties, and give well-crystallised salts with two equivalents of an acid. The nitrates and hydrochlorides are readily soluble in water and alcohol, whilst the latter salts are sparingly soluble in concentrated hydrochloric acid. The acetyl and benzoyl derivatives are the sole products of the action of the corresponding acid anhydrides on the *m*- and *p*-compounds, no condensation to di-anhydro compounds taking place as in the case of the *o*-derivative. It is also to be observed that the action of benzoyl chloride and soda lye does not decompose the imidazole ring. Carbon bisulphide in alcoholic solution forms, with the *m*- and *p*-derivatives, the corresponding thioureas in the same way that primary aromatic amines react. The products are yellow substances readily soluble in alkalis. On diazotising the aminobenzimidazoles at 0° C. in strongly acid solution, the resulting compounds combine readily with alkaline β-naphthol solution, yielding red azo dyestuffs. When the diazo salts are reduced with stannous chloride and hydrochloric acid, the corresponding hydrazines are obtained. These substances are yellow in colour, soluble in concentrated alkali lye, and precipitated from these solutions by carbon dioxide. The hydrazines are also soluble in acids, giving well-crystallised hydrochlorides and nitrates. The bases are precipitated by ammonia from solutions of these salts. The hydrazines reduce ammoniacal silver, but are very stable towards Fehling's solution, and condense with aldehydes, ketones, and ketocarboxylic acids to the corresponding hydrazones. These products are crystalline yellow substances, insoluble in water, soluble in alcohol, and do not possess sharp melting points. They are decomposed into their components by boiling with mineral acids, and certain of them, when treated with concentrated nitrite solution, give a pink coloration. The quinoline bases from the three isomeric (β)-aminophenylbenzimidazoles were obtained by means of Skraup's reaction, but only one of the two possible derivatives was formed from the *m*-compound. The new quinolines are similar to that from the *o*-compound which has been obtained previously; both contain a molecule of water of crystallisation, are soluble in organic solvents, and form diacid salts; for example, $C_{16}H_{11}N_3 2HCl$.—T. A. L.

Anthragallol: Autoxidation Products of ——. M. Bamberger and A. Praetorius. Monatsh. Chem. **22**, [6] 587—589.

The authors have commenced an investigation into the changes undergone by anthragallol when a current of ai is passed through the alkaline solution for a considerable time. A yellow substance was isolated, which crystallises from alcohol, ether, and water in fine plates, melting a 197°, and which dissolves in alkalis with crimson colour The behaviour of this body is similar to that of oxyjuglone and hydroxy-α-naphthoquinone acetic acid (Liebermann, Ber **33**, 1900, 572), but the constitution is not yet ascertained It has the empirical formula $C_{12}H_{10}O_5$; gives a red-violet silver salt, $C_{12}H_8O_5Ag_2$; a monomethyl ether crystallising in yellow needles, melting at 135° C.; and a crystalline orange coloured derivative with phenylhydrazine.

During the oxidation of anthragallol in this manner hydrogen peroxide is freely formed.—H. L.

Luteolin and Digitoflavone; Identity of ——. H. Kilian and O. Mayer. Ber. 1901, **34**, [14], 3577—3578.

The flavone detected in *digitalis* leaves, to which the name Digitoflavone was given (Ber. **32**, 1184; this Journal, 1899 677), is now shown to be identical with Luteolin. On fusion with potash it yields protocatechuic acid. On benzoylation it gives a tribenzoate melting at 201° C., whilst a tetrabenzoate is obtained, melting at 200°·5 C., from so-called digitoflavone or from its tribenzoate by the action o benzoylchloride and pyridine (Deninger's method). Comparative mordant dye tests further showed the identity o the Luteolin and digitoflavone, so that the latter term is superfluous.—T. A. L.

Amino-azo Compounds; Fatty Aromatic ——. B. Prager. Ber. 1901, **34**, [14], 3600—3606.

Fatty aromatic compounds, such as benzene-azo-aceto-acetic ester, in their enolic form, are analogues of *o*-hydroxy-azo compounds, but hitherto no fatty aromatic analogues o amino-azo compounds have been described. The author has obtained two representatives of this class of bodies by combining diazobenzene chloride with β-aminocrotonic ethy ester, $CH_3.C(NH_2):CH.CO_2C_2H_5$, and its N-methyl derivative. The reaction takes place most readily in hydrochloric acid solution, the hydrochloride of the new compound crystallising out and readily yielding the base on neutralisation with ammonia. The amino-azo compounds have a decided basic character, but the amino group is only loosely attached, since, if the acid solution of the benzene-azo-aminocrotonic ethyl ester be allowed to stand some time ammonia is split off and benzene-azo-aceto-acetic ester is formed. The action of alkalis or boiling with water produces the same decomposition. Aromatic amino-azo compounds react with *p*-nitrobenzaldehyde, forming nitrobenzal compounds or else triazines, whereas benzene-azo-aminocrotonic ester and *p*-nitrobenzaldehyde condense with elimination of alcohol, the reaction taking place at the ordinary temperature, yielding a neutral compound, $C_{17}H_{14}O_4N_4$, which, on heating with alcoholic sulphuric acid, readily decomposes into *p*-nitrobenzaldehyde and benzene-azo-aceto-acetic acid. In the case of the N-methylated derivative, condensation with *p*-nitrobenzaldehyde also takes place, but neither water nor alcohol is eliminated. The reaction product, $C_{20}H_{22}O_5N_4$, splits off methylamine on heating with alcoholic sulphuric acid, but neither nitrobenzaldehyde, benzene-azo-aceto-acetic acid nor its ester are formed. No amino-azo compound could be obtained from diazobenzene and diethylamino-crotonic ester, $CH_3.C[N(C_2H_5)_2]:CH.CO_2C_2H_5$, and the basic compound, $C_{22}H_{29}ON_5$, formed in presence of sodium acetate is characterised by its stability, although only a small yield of the product is obtained.

Benzene-azo-aminocrotonic ethyl ester is formed by mixing 150 c.c. of a seminormal diazobenzene chloride solution with 10 grms. of β-amino-crotonic ethyl ester dissolved in 20 c.c. of alcohol. The solution solidifies after 15 minutes to a yellow crystalline magma, which, after filtering, is washed with brine, dissolved in water, and precipitated as base with ammonia. The pure product melts at 103° C., the yield being 9·4 grms.

By adding 3·49 grms. of this substance to a warm (20° C.) solution of 2·26 grms. of *p*-nitrobenzaldehyde in 110 c.c. of alcohol, and allowing the whole to stand about 30 hours, a yellow crystalline precipitate (2·9 grms.) separates. This, after crystallisation from benzene (420 c.c.), melts at 177° C., and has the formula $C_{17}H_{14}O_4N_4$. As stated above, when heated with alcoholic sulphuric acid, it decomposes into *p*-nitrobenzaldehyde and benzene-azo-aceto-acetic acid. The combination of diazobenzene chloride and β-methylamino-crotonic ethyl ester in aqueous hydrochloric acid solution, yields benzene-azo-methylaminocrotonic ethyl ester hydrochloride, the orange-coloured base, $C_{13}H_{17}O_2N_3$, separating from alcohol and melting at 114° C.—T. A. L.

Dyestuffs; Sulphonated Oxyazo ——, and their Salts. P. Sisley. Bull. Soc. Chim. 1901, **25**, [18], 862—867.

This investigation of Orange II. (diazosulphanilic acid and β-naphthol), Chrysoïn (diazosulphanilic acid and resorcinol), and Crystal Ponceau (diazo-α-naphthylamine and G-salt, 2.1′.3′-naphthol disulphonic acid), has shown that the free acids of these dyestuffs are strong acids decomposing mineral salts in aqueous solution. The precipitate formed on adding hydrochloric acid to a hot concentrated solution of Orange II. is principally the undecomposed sodium salt. To determine the amount of decomposition by hydrochloric acid of various strengths, 2 grms. of Orange II. were cohobated with 50 c.c. of boiling acid for 10 minutes, left cold for 24 hours, and the precipitate collected and calcined. The sodium sulphate determined in the ash was taken as representing the undecomposed sodium salt. With acid containing 2 per cent. of hydrochloric acid (*i.e.*, 4·28 times the quantity theoretically necessary for complete decomposition), there was no precipitate and presumably little decomposition. With acid containing 2·5 per cent. HCl the decomposition, according to the table given, amounted to 46·2 per cent., and gradually rose, with increasing strength of acid, until, with 20 per cent. HCl, 97·4 per cent. of the dyestuff was decomposed. The isomeric α-naphthol derivative Orange I. is entirely decomposed by 2 per cent. acid, and Chrysoïn by 3 per cent. acid under the same conditions. The pure acid of Orange II. was prepared by dissolving the crude product in a mixture of 1 vol. of alcohol and 2 vols. of ether, filtering, and adding 12 vols. of ether. The precipitated acid was redissolved in a little hot alcohol, and reprecipitated with ether in the form of reddish-brown crystalline needles having the formula $C_{16}H_{12}SO_4N_2 4H_2O$. It is very soluble, 1 litre of water at 19° C. dissolving 174·4 grms. and 1 litre of dilute hydrochloric acid (10 grms. of HCl per litre) dissolving 69·7 grms. of the organic acid. With acid of twice this strength the solubility falls to 9·7 grms. per litre. If sodium chloride solution (8 per cent.) be added to an equal volume of a 4 per cent. solution of the Orange acid, the sodium salt of the dyestuff is precipitated and the filtrate is found to be strongly acid. Sodium sulphate is decomposed in the same way. This remarkable property appears to be common to all the oxyazo dyestuffs. The decomposition of the mineral salt by the organic acid takes place even in the presence of five equivalents of hydrochloric acid. Commercial Orange II. consists of the sodium salt, and when recrystallised from alcohol separates in plates having the composition $C_{16}H_{11}N_2SO_4Na2\frac{1}{2}H_2O$. Dissolved in saline solutions (*e.g.*, in water containing 15 grms. of sodium chloride per litre) it crystallises therefrom in needles containing $5H_2O$. The anhydrous salt, the lower hydrate, and the higher hydrate have different solubilities in water and also in brine. Saturated solutions in water at 19° C. contain respectively 19·56, 32·01, and 41·16 grms. per litre reckoned as anhydrous salt. In this respect Orange II. resembles sodium sulphate. The author has observed the same phenomena with Croceïne Orange, Croceïne Scarlet 3 B X, and Croceïne Scarlet 8 B. He has further prepared the calcium, magnesium, and ferrous salts of Orange II. by double decomposition from the sodium salt or by the action of the free Orange acid on the appropriate chlorides or sulphates. All these salts crystallise with $2\frac{1}{2}H_2O$, and are closely analogous in crystallographic properties. The aniline salt of Orange II. is obtained by adding aniline hydrochloride or the theoretical quantity of aniline to a solution of the Orange acid. The product is easily crystallised from a mixture of alcohol and water (2 : 1), the crystals resembling sublimed alizarin. This salt remains unchanged in sulphuric acid containing 50 grms. of sulphuric acid per litre. Its solubility in water at 24° C. is 0·508 grm. per litre.

The free acid of Chrysoïn, $C_{12}H_{10}SO_5N_2$, crystallised from dilute hydrochloric acid forms steel-grey needles very little soluble in cold water (2 grms. per litre at 19°·5 C.). Taking advantage of the ready decomposition of mineral salts by Chrysoin acid, a number of its salts have been prepared and are described.

The free acid of Crystal Ponceau, a disulphonic acid, is peculiarly difficult to prepare. E. Knecht (this Journal, 1888, 623) added one equivalent of sulphuric acid to a dye-bath containing this dyestuff as sodium salt, with the object of setting free the dyestuff acid. The bath dyed wool no better than before the addition. Nothing can be concluded from this experiment, because the sodium salt was not really decomposed. The author finds that even from its solution in strong sulphuric acid the sodium salt is reprecipitated on dilution with water. He succeeded, however, in preparing the free acid by suspending 200 grms. of the calcium salt in 2 litres of alcohol, and adding the equivalent 32 grms. of sulphuric acid. After boiling for 10 minutes and cooling, he obtained by filtration 43 grms. of calcium sulphate—the theoretical quantity. The filtrate, after distilling off most of the alcohol, was diluted with water, acidified with hydrochloric acid and boiled. On cooling, the dyestuff acid separated in small red crystals. Dried in the air they have the composition $C_{20}H_{14}S_2O_7N_2.9H_2O$, are very soluble in water (209·6 grms. per litre at 23° C.), and mineral acids diminish the solubility less than usual. From a solution in normal sulphuric acid, sodium chloride at once precipitates the dyestuff as sodium salt. The dyestuff acid also decomposes acid sodium phosphate and sodium bisulphate. The above method of preparation is a general one, and has enabled the author to obtain many sulphonic acids otherwise difficult to prepare. Commercial Crystal Ponceau, consisting mainly of the sodium salt, contains some calcium salt which can only be removed by several crystallisations from dilute alcohol. The pure sodium salt—

$$C_{20}H_{12}N_2S_2O_7Na_2.7H_2O,$$

has a deep brownish-red colour. Its solubility in water at 23° C. is 55·7 grms. per litre. Mineral salts diminish the solubility without causing the formation of any other hydrate such as that described above in the case of Orange II. The calcium, barium, and ferrous salts have also been prepared, and all crystallise with $7H_2O$. The calcium salt separates on mixing a saturated aqueous solution of calcium sulphate with the equivalent quantity of the sodium salt. But when the calcium salt is dissolved in alcohol and water (1 : 2), and the equivalent of sodium sulphate is added, the reverse reaction takes place, the whole of the calcium being precipitated as calcium sulphate. Here the direction of chemical change is determined by the nature of the solvent, and we have a neat illustration of the laws of Berthollet.

—T. A. L.

Benzene-azo-β-naphthylauramine. R. Möhlau and K. P. Graelert. Ber. 1901, **34**, [13], 3384—3386.

The action of tetramethyldiaminodiphenylcarbinol on *o*-amino-azo compounds (Ber. **34**, 881; this Journal, 1901, 570) yields azo-auramines containing the chromophoric groups N : N and N : C, and formed from the azoleucauramines by loss of hydrogen, which takes place on heating them in alcoholic solution. In the case of benzene-azo-β-naphthylauramine, since this compound itself readily undergoes decomposition under these conditions, it was found necessary to conduct the transformation in presence of a very small quantity of the reagent (alcohol). For this purpose, one part by weight of benzene-azo-β-naphthyleucauramine was heated on the water-bath with 1·5 parts of alcohol under a reflux condenser for 14 hours, when a sample, on warming with acetic acid, remains red, and does not turn blue or green. The resulting product, after recrystallisation from a mixture of acetic ester and methyl alcohol, formed scarlet rhombic prisms with a bluish reflex, melting at 180° C. The yield was 15 per cent. of the weight of the leuco compound. The auramine is readily soluble in benzene, chloroform, and acetic ester, sparingly soluble in acetone and alcohol, and very slightly soluble in ether and methyl alcohol. On heating with 5 per cent. sulphuric acid, it is readily decomposed into benzene-azo-β-naphthylamine and tetramethyldiaminobenzophenone. The azo auramine is reduced in alcoholic solution by sodium amalgam to its leuco compound, when, on adding acetic acid, the solution turns blue.

—T. A. L.

Euxanthone and Alizarin; Methylation of ——, by Means of Dimethyl Sulphate. C. Graebe and R. H. Adèrs. Annalen, **318**, [2 and 3], 365—370.

Euxanthone was dissolved in excess of dilute caustic soda and shaken with dimethyl sulphate (considerably more than 2 mols.). The yellowish-white precipitate was washed with water to disappearance of alkaline reaction, and then recrystallised from alcohol. The pure 7-methyl ether was obtained, melting at 130·5° C. The colourless dimethyl ether remains in the mother-liquor, from which it is precipitated by water; it is, however, better obtained from the sodium salt of the monomethyl ether. This salt is obtained by precipitating a solution of the 7-methyl ether in hot alcohol by a solution of the calculated quantity of sodium in alcohol. The sodium salt (dried at 100° C.) was heated on the water-bath for 30—60 minutes with rather more than 1 mol. of dimethyl sulphate, the product extracted with alcohol, and the solution precipitated by water. After crystallisation from petroleum spirit, the dimethyl ether is colourless, and melts at 149·5° C. Colourless euxanthone monomethyl ether is obtained on heating the dimethyl ether on the water-bath with sulphuric acid of 90 per cent. strength, and precipitating with water. This ether melts at 240° C.; it is soluble in dilute alkalis.

Xanthone gives a considerable quantity of xanthene on heating with zinc dust, euxanthone a very small quantity. It was now found that euxanthone dimethyl ether gives only a small quantity of a reddish substance, consisting chiefly of xanthene.

Alizarin 2-methyl ether is obtained by dissolving alizarin in a solution of 2 mols. of caustic soda, evaporating to complete dryness, heating with dimethyl sulphate, treating with water, and recrystallising from alcohol. The melting point is 230°—231° C. (corr.). An attempt to convert the ether into an anthrol methyl ether, by heating with zinc dust, was unsuccessful; anthracene was almost the only product. The sodium salt of the monomethyl ether, obtained as a red precipitate by the addition of the calculated quantity of sodium ethylate to a hot alcoholic solution of the ether, remained unchanged on heating with methyl iodide and dimethyl sulphate. In attempting to prepare the silver salt of the monomethyl ether by acting on the sodium salt with alcohol and silver nitrate, a mixture of the ether, silver oxide, and sodium nitrate separated.

—A. C. W.

Chloranthranilic Acids; Two New ——. P. Cohn. Mitt. d. tech. Gew. Museums, Vienna, 1901, **11**, [7, 8, 9, and 10], 178—182.

By oxidising the two isomeric chloracet-o-toluidines with permanganate in neutral solution, the author has obtained two new chloranthranilic acids, which he now further characterises by preparing a number of azo-dyestuffs from them, and also by converting them into the corresponding 4- and 6-chlorosalicylic acids. Tables are given showing the characteristics of the various azo dyestuffs, from which it appears that the azo derivatives of the 2.6-acid are much more soluble and bluer in shade than those from the 2.4-acid, but yellower than the dyestuffs from anthranilic acid itself. On boiling the diazo solutions of the 2.4- and 2.6-acids with water, the former yields 4-chlorosalicylic acid, crystallising from water in white needles, melting at 207° C., whilst the latter gives 6-chlorosalicylic acid, having a similar appearance and melting at 166° C. This acid is readily soluble in water, alcohol, and most organic solvents, is scarcely volatile with steam, and gives the salicylic reaction (violet coloration) with ferric chloride. The salts are well crystallised, and with the exception of the silver salt are very easily soluble in water.—T. A. L.

Mordant Dyestuffs. Noelting. Chem. Zeit. 1901, **25**, [80], 860.

The following new facts in the substituted anthraquinone (diphenylene diketone) series of dyestuffs, show that some modification of Liebermann and v. Kostanecki's theories have now become necessary. (1) Hystazarin—

$$C_{14}H_6O_2(OH)_2\ [2:3]$$

is a mordant dyestuff, but inferior to alizarin—

$$C_{14}H_6O_2(OH)_2\ [1:2],$$

where one hydroxyl is adjacent to a chomogenic CO-group. (2) Quinizarin, $C_{14}H_6O_2(OH)_2$ [1 : 4] is also a mordant dyestuff, but much weaker than alizarin. (3.) Anthrarufin, $C_{14}H_6O_2(OH)_2$ [1 : 5], and anthraflavic acid—

$$C_{14}H_6O_2(OH)_2\ [3:7]$$

are not mordant dyestuffs, but when the two positions, 1·5 and 3·7 are occupied, in the same compound, as in anthrachrysone, $C_{14}H_4O_2(OH)_2$ [1 : 3 : 5 : 7] the latter shows mordant-dyeing properties which are increased by the entry of two sulphonic groups. (4) Nitro groups confer mordant-dyeing properties, or increase the same if already exhibited. Thus, chrysophanic acid—

$$C_{14}H_5O_2(OH)_2CH_3\ [1:8:2]$$

and chrysazin, $C_{14}H_6O_2(OH)_2$ [1 : 8], are not mordant dyestuffs, but tetranitrochrysazin—

$$C_{14}H_2O_2(OH)_2(NO_2)_4\ [1:8:2:4:5:7]$$

and dinitro-anthrachrysone, tetranitro-anthrachrysone, and dinitro-anthrachrysone disulphonic acid all have this property. Nitro groups also increase the mordant-dyeing properties of azo dyestuffs.—R. L. J.

Dinitro-ortho-anisidine: Chemical Reaction in which one of the Products continues the same Reaction. R. Meldola and J. V. Eyre. Proc. Chem. Soc. **17**, [241], 185.

The authors give further evidence in support of the constitutional formula assigned to the dinitroanisidine already described (this Journal, 1901, 572). The 3:4:6-triaminoanisole and the corresponding 3 : 4-diamino-6-acetaminoanisole, both form azines on condensation with benzil, which are described. The view put forward (*loc. cit.*), that the eliminated nitro group comes out in the form of nitrous acid, is confirmed by quantitative determinations of the amount of diazo-oxide formed from known weights of dinitroanisidine in acetic acid solution with accurately titrated solutions of nitrite. The latter was added to the extent of one-fourth of the theoretical quantity required on the assumption that one molecule of dinitro-anisidine requires one molecule of nitrite. In all cases the diazo-oxide produced, as determined by the quantity of azo-β-naphthol compound formed, was far in excess of that capable of being produced by the nitrite added, thus proving that the nitro group eliminated by the nitrous acid continues the process of diazotisation.

PATENTS.

Amido-benzoic Acids, and of Anthranilic Acid and Colouring Matters therefrom; Manufacture of Substituted ——. G. B. Ellis, London. From F. A. Pertsch, Avully, Switzerland. Eng. Pat. 19,202, Oct. 26, 1900.

Salicylic acid is converted into 5-nitro-2-amino-benzoic acid. This product is acetylated and reduced, when it yields 5·2-aminoacetamino-benzoic acid, which, after diazotisation, combines with phenols, amines, and their derivatives forming azo dyestuffs. These, after hydrolysis, may again be diazotised and combined, giving disazo dyestuffs. If the 5·2-aminoacetamino-benzoic acid be diazotised in alcoholic solution and boiled, acetamino-benzoic acid is formed, which, after hydrolysis, yields anthranilic acid.—T. A. L.

Colouring Matters of the Anthracene Series; Manufacture and Production of ——. B. Willcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 20,719, Nov. 16, 1900, Second Edition.

The halogen derivatives of mono- or di-amino or alphylamino-anthraquinones or their sulphonic acids are treated with ammonia, or with substances which produce ammonia during the reaction. If necessary the products may be subsequently sulphonated by any suitable method. For nstance, 10 kilos. of crude anilino-anthraquinone sulphonic acid suspended in 200 litres of water are treated with 12 kilos. of bromine and well stirred for 12 hours, when the bromo-anilino-anthraquinone sulphonic acid is precipitated by adding salt. After filtering off and drying, 10 kilos. are mixed in an autoclave with 50 kilos. of aqueous ammonia (20 per cent. of NH_3) and heated for about six hours to 200° C. When cold, the new dyestuff is salted out and gives, on chrome mordanted wool, greyish-blue to bluish-black shades.—T. A. L.

Indigo; Impts. in the Manufacture of an Initial Material for the Production of ——. B. Willcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 21,821, Dec. 1, 1900.

The specification relates to the preparation of phenylglycocoll *o*-carboxylic acid, by causing the neutral salts of anthranilic acid and of chloracetic acid to react on one another in aqueous solution at about 40° C. for some days. The acid salt which separates is then filtered off and employed for the production of Indigo.—T. A. L.

Indigo Leuco Compounds into Indigo, and the Application thereof to Covering Textile Fibres; Impts. in the Conversion of ——. B. Willcox, London. From The Badische Anilin und Soda Fabrik, Ludwigshafen, Germany. Eng. Pat. 23,338, Dec. 20, 1900. Second Edition.

The patentees find that sulphur reacts with Indigo leuco compounds such as indoxyl, indoxylic acid, and Indigo-white, the leuco compound being converted into Indigo. The reaction can be carried out in the presence or absence of textile fibre, and if the textile material be impregnated in parts with sulphur, light and dark blue effects are produced when the fibre is passed through an Indigo-vat. The method is also applicable for printing Indigo shades, for which purpose a mixture of sulphur and indophor (indoxylic acid) is printed on the material. On subsequent steaming, Indigo is formed directly on the fibre.—T. A. L.

Sulphide Colour [Blue], and of its Leuco Compound; Manufacture of a ——. R. B. Ransford, Upper Norwood. From L. Cassella and Co., Frankfort-on-Main, Germany. Eng. Pat. 21,310, Nov. 24, 1900.

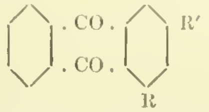
The blue dyestuff obtained, according to Eng. Pat. 16,247 of 1900 (this Journal, 1901, 889), by heating *p*-dialkylamino-*p*-dihydroxydiphenylamine with sulphur and alkaline sulphides cannot be successfully purified by the process given in the specification. The patentees now find that if the crude melt be neutralised with hydrochloric acid the products formed separate as leuco bases, and, after well washing with water, the hydrochloride of the pure leuco blue may be dissolved with dilute hydrochloric acid and salted out from this solution, the impurities remaining undissolved. The soluble leuco hydrochloride may be oxidised to blue by air in an alkaline solution, or its aqueous solution may be oxidised with other reagents, such as ferric chloride. The aqueous solution of the leucohydrochloride dyes tannined cotton, and may then be subsequently oxidised. It is also suitable for dyeing wool. Moreover, the blue dyestuff gives bright blue shades fast to light, washing, and chlorine on unmordanted cotton from baths containing caustic alkalis or alkaline sulphides.
—T. A. L.

Colouring Matters [Bluish-green] therefrom; Impts. in the Manufacture of Sulphonated Aldehydes and ——. G. B. Ellis, London. From the Société Chimique des Usines du Rhône anc. Gilliard P. Monnet et Cartier, Lyons, France. Eng. Pat. 21,365, Nov. 26, 1900.

By sulphonating *m*-toluic aldehyde at 0—5° C. with fuming sulphuric acid (60 per cent. SO_3) it yields *o*-sulphotoluic aldehyde. This substance readily condenses with dimethylaniline, its homologues or derivatives, to form bluish-green dyestuffs fast to alkalis.—T. A. L.

Dyestuffs of the Anthracene Series; Manufacture or Production of ——. H. E. Newton. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat, 21,897, Dec. 3, 1900.

According to Eng. Pat. 23,927 of 1894 (this Journal, 1895, 1041) dyestuffs are obtained by reacting with aromatic amines on hydroxyanthraquinones. The patentees now describe the manufacture of new dyestuffs by treating with primary aromatic amines, derivatives of erythro-oxyanthraquinone, having the general formula—



where R represents halogen or nitro group, and R′ halogen or a sulphonic acid group. For instance, dibromo-erythro-oxyanthraquinone and *p*-toluidine give a condensation product which, on sulphonation, yields a product dyeing blue shades on unmordanted and greenish-blue on chrome-mordanted wool.—T. A. L.

Dyestuffs containing Sulphur; Impts. in the Manufacture or Production of ——. H. E. Newton, London. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 21,898, Dec. 3, 1900.

The patentees find that the products obtained by treating various aromatic compounds with sulphur and alkaline sulphides react like thiophenols, in that they are capable of alkylation or alphylation. The process can be carried out with the dyestuffs themselves or when dyed on the fibre, employing the usual reagents, which react in a neutral or alkaline solution, such as ethyl or benzyl chloride, the salts of alkyl sulphuric acid, alkyl sulphates, chloracetic acid or its amide. Moreover, certain ammonium derivatives, such as dimethylbenzylphenyl ammonium chloride, serve as alkylating agents for these products, and, owing to their solubility in water, are distinct from other alkylating agents. They are also inodorous.—T. A. L.

Monobrom-Indigo and Dibrom-Indigo, as well as Monochlor-Indigo and Dichlor-Indigo, and Monochlor-monobrom-Indigo; also Methods of Dyeing and Printing with the said Halogen-Indigos; Method of Preparing ——. A. Rahtjen, Hamburg, Germany. Eng. Pat. 11,022, May 28, 1901.

Indigo in the dry state, or in presence of a solvent or diluent, reacts with bromine or chlorine at a low temperature, forming the products enumerated in the title. The new derivatives are very similar to Indigo, and dye from a vat in the same way. They may also be sulphonated, although not so readily as Indigo itself.—T. A. L.

Greenish-Black Sulphurised Directly Dyeing Dyestuffs for Cotton; Manufacture of ——. A. G. Bloxam, London. From Chemische Fabrik Brugg, A. G., Brugg, Switzerland. Eng. Pat. 16,876, Aug. 22, 1901.

Benzene sulphonic acid, or one of its homologues or salts, or a corresponding sulphochloride or sulphamide is fused with sulphur and an alkaline sulphide. The resulting products dye cotton greenish-black shades from baths containing sodium sulphide, carbonate and chloride or sulphate.—T. A. L.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Finishing Materials containing Starch and Starch Products. P. Saare. Zeits. Spiritusind. 1901, **24**, [41], 451. (See also Fürth, this Journal, 1901, 242.)

The author discusses the composition of certain typical starch glazes which have passed through his hands. In the first group are starches brought into a pasty condition by the aid of alkalis. One of these was a slimy, pasty mass with a tinge of grey colour; it was odourless and had the composition: water 80·5, starch 16·5, ash 1·9 per cent., with an alkalinity of 1 per cent. caustic soda. Such a mixture would require to be neutralised by sulphuric or acetic acid before use. Another had been prepared with soda and then treated with acetic acid; analysis showed: water 93·03, starch 6·9, ash 0·08 per cent.; it had an acid reaction and yielded 0·14 per cent. of acetic acid on distillation with steam.

Another group of glazes contain calcium and magnesium chlorides, the object of which is, partly to increase the liquefaction of the starch and partly to act as antiseptic and loading. One of these was a uniform, pasty, and cloudy mass in the form of a viscous fluid; it contained: water 64·00, calcium chloride 21·67, magnesium chloride 0·06, and starch 14·27 per cent. Those made with an admixture of magnesium chloride as well as calcium chloride appeared in the form of transparent, gelatinised, wax-like pieces. Two samples showed the following composition:—

—	1.	2.
	Per Cent.	Per Cent.
Water	50·17	61·49
Calcium chloride	16·49	18·43
Magnesium chloride	4·31	7·44
Starch	29·03	12·61

Those finishes which contain calcium chloride possess the disadvantage of rusting iron, a drawback which does not occur with those prepared with magnesium chloride only.

This type of size is largely used by felt-hat makers under the name of "vegetable glue."

"Lucon" may also be cited as representing another class. It forms a yellowish-white, lumpy powder with an odour of tallow. Its composition was found to be.—water 8, starch (partly dextrinised) 54, tallow 5, salt, clay, and sand 25, soda-ash 8 per cent. The aqueous solution gave a red coloration with iodine solution. Lastly, the group of soluble starches is dealt with. These products give clear solutions instead of pastes with hot water, gelatinising on cooling to a milky paste. In the case of dextrins the addition of 10 per cent. of glucose is considered an advantage. Glucose makes the goods softer and more pliable, and does not fill, but if used alone, the cloth has a greasy feel; dextrin on the other hand, makes the goods hard and fills them. A finish of this kind appeared as a viscous, milky, sweetish mass, with a slight odour of potato farina; it contained: water 27·8, potato starch 1·4, dextrin 54·9, and sugar (glucose) 13·8 per cent.—J. F. B.

Wool; Action of Caustic Soda on ——. C. E. Washburn. Textile World, Aug. and Sept. 1901.

The author has subjected various woollen yarns to the action of caustic soda solutions of different concentration, for longer or shorter periods, at different temperatures, and has examined the tensile strength and behaviour towards dyestuffs of the yarns before and after treatment. His results agree closely with those obtained by Buntrock (this Journal, 1898, 452). The maximum increase in tensile strength is obtained with solutions of 82° Tw. (42° B. or 1·41 sp. gr.) at 15° C., by which in five minutes, for example a yarn of 40 strands having a tensile strength of 12·0 lb. is converted, after treatment and washing with 1 per cent. sulphuric acid, into a yarn showing a tensile strength of 57·0 lb.

After treatment with the caustic soda, a whiter yarn is obtained by washing with a 1 per cent. solution of sulphuric acid than by using dilute nitric or hydrochloric acid, which colour the wool yellow. Ammonia can be used in the place of acid, but it acts much slower. If the caustic soda is not entirely removed from the wool before drying, the yarn is harsh and brittle.

The author likewise tried the effect of adding glycerin to the lye, with results similar to those obtained by Buntrock. (This Journal, 1898, 452.)

The combined action of formaldehyde and caustic soda somewhat lowered the tensile strength of the fibre.

Yarns which had been treated for five minutes with lyes of 82° Tw., when dyed in the same bath with untreated yarns, were found to show the following saving:—

Mordant Dyes.—Dyestuff saved = $\frac{1}{3}$ the amount used; time saved: 40 per cent.

Basic Dyes.—Dyestuff saved = $\frac{1}{8}$ the amount used; time saved: 10 per cent.

Acid Dyes.—Dyestuff saved = $\frac{1}{5}$ the amount used; time saved: 30 per cent. Indigo, too, is taken up better by the treated wool than by untreated.

The author then shows that by weaving untreated and treated yarn together, or by printing woollen cloth with caustic soda thickened by gum tragacanth paste, and then dyeing, various colour effects may be produced, the wool which has been acted upon by caustic soda acquiring a deeper shade in the dyebath than the untreated wool.

The chemical change brought about in the wool fibre by the action of caustic soda, and subsequent washing in dilute sulphuric acid, appears to be the removal of 84·45 per cent. of its sulphur, since the author finds untreated wool to contain 3·42 per cent. sulphur, while wool after treatment contains only 0·53 per cent. This sulphur is in part removed by the caustic soda in the bath, and partly evolved as sulphuretted hydrogen during the washing with dilute sulphuric acid.

In determining the best temperature, it was found that if the bath was cooled to 5° C. caustic soda began to separate, and the yarn began to lose its strength. The author is of the opinion that if it were possible to maintain the concentration of 82° Tw. at 0° C., the tensile strength of the yarn would be even more increased than at 15° C.

A machine is employed, containing three compartments; the first, for caustic soda, should be copper-lined; the next compartment, containing lukewarm water, should be the same size as the first, and built of iron or wood. Between the first and second compartments, is a pair of squeezing rolls. The third compartment is copper lined, and contains 1 per cent. sulphuric acid solution. After passing from the acid bath, the wool may be either washed by hand, or may be passed into a fourth compartment.

The skeins of yarn are to be linked into a continuous chain, and the speed of the machine so regulated that exactly five minutes would be required to pass this through the caustic bath. The material to be treated should be thoroughly scoured and wetted before passing into the caustic soda of 82° Tw. (at 15° C.) in the first bath. After leaving the fourth compartment, the yarn may be dyed or dried in the usual manner.—H. I.

PATENTS.

Artificial Filaments, Threads, Horse Hair and the like; Manufacture of ——. F. Lehner, Zurich, Switzerland. Eng. Pat. 20,461, Nov. 13, 1900.

In this process two or more threads of cellulose, nitrocellulose, or cellulose derivative (prepared as in the artificial silk process, but somewhat thicker than such filaments) are llowed to run together through a glass fork, immediately fter their formation, and whilst they are still in a condition mutually combine into a perfectly solid single thread. —R. L. J.

Textile Fibres or Filaments from Solutions of Cellulose, or of other Material from which Fibres or Filaments can be formed; Improved Apparatus for Production of ——. C. F. Topham, Kew Gardens, Surrey. Eng. Pat. 23,157, Dec. 18, 1900.

THE apparatus consists of a cylindrical vessel containing a ilter formed with an internal passage communicating with xternal grooves which are covered by the filtering medium, nd thus securing a large surface. The filtered material ollects in the vessel and passes out through an arm (which nters the vessel a short distance so as to form a trap for ir-bubbles) to the forming nozzle, which is specially esigned to facilitate cleaning.—R. L. J.

Thread from Cellulose Solutions; Manufacture of ——. J. Imray, London. From E. Bronnert, Niedermorschweiler, Alsace, and M. Frémery and J. Urban, both of Dremmen, Aachen, Germany. Eng. Pat. 4303, Feb. 28, 1900.

CELLULOSE, dissolved in ammoniacal cupric oxide solution r zinc chloride solution, is expressed into sulphuric acid olution containing from 30 to 65 per cent. of real acid. A weaker acid solution produces threads deficient in tenacity, nd acid stronger than the above-mentioned limits attacks heir substance, 50 per cent. acid being the optimum for most purposes.—R. L. J.

Asbestos; Treatment of ——, for rendering it Waterproof, and increasing its Fire-resisting Qualities. M. Raphael. Eng. Pat. 11,856, June 10, 1901.

See under IX., *page* 1212.

Fabrics; Treating ——, with Liquids. G. H. France, Bradford. Eng. Pat. 18,079, October 11, 1900.

AN improved method and apparatus for discharging, drying, bleaching, or otherwise treating textile fabrics, particularly heavy cotton tissues, which are liable to be creased in such operations.

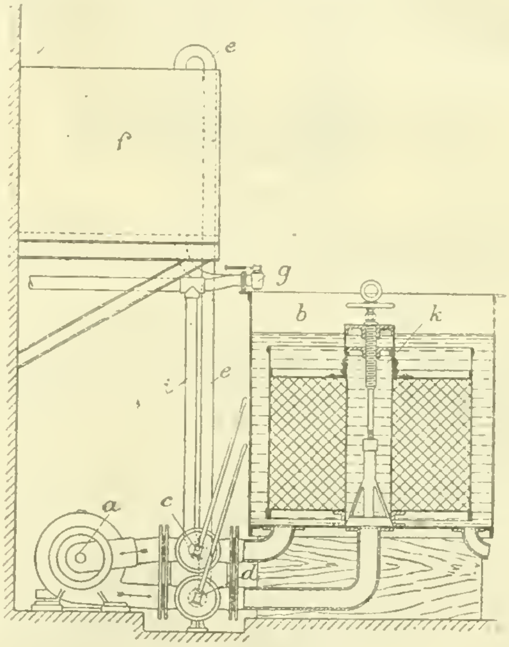
The bath employed in treating the tissues is contained in a long vat, the back of which is inclined at an angle of 45°, while its front is vertical. A revolving winch is mounted at a suitable height above it. The "pieces" of tissue to be treated are fastened together end to end, and then passed in a continuous manner through a guide eye over the winch into the vat. After a considerable length of tissue has been received in the vat, the end first fed into this is passed up between a pair of guide bars over the winch and down again into the vat. This is repeated until the tissue has arrived at the exit end of the machine, when it is withdrawn by a pair of squeezing rollers. After passing through a cooling or rinsing tank, it may be taken to another machine for further treatment.—E. B.

Dyeing Apparatus. J. O. Obermaier, Rheinpfalz, Germany. Eng. Pat. 15,191, Aug. 25, 1900.

THE object of this invention is to provide apparatus for dyeing cotton materials with certain dyestuffs, such as the sulphur dyestuffs, as much as possible in the absence of air, for enabling the greater part of the dyestuff which it is necessary to employ to be rapidly and economically recovered, and for rapidly and thoroughly rinsing the materials after dyeing.

Between a pump *a* (see figure) and a dye-vat *b* two three-way cocks *c*, on the suction pipe, and *d*, on the delivery pipe, are arranged. *c* is in communication through a pipe *i* with a water tank (not shown), and *d* is connected through a pipe *e* with a dye-liquor reservoir *f*. *g* is a water-supply cock, and there is a water-discharge cock at the bottom of the dye-vat. Over the orifice of the pipe connecting the three-way cock *d* with the dye vat, there is placed a hollow distributing cone provided with opening for the escape of the liquid supplied. The cone is surrounded by a perforated drum *k*, screwed to a spindle.

At the beginning of the dyeing operation the dye-vat *b* is filled with water, and this is circulated by means of the pump, to expel all air from the material. The dyestuff is then added, and the bath is further circulated while dyeing takes place. When this operation is finished, the three way cocks are turned and the dye-liquor is forced into the tank *f*. As it is necessary to employ concentrated solutions of the dyestuffs, from which only a small proportion is abstracted by the cotton, the greater part of the dyestuff employed, is thus recovered for use again. Moreover, since the recovery is effected very rapidly, namely, in about half a minute's time, inequalities in dyeing, due to mechanical deposits of dyestuff upon the materials caused by the decomposition of the dye-liquor by the air, do not result, as is the case when centrifugal and squeezing machines are used in recovering the excess of the liquor.



DYEING APPARATUS.

By again changing the position of the cocks *c* and *d* and opening the water-discharge cock, water is caused to flow through the materials from the inside to the outside of the drum. The materials are thus effectually rinsed, the operation being accomplished with most dyestuffs in one minute's time, whereas in the apparatus hitherto in use 1—2 hours have been required for the purpose.—E. B.

Shades Fast against Washing; Manufacture or Production on the Fibre of ——. H. E. Newton, London. From The Farbenfabriken vorm. F. Bayer and Co., Elberfeld, Germany. Eng. Pat. 913, Jan. 14, 1901.

IN place of using diazotised *p*-nitraniline for developing the "Benzonitrol" or "Nitrazol" colours, the patentees employ the diazo derivatives of the dichloro-anilines $NH_2 : Cl_2 =$ 1:2:4, 1:2:5, or 1:3:4. The shades obtained are remarkable for their fastness to washing. For example, Chicago Blue B, when developed with diazotised dichloro-aniline, yields a clear greenish blue, and Primuline, developed in the same way, gives a bright greenish-yellow shade which is fast to washing, whereas the yellow obtained with Primuline and diazotised *p*-nitraniline bleeds on to the interwoven white fibre when washed.—T. A. L.

Dyeing [with Sulphide Dyestuffs]; Impts. in ——. C. D. Abel. From the Actiengesellschaft fur Anilinfabrikation, Berlin. Eng. Pat 1285, Jan. 19, 1901.

Cotton materials which have been dyed with sulphur dyestuffs become tender on being stored, most probably as a result of the oxidising action of the air upon the dyestuffs, and the consequent formation of acids which attack the fibre. This damage is avoided by treating the materials, after dyeing, with alkaline oxidising mixtures, such as alkaline solutions of sodium peroxide, potassium ferricyanide, potassium permanganate, sodium hypochlorite, and potassium chromate, as in the following examples:—

1. A bath is prepared of caustic soda and sodium hypochlorite, so as to contain 1—2 c.c. of caustic soda-lye at 40° B. per litre, and ½ per cent. (of the weight of the cotton) of active chlorine. The cotton material, previously dyed with Sulphur Black T, is introduced into the bath, which is then heated slowly to boiling. The material is afterwards rinsed and dried.

2. The material dyed with Immedial Black is boiled for about half an hour with 2 per cent. of its weight of potassium chromate and 5 per cent. of its weight of sodium carbonate. It is then washed and dried.—E. B.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

PATENT.

Production of Designs or Representations: Pigments and Dyes with relation to the ——. J. Stevenson, Edinburgh. Eng. Pat. 17,783, Oct. 6, 1900.

According to this invention designs are produced from permanent and non-permanent pigments or dyestuffs, either used together or superimposed. By the fading caused by light, exposure to the atmosphere or internal chemical action, the non-permanent colour is changed or disappears, whereby the production of many pleasing colour effects in the design is claimed.—H. I.

Printing Tinplate in Dead or Dull Colours; Process of ——. H. Bayerthal, London. From Fr. Ewers, Lübeck. Eng. Pat. 11,745, June 8, 1901.

The tinplate is first spread all over with a ground colour made from a quick drying varnish mixed with any "earthen or metal" colour and glycerin or "stearine oil." The preparation is spread thickly by a rubber roller, to which "the surface of the coating will adhere owing to its flexibility, the result being a grainy rough appearance which makes the colours appear dead or dull." The coloured design is printed in colours such as are usually employed.—H. I.

VII.—ACIDS, ALKALIS, AND SALTS.

Nitric Acid Solutions; Some Physical Properties of ——. V. H. Veley and J. J. Manley. Proc. Roy. Soc. 1901, **69**, [452], 86—119.

The authors have plotted the contractions which occur on mixing nitric acid and water against the percentage composition of the diluted acid, and find changes of curvature at points corresponding to hydrates of nitric acid with 14, 7, 4, 3, 1½, and 1 mols. of water.

Similarly, in the case of the refractive indices, the most marked points of curvature correspond to the 14, 7, and 1½ hydrates.—J. S.

Condensing Towers for Noxious Gases. J. G. Clemmer. Eng. and Mining J. 1901, **72**, [15], 453—455.

The author recommends pipe towers packed with coke, instead of the usual brick or stone towers, for condensing gases. The former, in consequence of their thin walls, do not retain the heat of the gases from the furnaces, and they have a greater capacity per sectional area than brick towers It is stated that one pair of pipe condensing towers, a shown in the accompanying figures, will condense as muc gas as a brick or stone condenser, 6 ft. by 6 ft. in cros section. The towers described and illustrated are for th purpose of condensing noxious gases, but they may be als used, with slight modifications, for condensing hydrochlori acid. Fig. 1 is a side elevation of the towers, whilst th smaller diagrams show the details of construction, th figures giving the numbers of the different parts require being for a set of three pairs of pipe towers. The tower are built of ordinary sewer pipe, and are bound in with iro straps or clamps, several layers of roofing felt, coated wit soft tar, being interposed between the pipe and the clamp the latter is also coated with soft tar. If a pipe cracks, th crevice is filled with a mixture of China-clay and soft ta of the consistence of putty, and the joint clamped. Th lower section of the tower is packed with chemical bri crib work, so as to sustain the packing of coke in the upp sections. It is advisable to pack the joints between t sections of piping with one strand of asbestos rope, and cover this with a layer of the mixture of China-clay and ta The tops of the towers are closed, and the gases prevent from escaping at that point by inverted "chemical ware cups sealed with the condensing water. The condensi water may be distributed from the spigot on to the perforat tops, in the openings covered by the inverted cups, or oscillating trough may be used. The stones for the bas of the towers are hollowed out to provide a receptacle f the condensed gases, and a hole is drilled through from t bottom of the hollow part, for the removal of the condens products. The stones are then treated with hot tar, to rend them capable of resisting the action of the condensed gas For draught, a steam jet controlled by a valve may be used the outlet pipes, or the latter may be run down to the ear and connected to the chimney flues, with a damper betwe them for control.

Fig. 1.

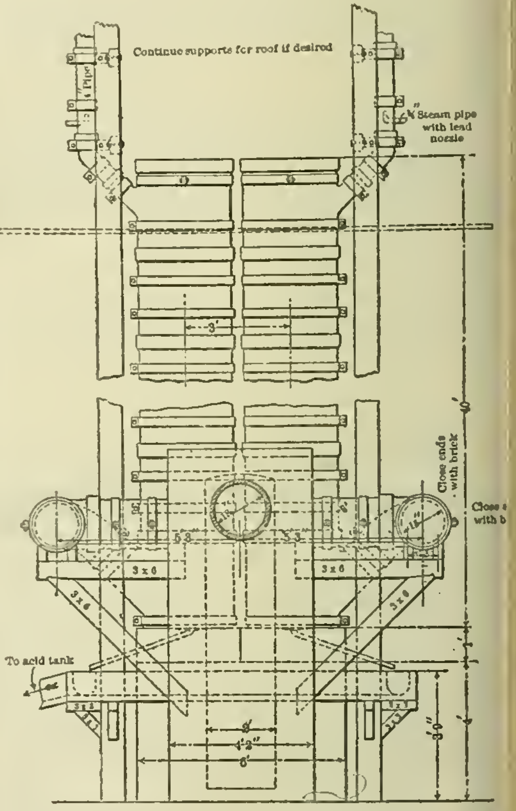
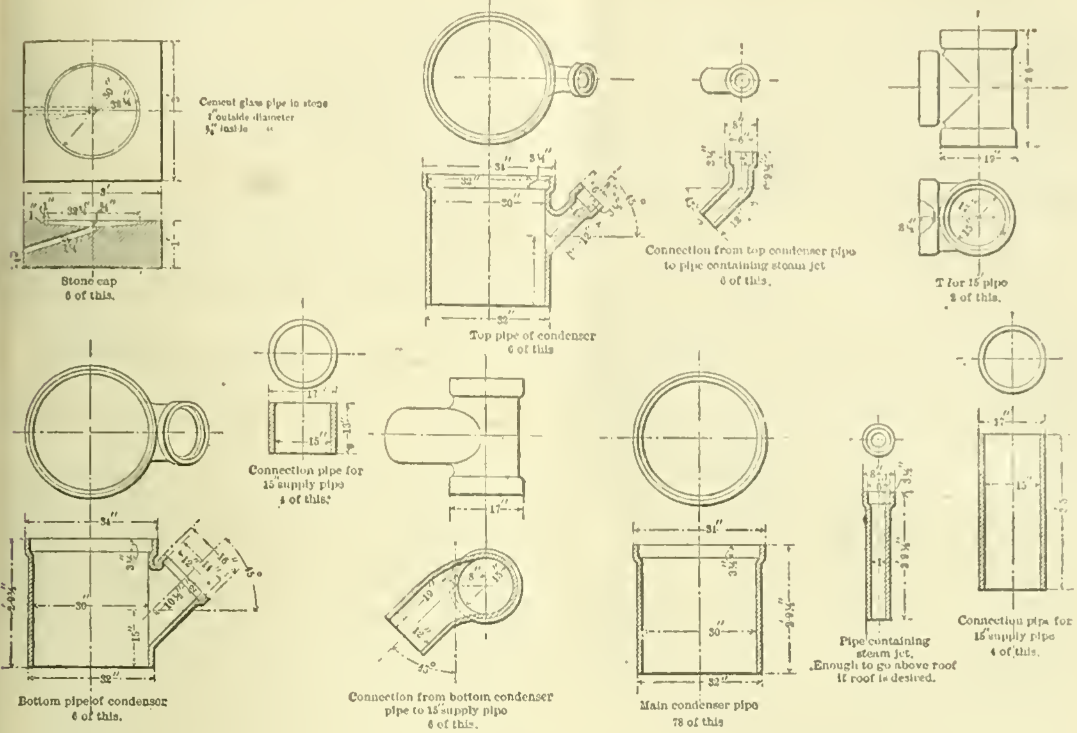


Fig. 2



—A. S.

Nitric Acid; Manufacture of ——. C. W. Volney.

See page 1189.

Boric Acid; Determination of ——. Partheil.

See under XXIII., *page* 1244.

PATENTS.

Alkaline Chlorides; Electrolytic Decomposition of ——, and Apparatus therefor. J. D. Gilmour. Eng. Pat. 18,397, Oct. 16, 1900.

See under XI. A., *page* 1220.

Alkali Salts (Chlorine and Caustic Soda and Potash); Decomposition of —— by Electrolysis, and Apparatus therefor. J. Greenwood. Eng. Pat. 22,406, Dec. 8, 1900.

See under XI. A., *page* 1220.

Liquid and Gas; Process and Apparatus for Treating Materials with [Manufacture of Bicarbonates] ——. P. Naef. Eng. Pat. 17,054, Sept. 25, 1900.

See under I., *page* 1195.

Sulphuric Anhydride; Manufacture of ——, by the Contact Process. O. Imray, London. From Farbwerke vormals Meister, Lucius und Brüning, Hoechst-am-Main, Germany. Eng. Pat. 1385, Jan. 21, 1901.

It is found that, although at a temperature of 400° C. or slightly over, the oxidation of SO_2 in presence of air and catalysing agents is practically complete, with no reverse action, yet the progress of the reaction is very much slower than at the temperature of, say 500°; but, at the latter temperature there is a tendency for the SO_3 formed to split up into SO_2 and O. The present invention consists in conducting the process, first at the higher temperature to obtain the advantage of the far greater speed of reaction, and in completing it at the lower temperature, at which no reversal takes place. This may be done in two ways: first, before the single contact hitherto used, a smaller contact is inserted with a reacting temperature for the burner gases of about 530° C., where about three-fourths of the SO_2 is rapidly oxidised; the gases are then cooled, either by admission of cold non-acting gases, or by an external set of pipes, to about 430°, and passed into the second contact chamber for completion of the process. Second, the contact chamber is enlarged, the gases entering at about 530 and leaving the chamber at about 430°, similar means for cooling as described before being used.

The following list of substances available as catalytic agents is given:—

1. The metals of the platinum group.
2. The oxides and sulphates of Fe, Cr, Ni, Co, Mn, Ur, Cu.
3. The oxygen compounds of Al, Be, Zr, Ce, Di, La, Th, Ti, Si, and of nearly all rare metals.
4. Mixtures of No. 1 with one or more substances of Nos. 2 and 3.
5. Mixtures of two or more of the substances mentioned under Nos. 2 and 3.

Agents Nos. 2, 3, and 5 are efficacious only at high temperatures, hence, one of these may be substituted for platinum in the hotter part of the contact chamber; while for the low temperature contact zone, substances Nos. 1 and 4 only are found to be applicable. Reference is made to Eng. Pat. 3166, 1888, German Pat. 113,932, and to Eng. Pat. 285, 1899 [this Journal, 1899, 1124].—E. S.

Nitrogen and Nitrous Oxide; Manufacture and Use of ——, from Atmospheric Air. R. Marston, Leicester. Eng. Pat. 19,074, Oct. 25, 1900.

Air, previously freed from carbon dioxide, is passed, with a regulated proportion of hydrogen or of such bodies containing hydrogen, as ammonia, into a heated retort containing copper, iron, or other oxidisable metal. It is stated that thus a mixture is obtained of nitrogen with nitrous oxide and other nitrogen oxides, which latter are removed by passage of the gases through scrubbing towers containing [illegible] sulphur, or other substances capable of [illegible] removed it may be by treatment with a [illegible] alkaline solution so as to leave a [illegible] largely nitrogen and nitrous oxide. This [illegible] is stated to be superior as an anaesthetic [illegible] oxide alone. The separation of nitrous oxide [illegible] mixture with nitrogen may be effected either by [illegible] nitrous oxide in water and its subsequent liberation by heating; or by subjecting the mixture to sufficient pressure in a suitable vessel, to liquefy the nitrous oxide, which is then withdrawn. Apparatus for adjusting the [illegible] of air and hydrogen or ammonia passed into the retorts is described.—E. S.

Brine: Purification of ——. G. N. Vis, Schweizerhalle, Switzerland. Eng. Pat. 276, Jan. 4, 1901.

Brine containing other sulphates, or calcium or magnesium compounds besides gypsum, is treated with sodium sulphate in such proportion as to form with them magnesium or calcium sulphate and sodium chloride. Then slaked lime is added to precipitate magnesium hydroxide, any calcium sulphate thus formed being also precipitated, as the brine is supposed to have been originally saturated with that sulphate. The brine thus freed from magnesium salts and from calcium halogen salts is treated with ammonium carbonate in the proportion necessary to decompose the gypsum present and precipitate calcium carbonate. The brine freed from the precipitate, is evaporated until only about 15 per cent. of its original volume remains, the salt deposited being removed. The ammonium salt used is then contained in the mother liquid as sulphate, and the liquor is used for the treatment of fresh brine, to which slaked lime is added, and, if necessary, sodium sulphate. The brine thus treated is stirred for several hours, then filtered, and carbon dioxide is passed in until no further precipitate forms. The ammonium salt originally used is thus recovered continuously in the mother liquors.—E. S.

Cyanogen Compounds; Manufacture of ——, *from Gas Mixtures containing Ammonia.* E. K. Besemfelder, Charlottenburg, near Berlin. Eng. Pat. 4,323, Feb. 28, 1901.

The ammoniacal gases produced by the destructive distillation of organic nitrogenous matter, preferably in the continuous manner described in Eng. Pat. 13,830, 1899 (this Journal, 1900, 725) are passed through a rope or chain tower fed with cold, strongly alkaline liquid, whereby ammonium salts are decomposed with liberation of ammonia; the gases are then dried by passage through scrubbers containing caustic lime before being led to the cyanogen generators. These contain incandescent coke, assumed to have been in previous use. The contained gases are expelled by "gas residue," that is, the inflammable gas collected in holders from the cyanogen absorbers. The generator is then heated or "blown hot," by compressed air, and the gases of combustion are blown out by "gas residue," after which the purified ammoniacal gases are admitted. When the temperature falls too low for the reaction to go on, the process is repeated. The generators are used in series, as of four, each of which is separately connected to a common chimney flue, and to a cyanogen absorber, and is fitted with pipes for admission of "gas residue," and of compressed air, for blowing the coke hot when needful. They have ashpits and a carbon feed, and are worked in a continuous cycle.—E. S.

Solids and Liquors; Heating for the Purpose of Decomposing, Drying, Calcining, or Distilling them. Process and Apparatus for ——. P. Naef, New York, U.S.A. Eng. Pat. 17,053, Sept. 25, 1900.

[illegible] apparatus is described with especial reference to the conversion of sodium bicarbonate of the ammonia-soda process into carbonate. The bicarbonate is charged by means of a hopper and conveyor into the upper end of an inclined revolving cylinder, having a hopper connection at its opposite end to the upper end of a similar, but reversely-inclined, lower cylinder, having a discharge hopper, on which a furnace or fire-box may be mounted for the combustion of fuel. Or a pipe conveying combustible gas may enter the lower end of the bottom cylinder, inside which the gas is burned by aid of air heated by passage through the discharging hopper. Both cylinders contain series of perforated agitating devices, arranged in sections, radially off-set from each other, varieties of which are shown. Carbon dioxide is passed from a heater into the upper cylinder, so as to flow in opposite direction to the passage of the bicarbonate, and has exit from the upper end into a dust chamber, and thence to a washer or absorber for collection of the ammonia. By means of suitably connected and valved pipes, the heated carbon dioxide is also circulated through the heater and the lower cylinder, the carbon dioxide liberated in which goes partly through the connecting hopper into the upper cylinder, and partly to the heater for circulation. Thus the bicarbonate is converted into carbonate in an atmosphere of heated carbon dioxide, partly extraneous and partly derived from the bicarbonate.

—E. S.

VIII.—GLASS, POTTERY, ENAMELS.

Glass; Plasticity and Adhesiveness of Diamond-cut ——, *at ordinary Temperatures.* J. Piccard. Ber. **34**, [11], 3635—3639.

It is certain that glass possesses a certain amount of plasticity (capacity of movement of the molecules beyond the limit of elasticity) not only on heating, but also at ordinary temperatures; but it is questionable whether it combines with this the property of adhesiveness (union of separated parts, capacity for being welded). The question was, *e.g.*, whether a fine crack in a piece of glass could be made to disappear at ordinary temperatures so that the rigidity would be restored, if not completely, at least to a considerable extent. To answer this question, the author has experimented by means of diamond cuts.

When a scarcely visible scratch made on a glass plate with a good diamond is examined under the microscope, it is seen to consist of two distinct parts. On the surface is a channel 0·02 mm. broad and 0·01 mm. deep, formed partly by splintering, partly by the plastic movement of the glass to either side; this plays a subordinate part in the breaking. From the bottom of this channel, a fine capillary slit extends perpendicularly into the glass to a depth of 0·05—0·1 mm. This crack, which at first extends only to one-tenth or one-twentieth of the thickness of the plate, weakens it, and by a tap, or snapping action, is widened till the plate breaks. In this capillary slit where the breaking process goes on, we also see the beginning of the re-uniting or healing process.

The natural, rounded, crystal edge of a "cutting" diamond—as contrasted with a "writing" diamond, made from a sharp splinter—produces a jagged scratch on a glass plate, and causes an uneven break. Hence it is necessary to use a mechanical device, so that the diamond produces a uniform clean cut.

The author takes a strip of clear window or plate glass about 70 cm. long, and exactly 10 cm. wide, and on one side, with any diamond, divides it into 14 numbered squares, and on the other side makes a fine cut with the special diamond along the whole length of the strip, which is then broken so as to give 12 good pieces, 10 cm. long and 5 cm. wide, and each divided into equal squares by the fine diamond cut. These are placed in two groups of six pieces each, and used the one for the immediate, the rest for the supplementary strength tests.

For the strength test they are clamped horizontally, near to the cut, which is on the upper surface, between two carefully levelled metal plates, and the free ends loaded with a tin box (fastened on by a stirrup) into which shot are poured till the plate breaks, and the weight of the shot, &c. noted. The shot must be added regularly, as the breaking depends not only on the weight but on the time during which it acts.

The other six pieces are loosely clamped with the cut downwards in a horizontal tin gutter, and the free ends either not loaded at all, or with 50, 100, 200-grm. lead plates, and allowed to rest. After one, two, or three days they are subjected to strength tests like the others. By this means a constant increase in carrying power is developed.

the load necessary to break a glass 1·5—2·0 mm. thick considered equal to 100, 30 represents that necessary to eak a plate with the diamond cut, and after a 1—3 days st, 36, or an increase of 20 per cent. Thus the adhesivess, or at least the plasticity of glass at ordinary temperares can be indicated numerically. To the question as to w deep the effect of the diamond cut extends in the ass, the answer is, that by carefully obliterating the cut a plate with gypsum cement, the plate will attain the me rigidity as an uncut plate of the same thickness.

—W. C. H.

Glass; Method of Colouring ——. N. Meurer.
Monit. Ceram. **32**, [11], 105.

CORDING to the author a yellow, brown, red, or black lour can be imparted to glass by adding carbon, preferly in the form of sifted and slightly moistened lignite, to e charge of glass metal previous to melting. The pigentary power of lignite is said to be three or four times as eat as that of manganese peroxide, whilst the relative st of the two ingredients is given as about 1 : 20.—C. S.

ottery; Flowing Under-Glaze Colours in ——. J. Salt
Monit. Ceram. **32**, [15], 138.

HE flowing of these printed colours (chiefly blue, black, nd dark green) under the glaze when fired is produced y the aid of copper oxide added to the colours themselves, r by placing a mixture of lime and common salt in the ggar along with the printed ware. The presence of tin ompounds and sodium chloride in the covering glaze may lso produce a similar result.

For blue, the author prepares a flux of: Nevers sand, 0 kilos.; "Cornwall stone," 6; calcium carbonate, 1; orax, 3·5 kilos., strongly calcined in the biscuit kiln. he preparation applied to the ware is composed of: above ux, 2,500 grms.; copper oxide, 250; cobalt oxide, 2,500 rms., ground and passed through a fine sieve.

For black, 1·5 kilos. of dry ("sec") copper sulphate and ·15 kilos. of potassium chromate are dissolved separately, ach in 5 litres of water, and then mixed. After 25—30 ninutes the precipitate is filtered, washed, and dried. The roduct, weighing 1·75 kilos., is gently calcined in the glaze urnace, finely ground, and washed, the weight being thereby educed to 600 grms. When printed and fired under glaze, this preparation gives a handsome black, surrounded y a bluish green aureole.

A second quality black is obtained by the following nethod:—Two fritts are prepared, the one (A) by intimately mixing 125 parts of copper oxide with 75 parts of chromium oxide; the second (B) by calcining in the glaze kiln: Fontainebleau sand, 100 parts; sodium phosphate, 100; lead oxide, 80; pegmatite, 70; calcium carbonate, 50; borocalcite, 20; kaolin, 10; and fluor spar, 20 parts. Of these ingredients, 700 parts of fritt A and 100 of fritt B are finely ground along with 75 parts of calcium carbonate and 25 of sand.

In many cases, however, the salt and lime mixture is to be preferred, provided care be taken not to place the saggars anywhere near other printed pieces in the kiln, especially such as are decorated with cobalt colours, since these latter are liable to alteration by the evolved gases. The mixture employed consists of: red lead, 100 parts; common salt, 50 parts; quicklime, 50; borax, 50 parts. It is best placed in a small receptacle near the top of the saggar, so as to obtain the most uniform distribution of the gases.—C. S.

PATENT.

Enamelled Articles; Manufacture of ——. J. Rapoport,
Budapest. Eng. Pat. 18,014, Sept. 9, 1901.

IN this process the powdered colours are applied to the object to be enamelled, in small heaps placed side by side, or in separate or mixed layers, and so arranged that in the kiln the colours shall be on the highest parts of the object, and will consequently when fused flow over it. More powder should be taken than is required to cover the surface treated, the excess being allowed to drain off.

—W. C. H.

IX.—BUILDING MATERIALS, CLAYS, MORTARS AND CEMENTS.

Chimney Construction; German Practice in ——.
G. Lang. J. Gas Lighting, 1901, **78**, [2007], 1092.

As high chimneys, compared with other brickwork structures, occupy a very short time in building, it is important to so construct them that the mortar shall safely sustain the superincumbent weight, whilst yet "green." Lime mortar strengthened by an addition of Portland cement is usually considered best for expeditious work. Lime mortar alone becomes equally strong in time, and resists the heat better, but it does not harden quickly enough, and is therefore only used for building tall chimney stacks, when the work is to be done very slowly, and where a strong outside scaffolding is used. It is recommended to use a mixture of cement, lime, and sand, in the proportions 1 : 2 : 6 for the upper portion of the shaft, and 1 : $2\frac{1}{2}$: 8 for the bottom courses. The proportion of cement may be reduced if the lime is of a hydraulic nature, but should be increased if the sand is very sharp. For the cap of the chimney, the proportions should be 1 : 1 : 4. Mortar made of cement and sand alone is not suitable, as it does not resist heat well, and is attacked by the carbon dioxide in the flue gases, especially in the presence of moisture.

—A. S.

Building Stones and Mortar Materials for the Walls of Reservoirs at Gotha: Experiments on ——. Mitt. aus den Königl. t. Versuchs-Anst. zu Berlin, 1901, **19**, [2], 59—86.

AN account, with tables of results of tests applied to building stones and mortar materials, is given, and of tests of resistance to tension, compression, and penetration of water, &c.

The following conclusions are drawn:—

(*a.*) The strength of trass-mortar is increased by an admixture of cement, especially when set in air.

(*b.*) The strength of mortar diminishes when very fine grained sand is used.

(*c.*) When "air-set," pure cement-mortar acquires tensile strength more quickly, and compressive strength more slowly, than when "water-set." This holds good also for cement-trass mortars as long as the cement exceeds the trass by a certain amount. A deficiency of water is unfavourable to the hardening of pure trass-mortar.

(*d.*) The difference in strength of air-set, as compared with water-set mortars, follows from the incomplete hardening in air; it increases with the age of the mortar. At first the difference is scarcely perceptible; the explanation offered is that the consolidation, in the early stages of the tests, is mechanical rather than chemical, and the water-content, in water-set mortars, hinders the development in the mortar tested of resistance to tension and still more to compression.

(*e.*) The impenetrability to water of trass-mortar is increased by an addition of cement, but it partly depends on the proportions employed.

The author mentions that (*c*) and (*d*) confirm his earlier observation (Mitth. **4**, 1900) that trass-mortar properly hardens only in presence of sufficient moisture. He quotes Bachmann's remark that, against the advantage of the slow hardening of trass-mortar must be set the possible disadvantage that a complete stoppage of hardening may occur through an insufficient supply of water.

The author adds that the preceding results of his are, as a whole, confirmed by practical observations referred to in "Le Ciment," made by Equer, on mortars used in the dry dock at Castigneau. He states that the mortar in the seams, where water had penetrated, deteriorated into a soft white powder. It is stated that Portland cement, when mixed with suitable sand, gives excellent results (*e.g.*, in Boulogne harbour). In any case greater care must be used in the employment of hydraulic lime.—W. C. H.

Lime and Cement Kilns: Quartz Shale versus Firebrick as Material for ——. P. Jochum. Thonind. Zeit. **25**, [141], 1387—1391.

The conditions exacted of fireproof materials for lining such kilns are:—Capacity to withstand a temperature of 1,600° C.; to exhibit neutral behaviour towards the lime dust, as well as towards the alkaline dust and the gases furnished by the fuel used in the kiln; and, in the case of shaft furnaces, sufficient mechanical tenacity to withstand the physical influences of the descending charge. Now, as quartz shale, by reason of its high percentage of silica, is peculiarly susceptible to the action of alkalis, it is evidently less suitable for the purpose in view than good firebrick containing 42—45 per cent. of alumina, provided the latter be present in the form of normal silicate and not simply the result of additions of bauxite made for the purpose of imparting a fictitious percentage of alumina.—C. S.

Slag Cement. W. K. Hatt. Chem.-Zeit. 1901, **25**, [82], Rep. 294. From Thonind. Zeit. 1901, **25**, 1336.

The author accepts the definition of Portland cement adopted by the Verein Deutscher Portland Cement Fabrikanten, namely, that it is a product obtained by crushing, after heating to the sintering point, a mixture of limestone, marl, chalk, or hydraulic limestone with clay, whilst slag-cement is a material prepared by the following processes: (1) Granulation of the slag; (2) drying of the slag; (3) mixture with a suitable proportion of slaked lime; and (4) grinding of the mixture. The Portland cement of the United States comprises those cements which are produced by the burning to the sintering point and grinding of artificial mixtures of limestone (or of marl, chalk, or hydraulic limestone), and clay (or slag sand).—W. G. M.

Incrustation from the Stone Gallery of St. Paul's Cathedral. E. G. Clayton. Proc. Chem. Soc. **17**, [241], 201—203.

Around what is known as the Stone Gallery, at the base of the dome of St. Paul's Cathedral, is a balustrade of Portland stone, surmounted by a heavy coping-stone of the same material. Much of the surface of the stone is greatly "weathered," and is coated by a stratum of a grey or black substance largely consisting of calcium sulphate, which in some places (especially on the under-side of the coping-stone) attains a thickness of three-quarters of an inch. This material, which is brittle and detachable with a knife, has a very rough and irregular surface, is stalagmitic in character, and, though differing in colour, in other respects resembles very closely some boiler deposits.

It is suggested that the presence of so much calcium sulphate is principally due to two centuries' solvent and weathering action of rain, charged with sulphurous and sulphuric acids derived from the gases and smoke of innumerable surrounding chimneys.

Asbestos. E. G. Clayton. Proc. Chem. Soc. **17**, [241], 203.

The following analyses are of four kinds of asbestos (one of which, A., was stated to be of English origin, the remainder being examples of the ordinary mineral).

Including the English specimen, all possess the general composition distinctive of true amphibole-asbestos. The English mineral consisted of moderately long greyish-green fibres, easily separable. B., C., and D., which had been pulverised before reaching the writer, were apparently associated with a little gypsum.

——	A.	B.	C.	D.
Water lost at 100°	1·19	0·87	0·86	..
„ „ 150°	0·05	0·13	0·00	..
„ „ a red heat	0·70	0·95	1·83	..
Total water	1·94	1·95	2·69	1·39
Silica (with traces of manganese oxide, alkalis, &c.)	60·88	48·48	59·82	61·74
Lime	11·11	6·19	5·91	6·91
Magnesia	10·84	35·52	28·27	25·72
Alumina	Trace	4·69	1·25	2·30
Iron oxide	15·23			
Sulphuric anhydride	..	3·17	2·06	1·94
	100·00	100·00	100·00	100·00

PATENTS.

Plaster or Artificial Stone; Composition for Use as ——. E. Bushman, Stapleton, N.Y., U.S.A. Eng. Pat. 19,597, Nov. 1, 1900.

The composition consists of oxide of zinc, pulverised flint, pulverised silica, borax solution, caustic soda, caustic potash, aluminium, asbestos, silicate of potash, silicate of soda, and water.—W. C. H.

Artificial Stone. S. E. Boivie, Ragnhildborg, Sweden. Eng. Pat. 10,084, May 15, 1901.

The process consists of mixing slaked lime with quartz or slate, nitric acid being then added to the mixture, which is immediately pressed into slabs, and subsequently submitted to steam pressure.—W. C. H.

Artificial Marble and the like; Manufacture of ——. O. Hertwig and E. Liebaug, Thuringia. Eng. Pat. 16,610, Aug. 19, 1901.

The artificial marble is made by intimately mixing, approximately in the following proportions: 16 parts of magnesite, 17 parts of magnesium chloride, 45 parts of flint or equivalent, 5 parts of kaolin or equivalent, and 17 parts of water, and pouring the mass on to glass or other polished plates.—W. C. H.

Wood; Preserving, Fireproofing, &c. ——. G. Feyerabendt, Tilsit, Germany. Eng. Pat. 15,402, July 30, 1901.

The method is to treat wood with a solution of sodium aluminate, to which some alumina has been added, under pressure, at a temperature of about 270° F. The wood may subsequently be washed, if necessary.—W. C. H.

Asbestos; Treatment of —— *for rendering it Waterproof, and increasing its Fire-resisting Qualities.* M. Raphael, Breslau. Eng. Pat. 11,856, June 10, 1901.

Asbestos articles, which are naturally hygroscopic, if for use at ordinary temperatures, are, by this process, coated with chrome glue, alum glue, or chrome alum glue, or are coated first with a solution of resin soap, and afterwards immersed in a solution of, say, calcium chloride, to form an insoluble calcium soap on the surface and in the pores. When the articles are to be subjected to high temperatures, they are coated with water glass, or a glass or porcelain enamel is burnt on to the surface.—W. C. H.

X.—METALLURGY.

Metals; Action of Ammonia on ——, *at High Temperatures.* G. G. Henderson and G. T. Beilby. J. Chem. Soc. 1901, **79** and **80**, [468], 1245—1256.

When platinum, gold, silver, copper, iron, nickel, or cobalt is exposed to the action of ammonia at temperatures ranging from 600° to 900° C., a large proportion of the latter is resolved into its elements, whilst the metal becomes disintegrated. The fracture of metals which have been exposed to this action is not crystalline, as has been previously stated, but spongy or cellular, giving the idea of sudden cooling while in a state of active effervescence. Iron and copper rods, a quarter of an inch in diameter, were completely penetrated to the centre by the ammonia in 30 minutes. Copper exposed for seven days to the action of ammonia at 800° C. became reduced to a fine spongy powder.

By the prolonged action of ammonia on platinum, very fine deposits of platinum black are produced on the surface of the more massive metal. The formation of spongy deposits on the outside of platinum crucibles heated by Bunsen burners, and the disintegration of the platinum wires of pyrometers exposed to furnace gases, may perhaps be accounted for by the presence of traces of ammonia in the combustion gases.

The absorption of small quantities of nitrogen by pure iron rendered it hard and brittle like steel. Malleable iron tubes exposed to the action of ammonia for seven days at 800° C. became so brittle that they could be broken like porcelain by a blow from a hammer. It is probable that some of the effects on the structure and properties of iron and steel, which are at present attributed to other elements, may be due to the presence of traces of nitrogen.

It may be stated that metals, in general, when exposed to the action of ammonia at high temperatures, are either converted into nitrides—wholly or partially—or else considerably changed in their physical properties, even although no nitrogen is permanently fixed by the metal.

The authors consider that the physical effects produced are due to the alternate formation and dissociation of the nitrides of the metals taking place between certain narrow limits of temperature, the reaction being turned in either one direction or the other, according as ammonia or hydrogen molecules preponderated in the gases which were in contact with the molecules of metal at and below the surface.

—A. S.

Metals; Distilled ——. Kahlbaum. Chem.-Zeit. 1901, **25**, [84], 919.

This is a continuation of the author's work published in 1899. He has distilled 24, and examined closely into the properties of 9, metals. The object of the distillation is complete purification. The test of purity is absolute homogeneity and constancy of spectrum. If the spectrum of a metal is identical before and after distillation, absolute purity has been attained, in the author's opinion. In the case of a specimen of tellurium, 25 lines vanished after the first distillation, and 21 after the second; other lines were diminished in intensity but not removed. The suppressed lines were those of foreign constituents.

The density and specific heat of distilled metals were re-determined, a cylinder of 1·5 c.c. volume being cast and turned from metal which had been distilled *in vacuo*, and then submitted to pressure for the purpose of determining the density. A copper cylinder was immersed in castor-oil and subjected to various pressures (on all sides) up to 20,000 atmospheres, the density being taken after each successive increment. At the highest pressure the metal was completely plastic. Whilst the density of ordinary copper increased at first rapidly, afterwards slowly, with each rise of pressure, that of distilled copper at first increased and then fell off. Hence it is assumed that the density is not a specific property of a substance, but the individual property of a given specimen. The specific heat is analogous, decreasing with increasing pressure, but the decrease is very slight.—W. G. M.

Blast Furnace; Calculation of the Composition of the Gases from, and of the Volume and loss of Blast in the ——. B. Osann. Stahl u. Eisen, 1901, **21**, 905. Through Chem.-Zeit. 1901, **25**, [82], Rep. 295—296.

Analysis of the flue-gases does not always give correct indications of the chemical reactions taking place in the furnace; and consecutive tests may give results which differ markedly, without apparent cause, but really by reason of the fluctuation in the oxidising and reducing reactions of the furnace. The process of calculation used gives an average result; it relates to the proportion of CO_2, CO, N, and H_2O in the flue gases. In the original paper a practical example is taken; the composition of the gases is calculated, as also the heat required per 100 kilos. of pig-iron, the heat introduced with the blast, and the volumes both of blast used and of gases produced. A number of thermal balance-sheets are given, and a table is introduced showing the quantity of heat w, and the values of x and y (the proportions of CO_2 and CO), and the quantity of combined oxygen in the gases. Further calculations show the value of the oxygen available from the reduction of the ores. There is also a table showing the composition of the gases when different proportions of coke are used. In calculating the volume of blast used, the author recommends that the quantity of air blown into the furnace be referred to the ton of coke burnt, instead of using the proportion of the number of revolutions of the blowing engine to the quantity of pig-iron produced daily. Finally he calculates the loss of blast in the blowing engine.—W. G. M.

Cast Iron; Influence of Aluminium on the Carbon in ——. Melland and Waldron. Chem.-Zeit. 1901, **25**, [82], Rep. 296.

Various proportions of aluminium (of 99 per cent.) were melted with pure Swedish charcoal pig in crucibles and poured into two ingots, one of which was cooled quickly, the other slowly. About 1·4—1·8 kilos. were used in each experiment, the charge being melted under charcoal. Up to 2 per cent. Al, aluminium was without influence on the proportion of carbon present, but with from 2 to 11 per cent Al, there was a reduction of 0·13—0·39 per cent. in the total carbon. In the rapidly-cooled specimens, 0·23 per cent. or less of Al was without influence on the proportion of graphite; the separation of graphite then increased as the Al rose to 0·53 per cent., and then remained constant up to 1·78 per cent. Al, after which it decreased again. In the slowly cooled ingots, the effect of small proportions of Al was found to be irregular; with from 0·23 to 1·78 per cent. Al, the metal was grey, and contained 3 per cent. of graphite, but with large additions of aluminium the graphite percentage was lower, being only 0·2 per cent. when 11·8 per cent Al was present. Aluminium cannot, like silicon, cause the separation of all the carbon present in the form of graphite. The quickly-cooled bars were very fine-grained and quite unlike the others in texture. A carbide, Al_4C_3 was found to have been formed at temperatures below the melting-point of cast-iron, a circumstance which may account for the low proportion of graphite in the high aluminium alloys. No hydrocarbon was however evolved from the finely-divided metal, and the examination of the etched polished surface gave no indication of its existence. The original strength of the metal was lowered by 60 per cent. by the addition of 0·25 per cent. Al. The metal containing 3·8 per cent. of Al bore a crushing stress of 121 kilo. per square millimetre even with the skin of white-iron removed.—W. G. M.

Open-Hearth and Converter Process; A Combined —— Stahl u. Eisen, 1901, **21**, 524. Proc. Inst. Civil Eng. 1901, **146**, [1], 41—42.

It has been observed at Nischne Salda in the Ural, that the pig iron smelted from very pure magnetic ores with charcoal is so low in silicon that, with the converter alone, it is impossible to bring out the charge at the proper heat. The difficulty has been overcome by first passing the metal through a Siemens regenerative furnace, where its temperature is raised to over 1,400° C. It is stated that by increasing the initial heat in the metal in this way, the time of blowing in the converter is shortened, and the charge is finished at a high temperature, the combustion of silicon going on through the whole period, instead of being completed in the first few minutes. The following table shows the nature of the changes which occur.

——	Silicon.	Manganese.	Carbon.
Blast furnace metal ...	0·75	2·6	3·7
Metal superheated in Siemens furnace.	0·70	2·01	3·65
Metal blown 3 mins. in converter.	0·56	1·31	2·50
Metal blown 6 mins. in converter.	0·47	1·31	1·80
Metal blown 9 mins. in converter.	0·43	1·01	1·05
Metal blown 12 mins. in converter.	0·33	0·65	0·53
Metal blown 14½ mins. in converter.	0·026	0·31	0·25

If the silicon in the pig iron exceed 1 per cent., sufficient steel scrap is added in the open-hearth furnace to reduce it as nearly as possible to that amount. The table on next page shows analyses of such a charge at different periods.

When the silicon in the superheated metal amounts to 1·2—1·4 per cent., additions of 10—12 per cent. of cold scrap during the blow in the converter are necessary to control the heat developed. For the production of 1 ton of ingots by this method, there are required 1·1 tons of pig

—	Silicon.	Manganese.	Carbon.
[illegible]	1·96	3·45	4·40
[illegible]	0·21	0·20	0·45
[illegible]	1·31	2·37	3·92
[illegible]	1·48	1·72	2·28
[illegible]	0·68	1·12	1·34
[illegible]	0·35	0·80	0·70
[illegible]	0·08	0·125	0·28
[illegible] spiegel	0·02	0·275	0·33

[illegible] and 1·18 cb. m. of wood consumed in the gas-producers of the Siemens furnace.—A. S.

Iron and Steel. Internal Strains of ——; and their Bearing upon Fractures. A. Wiogham. Iron and Steel Institute, Autumn Meeting, 1901.

The author puts forward a series of hypotheses in an attempt to elucidate the sources and the character of the internal strains of metals generally, but more especially of iron and steel, and to throw light upon the cause of the sudden and unexpected breakages of metal used for machinery and for structural purposes.

A given mass of crystalline material tends to become more largely crystalline, and the crystals to become more compact, and any excess of the mother mass or eutectic existing between the minute crystals, which are first formed and which go to build up the larger crystals, must, when these are brought into closer contact with one another, be squeezed out into the larger channels which constitute the films between the facets of the larger crystals. During the slow cooling, after solidification, of a piece of steel, its constituents will tend to assume the simplest forms of chemical combination preferentially existing at normal atmospheric temperature, and its crystalline character will be developed to the greatest extent compatible with the existing conditions. The cooling, however, being more rapid than the process of adjustment, complete equilibrium is not attained at any given temperature, and hence, in the final condition of coldness, there exists in the metal a certain amount of latent effort to adjustment, which may be considered as a potential disruptive force. The metal, although apparently adjusted to the general conditions of pressure and temperature, &c., is gradually and persistently endeavouring to become more crystalline, and is accumulating an internal expansive pressure. This internal pressure is accentuated, and the tendency to readjustment favoured by various conditions, such as changes of temperature, vibration, oscillation, revolution, and jolting or jarring, especially of a tensile character, to which the metal is subject during its industrial life. The readjustment which takes place constantly, though slowly at the ordinary temperature, proceeds more rapidly under the accelerative influence of heat, so that a metal used at steam heat will develop, in a much shorter time, internal strains leading to flaws, and finally to fracture.

Ewing and Rosenhain (this Journal, 1900, 1115) have observed that the crystals of a piece of lead when strained under compression beyond the elastic limit, grow with arms and branches thrown out, and producing spaces between them, which, at a later stage, become filled up to form the face of the crystal. It is maintained that the medium for the development of this and other fern-like growths which have been observed, must be the eutectic; and if, from any cause the crystals are not completed, the metal becomes a mass of crystals welded or cemented by interpenetration with the eutectic. This hypothesis is stated to offer an explanation of the modifications of the character of a metal by mechanical treatment, such as the breaking down of crystalline structure and the production of a closer texture by hammering, &c., the interpenetration and binding together by welding and soldering, the power to bend, the disruption under stress, &c.

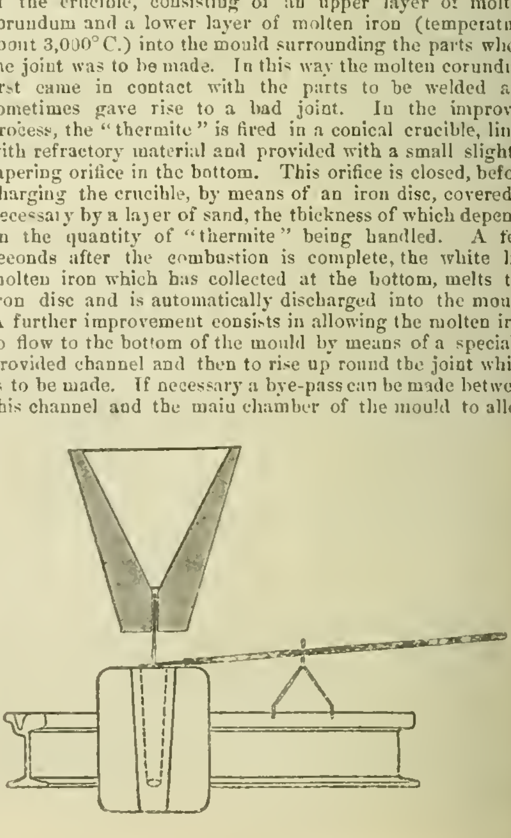
It is concluded that a metal, in order to possess durability and stability, should contain those constituents which do not lend themselves to after-crystallisation or separation. The fluidity or mobility of the eutectic is important in this respect, and the best conditions are fulfilled when the eutectic has a solidifying or rigidity point not far removed from that of the crystals which separate from it. In this way the minute crystals first formed quickly become cemented with the solidified eutectic, and a metal of fine grain texture results. This should be accomplished, however, with the minimum possible quantity of eutectic. The high elastic limit and strength of steels containing metals like nickel, &c., may be explained by the formation, with the less fusible nickel, of a high melting eutectic, which solidifies and hardens soon after the separation of the minute crystals of steel or nickel steel. The nature and number of the non-metal constituents of a complex metal also considerably influence the character of the eutectic; in general, these should be kept down to the lowest possible limit, so as not to produce any superfluous eutectic, which would facilitate the readjustment to crystalline form.

The effects of the various methods of thermal treatment of steels are explained in the following manner:—With sudden cooling to normal temperature, the natural preferential separation of the constituents is prevented, and there results a complex metal which is itself hard. The effect of annealing is to allow the natural stages of separation to take place, partly or wholly, according to the temperature and time occupied in the process. The effect of tempering is to allow sufficient release of the eutectic to take place to have a binding action upon the remaining hard particles, so that the brittleness resulting from the absence of a cementing agent is destroyed, whilst the hardness is not entirely obliterated, and, consequently, a tough and flexible steel is obtained.—A. S.

Welding Process: Automatic Tapping Arrangement for the Thermite ——. H. Goldschmidt. Zeits. für Elektrochem. 1901, 7, [68], 935—943.

The author describes an improvement in the process for welding rails, broken shafting, &c. by means of the high temperature generated by the combustion of a mixture of aluminium powder and oxide of iron, "thermite." (See this Journal, 1899, 870, and 1900, 908.)

Formerly the weld was effected by pouring the contents of the crucible, consisting of an upper layer of molten corundum and a lower layer of molten iron (temperature about 3,000° C.) into the mould surrounding the parts where the joint was to be made. In this way the molten corundum first came in contact with the parts to be welded and sometimes gave rise to a bad joint. In the improved process, the "thermite" is fired in a conical crucible, lined with refractory material and provided with a small slightly tapering orifice in the bottom. This orifice is closed, before charging the crucible, by means of an iron disc, covered if necessary by a layer of sand, the thickness of which depends on the quantity of "thermite" being handled. A few seconds after the combustion is complete, the white hot molten iron which has collected at the bottom, melts the iron disc and is automatically discharged into the mould. A further improvement consists in allowing the molten iron to flow to the bottom of the mould by means of a specially provided channel and then to rise up round the joint which is to be made. If necessary a bye-pass can be made between this channel and the main chamber of the mould to allow



the molten corundum to flow over the upper part of the joint.

The paper is illustrated by seven figures, and detailed instructions and dimensions are given which are applicable to given conditions. The accompanying figure shows the general arrangement and also the means provided for tapping the crucible if for any reason the iron disc should not melt through after the combustion is complete. This consists of an iron rod, placed in the discharge orifice, which, when raised by means of the lever, displaces the disc. The illustrations refer chiefly to the welding of electric tramway rails and a ten-inch shaft.—J. S.

Cementation [Iron] of Finished Goods. C. W. Bildt. Chem.-Zeit. 1901, **25**, [82], Rep. 296. From Oesterr. Zeits. Berg- u. Hüttenw. 1901, **49**, 504.

The objects to be cemented are packed at some distance from one another—the distance depending upon the size of the objects and the degree of cementation required—in a mixture of 60 per cent. of wood charcoal and 40 per cent. of bone meal. They are placed in chests which are kept tightly closed throughout with a cover of loam, and heated to 1,110°—1,200° C. The objects should be made of refined-iron or of good mild steel, low in carbon, but not of Swedish iron, which, on account of the slag, contained in it, is liable to form blisters. The cemented steel goods do not require re-melting; they may be hardened and tempered, and will bear hammering hot or cold. For cutting-tools, the resulting material is said to be better than English cast-steel. Objects may be locally hardened by covering the parts not to be affected with clay. —W. G. M.

Soldering Experiments with the so-called Solder Paste "Ferrofix" for Cast Iron. Mittheilungen aus den Königl. t. Versuchs-Anst. zu Berlin, 1901, **19**, [2], 86—90.

The process of F. Pich, of Berlin, is described in Ger. Pat. 110,319. The surfaces to be soldered are freed from graphite during the process, and at the same time molten solder is brought into contact with the graphite-free cast-iron surfaces at a red heat in the furnace.

The solder consists of a paste of cuprous oxide, and borax as a flux. The latter melts on heating, and protects the surfaces and the cuprous oxide from oxidation. Stronger heat is then applied, and the cuprous oxide gives up its oxygen to the graphite, forming carbon monoxide and dioxide, and the metallic copper is left in a finely divided condition, and combines with the hard solder applied to the edges and unites them. The results of the experiments show that with care it is possible by this process to form soldered joints of cast-iron, practically equal to the material itself in strength.—W. C. H.

Ferro-Manganese; Cause of the Disintegration of —— when exposed to the Open Air. R. Dubois. Bull. Assoc. Belge des Chim. **15**, (7), 281—286.

The author reports an instance where a pile of ferro-manganese, left exposed to the open air for a couple of months, was found to have suffered disintegration, the mass shrinking to about one-half its original bulk. It was at first thought that this change was the result of oxidation, assisted by the action of carbon dioxide and water vapour, the more so, because the same change was particularly noticed in some pieces of the alloy lodged on a steam pipe. The chemical examination of the powder, however, showed that such was not the case, but that the alteration was due to the weathering of the portions richest in manganese, the powder containing 82·17 per cent. of Mn and 7·43 per cent. of Fe, compared with 79·99 and 11·94 per cent. respectively, in the original sample. Moreover, the presence of 0·135 per cent. of moisture in the weathered sample is sufficient to indicate that the disintegration could be effected by the mechanical action of frost.

As, in its altered condition, the ferro-manganese is practically useless for its intended purpose in the converter, it is evident that care should be taken to store it under cover.—C. S.

Nickel Steel, The Metallurgy of ——. A. W. Zdanowicz. Stahl und Eisen, **21**, 753; through Zeits. angew. Chem. 1901, **14**, [44], 1112.

According to Browne and Porter, the nickel steel used for shafting and other forgings contains 3·25 per cent. of nickel and 0·25—0·35 per cent. of carbon. The author has obtained good results with less than 2 per cent. of nickel, adding pure nickel just after re carburisation; in many works the ferro-manganese and ferro-silicon are introduced into the bath at the same time. For shafts and forgings the bath should be fined down as far as possible; too high a percentage of manganese and silicon has a bad influence on the tenacity of nickel steel.

One of the main conditions in forging nickel steel is the possession of a sufficiently powerful steam hammer or hydraulic press, otherwise the texture of the interior remains crystalline, and the forging is crude and liable to crack diagonally. The effect of the blows must penetrate to the heart of the mass, and produce a blending of the metal and the pressure must be continued for a sufficient length of time; hence the hydraulic press is most suitable.

On cooling, a recalescence point occurs between 700° and 650° C., and a change of structure takes place; crystallisation of the steel begins as it solidifies, and the crystals are larger the more slowly it is cooled. At the recalescence point the crystallisation seems to stop; if the block be heated to a temperature above the recalescence point, smaller crystals will be found on cooling; by overheating the crystals are destroyed, and an amorphous structure is produced. According to Souther, an increase of 0·25 per cent. of carbon lowers the recalescence point of ordinary steel 138° C., and 5 per cent. of nickel lowers it 302° C.; nickel, therefore, has a considerable influence on the critical temperature of steel, the duration of recalescence is nearly proportional to the percentage of nickel. The nickel, therefore, probably forms at the critical temperature definite compounds with the iron or carbon, perhaps with both.

In heating or annealing, the temperature of the block must be kept slightly below the recalescence point. In order to compensate for the stresses produced in forging, and for the molecular disturbances, and to increase the contraction and elasticity, the annealing of the forgings is absolutely necessary. Unannealed forgings are liable to bend in working; the greatest care must be paid to the temperature whilst annealing. The nickel steel prepared by the author for shafts and forgings showed a tenacity of 55—60 kilos. per sq. mm. and 20 per cent. extension, with a good bending test. The unannealed pieces could be bent almost on themselves, and the fracture had a good, fibrous structure, whereas pieces annealed at temperatures above the recalescence point broke at a very small angle, and showed a totally altered structure.—J. F. B.

Cyanide Plant at the Athabasca Mine, British Columbia. Eng. and Mining J. 1901, **72**, [16], Canadian Supplement, 515.

The plan followed, comprises:—(1), Settling in tanks; (2) straight percolation, assisted by vacuum; (3) deposition on zinc shavings; (4) acid treatment for refining the product. The plant, which is capable of treating 35 tons daily, consists of one stock solution tank, diameter 4 ft., stave 6 ft.; two solution tanks, diameter 10 ft., stave 6 ft.; two settling tanks, diameter 14 feet, stave 10 ft.; five leaching tanks, diameter 18 ft., stave 4 ft.; two gold solution tanks, diameter 10 ft., stave 6 ft.; 24 zinc boxes, each 1 cb. ft. capacity; one clean-up tank, diameter, 6 ft., stave $2\frac{1}{4}$ ft.; one clean-up tank, diameter, 4 ft., stave 6 ft.; one vacuum filter box; one Hampton zinc lathe, one solution pump; and one vacuum pump. The tailings pass directly into the settling tanks, which are provided with automatic distributors, annular launders for overflow, and three side discharge doors each. The leaching tanks are fitted with filters and centre discharge doors, and are so arranged that the tailings can be sluiced out through the bottoms of the tanks. The zinc boxes are square sheet iron buckets; each one is independent of the others and can be handled by means of an iron bail. —A. S.

Gold Haloids. F. Lengfeld. Amer. Chem. J. 1901, **26**, [4], 324—332.

By the rapid action of bromine upon finely divided gold, the first product is aurous bromaurate, Au_2Br_4, mixed with some aurous bromide or gold (probably the latter). The bromaurate is a steel-blue solid, stable in the absence of water, but easily decomposed at the ordinary temperature by water and many organic solvents.

When chlorauric acid is left in a moderately dry atmosphere the compound $HAuCl_4.3H_2O$ is obtained. If this be kept *in vacuo* over phosphorus pentoxide, loss of water of crystallisation is accompanied by decomposition. On standing in air it rapidly deliquesces, but attempts to identify a definite compound failed. It was not found possible to isolate $HAuCl_4.4H_2O$, which Thomsen believed to exist.

Bromauric acid has the formula $HAuBr_4.6H_2O$, and not $5H_2O$ as stated by Thomsen. Kept over drying agents it loses three molecules of water of crystallisation, but can lose no more without decomposition.

In investigating the silver salts of halauric acids, the action of chlorauric acid upon silver carbonate was found to be a complicated one. Among the products formed are silver chloraurate, silver chloride, and auric chloride.

The main reaction between potassium chloraurate and silver carbonate, whether in aqueous or alcoholic solution, appears to be: $2KAuCl_4 + Ag_2CO_3 = K_2CO_3 + 2AgCl + 2AuCl_3$.—E. H. T.

Sulphide Ore Treatment (Phœnix Process). E. A. Ashcroft. Trans. Inst. Min. and Met. **9**, 378—418.

The Phœnix cyclic process is the joint invention of the author and Mr. J. Swinburne, and is conducted in four stages.

1. The mixed or complex sulphide ore is treated with dry chlorine gas at a temperature above 600° C. in a large tipping converter of the Bessemer type, whereby the chlorine displaces the sulphur and other elements combined with the metal and forms metallic chlorides. The crushed ore is introduced at the top of the converter into a bath of fused zinc chloride and chlorine is injected at the bottom, the temperature being such that free sulphur is produced and volatilises, together with a little sulphurous acid, for condensation and recovery. Chloride of sulphur is produced only at temperatures below 600° C. The decomposition is rapid and complete, the heat set free maintaining the bath at the proper temperature. Additions of ore are made until the converter is filled with fused chlorides, part of which is run out for the next treatment, whilst some is left in to form a bath for further quantities. Neither the silicates of iron and manganese in the ore nor the converter lining are attacked, the former remaining with the gangue suspended in the chlorides. The time for a trial treatment of 1,000 kilos. of ore, requiring four pourings, was 12 hours. The average temperature was 650° C., the chlorine consumed 470 kilos., and the sulphur condensed 100 kilos out of a total quantity of 210 kilos., the remainder having oxidised. The weight of the fused chlorides, chiefly lead and zinc with suspended gangue, was 1,260 kilos. All the gangue, and 92 per cent. of the total chlorides, remained in the converter, the remaining 8 per cent., chiefly of iron and zinc, being found in the condenser with the sulphur, from which it was separated by washing in water.

2. In this stage the lead is removed from the fused chlorides by the action of metallic zinc at about 450° C., any gold or silver having previously been thrown out by metallic lead. Any copper or antimony may similarly be removed. The separations may likewise be obtained by fractional electrolysis, in which case chlorine is set free and has to be recovered. Any iron which might be present to interfere with the ultimate electrolysis of the zinc chloride, can be removed at a stage in the converter treatment by blowing in air, whereby it is thrown out and remains suspended as oxide for separation in stage 3.

3. The heavy sands and oxides of iron and manganese are allowed to settle by standing in iron pots at a little below [illegible] C., and the pure fused zinc chloride decanted as far as possible. The residue may be distilled to complete the removal of the chloride, but preferably it is dissolved out by water and the solution evaporated until the fused salt is obtained. Alternatively, to obtain the oxides of iron and manganese free from gangue, they may be thrown out from the chlorides by a supplementary air treatment after the gangue has been removed as above (this Journal, 1901, 907).

4. The final stage is the electrolysis of the pure zinc chloride, and this may be effected in three ways: in solution with diaphragms; fused and externally heated; and fused and internally heated by the current. Of these the last named is preferred as being less expensive than the first, and without the difficulty of materials for the vessels in the second, since the fused chloride in the centre is surrounded by solid and cooled layers. The apparatus consists of a steel tank 6 ft in diameter, lined with 18-in. fire bricks, the inner layers being set in a special cement. The cathode is a mass of molten zinc, of approximately 1 ton, in the bottom of the tank, and connection is made by a steel block buried in the brickwork, and provided with five screwed copper tubular rods, through which the current enters, and through which air circulates to prevent overheating. The anode consists of 120 rods of hard carbon dipping about 6 ins. into the electrolyte, and suspended from a removable cement-lined iron plate. The zinc is tapped by removing a carbon plug, and fresh fused chloride poured in from above. The carbons last six months or longer. The purity of the zinc depends on the previous purification of the chloride, but it has practically been obtained with only 0·15 per cent. of lead and 0·02 per cent. of iron. The vats are sealed from the air to prevent dilution of the chlorine, which is drawn off for re-use in stage 1. The best results are obtained with the temperature between 425° and 525° C., and it is found advantageous as regards conductivity to have sodium or calcium chloride present in the electrolyte to an extent resulting in not more than 28 per cent. of zinc, instead of 48·5 per cent. for the zinc chloride alone. These chlorides are not decomposed and do not require renewing, but rather have a tendency to accumulate by the introduction of small quantities with the zinc chloride, a periodical removal of part of the electrolyte being then necessary. The chlorine gas evolved, is dried in towers packed with zinc chloride, and liquefied or kept under pressure, the oxygen with which it was diluted being then, with some of the chlorine, used for oxidising and precipitating the iron in the converter.

The working cost will depend largely upon the cheapness of power, of which the process is a large consumer, the computation at 2·2 volts (theoretically calculated) required for a ton of average ore, yielding about a quarter of a ton of zinc, resulting in 495 kilowatt-hours. Estimated items of cost are given based upon present experience. The merits claimed for the process are the high percentage of recoveries, the absence of undesirable by-products, the absence of wear and tear on the converter and vat linings and carbon anodes, and the general simplicity with the economy of automatic working.—A. W.

Tin Ores, especially Silicates or Tin-Slags; Lixiviation of ——. Brandenburg and Weyland, Kempen. Ger. Pat. 123,764, Jan. 22, 1901. Through Zeits. angew. Chem. **14**, [43], 1095.

The ores or slags are boiled with an aqueous solution of sodium bisulphate, the solution filtered from the separated gelatinous silica, and worked up for tin or tin compounds. —J. T. D.

Tinfoil and Bottle Caps Manufacture. R. Granja.

See page 1191.

Metals and Alloys; Analysis of ——. F. Ulzer. Mitt. d. tech. Gew. Museums, Vienna, 1901, **11**, [7, 8, 9, and 10], 162—165.

The alloy known as Namo metal consisted of: lead, 0·27; copper, 12·98; tin, 83·27; antimony, 3·15; iron, 0·25 per cent., and traces of phosphorus; whilst a sample of Babbit's metal gave: lead, 40·69; copper, 6·48; tin, 43·76; antimony, 8·82; and iron, 0·12 per cent. The alloy Magnolia had the following composition:—Lead, 76·60; antimony, 18·24; tin, 4·91; copper, 0·064 per cent., and a trace of iron. A phosphor bronze contains: lead, 14·62; copper, 4·58; antimony, 7·37; tin, 73·08; phosphorus, 0·12 per cent., and traces of iron.—F. A. L.

Nickel Alloys. H. Wedding. Verhandl. des Vereins zur Beförd. des Gewerbfleisses, 1901, 143. Proc. Inst. Civil Eng. 1901, **146**, [4], 50.

For the results obtained with nickel-iron alloys see this Journal, 1901, 127. Experiments dealing with the preparation of alloys of the four elements, iron, nickel, manganese, and carbon, showed that the proportion of manganese in the finished alloy did not at all correspond with the amount originally weighed out. In some of the casts, instead of 0·5 per cent. of manganese, there was, on the average, only 0·15; in others, instead of 1, there was only 0·33 per cent. In order to produce an alloy containing the proportion desired, it is proposed to melt the manganese first, and then introduce it into the mixture of the other metals.—A. S.

Nickel, Copper, and Aluminium; New Alloys of ——. Häntzschel. Verhandl. des Vereins zur Beförd des Gewerbefleisses, 1901, 5. Proc. Inst. Civil Eng. 1901, **146**, [4], 49.

"*Nickel-aluminium.*"—In the production of this alloy, the difficulty experienced in making alloys of nickel and aluminium, owing to the great difference between the melting points of the two metals (1,450° and 600° C. respectively) has been overcome by the addition of copper, the melting point of which is intermediate between those of nickel and aluminium. The alloy obtained is thus really one of aluminium, nickel, and copper, consisting for the most part, however, of aluminium, as is shown by its low specific gravity—2·86. "Nickel-aluminium" can be rolled into plates and bars: in six tests, it showed an average ultimate tensile strength of 25·9 kilos. per sq. mm. (16·44 tons per square inch).

"*Minckin.*"—This is an alloy similar to, but containing more nickel than the so-called German silver; the latter contains about 26 per cent. of nickel. It is chiefly useful on account of its resistance to the corrosive action of weak acids and alkalis.—A. S.

Nickel-coloured Alloy; Manufacture of a ——. M. Ekker and J. Krajcsics, Budapest. Ger. Pat. 123,750, Sept. 25, 1900. Zeits. angew. Chem. **14**, [43], 1095.

The following ingredients are placed in layers in a crucible:—Copper, 375; phosphor-bronze, 2; nickel, 700; magnesium powder, 8; copper, 375; aluminium, 2; zinc, 800; cadmium, 15; zinc ashes, 2; copper, 750. After melting, 2 parts of powdered sal ammoniac are well stirred in. The alloy does not oxidise in the air, keeps its lustre at 100° C., and resists corrosion by acids.—J. T. D.

Silver-coloured Alloy; Manufacture of a ——. M. Ekker and J. Krajcsics, Budapest. Ger. Pat. 123,919, Sept. 25, 1900. Zeits. angew. Chem. **14**, [43], 1095.

The following ingredients are placed in layers in a crucible:—Nickel, 600; copper, 2,000; zinc, 400; magnesium powder, 10; cadmium, 80; zinc ashes, 2: aluminium, 1. After melting, 1 part of powdered sal-ammoniac is well stirred in. The alloy does not oxidise in the air, keeps its lustre at 100° C., and is very resistant to acids.
—J. T. D.

Aluminium and Copper; Alloys of ——. L. Guillet. Comptes Rend. **133**, [18], 684—686.

Aluminium-copper alloys were formed by burning a mixture of metallic aluminium, finely granulated, with copper oxide; when the amount of aluminium was greater than that corresponding with the production of the substance $CuAl_4$, the mixture would not ignite. After reaction and cooling, the crude button was analysed, and also the residue (usually crystalline) left after treating it with dilute hydrochloric acid. The three compounds (Cu_3Al, $CuAl$, $CuAl_2$) described by Le Chatelier were all isolated. With the compound CuAl there was obtained always 2 or 3 per cent. of a silicide of copper and aluminium.—J. T. D.

Copper; Precipitation of ——, by Ferrous Salts. H. C. Biddle. Amer. Chem. J. 1901, **26**, [4], 377—382.

Investigation of the reduction of copper salts by ferrous salts in aqueous solution shows that the reaction is a reversible one, and that its direction is determined by the relative concentration of the ferrous, ferric, cuprous, and cupric ions. Theory indicates that copper will not be deposited in a solution containing many ferric ions (either originally present or formed during the reaction), and this is confirmed by the fact that ferrous chloride, or sulphate, does not precipitate copper from the corresponding copper salts, however long they may be kept in contact. On the other hand, reduction does take place if few ferric ions be present; *e.g.*, when an excess of ammonium carbonate is added to a solution of ferrous and cupric chlorides, the yellow liquid obtained, deposits, on standing, a slight but brilliant mirror of copper. The influence of the concentrations of the ions is also shown by the fact that if an excess of sodium carbonate be added to a solution containing cupric and ferrous salts, there is no deposition, but if only a slight excess of the carbonate be employed, the precipitated carbonates gradually change to a brick-red precipitate containing copper and basic ferric carbonate. Potassium bicarbonate reduces in a similar way, whether in slight or great excess; this is because the acid ferrous and cupric carbonates are more soluble than the corresponding normal salts. Their solubility is increased under pressure; consequently, if the action take place in a closed vessel containing carbon dioxide, the deposition takes place more readily. Copper from the cuprous state may be reduced in a similar manner.
—E. H. T.

Tungsten and Copper; Aluminium Alloys containing ——. Carl Berg, Eveking. Ger. Pat. 123,820; addition to Pat. 82,819 of Jan. 18, 1894. Through Zeits. angew. Chem. **14**, [43], 1095.

Tungstic acid is reduced, using cryolite as a flux, and aluminium is added to the melted metal so as to produce an alloy containing 10 per cent. of aluminium. Another alloy of aluminium with electrolytic copper and zinc is made, and the two alloys are melted together in such proportions that the resulting alloy may contain 91 to 92 per cent. of aluminium and 2 to 7 per cent. of zinc.
—J. T. D.

Platinum and Iridium; Determination of —— in Platinum Ores. Leidié and Quenuessen.

See under XXIII., *page* 1242.

Furnace Combustion; Phenomena of ——. O. Boudouard.

See under II., *page* 1196.

Pyrite and Marcasite, and Methods of Distinction. H. N. Stokes.

See under XXIII., *page* 1241.

Vanadium: Its Extraction and Uses. H. Procter Smith.

See page 1183.

PATENTS.

Alluvial Deposits; Extraction of Metals and Minerals from ——. J. Mactear, London. Eng. Pat. 19,150, Sept. 25, 1901.

This is a kind of continuously working cradle for treating alluvial deposits or accumulations of gold, tin, and other metals and minerals, &c.—J. H. C.

Tin: Recovery from "Hardhead" or Slag. E. M. Bradford, Neath Abbey. Eng. Pat. 19,592, Nov. 1, 1900.

Sulphur (or a suitable sulphate or sulphide) is added to the material to be treated, and the mixture is strongly heated in a blast or cupola furnace, with or without the addition of lime or an alkali. The tin is volatilised as oxide and collected as fume.—J. H. C.

Iron and Steel; Process for Toughening, Hardening, or Annealing ——. W. Holder, New York and London, and W. H. [illegible] F[illegible], London. Eng. Pat. 13,352, July 24, 1[illegible].

The metal is toughened by being heated in a bath of [illegible] within a closed receptacle, and allowed to slowly cool whilst in the bath. The temperature may be about [illegible] F. Further, an electric current may be passed through the bath while the metal is under treatment, *i.e.*, during the heating or cooling, which current should be intermittent.—A. W.

Steel; Production of ——. A. J. Boult, London. From F. Goldschmid, Frankfurt a/M., Germany. Eng. Pat. 21,552, Nov. 28, 1900.

The process is for the production of steel in Martin's furnaces, and consists in the application of a water-gas flame for heating and fusing the charge in a twin furnace or a furnace with two hearths, so that the gases escaping from the first hearth pass over and heat the charge on the second hearth, the preliminary heating of the water-gas being unnecessary. The furnace can be arranged so that after tapping and recharging the first hearth, the air through the regenerator and the gas can be reversed, and the charge in the second hearth worked, whilst the gases therefrom pass over and heat the fresh charge on the first hearth.—A. W.

Iron or Iron Alloys; Manufacture of ——. F. C. Crean, Montreal. Eng. Pat. 17,639, Sept. 3, 1901.

The iron or alloy is made by mixing magnetite, such as black sand which has been freed from silica, &c., with molten cast iron or other suitable metal, the proportions varying according to the quality of metal required. The mixing may be done in a ladle by filling a tube, having a funnel opening at its upper end, with the magnetite in a loose granular state, passing its lower end to the bottom of the molten metal and gradually raising it to the surface, whereby the magnetite gradually falls into and becomes mixed with the metal.—A. W.

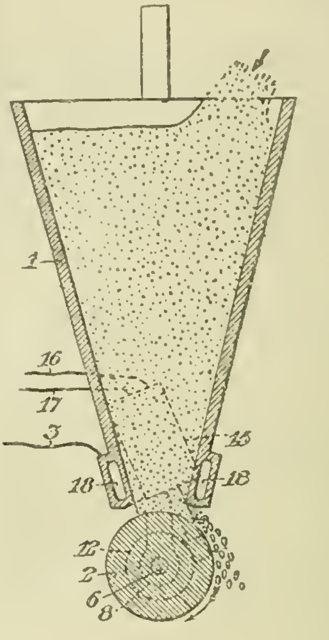
Iron; Manufacture of ——. A. Simon.
Eng. Pat. 20,513, Nov. 14, 1900.
See under XI. B., *page* 1221.

Gold; Extraction of ——, *from Sea-Water or other Solutions containing the same.* J. F. Duke, Downe. Eng. Pat. 22,389, Dec. 8, 1900.

The solution containing gold is submitted to the action of aluminium hydroxide, a gelatinous silica compound, or other substance, such as that obtained by neutralising an aluminium salt or a tin salt with an alkali, these substances reacting with the gold haloid salt to free the gold, and afterwards exerting a fining action upon the solution by settling and carrying down the gold. The gold may also be separated from the solution by the action of substances, such as protochloride of tin, used in conjunction with the aluminium hydroxide, &c., for the said purpose of rapid deposition.—A. W.

Ores and Concentrates [*Fe*]; *Methods of and Apparatus for Agglomerating Comminuted* ——, *and for reducing Metal therefrom.* M. Ruthenburg, Philadelphia, U.S.A. Eng. Pat. 13,867, July 8, 1901.

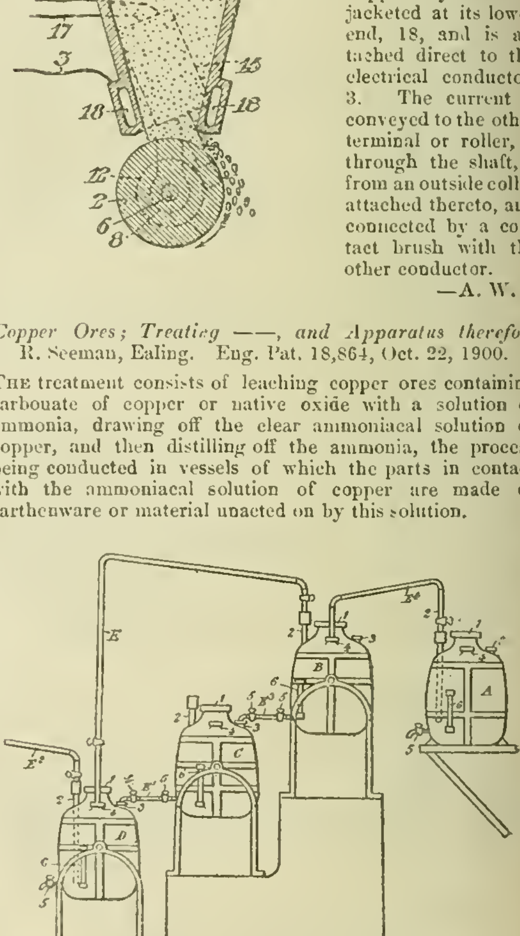
The comminuted ore or concentrate, either alone or mixed with a fluxing medium or a reducing agent or both, is brought together in the path of an electric current, whereby the particles of the mass are fritted and perhaps partially reduced, the product then being removed from the action of the current in coherent lumps suitable for smelting. The lumps may be conveyed to an enclosure and maintained at a temperature sufficient to complete reduction or until the effects of the reducing agent are equalised throughout the mass.



The apparatus, which may be constructed according to the accompanying sectional drawing, consists essentially, in combination or separately, of the parts as follows:—A hopper, 1, a cylindrical roller, 2, placed opposite the discharge of the hopper, the said roller being fixed upon a shaft, 6, which is mounted for rotation in bearings, and held upon, but electrically insulated from the hopper. The hopper and the roller are connected with and form the terminals of an electric current, so that the ore mixture in its descent passes through the heating circuit and is fritted by the action of the current into lumps which are discharged by the revolution of the roller. The roller revolves by means of worm gearing in engagement with a worm, 12, on the end of the shaft, and connected with an outside motor, 15, which motor may be electrically actuated through the conductors, 16, 17. The hopper may be water-jacketed at its lower end, 18, and is attached direct to the electrical conductor, 3. The current is conveyed to the other terminal or roller, 2, through the shaft, 6, from an outside collar attached thereto, and connected by a contact brush with the other conductor.
—A. W.

Copper Ores; Treating ——, *and Apparatus therefor.* R. Seeman, Ealing. Eng. Pat. 18,864, Oct. 22, 1900.

The treatment consists of leaching copper ores containing carbonate of copper or native oxide with a solution of ammonia, drawing off the clear ammoniacal solution of copper, and then distilling off the ammonia, the process being conducted in vessels of which the parts in contact with the ammoniacal solution of copper are made of earthenware or material unacted on by this solution.



The plant claimed is outlined in its preferential form in the accompanying drawing. It consists of four different vessels: A the safety vessel, B the mixer, C the settler, and D the still. Each can be closed hermetically, and is provided at the top with a central filling-opening with cap, 1, three side nipples, 2, 3, 4, adapted both for plugs and connecting pipes, and at the lower side with taps, 5, and gauges or inspecting glasses, 6. The vessel A is stationary, but the other three are mounted at different levels on trunnions connected with a fly-wheel, so that when disconnected they can be rotated, rocked, or tilted. When connected up, the whole of the apparatus is closed except the nipple 3 in the vessel A. The powdered ore and ammonia solution are placed in B, which is then plugged and rotated until sufficiently leached. Whilst settling, the connections are made, and the solution is then decanted through E^3 into C, whence, after further settling, it is run through E^1 into D. The ammonia is then volatilised by steam entering D through E^2, and the vapour passed through the pipe E and condensed in the mixer B, which has been charged with fresh ore, any ammonia escaping therefrom through E^4 being absorbed by water in the safety vessel A. The residue in D is cupric oxide, and is washed out through the central opening. The residue ejected from the mixer B may contain copper sulphide, and is smelted by any known process.—A. W.

Lead; Process for the Dezincing of Zinc Desilverised ——. T. Barton and T. B. McGhie, both of London. Eng. Pat. 19,273, Oct. 27, 1900.

To remove zinc from metallic lead a layer of caustic soda or other alkali is fused on the surface of the molten metal, whereby the zinc is oxidised, and can be removed with the alkali. A current of steam or steam and air may be used to accelerate the oxidation, whilst the alkali can be repeatedly used, after the separation of the zinc oxide by skimming or dredging, since a small quantity only of the latter is dissolved.—A. W.

Zinc; Treatment of Slags and By-Products containing ——. H. F. Kirkpatrick-Picard, London. Eng. Pat. 15,166, Aug. 25, 1900.

The slags, &c., are ground, roasted to oxide if necessary, mixed with carbonaceous material suitable for coking, such as bituminous coal, preferably formed into briquettes, and distilled under such conditions that they are first coked into coherent masses, and finally the zinc reduced and volatilised, while the residual molten slag, which may contain recoverable metals, is retained in the remaining coke.—A. W.

Composition or Flux; A New or Improved ——, *for use as a Substitute for Borax.* Louise Alpe, Birmingham. Eng. Pat. 19,326, Oct. 29, 1900.

The composition is prepared by mixing 85 parts of boric acid with five parts each of barium chloride, cryolite, and graphite. The joint to be brazed is covered with the composition, heated to dull redness, more of the flux is dusted on, and at the proper temperature, brass wire or spelter is applied, which melts and flows through the joint.—E. S.

Aluminium or its Alloys; Coating of ——. A. G. Betts, New York, U.S.A. Eng. Pat. 10,705, Oct. 24, 1900.

The surface of the aluminium or alloy is covered with a layer of dry fusible non-oxygen salt of copper or other suitable metal, which is then heated to fusion.—J. H. C.

Solder for Aluminium, &c. J. A. McLeod and H. E. Prevost, Haverhill, U.S.A., and H. Smith, Lowell, U.S.A. Eng. Pat. 19,836, Oct. 4, 1901.

This consists of: zinc, 25; aluminium, 6; and tin, 69 parts by weight.

The zinc and the aluminium are melted together, after which the tin is added and stirred into the molten mass.
—J. H. C.

Aluminium Alloy. A. Malhardt, Vienna. Eng. Pat. 19,403, Sept. 28, 1901.

12·05 parts of tin, 0·20 of antimony, 0·09 of phosphorus, 7·50 of copper, and 0·06 part of magnesium are melted together, then 100 parts of aluminium are added little by little, and finally 0·06 part of bicarbonate of soda and 0·04 part of sulphur. After skimming off the slag, the alloy is ready for use.—J. H. C.

Mineral and other Substances; Apparatus for Pulverising and Separating ——. C. W. and H. H. Kitto. Eng. Pat 20,040, Nov. 7, 1900.

See under I., *page* 1195.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

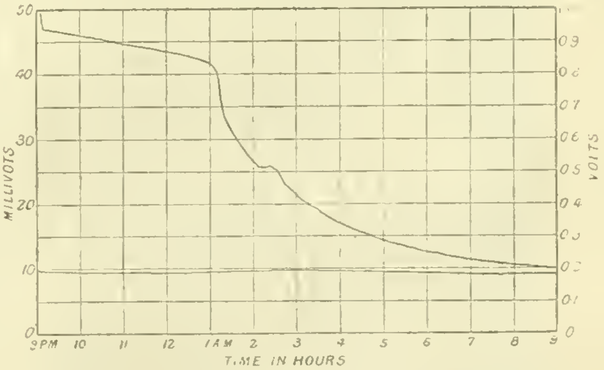
(*A.*)—ELECTRO-CHEMISTRY.

Cell; A Cadmium Standard ——. H. Tinsley. The Electrician, Oct. 18, 1901, **47**, [26], 991.

The author has designed a practical form of cadmium cell, based upon ideas advanced in a note by Prof. Callender, published in *The Electrician* of Sept. 10, 1897. The negative electrode of this cell is composed of an amalgam of cadmium and mercury suitably proportioned, above which is a layer of cadmium sulphate. Further above is the mixture of mercurous and cadmium sulphate crystals, in which is placed an amalgamated sheet of platinum. Connection to this sheet is made by a platinum wire, and the same metal is used to make electrical connection with the amalgam. A layer of glass wool comes above the layer of mixed crystals, and keeps the chemicals in place, while the cell is sealed with marine glue.

The advantages of this type of cell are, firstly, that the E.M.F. is invariable; secondly, that small currents can be taken from it without polarisation; and, finally, that if short-circuited by accident, recovery of the normal E.M.F. will occur without artificial aids. The constancy of the E.M.F. is shown by the following tests of six cells made on different dates, with chemicals from two different sources:—1·0191 v., 1·0192 v., 1·0191 v., 1·0192 v., 1·0190 v., 1·0191 v.

Below a typical discharge curve for this cell is shown. The internal resistance of the cell when passing a current of 1·8 milliampères, is seen from this curve to amount to only 40 ohms. If discharge be allowed to proceed at this rate for a longer period than four hours, a marked drop in the E.M.F. occurs, and complete recovery of the cell cannot be obtained without artificial aid.



The chief disadvantage of this type of standard cell is that the cadmium amalgam has a tendency to separate into its constituents when subjected to accidental jars. This drawback can be partially overcome by keeping the other constituents of the cell as solid as possible.—J. B. C. K.

Alkali and Chlorine; The Acker Cell, and Process for Electrolytic Production of ——. J. B. C. Kershaw. Electrician, Oct. 25, 1901, **48**, 20.

The principle of this process is not new, cells for the electrolysis of fused salt with molten lead as cathode material, having been patented in 1893 and 1894 by Vautin and Hulin respectively. A diagrammatic section of the Acker cell is shown in Fig. 1, and cross sections on the lines *a—b* and *c—d* in Figs. 2 and 3.

The bottom of the cell P is trough-shaped, and is constructed of cast iron. It serves as electrical connection between the lead conductor, and the mass of fused lead L resting upon it. The upper portion of the cell Q is constructed of any refractory basic material, not attacked by chlorine gas or fused salt. The anode C is of carbon, and dips into the fused salt. A hollow rib runs along the centre of the cast-iron trough forming the base of the cell, and two rectangular channels run parallel with the centre opening for half the length of the cell. Figs. 2 and 3 show the position of these channels in the cell base. These channels connect with the side vessel K and with the interior of the cell by the openings O and B. At A, an injector supplies steam under pressure to the cell, and carries the lead-sodium alloy from the interior of the cell into the side vessel K. Here the steam and sodium react, and produce molten sodium hydrate and hydrogen, which rise to the surface of the lead and pass into the collecting vessel T by the overflow pipe Z.

Fig. 1.

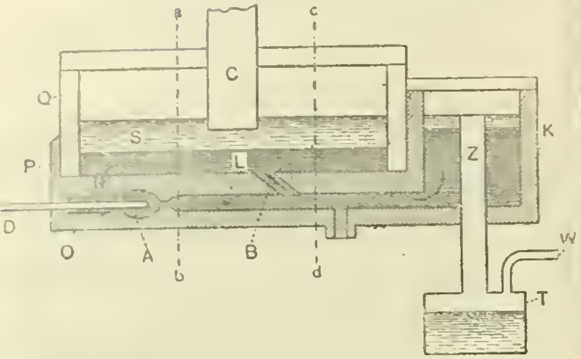


Fig. 2.

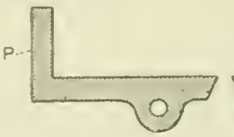
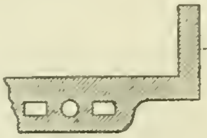


Fig. 3.



The purified lead returns to the cell by the side channels and openings B. The circulation and decomposition of the lead-sodium alloy is thus continuous, and sodium hydrate testing 79 per cent. (Liverpool test), Na_2O is said to be obtained without evaporation in the collecting vessel T. The author considers that this result will depend largely upon the care used in casting the aspirator neck at A, and in the position and size of the steam-supply pipe D.

The heat of the cell is partly maintained by the steam supply at A and by the heat liberated in the reaction $Na_2 + H_2O = Na_2O + H_2$.

The hydrogen escaping at W can also be collected and burned in a special apparatus to supplement this heat, or to fuse the salt used in feeding the cell when at work. No details have been published concerning the materials used in constructing the upper portion of the cell. Efficiency data are also lacking. The Niagara works were erected in 1900–1901, and the first unit of plant was started early in the present year.—J. B. C. K.

Ammonium Chloride dissolved in Liquid Ammonia; Electrolysis of ——. H. Moissan. Comptes Rend. **133**, [19], 713—714.

Pure liquid ammonia, as Frenzel has shown, has a very low conductivity; for the current of 115 volts, hardly 0·01 ampère passed between the platinum electrodes of the author's U-tube containing liquid ammonia; but on dissolving ammonium chloride in the ammonia, a great increase in the current took place, and gas was evolved at each electrode—chlorine at the anode (which at the low temperature of −60 or −80 C. did not react on the ammonia to form either nitrogen or nitrogen chloride), and pure hydrogen at the cathode. Ammonium iodide yields a similar result.—J. T. D.

Ozone; Formation of ——. A. Chassy. Comptes Rend. **133**, [20], 789—791.

The author has examined the rate at which oxygen becomes converted into ozone under the influence of the silent discharge caused by a constant current in the primary circuit of the Berthelot's ozoniser which he employed. The following figures express his results, where the unit of time is that required to convert into ozone the first 0·5 per cent. of the total oxygen. The figures are independent of the strength of the current, the unit of time, however, being longer the weaker the current. The temperature of experiment was 20° C.

Total Time.	Ozone Produced (Per Cent. of Total Oxygen).	Total Time.	Ozone Produced (Per Cent. of Total Oxygen).
1	0·5	10	3·15
2	0·91	12	3·45
3	1·27	14	3·74
4	1·61	20	4·40
5	1·92	36	5·40
6	2·22	60	6·45
7	2·50	90	7·05
8	2·72	120	7·30

Thus the quantity of ozone produced tends to a limit, not easy to fix precisely, depending on temperature but not on strength of current. It is clearly economical, if quantity only and not concentration of ozone is required, to ozonise the oxygen only to a slight extent.—J. T. D.

Strychnine and Brucine; Electrolytic Reduction of ——. J. Tafel and K. Naumann.

See under XX., *page* 1233.

PATENTS.

Electrical Insulating Materials; Manufacture of ——. E. A. Claremont, Knutsford, Cheshire. Eng. Pat. 21,804, Dec. 1, 1900.

Paper and the like materials are impregnated with the usual insulating substances, such as oils, first under considerably reduced pressure and then under the atmospheric pressure, whereby a better penetration of the material by the insulating compound is effected than is possible by the present methods.—H. I.

Alkaline Chlorides; Electrolytic Decomposition of ——, *and Apparatus therefor.* J. D. Gilmour, Glasgow. Eng. Pat. 18,397, Oct. 16, 1900.

The apparatus comprises inner and outer vessels in electric contact with the positive and negative poles of a source of electric current supply, and means are provided for permitting the circulation of the mercury between the vessels, and for preventing the chlorine compounds in the inner vessel from mixing with the caustic alkali formed in the outer one. The circulation of the mercury is effected by the pulsating action of a caustic liquor pump, which causes the circulating liquor to flow from one end of the outer vessel down under the bottom of the inner one, and after scrubbing the mercury, to pass out at a higher level on the opposite side of the inner vessel, and means are provided for causing a cycle of circulation of liquor from delivery to entering the end of the outer vessel.—G. H. R.

Alkaline Salts (Chlorine and Caustic Soda and Potash); Decomposition of —— *by Electrolysis, and Apparatus therefor.* [*Intermediate Electrode.*] J. Greenwood, London. Eng. Pat. 22,406, Dec. 8, 1900.

Two types of apparatus are described, one of which consists of two vessels, each divided into an even number of anode and cathode sections arranged alternately, by slate or porcelain-enamelled iron partitions dipping into mercury. The second type also consists of two vessels, one of which forms a single anode, and the other a single cathode section, the latter being divided into several compartments through which the mercury circulates in a reverse direction to the caustic lye, causing the latter to be highly concentrated. An intermediate electrode forms the base of each electrolytic vessel or section of either type, and is constructed preferably of a solid cast-iron plate, the internal surface of which is entirely coated with a suitable insulating substance, with the exception of lines or narrow grooves, about one or two inches apart, running in parallel lines across the plate. The bare metal becomes well amalgamated with the amalgam, and establishes perfect electrical contact equally at all points with the mercury flowing through the apparatus, and the intermediate electrode constitutes a practically perfect conductive material entirely independent of the mercury for the passage of the current at a high and uniform current density between the several anode and cathode sections respectively. —G. H. R.

Chromium Oxide Salts; Electrolytic Oxidation of Solutions of ——. C. Schneider, London. Eng. Pat. 19,029, Oct. 24, 1900.

This method of electrolysis with the employment of diaphragms is an improvement on that described in Eng. Pat. 15,724, 1898, and consists in compensating the alterations of concentration caused by the electrolytic process by mixing the fluids of both compartments of the electrolytic vessel by diffusion through the diaphragm and introducing a continuous or intermittent stream of new lye into the anode compartment, and drawing off the corresponding amount of old lye. The velocity of diffusion is increased with relation to the velocity of the migration of the sulphuric acid by regulating the density of the electric current, and the latter may be temporarily interrupted. The most rapid compensation of the alternations of concentration is effected by mixing the liquids of both compartments directly by filling in fresh lye, so that it overflows the brim of the diaphragm, allowing it to stand over for a time, and then drawing off again a sufficient amount; or the two lyes may be mixed by artificial means, as by a current of air, or by mechanical agitation.—G. H. R.

(*B.*)—ELECTRO-METALLURGY.

Anodes; Disintegration of ——. E. Wohlwill. Chem.-Zeit. 1901, **25**, [84], 917. (Paper read at the Hamburg Meeting of the Gesellschaft deutscher Naturforscher und Aerzte.)

The anode slime produced in electrolytic copper refining always contains copper, in addition to the insoluble constituents of the crude metal, so also silver is found in the anode residues in silver refining, and the slime produced in the electrolysis of gold may contain as much as 20 per cent. of that metal. The obvious hypothesis that the soluble matter is enclosed within a crust composed of insoluble constituents is untenable, inasmuch as a disintegration of the anode occurs even when the pure metals are under treatment. The author ascribes the phenomenon to the formation of a pulverulent metallic covering of lower solubility, which takes place directly the electric circuit is completed, and which is constantly renewed during the progress of electrolysis, with the result that the anode is unevenly attacked, becomes roughened, and finally disintegrates. In the case of gold, this film is due to the decomposition of the gold sub-chloride formed along with the chloride. Everything therefore points in the case of copper, to the formation of a certain amount of cuprous sulphate with the cupric salt, the cuprous compound at once breaking up into cupric sulphate and metallic copper. It was at first thought that the inferior solubility of the film was due to the physical condition of the metallic particles being different, but the author was afterwards led to the view that it was explained by the looseness of its contact with the anode plate. A negative proof of the correctness of the pulverulent-film hypothesis is that anodes of metals which do not form such a film do not disintegrate, for example, Cu, Ag, or Au, in potassium cyanide solutions. Disintegration, however, does not occur, even when a film is formed, if the deposit does not adhere to the anode metal, as is the case for example when a high current density is employed, and the flow of solution over the surface washes away the film as it is formed. Specimens were shown of identical bars of copper; one that had been used as anode with a current density of 0·3 amp. per sq. dm., and that appeared to be completely honeycombed; and the other, after use with a density of 20 amp. per sq. dm., retaining a perfectly smooth surface.—W. G. M.

Alloys; Cathode Polarisation and Formation of ——. Coehn. Zeits. angew. Chem. 1901, **14**, [42], 1071. (Paper read before the Versammlung deutscher Naturforscher und Aertze, Hamburg, 1901.)

When work is done by a secondary reaction during the electrolytic separation of a substance at the electrode, there must be a corresponding alteration in the potential difference required for the deposition. Such an alteration is to be expected when one metal is deposited upon another with which it is capable of alloying. Thus, when silver is deposited upon gold, there is a reduction of 0·05 volt in the pressure required; and when certain metals are deposited on mercury, the following reductions are observable, Zn, 0·15; Cd, 0·12; Ag, 0·03; Cu, 0·08; and Fe, 0·07 volt. Hydrogen deposited on palladium requires a pressure of 0·26 volt lower than when separated on platinum, whilst on all other metals, the pressure required is higher than on platinum. In determining the voltage required for the decomposition of caustic potash, two special points may be noted, the first probably corresponding to the separation of hydrogen ions, the other to the formation of a potassium-hydrogen alloy.—W. G. M.

PATENTS.

Minerals or Ores [*Electric*]; *Disintegration of* ——. E. L. Graham, Upper Warlingham, Surrey. Eng. Pat. 14,291, Aug. 9, 1900.

The ores are placed in a bath containing an acid solution with or without the addition of fluorspar. An electric current of 50 or more volts is then passed through the solution, when the ores are found to be disintegrated. —J. H. C.

Iron [*Electrolytic*]; *Manufacture of* ——. A. Simon, Bordeaux. Eng. Pat. 20,513, Nov. 14, 1900.

Oxide of iron, with or without an addition of carbon, is dissolved in calcium fluoride or other suitable electrolyte, and then treated electrolytically so as to deposit iron on the cathode. The voltage required varies under different circumstances from 7 or 8 up to 18 or 20.

About 590 kilos. of fluorspar are required per ton of iron produced.— J. H. C.

Heat-producing Devices for Smelting, &c. in [*Electric*] *Furnaces.* S. F. Pierce, St. Paul, U.S.A. Eng. Pat. 17,852, Sept. 6, 1901.

Cylindrical bars of carbon or other electrically conducting substance of special form and covered with fire-clay or other non-conducting refractory material, are made to extend through the furnace chamber. An electric current is then passed through the bars, so as to heat them to the required temperature.—J. H. C.

Iron and Steel; Process [*Electric*] *for Toughening, Hardening, or Annealing* ——. W. Holzer and W. F. L. Frith. Eng. Pat. 13,352, July 24, 1900.

See under X., *page* 1218.

XII.—FATS, OILS, AND SOAP.

Montan Wax. E. von Boyen. Zeits. angew. Chem. 1901, **14**, [41], 1110—1111.

The product known as "Montan wax" is derived from the lignites of Saxony and Thuringia, and comes into commerce as a white, high-melting candle-material. The raw material is a bitumen extracted from *pyropissite* by various solvents; this bitumen is a hard, odourless mass of the colour of ozokerite with a melting point between 80° and 90° C. By steam-distillation, a yellow, crystalline mass melting above

70° C. and [illegible] a fairly dry consistency was obtained. This was purified by [illegible] and steam-distillation, repeated treatment with brown coal tar spirit, and filter-pressing. Subsequent treatment with decolorising agents furnished at length a white crystalline substance melting above 70° C.

Montan wax is not a paraffin, but consists of two bodies in about equal proportions. One of these is a high molecular acid, montanic acid, having the formula $C_{29}H_{58}O_2$, m. pt. 83°—84° C. The sodium and potassium salts are readily soluble in hot water, less soluble in alcohol. The acid itself is with difficulty soluble in alcohol but readily soluble in brown-coal tar spirit. Concentrated sulphuric acid carbonises the acid, nitric acid having no apparent action even on boiling. Montanic acid when solidified after fusion, shows a radiating shining structure, similar to that of Chinese wax.

The other constituent of montan wax is apparently an alcohol; it is separated from the acid by hot-pressing with the benzine and melts at 60° C. Its behaviour towards solvents is similar to that of montanic acid; it is more readily decomposed by sulphuric acid than montanic acid is, and is oxidised by nitric acid to fatty acids of low melting points. The formula of this alcohol has not yet been determined; the bitumen is probably the non-crystallisable ester of these two bodies. They are always obtained by the steam distillation of the bitumen, the formation of mineral oils being due purely to a secondary decomposition.—J. F. B.

Lubricating Oils at High Temperatures; Friction of ——. S. Kapff. Zeits. Verein. deutsch. Ing. 1901, 343. Proc. Inst. Civil Eng. 1901, **146**, [4], 34.

Thurston, in 1899, stated that the coefficient of friction of lubricating oils decreases as the temperature rises to a limit of about 82° C. and concluded that heating of the bearings to this degree must not be regarded as harmful, and that a hot bearing need not be cooled unless its temperature exceeds 100° C. The author states that these views are fallacious, as they only take into account the frictional resistance, and that even if the latter were the principal factor to be considered, they would not hold true generally. The small saving of energy due to the low value of the coefficient of friction of the oil would be far more than counterbalanced by the amount of heat wasted in the maintenance of the bearing at a temperature of 82° C. If a bearing becomes heated to 80° it may be accepted that either the oil is bad, or too little of it is employed, or possibly the bearing is dirty or otherwise out of order. According to the author, a good lubricating oil should fulfil the following conditions:—(1) It must be free from acid and solid particles, and must not resinify or become acid on exposure; (2) it must have a suitable adhesion; and (3) at the temperature at which it is used, its frictional resistance must be as small as possible.—A. S.

Oils; Detection of Drying and Marine Animal ——. G. Halphen.

See under XXIII., *page* 1244.

Fats and Oils; Use of Iodine Monobromide in the Analysis of ——. J. Hanuš.

See under XXIII., *page* 1246.

Rosin Grease. L. Archbutt.

See page 1193.

Butter; Observations on the Composition of ——. A. Pagnoul.

See under XVIII. A., *page* 1228.

PATENTS.

Margarine; Production of ——. J. H. G. Neisse and J. H. Boll. Eng. Pat. 21,626, Nov. 29, 1900.

See under XVIII. A., *page* 1229.

Margarine; Manufacture of ——. A. Pellerin. Eng. Pat. 22,905, July 12, 1900.

See under XVIII. A., *page* 1229.

XIII.—PIGMENTS, PAINTS; RESINS, VARNISHES; INDIA-RUBBER, Etc.

(*A.*)—PIGMENTS, PAINTS.

PATENT.

Heating or Roasting Powdered Iron Salts [Production of Pigments] and similar Compounds; Method of, and Apparatus for ——. J. W. Hinchley. London. Eng. Pat. 18,669, Oct. 19, 1900.

The finely powdered compounds are allowed to fall down a vertical metal flue, so that they meet a slow current of hot gases passing up the tube which carry away the liberated acids and other volatile constituents down a second tube into a settling chamber, where the finest particles are filtered out of the gas stream by an asbestos screen. The gases are then freed from their acid vapours by suitable absorbents.—H. I.

(*B.*)—RESINS, VARNISHES.

Sandarac Resins; Constituents of the ——. T. A. Henry. Proc. Chem. Soc. **17**, [241], 187.

The sandarac of commerce is the naturally exuded resin of various species of *Callitris*, usually either *C. quadrivalvis* or *C. verrucosa.*

Both varieties of resin consist of a mixture of resin acids and terpenes separable by steam distillation. From the latter, *d-pinene* has been isolated and identified. The chief volatile constituent is a diterpene, boiling at 265° C., μ_D = 1·5215, $[\alpha]_D = + 55°$, which behaves like a saturated substance, forming no additive compounds with bromine, hydrogen chloride, or nitrosyl chloride. Two resin acids have been isolated and examined. One of these has the composition, $C_{20}H_{30}O_2$, and closely resembles in behaviou the isomeric *d-pimaric acid* of Vesterberg (Ber. 1885, **18** 3331), but is optically inactive, and is therefore named *inactive pimaric acid.* On reduction with hydriodic acid, it gives a diterpene, $C_{20}H_{32}$. On oxidation with permanganate pimaric acid yields acetic acid and a crystalline substance melting at 206° C., which is probably *trimellitic acid.*

The second resin of sandarac has not been obtained in a crystalline form, but the highly deliquescent sodium sal and the characteristic lactone have been prepared; from analyses of these, the formula of the free acid is probably $C_{30}H_{48}O_5$. For this substance, the name *callitrolic acid* has been retained. The acid is remarkably resistant to the action of reagents, being unattacked, even by hot fuming nitric acid. When heated in a vacuum, it is decomposed with the formation of carbon dioxide and a diterpene dentical with that occurring naturally in the resin.

Shellac; Analysis of ——. E. J. Parry.

See under XXIII., *page* 1245.

Brass Lacquers; Action of Light on Coloured ——. H. Smith.

See page 1188.

(*C.*)—INDIA-RUBBER, &c.

India-rubber. Schneider. Chem.-Zeit. 1901, **25**, [84] 924. [Paper read at the Hamburg meeting of the Gesellschaft deutscher Naturforscher u. Aerzte (1901).]

The author exhibited several kilos. of caoutchouc mill which had been collected in 1899, and preserved with the aid of small quantities of ammonia and creosote. Precipitation with citric acid solution during the meeting produced an exceedingly tough and colourless caoutchouc.—W. G. M

PATENT.

Fabric or Material (Leather and Rubber Substitute, Insulator, &c.), and Articles from Fibre and an Adhesive Manufacture of ——. A. Oesterheld, Vöcklabruck Austria. Eng. Pat. 10,007, May 14, 1901.

A new article of manufacture, produced from alternat layers of fibres (jute, cotton, silk, wool, asbestos, &c.) an an adhesive substance (india-rubber, gutta percha, spermaceti, artificial gum, resin, or other like material), the fibres lying in all directions, combined by pressure to form a homogeneous whole, is claimed.

The fibres are blown by hot air in a chamber on to an endless cloth covered with an adhesive layer, and when one layer has been deposited, the material is passed through a heated chamber to dry and then through calenders. It again receives a coat of adhesive and fibres, and is again dried and calendered, and so on, until the desired thickness is obtained. By spreading the layers on a model, cycle tyres, &c. may be made.

The material is said to be also useful for straps, belts, washers, tyre covers, floor cloths, wall coverings, insulating materials, and the like.—H. I.

XIV.—TANNING; LEATHER, GLUE, SIZE.

Tannoids; Contribution to the Study of the ——. H. Kunz-Krause. Chem. Centr. 1899, **1**, [9], 559.

The author treats of his subject under five headings:—(1) The so-called tannins and their significance in plant life. (2) Attempts to classify the so-called tannins. (3) Systematic classification of the tannoids. (4) The relation between the constitution of the tannoids and their behaviour to reagents. The reagents considered, comprise ferric chloride, gelatin (glue), albumin, alkaloids, and tartar emetic. The author found that the reagents named are not general reagents for tannin as is usually accepted, but are only specific group reagents for different subdivisions of his system, viz., for the tannoid anhydrides produced from two or more molecules of protocatechuic acid or gallic acid by abstraction of water. The reactions given by the above reagents and others with gallic, digallic, ellagitannic, and ellagic acids, tannin, trigallic acid, &c., are collected in a table. (5) The natural transformation products of the tannoids, and the relation of these to the phlobaphenes and rotene and to other groups of plant constituents. For the purpose of classifying the tannoids, besides the reactions and decompositions effected by chemical means, the author proceeds on the lines that use can be made also of the changes which occur naturally in the plants, especially the formation of "phlobaphene" and "reds" ("*Rote*"), *i.e.*, the red to reddish-brown amorphous colouring matters of barks, which, like gallotannic acid, may be considered as anhydrides of tannoid mother-substances (that is, as definite intermediate products of a process of dehydration of aromatic hydroxy-acids). The relation of phlobaphene and "reds" ("*Rote*") to gallotannoid anhydrides is also shown by the similar behaviour (precipitation) with gelatin. (See also this Journal, 1896, 831.)—A. S.

Leathers; Composition of Belgian ——, and the Influence of the Nature of the Tannery Water on the same. E. Nihoul, Bourse aux Cuirs de Liège, Sept. 1901.

A. *Composition of Belgian Leathers.*—The following table shows the composition (highest and lowest values to one decimal place) of 15 genuine leathers, tanned with waters of known composition, most of them different.

The samples had all been kept for some time in a warm atmosphere, so that the percentage of moisture is rather low (usually about 18 per cent. for Belgian leathers). The "total soluble" is high because at least three litres were used for extraction, instead of only one litre. (See page 1249. For the same reason "un-combined tannin" and "soluble non-tannin" are also high.

The "hide-substance" was determined by Kjeldahl's original method, completed by addition of permanganate, which gives rather high results, and has a consequent influence on the factors associated with this one.

For the full details of each leather, and the results when calculated as percentages of *dry* leather, the original paper should be consulted.

B. *Influence of the Nature of the Water used in Tanning.*—Each of the foregoing leathers (except in two cases) was tanned with a different water, the composition of which was completely determined. The analytical results (composition of each water and of each leather) are collected in a series of tables, and the author makes the following observations upon them:—

Constituents, per Cent. of Sample.	Sole Leather. Seven Samples.	Smooth Vache. Four Samples.	Light Leather. Four Samples.
	Per Cent.	Per Cent.	Per Cent.
Moisture........	14·3 — 15·7	13·6 — 15·6	11·5 — 14·1
Ash	0·6 — 1·0	0·7 — 1·1	0·7 — 1·0
Fatty matter....	0·1 — 0·5	0·2 — 1·5	1·2 — 6·5
Total soluble....	6·7 — 14·1	16·2 — 23·5	9·5 — 14·8
Ash from above.	0·6 — 1·4	0·8 — 1·6	0·7 — 1·1
Organic soluble.	6·0 — 13·1	15·4 — 21·9	8·6 — 14·9
Soluble non-tannin.	2·4 — 6·9	2·6 — 8·9	2·5 — 5·2
Ash from above.	0·5 — 1·3	0·9 — 1·2	0·5 — 1·3
Soluble non-tannin organic.	1·5 — 6·0	1·6 — 7·7	2·0 — 4·5
Uncombined tannin.	3·9 — 8·9	12·0 — 14·8	6·6 — 10·7
Leather substance.	65·8 — 78·6	62·8 — 77·2	69·5 — 76·4
Nitrogen........	8·3 — 10·5	7·8 — 8·9	9·4 — 10·1
Hide substance.	46·7 — 59·2	44·2 — 50·2	53·2 — 56·8
Combined tannin	16·6 — 21·7	14·1 — 22·3	16·4 — 19·6
Total tannin	21·2 — 30·2	28·9 — 34·[illegible]	23·7 — 28·1
Yield of leather.	168·9 — 214·1	199·2 — 226·2	176·0 — 188·2
Index of tannage	28·0 — 45·5	28·1 — 50·2	30·8 — 34·5
Specific weight..	0·716 — 0·880	0·734 — 0·918	0·545 — 0·751

Sole Leather.—(1) The amount of saline matter present in the water has a general relation to the ash of the leather, though, in one case at least, a soft water produced a leather with more ash than those tanned with hard waters.

(2) The percentage of fat depends chiefly on the nature of the hide, and on the care taken in fleshing it; in three instances a low percentage was associated with free ammonia in the water.

(3) It seems probable that very soft waters give a low "total soluble" number.

(4) With hard waters, the amount of uncombined tannin is nearly three times as great as the amount of soluble organic non-tannin, whilst with soft waters the two amounts are nearly equal. Excess of saline matters, therefore, appears to hinder absorption of tannin by the hide substance.

(5) The amount of "combined tannin" is greater when the water used is soft than when hard.

(6) As regards "percentage yields of leather," hard waters give extreme results in both directions; the average yield with soft waters is high and less variable. As a general conclusion, soft waters give better results than do hard waters, but the knowledge and skill of the tanner are the most important factors.

Vache Leather (South American Cowhides).—Waters containing a large amount of temporary hardness cause a great ash percentage, but this factor also depends largely on the extent to which the lime used in unhairing is removed. The "total soluble" figure also is more influenced by details of manufacture than by the chemical composition of the water. The relation of "soluble non tannin" to "uncombined tannin," however, as in the case of sole-leather, is definitely connected with the amount of saline matter present in the water.

Light Leathers.—Here, the subsequent details of manufacture appear to cover up any differences that the nature of the tanning water may produce at the first stage.

In conclusion it seems impossible to prejudge the composition of leather from the nature of the water used. First quality leather can be made with hard or soft water, but the chief question of relative cost still remains to be investigated.—R. L. J.

Tannin; Report to the International Association of Leather Trades Chemists on the Methods in Use for Determining ——. H. R. Procter.

See under XXIII., *page* 1246.

Quebracho Extract; Analysis of ——. G. Klenk.

See under XXIII., *page* 1249.

Leather: Contribution to the Chemical Study of [*Analysis of*] ——. E. Nihoul.

See under XXIII., *page* 1249.

Chromed Hide Powder: Application of ——, *in Analysis of Tanning Materials.* J. Paessler and W. Appelius.

See under XXIII., *page* 1249.

PATENTS.

Raw Hide; Process for Treating ——. R. Croasdale Syracuse, State of New York, U.S.A. Eng. Pat. 19,542 Oct. 1, 1901.

The hide, after the removal of all hair, fleshings, &c., is soaked for 3—4 hours in a bath containing soft water (1,000 parts), salicylic acid (2 parts), picric acid (3 parts), and boric acid (25 parts). It is then stretched, dried in warm air, and sponged with a solution of potassium bichromate ($2\frac{1}{2}$ per cent.) in diffused daylight. Exposure to full sunlight completes the process.—R. L. J.

Artificial Sponges [*from Leather Fibres*]; *Manufacture of* ——. C. Paulitschky, Vienna. Eng. Pat. 18,808, Sept. 20, 1901.

Fine leather fibres, free from fat, are saturated with "sulphur milk," and, after drying, are soaked in liquid caoutchouc and ammonium carbonate, and the tough mass thus produced is heated gradually, preferably *in vacuo*, from 125° up to 140° C., whereby pores or channels are formed in the mass, by the escape of gas produced by the decomposition of the ammonium carbonate, and the caoutchouc is vulcanised by the sulphur.

The product thus obtained, may be dyed and used as a substitute for loofas and bath sponges, &c.—H. I.

Fabric or Material [*Leather Substitute*] *and Articles from Fibre and an Adhesive: Manufacture of* ——. A. Oesterheld. Eng. Pat. 10,007, May 14, 1901.

See under XIII. C., *page* 1222.

XV.—MANURES, Etc.

Nitrate Fermentation and its Significance for the Biological Processes of the Soil. J. Stoklasa. Zeits. angew. Chem. 1901, **14**, [41], 1029.

The author has made a series of experiments by inoculating aqueous solutions of nutrient salts, &c., containing sodium nitrate as the only source of nitrogen, with different species of bacteria, and determining the amounts of nitrogen in the form of ammonia, nitric and nitrous acids, and in the gaseous state, after incubation in the dark at 28°—30° C. From these experiments he concludes that there are two main groups of bacteria which effect the metamorphosis of nitrates. The first group comprises those which transform the nitrate nitrogen into elementary nitrogen, and includes *B. Hartlebii*, *B. fluorescens liquefaciens*, *B. pyocyaneum* *B. Stutzeri*, *B. centropunctatum*, *B. filefaciens*, *B. denitrificans*, &c.

To the second group belong: *B. megaterium*, *B. mycoides*, *B. subtilis*, *B. mesentericus vulgatus*, *B. ramosus*, *B. proteus vulgaris* and *proteus Zenkeri*, *B. radicicola*, &c. These reduce the nitrogen in the nitric acid present to ammonia.

The course of the vital processes of both groups is naturally considerably influenced by changes in the composition of the culture media, whilst the introduction of air during the fermentation leads to the reduction of a much smaller amount of nitrate.

The author also points out that there is a connection between nitrate and alcoholic fermentations. He has identified alcohol in the culture medium in which certain denitrification bacteria were grown in the presence of an excess of certain kinds of sugar, and considers that this is due to intramolecular respiration. In fact, in every fermentation in which different alcohols are formed, elementary nitrogen is produced when nitric or nitrous salts are present. According to former observations, intramolecular respiration must be regarded as identical with alcoholic fermentation, and the author's opinion is that the alcohol here produced acts upon the nitrates or nitrites, yielding elementary nitrogen or ammonia, and being itself oxidised to carbon dioxide.

The *Bacillus radicicola* assimilates the nitrogen formed in the nitrate fermentation. If, however, nitrogen be first passed through red-hot tubes, it is no longer assimilated. The author suggests that this may be due to the nitrogen liberated in the fermentation being of an active form, or to the presence of certain nitrous oxides which may have a favourable influence on the assimilation.

Finally, the author deals with the problem of inoculating the soil with bacteria capable of assimilating the nitrogen formed in the nitrate fermentation, and thus reducing the loss of nitrogen which occurs in agriculture.—C. A. M.

XVI.—SUGAR, STARCH, GUM, Etc.

Cane Sugar; Specific Rotation of ——, *and its Alteration with Temperature and Wave Length.* H. Pellat. Ann. chim. phys. 1901, **23**, 289; Zeits. Vereins Deut. Zucker-Ind. 1901, [548], 815—836.

The author was commissioned by the French Government to determine, as accurately as possible and with all the refinements attainable, the following data:—

(1) The normal weight of cane sugar for the Laurent polarimeter, *i.e.*, the weight of sugar to be contained at 20° C. in 100 c.c.* of the solution so as to give, in the 20 cm. tube with sodium light, a rotation of 21·67° at 20° C.

(2) The alteration of the specific rotation of the normal solution of sugar with change of temperature with sodium light.

(3) The alteration of the specific rotation of the normal solution of sugar according to the wave length of the light employed.

The normal weight of sugar was also determined independently by Mascart and Bénard, whose results are practically identical with those of the author.

A special apparatus by Jobin, consisting of spectroscope and polarimeter, which took two years to construct, was employed by the author. This instrument is fully described in the paper.

The normal weight of pure sugar found by the author worked out at 16·275 grms., fully corrected. For practical work, where the weighings are not reduced to vacuum, the normal weight found was 16·28 grms., as against 16·29 grms. finally adopted by the French Commission. The specific rotatory power calculated from the author's observations was $[\alpha]_D 20° = 66·536°$.

The mean coefficient for change of temperature was found to be: $\beta = -0·00036$ between 14° and 30° C. The value β includes the expansion of the metal tube; deducting this, the coefficient for the sugar solution alone is $\gamma = -0·00038$. The value γ is itself composed of the difference between the coefficient of expansion of the sugar solution μ and the temperature coefficient for the change of specific rotary power k. Taking μ as equal to $-0·00024$, the coefficient for the rotatory power $k = -0·00014$. For practical work with glass tubes instead of metal, the mean temperature correction would be $-0·00037$, and the corrected rotation $R\frac{D}{20} = R\frac{D}{t}\ [1 + 0·00037\ (t - 20)]$ between the limits of 14° and 30° C.

As regards the variation with wave length, the author has determined the rotation of the normal sugar solution with eight different well defined rays, corresponding to chemical lines in the spectrum; the results are all referred to the mean of the D_1 and D_2 rays.

The law that the rotations are inversely proportional to the squares of the wave lengths was not confirmed by these observations with sufficient closeness. The author has therefore drawn up an empirical formula which expresses his results within the limits of experimental error:—$R\lambda = R_D\left(\frac{A}{\lambda^2} + \frac{B}{\lambda^4}\right)$, where A = 0·325483, and B 0·00757003.

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* The French Commission, in spite of the resolution of the International Congress of Vienna and Paris to adopt metrical c.c.'s (*i.e.*, the volume of 1 grm. of water at 4° C. weighed *in vacuo* with brass weights), uses another standard such that 1 c.c. = the volume of 1 grm. of water at 4° C. weighed in air with brass weights. According to this standard (the c.c. in which, may be termed French c.c.'s) 100 c.c. = 100·106 metrical c.c.'s.

Critical Notes by Schönrock.—To the German translation of this paper certain critical notes are added by Schönrock. In the first place it is pointed out that the instruction given to Pellat to determine the concentration of the normal solution of sugar for "sodium light" is not sufficiently definite, since with modern polarimeters the results obtained with a sodium flame may vary, according to the intensity of the light and the method of purification of the salt, by as much as 1 per cent.

The experimental methods described by Pellat as "new" were completely worked out in 1885 by Lippich, and have been employed since by many other chemists. Certain details and remarks relating to the construction of the instruments used by Pellat are criticised. Further, it is remarked that the proportion of ash in the sugar employed, 0·06 per cent., is not "almost negligible" as claimed by the author; the sugar cannot be regarded as being especially pure and should have been purified further in the laboratory. The solutions to be polarised were filtered "three or four times," a procedure sufficient to alter their concentration by several hundredths of a per cent. The tube employed for polarising, measured 100·015 cm. at 20° C., a divergence from the metre which is left uncorrected by the author. The fact that the rotations diminished when the filled tube was allowed to remain in the water-bath of the instrument for some time can only be explained by leakage round the cover glasses. Schönrock regrets that the French Commission should have introduced yet another arbitrary definition of the cubic centimetre. His conclusion is that the normal weight of sugar, 16·29 grms. (or 16·28 grms. as found by Pellat), has only been established with an accuracy of ± 0·1 per cent. and that another more accurate determination will shortly be required. Other notes relate to divergences between the temperature coefficients found by Pellat and those of other authors, including Schönrock himself.—J. F. B.

Quotients of Purity and Saline Quotients of Sugar Products; Tables for Conversion of —— into Quotients of Impurity and Inorganic Quotients. F. Sachs. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **19**, [4], 419—421.

The author has shown that the method now used of giving the quotients of purity and the saline quotients of sugar products is unsatisfactory, and that it is preferable to reduce everything to the basis of 100 parts of sugar. Three tables are now given for converting results expressed in the old way to this new plan:—(1) This table is for transforming the quotient of apparent purity A into the quotient of impurity M, that is, the amount of impurity per 100 of sugar; the numbers are calculated from the formula, $M = 9000/A - 90$, which assumes a uniform average density for the non-sugar materials of 1·111 times that of the sugar. (2) This gives the quotient of impurity corresponding with the quotients of real purity R, the numbers being obtained from the equation, $M = 10000/R - 100$. (3) The third tables serves for transforming the saline quotient S into the inorganic quotient N, that is the amount of inorganic matter per 100 of sugar; the relation between these magnitudes is expressed by $N = 100/S$.—T. H. P.

Sugar Products; Nitrites in ——, and their Influence on the Frothing of Sugar Syrups. K. Andrlik and V. Stanek. Chem. Zeit. Rep. 1901, **25**, [84], 303.

But little attention has hitherto been paid to the quantity or the practical effect of nitrites in sugar products. Molasses from Bohemian works usually has only 0·004—0·01 per cent. N present in the form of nitrites. Hungarian and Italian products usually have more than this, and they generally show higher acidity; and froth in boiling. Frothing has generally been ascribed to the escape of carbon dioxide in boiling; but the author has found not only this gas, but also nitrogen peroxide, in the escaping gases; this gas was recognisable by its smell and by its turning iodide starch papers blue; nitrous acid fumes were also observable. Three frothing syrups were examined and were found to give the following results:—

——	I.	II.	III.
Dry substance	93·46	87·72	87·42
Direct polarisation	71·20	54·40	48·00
Invert sugar, in mgrms. Cu.	0·45	0·51	1·40
Ash	8·23	9·34	13·37
Purity	76·2	62·0	59·0
Nitrogen (Jodlbauer)	1·49	1·85	2·22
„ as nitrates	0·074	0·059	0·49
„ as nitrites	0·032	0·041	(not est'd.)
Acidity, in c.c. N/1 KOH per 100 grms.	6·0	10·7	10·0

From these and other experiments the author considers the characteristics of frothing syrups to be unusually high acidity and large proportion of nitrite nitrogen. He is in agreement with other observers that frothing chiefly occurs with syrups from abnormal beets, from rich nitrogenous soils, or by the alteration of the juices by the action of bacteria.—W. G. M.

Molasses Residues ["Schlempe"]; The Ether-soluble Acids of——. A. Herzfeld. Zeits. Vereins deutsch. Zuckerind. 1901, 720; through Zeits. angew. Chem. 1901, **14**, [44] 1115.

The molasses "Schlempe" examined had the following composition:—Apparent solids, 79 per cent. Brix; water, 22 per cent.; ash, 28 per cent.; organic non-sugar, 48 per cent., with 4 per cent. of nitrogen and 0·62 alkalinity to phenol phthalein; the sugar had been almost wholly removed by the strontia process. The sample, after acidification with sulphuric acid, was exhausted with ether; the residue, after evaporation of the ether, was distilled in the air and *in vacuo*, and the volatile portion was further separated by steam distillation. The acids were converted into esters which were fractionated, and crystalline salts of the acids were also prepared and separated.

The acids soluble in ether were found to contain about 5 per cent. of formic, 21 per cent. of acetic, and 21 per cent. of lactic acids; the remaining 53 per cent. could not be separated, but higher fatty acids, butyric and valeric acids, caramel bodies and succinic acid were present. Calculated to the original "Schlempe," 4·29 per cent. of acetic, 4·29 per cent. of lactic, and 1·02 per cent. of formic acids were found. A sample of "Schlempe" from another district gave practically the same results, so that the above may be taken as representing, on the whole, the proportions in the non-sugar of German molasses. The numbers obtained for acetic acid are important, since potassium acetate is the only really powerful melassigenic substance known. The quantity of acetic acid found in the non-sugar is alone sufficient to account for the quantity of sugar always present in molasses in an uncrystallisable state.

The melassigenic action of lactic acid has not yet been properly studied.—J. F. B.

Saturation Mud; Analyses of the First——, during the Season 1899–1900. K. Andrlik, K. Urban, and V. Staněk. Zeits. für Zuckerind. in Böhmen, 1901, **26**, [1], 1—5.

The authors communicate the results of complete analyses of 14 samples of mud from the first saturation, taken during the season 1899–1900. The results are fully tabulated in the paper, and only the extreme values will be quoted here: CaO, 41·06—49·53 per cent.; $Ca(OH)_2$, 0·20—3·02 per cent.; $Mg(OH)_2$ 2·15—8·36 per cent; $Fe_2O_3 + Al_2O_3$, 0·35—1·53 per cent.; inorganic matter insoluble in HCl, 0·37—2·65 per cent.; P_2O_5, 1·02—1·83 per cent.; SO_3, 0·37—1·72 per cent.; CO_2, 25·11—34·79 per cent.; oxalic acid $C_2H_2O_4$ + 2 aq., 1·07—2·56 per cent.; citric acid, 0·16—1·21 per cent., total nitrogen, 0·23—0·44 per cent.; nitrogen calculated as albuminoids, 1·44—2·75 per cent.; sugar, 0·45—4·31 per cent.; ethereal extract of the portion of the mud insoluble in HCl, 0·21—0·90 per cent.; resin acids, [illegible] acidity of the organic acids extracted by boiling the lime salts with sodium carbonate, 38·3—94·7 cc. normal acid, acidity of the oxalic acid 17·0—40·6 cc. normal acid; acidity of the acids other than oxalic 9·1— [illegible] normal acid. All the above results refer to 100 parts of the dry substance of the mud. In six cases the acids extracted from the mud by means of ether after decomposing with HCl were titrated, and, after allowing for the oxalic acid, the values for the other acids soluble in ether varied between 7·0 and 58·1 cc. normal acid. Thus some muds are rich in extractable acids and others are poor. Of the nitrogenous bodies, which may legitimately be classed as albuminoids, from 30 to 60 per cent. were soluble in sodium carbonate solution. The analyses of saturation mud will assume greater importance when it is possible to refer the weight of mud to the weight of diffusion juice from which it is obtained.—J. F. B.

Beetroot Sugar Factory Effluent; Purification of——, by the Proskowetz Process. A. Pritzkow. Zeits. Vereins. deutsch. Zuckerind. 1901. **51**, [549], 402—425.

The Stössen sugar factory finding that its effluent water treated by Oppermann's process, still caused complaints from riparian inhabitants, adopted the Proskowetz process which this year was at work for the second season with satisfactory results. The water treated, included that used for condensing the waste from the diffusers, that rich in ammonia condensed from the vacuum pans, and the water from the pulp presses.

After partial subsidence, the overflow is returned for conveying and washing beetroots and for condensing; the rest is run into a fermentation or putrefaction reservoir, and thence on two successive irrigation fields. The drainage from the field is treated with lime, and after subsidence, again passed over a field. It is finally either run into the stream or returned to the factory for all purposes, diffusion, boilers, &c., so far without any evil consequences.

The oxidisability is diminished by 93 per cent., the organic nitrogen about 79 per cent. The purified water possesses only a faintly alkaline reaction, is colourless, without smell and does not develop a putrid smell on standing. In the clarifying basins, besides the mechanical clarification, considerable chemical purification also occurs. In the fields the diminution in oxidisability is not great, but in the second field a considerable destruction of nitrogen compounds was noted. Putrefactive processes are working in both fields, but nitrification was not observed. The addition of lime occasions a further diminution of oxidisability by about 73 per cent., and this is not increased by subsequent earth filtration; merely the akalinity is removed. The quantity of lime added was very varying and might apparently be lessened. Automatic arrangements for adding lime and mechanical stirrers would alone render this possible.

The irrigation was not disturbed even by a prolonged severe frost. As only a part of the water of the Stössen factory was purified and the installation is very new, an exact estimate of the cost cannot be made.

It must also remain undecided whether the water has lost the power of favouring the development of the so-called "sugar algæ." Such algæ, particularly *Beggiatoa*, were observed in the river in quantity, but it is uncertain whether they were derived from the original water, the unpurified or the purified effluent.—L. J. de W.

Sucrose in Plants; Identification of ——, by the aid of Invertase, and of Glucosides by the aid of Emulson. E. Bourquelot.

See under XXIII., *page* 1244..

Arabitol and Rhamnitol; Nitro-derivatives of ——. Constitution of certain Nitric Esters. L. Vignon and F. Gerin.

See under XXIV., *page* 1254.

Finishing Materials containing Starch and Starch Products. D. Saare.

See under V., *page* 1206.

XVII.—BREWING, WINES, SPIRITS, Etc.

Brewing Water: Influence of the Chemical Composition of ——. F. Bousquet. La Bière, **9**, [9], 129—130.

This question has been recently investigated anew by Raux, who concludes, from the results furnished by his experiments, that gypseous waters, containing up to 50 grms. per hectolitre, furnish very pale ales, but of high attenuation and dry. On the other hand, calcareous waters, containing up to 12 grms. of calcium carbonate per hectolitre, give beers slightly darker than gypseous water, but less so than soft water. The attenuation is medium, the beer fuller in flavour and with more condition, but leaving a bitter aftertaste. In the case of such water, the hopping should be reduced. Waters containing chlorine (up to 18 grms. of NaCl per hectolitre), give an excessive attenuation, beers extremely flat and dry, with little condition, but darker in colour than those from gypseous or calcareous waters. Furthermore, the beers are somewhat more bitter and contain about 20 per cent. more phosphates.—C. S.

Sucrase; Part played by ——. E. Delafond. Bull. de l'Assoc. des Chim. de Sucr. et de Dist. 1901, **19**, [4] 421–423.

The author describes a case in which the fermentation of cane-sugar molasses, originally of 8° Baume, was arrested when the gravity reached the value $4\frac{1}{4}°$ Baume. Nine-tenths of the liquor was removed and divided into three equal portions which were treated as follows:—(1) The first part was boiled, cooled, and returned to the original vat. (2) This portion was boiled, cooled, and pitched with pure yeast. (3) The third part was pitched, without treatment in any way, with the same yeast as was used for (2). Fermentation in (1) and (2) proceeded to exactly the same extent, the final gravity being $\frac{1}{2}°$ Baume, whilst that of liquid No. (3) was $3\frac{3}{4}°$; in the last case a considerable quantity of non-inverted cane sugar remained. The author explains this inactivity of the sucrase as due to degeneration under the influence of certain substances present in the liquid.—T. H. P.

Pentosans of Brewers' Grains, Jute, and Loofah. A. Schöne and B. Tollens. J. Landw. 1901, **40**, 21—28, Zeits. Untersuch. Nahr. Genussm. 1901, **4**, [20], 938.

The above substances, as is known, are rich in pentosans, although only an approximately corresponding quantity of crystallised pentoses have been obtained from the same. The authors have endeavoured to obtain better results by altering the method of extraction. They found, however, that by heating with 1 per cent. sulphuric acid solution under pressure at a temperature of 125° to 128° C., worse results were obtained than by the ordinary process—heating with 5 per cent. sulphuric acid on the water bath. On digesting jute for some days with dilute caustic soda solution and precipitating the solution with alcohol, 4·6 per cent. of wood-gum was obtained, which yielded 1·2 per cent. of xylose (calculated on the jute) on hydrolysis. This wood-gum had a lævo-rotation of $[\alpha]_D = 11°$.

Loofah on treatment with sulphuric acid under pressure gave only 0·63 per cent. of xylose. This showed $[\alpha]_D = +17·9°$ and a strong multi-rotation.

By heating brewers' grains with sulphuric acid on the water-bath, 24·77 per cent. of pentosan-extract was obtained, corresponding to 28·16 per cent. of pentose. Calculated as glucose the amount was 29·08 per cent. Although the hydrolysis was practically complete, the undissolved residue still gave a lignin re-action.—W. P. S.

Barley; Treatment of ——, with Lime in the Steep. W. Windisch. Woch. für Brau. 1901, **18**, [43], 546—547.

The author calls attention to the good results obtainable by treating barley with lime water in the first steep. This treatment prevents the grain from going mouldy on the malting floor, an occurrence which frequently forces the maltster to stop the germinating process before modification is properly complete. Mouldy malt presents a very unfavourable appearance, and the proteolytic enzyme present in the mould has the effect of breaking down the albuminoids in the mashing process. All tendency to mould is prevented by the use of lime water, and the green malt from the floor has a good colour and fresh pleasant aroma. The germinating power of new barley is often very inferior, owing, in some cases, to the formation of a film of mould-slime during the harvest which chokes the pores and prevents respiration. This slime is dissolved by lime water, and the germinating power is improved. Originally the author recommended the use of milk of lime, but the particles dried up during kilning and produced great irritation when inhaled by the workmen. The employment of clear lime water surmounts this difficulty. The lime water is prepared in a reservoir situated above the steeping vats; caustic lime is stirred with water in this reservoir and allowed to settle. The clear saturated liquor is drawn off from a cock placed about a foot from the bottom; after one batch is drawn off it is only necessary to add more water and stir up the lime-sludge at the bottom to obtain a further supply of saturated lime water. The lime should be renewed once or twice a week. According to the state of the barley, the first steep may be composed of lime water at 100, 75, or 50 per cent. saturation; the barley is steeped in this for 4—6 hours and the subsequent steepings are made with pure water in the ordinary way.

—J. F. B.

Malt for Aromatic Full-bodied dark Beers; The Kilning of ——. O. Winde. Woch. fur Brau. 1901, **18**, [42], 533-534.

KILNS intended for pale lager beer malts are constructed with high wide exhaust shafts provided with mechanically driven fans, the floors are made of wire gauze so as to be easily permeable, and the malt is spread in thin layers, the object being to remove all the water very rapidly at the lowest possible temperature, before the kilning proper. In kilns for Munich malt, high, wide exhaust shafts are also used, but the floors are made of perforated metal and are heavily charged with malt (up to 100 lb. of kilned malt per square metre). The object is not the rapid and intense removal of moisture, but a certain chemical process and incipient saccharification, the products of which, after roasting, give the full-bodied aromatic flavour of this type of malt. The whole character of Munich malt is determined in the earlier stages, in the first 10 hours when the malt is on the warm withering floor at a temperature increasing from 25° to 36° C., and subsequently when the malt comes on to the upper kilning floor and is subjected to a temperature of from 66° to 73° C., for a considerable time whilst it contains the relatively high proportion of 15—20 per cent. of water. It is at this stage that the saccharine constituents are produced which give the flavour to Munich beers. Many maltsters are under the impression that the roasting and colour are the only factors in preparing Munich malt. They dry off the malt rapidly at low temperatures as with pale malts, with the idea of avoiding gelatinisation. They then subject it to a very excessive, high-temperature kilning process which turns the whole endosperm yellow or brown; such malt can only yield poor beer of an unpleasant burnt flavour. The full bodied flavour of Munich malt depends on the qualitative composition of its extractive matter, brought about by the process described above. The malt is kilned off at a temperature of 100° to 105° C., and the end point must be very carefully watched for, by taking out samples from time to time. The starchy endosperm should never be attacked by the high temperature, and the section should only show the faintest tinge of yellowish colour.

High kilned malt must always be thoroughly cooled before packing into store, otherwise deterioration of its characteristic quality will occur.—J. F. B.

Malt; Influence of the Moisture in ——, *on the Grist.* E. Diehl. La Bière, 9, [9], 130—131.

THE mechanical texture of the grist depends largely on the percentage of moisture in the malt. If the latter be too dry (less than 3 per cent. of moisture), the grist will be so fine as to obstruct the filtration of the wort, and hence such a malt should be damped a few hours before crushing. On the other hand, when the moisture exceeds 6 per cent., it renders the malt tough, and a coarse grist is the result, the consequence of which is a diminution in the yield of extract, unless the rolls be set more than usually close. This question of the setting of the rolls has been investigated by the author, who found that when a dark malt, containing 8·3 per cent. of moisture, was crushed with rolls set so as to give a fine grist with a normal pale malt (4 per cent. of moisture), the grist came through very coarse, and the yield of extract was 4½ per cent. below that obtained in the laboratory; whereas, on setting the rolls closer, to produce a normal grist, the yield was increased by 1·6 per cent. He therefore advises that the rolls should be set in every case in such a manner as to furnish a grist of normal fineness, instead of being left at a fixed distance apart.

—C. S.

Yeast inured to Hydrofluoric Acid; Employment of ——, *in Molasses Distilleries.* M. Verbièse. Bull. Assoc. Chim. Suc. Dist. 1901, **18**, 383; through Zeits. Spiritus Ind. 1901, **24**, [43], 442—443.

IN the fermentation of molasses there frequently occur irregularities, sluggishness or dying out of the fermentation before all the sugar is converted into alcohol and carbon dioxide. According to the practical experience of Effront, the cause of these difficulties lies in the action of the mineral constituents of the molasses on the sucrase (invertase) of the yeast, the activity of which thereby suffers.

In order, then, that the sucrase may resist these substances the yeast must be acclimatised to them; and to obtain a rapid and complete attenuation of the sugar, the following conditions must be fulfilled:—

(1) To the dilute molasses wort a sufficient quantity of an antiseptic (hydrofluoric acid) must be added, in order to suppress the development of bacteria.

(2) A filtration or decantation of the wort before fermentation is necessary.

(3) The wort must be pitched with a yeast acclimatised both to the presence of hydrofluoric acid and to a concentrated solution of molasses.—J. F. B.

Raisin Wine, Sweet; Constituents of ——. Aug. Schneegans. Archiv der Pharm. **239**, [8], 589—591.

IN addition to the raisin and currant wines previously reported on (this Journal, 1901, 599), the constituents of three specimens of so called "concentrated" sweet raisin wines prepared from chopped fruits and water by simple extraction and subsequent fermentation of the strong must, without any addition, are described. These were found to have the following percentage composition:—

——	No. 1. From Currants.	No. 2. From Currants.	No. 3. From Thyra Raisins.
Specific gravity	1·0265	1·0249	1·0131
Alcohol per cent. by weight	11·34	12·03	12·19
„ „ volume	14·29	15·16	15·36
Extractive per cent.	11·55	11·36	8·35
„ „ „ (sugar free)	4·15	4·13	6·03
Inorganic matter	0·298	0·299	0·784
Free acids	0·93	0·79	0·73
Volatile acids	0·18	0·13	0·11
Non-volatile acids	0·73	0·63	0·79
Total tartaric acid	0·17	0·16	0·10
Free „ „	0·0	0·0	0·0
Potassium acid tartrate	0·11	0·15	0·13
Tartaric acid as tartrates of alkaline earths.	0·18	0·04	0·0
Glycerin	1·27	1·33	1·06
Invert sugar	7·49	7·23	2·32
Cane sugar	0·0	0·0	0·0
Sulphuric acid	0·034	0·031	0·025
Phosphoric acid	0·055	0·054	0·092
Tannin and colouring matter	0·30	0·11	0·19
Nitrogen	0·027	0·026	0·50

The ratio of alcohol to glycerin is in No. 1, 100: 11·20; in No. 2, 100: 10·9; in No. 3, 100: 8·69. Fermentation of concentrated must therefore produces glycerin in practically the same proportion to the alcohol formed, as in ordinary must. The proportion of volatile acids is low for sweet wines. The figures for sugar-free extractive and for phosphoric acid are satisfactory.—J. O. B.

Yeast: Autofermentation and Liquefaction of Pressed ——. A. Harden and S. Rowland. Proc. Chem. Soc. 17, [illegible].

The time required for the liquefaction of pressed yeast is greatly diminished by rise of temperature, whilst the rate of evolution of carbon dioxide is greatly increased. The evolution of gas ceases as soon as the yeast becomes liquid, and hence is small at 50°, owing to the rapid liquefaction of the mass (1—1½ hours), whilst the total volumes evolved at 39° and 26° do not differ greatly, although the times required for liquefaction are 5 and 53 hours respectively. At 14° the time required is 16 days, the rate of evolution being extremely slow, and the total volume evolved about 75 per cent. of that produced at 26°. Alcohol is produced simultaneously, the process being apparently a true alcoholic fermentation of the glycogen of the cell. Microscopic examination shows that as the evolution of gas proceeds, the glycogen disappears and the vacuole of the cell increases in size. Finally, the vacuolar contents are discharged and the cell appears shrunken and irregular in outline, whilst the protoplasmic contents are highly granular.

In the presence of oxygen, a process of oxidation accompanies the evolution of carbon dioxide, a considerable rise of temperature being produced and the total volume of carbon dioxide increased. When exposed to a continuous current of oxygen, a sample of yeast was found to lose 26 per cent. of its carbon.

PATENTS.

Mashing and Fermenting Vessels; Improvements in ——. A. Meyer, Paderborn, Germany. Eng. Pat. 377, Jan. 7, 1901.

The inventor claims the use of aluminium linings for mashing or fermenting purposes. The outer mantle is constructed of sheet-iron, steel, or copper plate, to which the inner shell of aluminium is fixed either by solder or rivets. Such vessels do not rust, they are more durable than those made of ordinary metal, they are easily kept clean, they do not spoil the beer, and they are not expensive.—J. F. B.

Alcoholometers; Improvement in ——. T. C. Manley, London. Eng. Pat. 20,165, Oct. 9, 1901.

The improvements introduced in connection with ebullition alcoholometers consist of a somewhat conical shaped boiler; a hemispherical bottom to the boiler; a dished plate having its convex surface attached to the hemispherical bottom in order to distribute the heat of the flame; a straight or uncoiled pipe surrounded by a water jacket, standing up from the cover of the boiler and the lower end of the pipe opening into the boiler; a thermometer, the lower end of which dips into the boiler, and a support and sliding scale for use with the thermometer.—J. F. B.

Liquid and Gas; Process and Apparatus for Treating Materials with [Treatment of Beet] ——. P. Naef, Eng. Pat. 17,054, Sept. 25, 1900.

See under I., *page* 1195.

Casks, Jars, Bottles, and Other Vessels, Mode of, and Apparatus for Purifying ——; *for the Purpose of Destroying Germs of Disease and Putrefaction.* H. Hill. Eng. Pat. 20,567, Nov. 14, 1900.

See under XVIII. C., *page* 1230.

XVIII.—FOODS; SANITATION; WATER PURIFICATION, & DISINFECTANTS.

(*A.*)—FOODS.

Report of the Departmental Committee Appointed to Enquire into the Use of Preservatives and Colouring Matters in the Preservation and Colouring of Food, together with Minutes of Evidence, Appendices, and Index. Parliamentary Blue Book. (Messrs. Eyre and Spottiswoode, East Harding Street, Fetter Lane, London, E.C. 1901. Price, 1*s.* 3*d.*)

It is recommended, in the first place, that the use of formaldehyde or formalin, or preparations thereof, in foods or drinks, be absolutely prohibited, and that salicylic acid be not allowed in a greater proportion than one grain per pint in liquid food, or one grain per lb. in solid food, its presence in all cases to be declared. The next recommendation is that the use of any preservative or colouring matter whatever in milk offered for sale in the United Kingdom be constituted an offence under the Sale of Food and Drugs Acts, while the only preservative which it shall be lawful to use in cream should be boric acid or mixtures of boric acid and borax, and in amount not exceeding 0·25 per cent. expressed as boric acid, the amount of such preservative being notified by a label upon the vessel. The only preservative which the Committee recommends should be permitted to be used in butter and margarine is boric acid or mixtures of boric acid and borax, to be used in proportions not exceeding 0·5 per cent. expressed as boric acid. In the case of all dietetic preparations intended for the use of invalids or infants, it is recommended that chemical preservatives of all kinds be prohibited, also that the use of copper salts in the so-called greening of preserved foods be prohibited. Finally, it is recommended that means should be provided, either by the establishment of a separate Court of Reference or by the imposition of more direct obligation on the Local Government Board, to exercise supervision over the use of preservatives and colouring matters in foods, and to prepare schedules of such as may be considered inimical to the public health.

Proteids or Albuminoids; Present Position of the Chemistry of ——. A. Kossel. Ber., 34, [13], 3214—3245.

An important and exhaustive monograph with ample references.

Milk, Sterilisation of ——, *by Hydrogen Peroxide.* H. Chick. Centr. Bl. f. Bakter. u. Parasitenk. 7, [2], 705—717. Chem. Centr. 1901, 2, [17], 942.

The author states that hydrogen peroxide is a suitable agent for preserving milk for analytical purposes, as it does not alter the composition of the sample. The commercial "10 per cent. solution" can be used, an addition of 20 c.c. per litre being sufficient.

It was found that, for the complete sterilisation of milk, an addition of 2 parts per 1000 of H_2O_2 was necessary; the addition of 1 part per 1000, however, sufficed to keep the milk sweet and uncurdled for a week or even longer. The same results were obtained with milk in which propagation of bacteria had occurred, as with fresh milk, but with skimmed milk, a considerably smaller proportion of H_2O_2 was sufficient.—A. S.

Olive-Leaf Oil. Haensel. Pharm.-Zeit. 46, 582.

By steam distillation of dry olive leaves, 0·04 per cent. of an unctuous essential oil of a yellow colour and a peculiar very pleasant odour was obtained.—A. S.

Butters; Observations on the Composition of ——. A. Pagnoul. Bull. de l'Assoc. des Chim. de Sucr. et de Dist., 1901, 19, [4], 414—418.

The author compares the percentage of volatile acids in a number of butters of French manufacture and known purity with the values obtained for Dutch butters, some of which were prepared by a Commission for the study of Dutch butters, whilst others were purchased from the manufacturers, and in the market. The determination is made as follows:—5 grms. of the melted and filtered butter are saponified with 2·5 c.c. of concentrated potash solution (120 grms. KOH per 100 c.c.). The soap is dissolved in water, a slight excess of phosphoric acid added, and the mixture steam-distilled. The distillate is neutralised with

—	French Butters	Dutch Butters.
Above 6 per cent.	58	0
Between 6 and 5 per cent.	41	57
„ 5 „ 4 „	1	41
Below 4 per cent.	0	2

N/5 sodium carbonate, the number of c.c. used, multiplied by 0·352, gives the percentage of volatile acids expressed as butyric acid. The percentage of the samples containing various amounts of volatile acids are given in the table on preceding page.

Thus, the Dutch butters contain far lower proportions of volatile acids than those of French production, a result possibly due in part to the fact that the former were prepared in October. The author points out that a permissible minimum of 5 per cent. of volatile acids would admit many butters admixed with margarine.—T. H. P.

Casein with Phosphoric Acid; Production of a Soluble Compound of ——. Chem. Fabrik, Rhenania, Aachen. Ger. Pat. 123,555, Aug. 11, 1900. Through Zeits. angew. Chem. **14**, [43], 1094.

The casein is dissolved in weak phosphoric acid, and precipitated by a soluble phosphate. The precipitate is washed free from acid with the phosphate solution, and is then soluble in water.—J. T. D.

Salicylic Acid; Occurrence of ——, *in Strawberries.* L. Portes and A. Desmoulières. J. Pharm. Chim. 1901. **14**, [8], 342—351.

According to the authors' experiments, fresh strawberries contain an appreciable amount of salicylic acid in the form of a salt. It was isolated by the following method :—Five kilos. of strawberries were macerated in a mixture of alcohol and water, and two litres of the extract freed from tannin by means of gelatin, and, after the addition of sodium hydroxide, boiled under a reflux condenser. The alcohol was next distilled off, and the residue acidified with dilute sulphuric acid, and shaken with benzene. The benzene extract gave a violet coloration with ferric chloride, and this liquid, after removal of the iron by means of sodium hydroxide, was acidified with sulphuric acid, and shaken with ether. The residue left on evaporation of the ethereal extract was taken up with absolute alcohol which, on concentration, deposited microscopic crystals of salicylic acid. The amount of salicylic acid determined colorimetrically was found to be about 1 mgrm. in a kilo. of Jugonda strawberries.

Its presence was also identified by various tests in nine other varieties of strawberries.—C. A. M.

PATENTS.

Preserving Food; Media for ——. F. C. Kullak, Berlin. Eng. Pat. 7236, April 6, 1901.

The preserving salt claimed is prepared by dissolving, evaporating, and re-crystallising a mixture of about 20 parts of borax, 30 parts of boric acid, 50 parts of sodium chloride, and 0·001 part of tartaric acid.—W. P. S.

Flour, Bread, and other Food Material; [Medicinal] —— B. Hoffmann, Buda-Pesth, Hungary. Eng. Pat. 17,729 Sept. 4, 1901.

In making the bread claimed, 1 grm. of sodium bromide, instead of sodium chloride. is added to every 50 grms. of flour. Potato flour and carraway seeds or other flavouring material may be added.—W. P. S.

Margarine; Manufacture of ——. A. Pellerin, Paris, Eng. Pat. 22,905. Under Internat. Conv., July 12. 1900.

To render margarine more like butter in appearance, the patentee adds from 0·5 to 5 per cent. of animal or vegetable wax to the fats and oils used for the manufacture of the margarine. The method and the product are claimed.—W. P. S.

Margarine; Production of ——. J. H. G. Neisse, Hamburg and J. H. Boll, Hanover, Germany. Eng. Pat. 21,626, Nov. 29, 1900.

For producing a margarine which will "brown" easily on cooking, the patentees first mix yolk of egg with fresh milk or cream and sourish milk. This mixture is then churned, and the resulting egg-butter is incorporated with margarine.—W. P. S.

Eggs; Method of Preserving ——. K. E. Fryklind, Stockholm, Sweden. Eng. Pat. 9898, May 13, 1901.

The eggs are coated with linseed oil or other drying oil, and the latter is rapidly dried by means of an oxidising agent, such as potassium permanganate, chromic acid, ozone, &c. By quickly drying, the oil is prevented from penetrating to the interior of the eggs. The eggs may also be coated with dextrin before oiling.—W. P. S.

Fluids [Milk]; Apparatus for Equalising the Temperature of ——. T. T. Sabroe and H. J. T. Hansen. Eng. Pat. 13,128, June 27, 1901.

See under I., *page* 1194.

(*B.*)—SANITATION; WATER PURIFICATION.

Expired Air; Regeneration of —— *by Sodium Peroxide.* A. Desgrez and V. Balthazard. Comptes Rend. **133**, [20], 791—792.

The authors have made some improvements in their apparatus (this Journal, 1900, 920). The chief of these are, that the circulating fan is set to work, not electrically, but by the same clockwork which controls the supply, at regular intervals, of sodium peroxide into the regenerator; and that a receptacle of methyl chloride is provided to cool the air, and thus do away with the manipulation of a freezing mixture. The apparatus can thus be charged and kept ready for use: when required, one turn of a screw sets the clockwork in motion and opens a partition which separated the peroxide hopper from the regenerator, while the opening of a stopcock starts the evaporation of the methyl chloride.—J. T. D.

Water-borne Enteric Fever amongst Armies in the Field; Suggested Method of Preventing ——. L. Parkes and S. Rideal. Trans. Epidemiological Soc. of London, N.S. Vol. **20**, (1900–1901).

After pointing out the drawbacks to sterilisation by means of boiling or filtration, the authors proceed to inquire what substance added to water will destroy the virulence or inhibit the growth of the bacillus-typhosus, whilst not rendering the water unpalatable or injurious to health. After referring to previous investigations on this subject, they give the results of experiments showing that sodium bisulphate, tartaric and citric acids, dilute sulphuric acid, and dilute nitro-hydrochloric acid, when used in sufficient strength, and allowed to remain for a sufficient time in contact with infected water, are all capable of preventing any further growth of typhoid-bacilli. In the case of tartaric, citric, and nitro-hydrochloric acids, it was found that nothing less than the B.P. dose per pint of water sufficed to sterilise during 15 minutes' contact. Nitro-hydrochloric acid was more efficient than sulphuric, but no further experiments were made with these acids, as it was considered that liquids would be inconvenient in use, and that whatever substance was employed should be a solid. Sodium bisulphate seemed suitable, 1 grm. (15·5 grains) per pint of infected water, being sufficient to kill typhoid-bacilli during 5 minutes' contact, and to completely sterilise the infected water after 15 minutes' contact. The acid salt is probably not purgative, as the astringent properties of the free acid would tend to counteract the laxative action of the sodium sulphate, besides which the quantity necessary to be used is very much less than the minimum dose (¼ oz.) of the latter salt. Acid sodium phosphate and sodium sulpho-vinate were tried, but were found to be inefficient.

Further experiments showed that sodium bisulphate when used in the proportion above stated is effective after 15 minutes' contact in sterilising water containing as many as 50,000 colonies of *b. typhosus* per 1 c.c., but when the water is much more heavily infected, a longer contact is necessary.

After pointing out that only in about 1·25 per cent. of cases of enteric fever, the urine is so highly charged with the bacilli as to be turbid (in which case water infected with such urine might contain more than the above number of bacilli), and that it is very doubtful if the bowel excreta ever contain anything like the numbers met with in the urine of convalescing patients, the authors think they are [illegible] ng that water naturally infected with the [illegible] does not contain so very large a proportion of the bacilli, and, that, therefore, the use of [illegible] means of combating infection as they suggest has possibly a future before it, more especially under conditions where the means of sterilisation by boiling or [illegible] are not readily available. They recommend that the sodium bisulphate should be used in the form of tabloids each containing 5 grains, and made so as to dissolve quickly. These should be contained in light metal boxes holding about 350 tabloids, or ¼ lb., sufficient to sterilise over 100 pints of water. The acid tabloids have the additional advantage of rendering the water more effective in slaking thirst, and therefore they tend to reduce the quantity of water consumed.—L. A.

Sand Filters; Note on the Working of ——. H. F. Rutter, Proc. Inst. Civil Engineers, **146**, (1900—1901), Part 4.

A few years ago it was believed that the function of the sand in ordinary sand filters was quite a secondary one, that the sand merely served as a convenient support for the surface film, on which the efficiency of the filter actually depended. It was stated that the integrity of this film must be maintained with the greatest care, as its rupture would be followed by immediate deterioration of the filtrate from a bacteriological point of view. In the practical working of open filters, however, the maintenance of the surface film is impossible. In the summer months gases, generated among the low forms of vegetable life which grow on the surface of the sand, float these matted growths to the surface of the water, thus frequently exposing clean patches of sand to the passage of the water. In mechanical sand filters, the supposed necessity of maintaining the surface film is entirely ignored.

In 1899, the chief chemist to the Massachusetts Board of Health, communicated to the author some results which seemed conclusively to prove that the rupture of the surface film has no prejudicial effect on the filtrate. In a filter plant with which the author is connected, great inconvenience was formerly caused in the spring of every year, and sometimes during the summer months, through the rapid clogging of the surface of the sand by the formation of a film which, though of extreme tenuity, was sufficient to entirely prevent the passage of water. Filters which, ordinarily, continued to work efficiently for 2—3 months, became useless after 5—6 days' working. Arrangements were therefore made to break up the film by passing a rake across the face of the filter-bed when in this condition, and after 18 months' experience this has been found to result in greatly increased facility of working, and material reduction of expense, while the high character of the filtrate has been fully maintained.

Immediately the filter shows signs of clogging, the outlet is closed and an interval of about six hours is allowed to elapse to ensure that the whole body of sand below the film is fully charged with water. The film is then disturbed by the rake, and after another resting period of six hours, it is put into use again. It has been frequently observed that a filter which has shown signs of becoming blocked up within five or six days of ordinary cleaning, will work for 3—4 weeks after raking the surface before it again requires raking. The filters in question can be thus raked two or three times before they require cleaning in the usual manner.—L. A.

PATENT.

Water; Purification or Sterilization of ——. R. Orchard and C. E. Fox, London. Eng. Pat. 497, Jan. 8, 1901.

The patentees claim the process of sterilising water by treating it for a period of at least 15 minutes with a small quantity (20—25 grains per pint of water) of sodium bisulphate. Tablets are prepared by mixing 25 grains of the bisulphate with four grains of sodium bicarbonate, and one or two grains of dextrin as a binding agent. When the tablets are placed in water, a portion of the bisulphate reacts with the bicarbonate, and the effervescence so caused promotes the solution of the remainder of the bisulphate and its distribution throughout the volume of water.—L. A.

(C.)—DISINFECTANTS.

Ammonium Ichthyol-Sulphonate; Preparation of ——. A. C. McLaughlin. Amer. Pat. 681,568. Pharm. Zeit. **46**, [86], 858.

Asphalt is submitted to distillation, the hydrocarbons collected in suitable vessels, and the sulphocarbonates shaken with strong sulphuric acid until reaction is complete. The liquid then separates into two layers, a dark heavy portion containing the sulpho-acids and a lighter supernatant fluid. The former is separated and neutralised with ammonium carbonate, when impure dark coloured ammonium ichthyol sulphonate is formed. This is washed with light petroleum spirit, dissolved in methyl alcohol and filtered. On distilling off the solvent, ammonium ichthyolsulphonate is obtained.—J. O. B.

Creosote; Determination of ——. B. Hafner and W. Kreissl.

See under XXIII., *page* 1251.

Creosote for Therapeutic Purposes; Examination of ——.

See under XXIII., *page* 1245.

Formaldehyde; Determination of ——. L. Vanino and E. Seitler.

See under XXIII., *page* 1251.

Mercury in Combination with Chlorine, Iodine, Cyanogen, Determination of ——, *in Antiseptic Solutions.* G. Méillère.

See under XXIII., *page* 1243.

PATENTS.

Casks, Jars, Bottles, and other Vessels for the purpose of Destroying Germs of Disease and Putrefaction: Mode of, and Apparatus for Purifying ——. H. Hill, London. Eng. Pat. 20,567, Nov. 14, 1900.

The casks, &c. are placed in a closed chamber, where their interiors and exteriors are exposed to the action of sulphur dioxide, formaldehyde, or other suitable gas or vapour; or the casks are connected together in series by piping, and the gas or vapour passed through them successively. They are then rinsed out with hot water and dried.—L. A.

Disinfectant Compound; An Improved ——. A. Strandh, Stockholm, Sweden. Eng. Pat. 508, Jan. 8, 1901.

The disinfectant called "Lettubrin," for destroying all kinds of vermin, is "composed of 3—50 parts by weight of carbolic acid, 1—50 parts by weight of concentrated acetic acid, 1—10 parts by weight of benzene, and 72 parts by weight of 96 per cent. alcohol."—L. A.

Moths; Improved Means for Exterminating ——, *and Process for the Producton of such Means.* A. Kornfeld and J. H. Zirner, Vienna. Eng. Pat. 18,560, Sept. 17, 1901.

Fine sawdust is mixed with powdered ammonium carbonate "prepared with oil of lavender," then added to diluted acetic acid, and stirred until effervescence ceases. Another portion of sawdust is mixed with diluted acetic acid, camphor dissolved in alcohol, and oil of turpentine. The two portions are then mixed together, and to the whole is added a further portion of ammonium carbonate "prepared with oil of lavender." The mass thus prepared "is allowed to dry in a tightly closed vessel." In use it is sprinkled about in rooms containing the articles to be protected from moths, or on the articles themselves.—L. A.

XIX.—PAPER, PASTEBOARD, Etc.

Cellulose [Wood Pulp]; Alkaline Process of Boiling ——. W. Schacht. Papier Zeit. 1901, **26**, [84], 3143-3144.

It is well known that the alkaline processes for obtaining cellulose from wood on the industrial scale are attended with very large losses of fibre substance. For instance the soda and sulphite process only yields from 28 to 38 per cent. of unbleached pulp from wood as compared with a possible yield, according to Dammer, of 60 to 80 per cent. In the same way the yield of cellulose from straw varies from 36 to 48 per cent., whilst the theoretical proportion of cellulose and cellulosic matters is, in the author's opinion, from 56 to 70 per cent.

In order to restrict this loss of cellulose, the liquors should be far less alkaline or even neutral. Another drawback, which attends the processes in which alkaline sulphides are employed, is the very disagreeable and injurious odour evolved from the liquors owing to the production of mercaptans and similar bodies from the portions of the cellulose dissolved. Finally, cellulose produced by the alkaline processes is very prone to destructive fermentation and the attacks of fungi.

The author's new process for boiling wood, straw, &c., utilises the solvent action of sodium sulphite on the non-cellulose constituents of the material. In addition to avoiding the evil smell produced by the sulphide process, the new method has the advantage of increasing the yield of cellulose by 15 or 20 per cent., and of producing a cellulose of far higher quality, more comparable with the acid bisulphite product. The new liquor is prepared by nearly saturating the crude recovered soda solution with sulphurous acid, and then causticising the residual carbonate. The liquor consists, therefore, of a mixture of sodium sulphite, sodium thiosulphate and caustic soda. The last-named alkali is still necessary to a certain extent in order to deal with the silicates and alumina of the raw material, and it should not exceed the proportion required for this purpose. This process is being tried on the large scale, and is likely to be adopted by several factories in the near future.—J. F. B.

Silica; Removal from Alkaline Liquors of ——, especially from the Liquors of the "Sulphite" Cellulose Process. G. Lunge and W. Lohöfer. Zeits. angew. Chem. 1901, **14**, [44], 1102—1110.

In the boiling of wood, and especially of straw, by the alkaline process, a considerable proportion of the soda combines with the silica of the plant-ash forming silicate of soda, which is of no value for the boiling. This silicate has to be decomposed and the soda made available without at the same time destroying the valuable sodium sulphide. It is true that in the subsequent causticising of the recovered soda-ash the greater part of the silicate is precipitated as calcium silicate. But this makes the waste lime sludge so slimy that the removal of the caustic liquor by filtration and washing is very difficult and wasteful. The silicate must, therefore, be decomposed, and the silica may be removed from the solution of the recovered ash before causticising. The decomposition is effected by saturation with carbon dioxide, but experiments showed that under ordinary pressure at any temperature, the precipitated silica is so gelatinous and voluminous that the same difficulties as regards filtration and washing occurred here also. The problem was ultimately solved by saturating the dissolved ash with carbon dioxide whilst boiling under a pressure of about 7 lb. per sq. in., *i.e*, at temperatures from 103°—107° C. The silica was thus precipitated practically completely, and in a form in which it could be filtered off rapidly with a clear filtrate. If the saturation be stopped as soon as the whole of the silicate is decomposed, the sodium sulphide remains unaltered.

The sodium of the silicate forms a carbonate having a composition corresponding approximately with the formula $Na_2CO_3 + 2NaHCO_3$

A 10 per cent. solution of sodium metasilicate Na_2SiO_3 after saturation in the above manner and filtered, required for a 96 per cent. causticisation 120 per cent. of the theoretical quantity of lime calculated for the carbonic acid; calculated for the soda present 170 per cent. of the theoretical quantity of lime was required because of the acid nature of the carbonate to be treated. For causticisation without previous filtration of the precipitated silica, the latter still combined with 75 per cent. of the quantity of lime required to produce $CaSiO_3$, probably with the formation of an acid silicate of the formula $4(SiO_3)Ca_3H_2$. Thus for the technical causticisation, without filtration, 250 per cent. of the theoretical quantity of lime calculated for the soda of the sodium silicate was required.

The authors invite experiments on a practical scale in order to determine whether the advantage of the removal of the silicate will compensate for the extra cost of the process.—J. F. B.

PATENTS.

Cellulose Solution; Manufacture of ——. J. Imray, London. From E. Bronnert, Niedermorschweiler, Alsace, and M. Frémery and J. Urban, both of Oberbruch, Aachen, Germany. Eng. Pat. 20,801, Nov. 17, 1900.

Ammonia solution (16—18 per cent.) is saturated in the cold with cupric carbonate, and cellulose is dissolved therein. No oxycellulose is formed even after a long period.

—R. L. J.

[Waterproof] Paper, Cardboard, and the like; Improved Manufacture of ——. L. Joseph, Cologne, Germany. Eng. Pat. 536, Jan. 8, 1901.

The ordinary process of waterproofing paper, &c. (*i.e.*, dressing with a solution of paraffin wax in hot linseed oil), is supplemented by a second treatment of paraffin and oil mixed with a solution of shellac, or any gum-lac, gum-resin, wax, or albumin, dissolved in spirit or other mineral solvent.

Talc or similar substance is then strewed on the paper and rolled in to produce a smooth glazed surface.

—R. L. J.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, AND EXTRACTS.

Thorium; Existence of a New Element associated with ——. C. Baskerville. J. Amer. Chem. Soc. **23**, [10], 761—774.

The purest thorium salts obtainable were re-purified by converting them into sulphate; dissolving in cold water; adding solution of sodium sulphate, and allowing to stand 12—24 hours to separate any small amount of cerium compounds present, filtering, and precipitating the hydroxide by a large excess of sodium nitrite. After copious washing by decantation, the hydroxide was converted into chloride, reprecipitated by ammonia in slight excess, and washed thoroughly by decantation.

1. *Variation in the Specific Gravity of the Oxide.*—Muthmann and Böhm (this Journal, 1900, 267) have recommended the determination of the sp. gr. of the oxides as a means of judging the progress of the fractionation of the rare earths. The sp. gr. of ThO_2, as given by various observers, has varied from 9·077 to 10·2206; that of the oxide obtained by prolonged ignition of the hydroxide, purified as above, was 10·1 (corrected to 4° C., as in all cases throughout this paper). Part of the purified hydroxide was dissolved as chloride, and the solution, after neutralisation with ammonia, was saturated in the cold with SO_2. The basic sulphite which separated out was filtered off, the filtrate was boiled, filtered, and the earth remaining in solution was precipitated with ammonia. On igniting the two products to oxide, that obtained from the basic sulphite had a sp. gr. of 9·38, and that yielded by ammonia, 10·367.

Another portion of the purified hydroxide was added to a cold saturated solution of citric acid until no more was dissolved after 12 to 15 hours' stirring. On heating the diluted, filtered liquid at about 100° C., a white precipitate consisting of "an hydrated citrate of the real thorium" was obtained, which gave on ignition an oxide of sp. gr. 9·210—9·253. The filtrate, on evaporation to solidification, yielded on ignition an oxide of sp. gr. 10·50. A larger quantity of the saturated citrate solution, after removal of the precipitated citrate as just described, was evaporated till a crystalline scum began to form; on cooling over-night, a few crystals separated, which yielded an oxide of sp. gr. 8·47—8·77. On further concentration of the syrupy liquid, a white crystalline body, yielding an oxide of 10·14 sp. gr., separated out; and, after further concentration of the decanted solution, dilution with water, and boiling, a small precipitate was obtained, which yielded an oxide of 11·26 sp. gr. The filtrate from this was evaporated to dryness and ignited, giving an oxide of 10·46—10·53 sp. gr. The author considers that these results point to the presence of either an unknown element or a new oxide of greater density than the usual residue on ignition.

2. *Radio-activity of the Oxides.*—The oxide (sp. gr. 9·25) obtained from the insoluble citrate affected the sensitive plate but slightly, after an exposure of 72 hours, while the oxides of higher sp. gr. were quite active, the radio-activity increasing with increase of sp. gr. The 9·25 oxide is, therefore, probably not quite free from the oxide of higher sp. gr.

3. *The Atomic Weight of Thorium.*—Thorium dioxide, prepared from "the purest insoluble citrate" by ignition, was used for the determination, being converted into $ThCl_4$. The numbers 223·2 and 223·3 were obtained, and finally 222·13, after a more searching trial. These results lead the author to believe that ordinary thorium is not a simple substance, but contains an element which, if tetravalent, has an atomic weight lying between 260 and 280. If further investigation confirms this conclusion, he suggests naming the element *Carolinium*, with the symbol *Cn.*
—H. B.

Glycerophosphorous Acid and Glycerophosphites. A. and L. Lumière and F. Perrin. Comptes Rend. **133**, [17], 643—644.

Phosphorus trichloride and glycerin are allowed to act on each other in the cold; the product is dissolved in cold water, and the solution neutralised with calcium carbonate. The clear liquid is concentrated at a low temperature to a syrup, and the calcium glycerophosphite precipitated by alcohol. Glycerophosphorous acid has not been isolated: even dilute solutions decompose slowly in the cold, and very rapidly on heating. Most of its salts are soluble in water. The solution of the calcium salt can be boiled without decomposing, though it rapidly decomposes when a few drops of hydrochloric acid are added to the hot solution.—J. T. D.

Carbon Tetrachloride; Process for Manufacturing ——. Urbain. Rev. Prod. Chim. **4**, [15], 228.

Two parts by weight of aluminium chloride are boiled with 100 parts of carbon bisulphide, for about half-an-hour, the liquid being then cooled and treated with a current of pure dry chlorine until the weight has increased to 383 parts. To destroy the chlorosulpho products contaminating the carbon tetrachloride, the liquid is treated with about 0·05 per cent. of iron dust, or other analogous metal, and gently heated, the final products of the reaction being carbon tetrachloride and sulphur chloride. The former is separated by distilling at 60°—90° C., and is purified by washing with alkaline water and redistillation. The residual sulphur chloride is utilised for the furthur production of carbon tetrachloride by treating it with carbon bisulphide, in the proportion of 3 mols. of the former to 1 mol. of the latter, and 1 per cent. of iron dust. The ensuing brisk reaction is facilitated by gentle heat, applied until the liquid becomes quiescent, whereupon the product is distilled to recover the carbon tetrachloride. An almost theoretical yield is obtained, the extra molecule of sulphur chloride insuring complete conversion and maintaining the sulphur in solution during distillation.—C. S.

Quinine and Cinchonidine; Preparation of Carbonic Esters of ——. Vereinigte Chininfabriken Zimmer and Co., Frankfurt. Ger. Pat. 123,728 (Addition to Ger. Pat. 91,370 of 18th December 1895). (Through Zeits. angew. Chem. **14**, [43], 1094).

An alteration of the method described in the former patent, consisting in the treatment of the hydrated salts of the alkaloids by the esters of chloroformic (chlorocarbonic) acid in the presence of pyridine.—J. T. D.

Saloquinine and Rheumatine. Pharm. Zeit. **46**, [70], 694.

Two new preparations of quinine, which are claimed to have valuable therapeutic properties, have been introduced into commerce by Zimmer and Co.

Saloquinine is the quinine ester of salicylic acid $C_6H_4OH.COO.C_{20}H_{23}N_2O$; it occurs in crystals, melting at about 130° C., is insoluble in water, but soluble in alcohol and in ether. It is a powerful bactericide and prevents the growth of moulds, and also possesses marked analgesic properties when administered internally.

Rheumatine is the salicylate of saloquinine $C_6H_4OH.COO.C_{20}H_{23}N_2O.C_6H_4OH.COOH$. It occurs in white needles, very soluble in water, melting at 179° C.—J. O. B.

Cinchonine. E. Jungfleisch and E. Léger. Bull. Soc. Chim. 1901, **25**, [18], 880—884.

Having shown that hydrocinchonine is identical with cinchonifine, the authors recall the fact that when cinchonine is treated with aqueous sulphuric acid, a large proportion of hydrocinchonine is always obtained. They now show that ordinary cinchonine is in reality a mixture of cinchonine and hydrocinchonine; they have determined the proportion of the latter present and also give the properties of pure cinchonine. The basic sulphate of cinchonine employed, was obtained from wild cinchona. 200 grms. of the salt after treatment at 125° C. with sulphuric acid mixed with its own weight of water gave 28 grms. of hydrocinchonine corresponding to 34·28 grms. of the sulphate + $2H_2O$ or 17·19 per cent. Taking account of possible losses in the separation, and the amount of hydrocinchonine retained by the apocinchonine in spite of repeated crystallisations, it would appear that the original salt contained not less than 20 per cent. of hydrocinchonine sulphate. Oxidation with permanganate in ice of a cinchonine sulphate rich in hydrochonine gave only a very small quantity of the latter base. Hence the oxidation of the cinchonine is attended by destruction of the hydrocinchonine, even in the cold. After repeated crystallisations from water and 95 per cent. alcohol, a salt was obtained containing only about 1 per cent. of hydrocinchonine sulphate.

The following table gives the differences in solubility of one part of each of the various salts in water at different temperatures:—

—	Water at—		
	12° C.	36°·5 C.	101° C.
	Parts.	Parts.	Parts.
Purified cinchonine sulphate $+2H_2O$.	72·1	60·2	12·9
Ordinary cinchonine sulphate, containing about 20 per cent. of hydrocinchonine sulphate.	64·1	55·0	11·3
Hydrocinchonine sulphate....	37·6	34·8	10·7

The melting point of purified cinchonine crystallised in the cold from a mixture of chloroform and alcohol (2:1) was found to be 264°·3 C. The specific rotation of the same product in absolute alcohol (p = 6·1875, v = 30 cc. t = 17° C.) gave $[\alpha]_D$ = + 229°·6. Oudemans (Annalen, 1876, **182**, 44) gave $[\alpha]_D$ = + 223°·3, whilst a mixture of hydrocinchonine and purified cinchonine (1:4) gives $[\alpha]_D$ = + 223°·9. In a 1 per cent. aqueous solution with 4HCl for each molecule of cinchonine $[\alpha]_D$ at 17° C. = + 263°·4. Oudemans (*loc. cit.* 55) gives $[\alpha]_D$ = + 257°·7, whilst for the same mixture as above the authors find $[\alpha]_D$ = + 256°·3. These figures obtained for the mixtures have also been given by a sample of commercial cinchonine examined by the authors. They propose to investigate the question of purified cinchonine, and to determine how it is possible for cinchonine and its salts to crystallise with considerable quantities of hydrocinchonine. If the latter contains 2H more than cinchonine the law of isomorphism does not apply.—T. A. L.

Isoconiine. A. Ladenburg. Ber. 1901, **34**, [13], 3416.

Doubt has repeatedly been cast on the existence of isoconiine, the explanation of the observations made by the author being the presence of a mixture of *d*- and *l*-coniine. The author states that the reasons he gave in Ber. **29**, 2706, for the existence of isoconiine cannot be explained in any other way.—A. C. W.

Hyoscine and Atroscine. O. Hesse. J. prakt. Chem. 1901, **64**, [20], 353—386.

HYOSCINE (active or normal scopolamine) has been found in the roots of *Scopolia japonica* and *S. atropoides*, the seeds of *Datura Stramonium*, the leaves of *Duboisia myoporoides*, the flowers of *Datura alba*, the mandragora root (this Journal, 1901, 605 and 1135), and in *Hyoscyamus niger*. When the solutions of the alkaloids, *e.g.*, from *Scopolia* roots, in dilute sulphuric acid, are made slightly alkaline with sodium bicarbonate and extracted with chloroform, the hyoscine is taken up by the solvent, and by a repetition of the process may be freed from hyoscyamine. After removal of the chloroform, the syrupy residue is neutralised with hydrobromic acid, and the hydrobromide purified by recrystallisation from water or alcohol. When the crude alkaloid consists mainly of hyoscine, the hydrobromide may be at once prepared. Hyoscine is decomposed by acids or bases. Hydrochloric acid in a sealed tube at 100° C. gives oscine and atropic acid, $C_{17}H_{21}NO_4 = C_8H_{13}NO_2 + C_9H_8O_2$. Some tropide is also produced. Excess of baryta at 60° C. gives oscine and tropic acid, $C_9H_{10}O_3$. Hyoscine is soluble in 9·5 parts of water at 15° C., more readily in boiling water, and easily in chloroform, alcohol, &c. The alkaloid cannot be crystallised; the solutions all yield a varnish which melts at about 50° C. Hyoscine is separated from solutions of its salts by caustic alkalis and normal carbonates. Bicarbonates give no precipitate from acid solutions, but the alkaloid is completely extracted by chloroform. The *hydrochloride*, $C_{17}H_{21}NO_4.HCl.2H_2O$, separates from strong aqueous solutions as thick glassy crystals; it separates from acetone as an anhydrous white crystalline powder, which melts at 197° C. The gold salt melts at 198° C. with effervescence. The higher melting point found by Schmidt appears to be due to the method of determination. The *hydrobromide* has been obtained in six forms, anhydrous and with ½, 1, 2, and 3 mols. (needles or rhombs) of H_2O, according to the solvent. The *hydriodide*, $C_{17}H_{21}NO_4.HI.\frac{1}{2}H_2O$, melts at 197° C. *Acetylhyoscine*, $C_{17}H_{20}(C_2H_3O)NO_4$, is obtained by the action of acetic anhydride on anhydrous hyoscine hydrobromide; it is an uncrystallisable syrup, somewhat soluble in water and strongly basic. Boiling with excess of baryta water converts it into oscine and atropic and acetic acids.

Atroscine, $C_{17}H_{21}NO_4$, forms crystals which melt at 82°—83° C.; the hydrate, $C_{17}H_{21}NO_4.H_2O$, melts at 56°—57° C., and $C_{17}H_{21}NO_4.2H_2O$ melts at 36°—37° C. The latter hydrate was nearly always obtained by the author, though Gadamer regards it as the unstable form. Atroscine dissolves in 37 parts of water at 18° C.; it is optically inactive. Caustic potash and baryta water decompose it into oscine and tropic (or atropic) acid. The *hydrochloride*, $C_{17}H_{21}NO_4.HCl$, crystallises in long needles easily soluble in water. The gold salt is similar to the hyoscine gold salt; it melts at 201°—202° C. and effervesces at 204°—206° C. The *hydrobromide* separates from strong solutions in rhombic tables, $C_{17}H_{21}NO_4.HBr.\frac{1}{2}H_2O$, from weaker solutions with $3H_2O$, and from hot acetone as an anhydrous crystalline powder. *Acetylatroscine* is obtained by heating a solution of the base in acetic anhydride at 80°—90° C. for two hours. It is an uncrystallisable syrup, readily soluble in water. The solution has an alkaline reaction. *Atroscine methyl iodide*, $C_{17}H_{21}NO_4.CH_3I$, crystallises from chloroform in white leaflets, which melt at 202° C. The ethyl iodide compound is obtained by heating in a sealed tube at 80°—90° C.; it crystallises from hot water in fine octahedra, which melt at 170° C.

The optical rotation of anhydrous hyoscine hydrobromide was found to be $[\alpha]_D = -25·9°$, which fell to $-25·4°$ after keeping for 18 months, the original value being regained after recrystallisation from water. Wentzel, however, found $-32·9°$, falling to $-25·79°$ after one year. The alkaloid was separated from the hydrobromide which gave $-25·4°$; when seeded with atroscine it formed crystals in quantity corresponding to 8·5 per cent. of atroscine hydrobromide. The hydrobromide from the mother liquor then gave $[\alpha]_D = -32·9°$, but a second crop showed only $[\alpha]_D = -29·3°$. An explanation of this difference is still to be found.

For the following experiments on the conversion of hyoscine into atroscine, the hydrobromide of $[\alpha]_D = -25·9°$ was used, which the author considered to be pure. After fusion the rotation was $-23·7°$, and after keeping for 18 months in the dark, $-25·4°$. The activity of the pure alkaloid also slightly decreased on keeping in diffused light. Silver oxide decreases the activity by about one-eighth on standing in aqueous solution for five days. The conversion does not proceed further. Sodium and potassium carbonates in aqueous solution, barium and calcium hydroxides in aqueous and alcoholic solutions, are without action at 50° C. At 60° C. baryta decomposes the alkaloid on long-continued action. Caustic potash and soda rapidly decompose hyoscine in alcoholic solution, but are without action on an aqueous solution. Atroscine is best obtained by the action of small quantities of caustic soda on an alcoholic solution: a strong solution of 0·117 grm. of caustic soda is added to a solution in 60 c.c. of absolute alcohol of the alkaloid from 10 grms. of the hydrobromide. After standing 10 hours at the ordinary temperature, the solution is neutralised, alcohol removed, the alkaloid separated by soda and chloroform, the solvent distilled off, the syrupy residue stirred with water in a dish, and left to crystallise at a low temperature. Atroscine and hyoscine are similar in physiological action, but the former has certain advantages. Solutions of the alkaloids in castor oil are used in ophthalmic practice in England.

Oscine (Schmidt's scopoline), $C_8H_{13}NO_2$, crystallises in colourless prisms, sublimes at 90° C., distils at 241°—243° C., and when free from moisture melts at 106°—107° C. The base is tolerably hygroscopic. Oscine contains a hydroxyl group which can be readily esterified, but bases corresponding to atroscine cannot be obtained by evaporation with the proper acids and hydrochloric acid. It is not reduced by hydriodic acid and red phosphorus at 140° C.; also hydroxylamine and phenylhydrazine do not react with the base.—A. C. W.

Strychnine and Brucine; Electrolytic Reduction of——. J. Tafel and K. Naumann. Ber. 1901, **34**, [13], 3291—3299.

BY the electrolytic reduction of strychnine in sulphuric acid solution with a lead cathode, tetrahydrostrychnine and strychnidine are produced (this Journal, 1898, 945). By using the closed apparatus (this Journal, 1899, 909) it is now found that tetrahydrostrychnine is the initial product of the reduction; it is formed in much the larger quantity at low temperatures, and the higher the temperature the more strychnidine is obtained.

Brucine is also reduced by electrolysis in sulphuric acid solution with a lead cathode; it is necessary to keep the temperature below 15° C., otherwise uncrystallisable compounds are produced, readily acted on by light. The filtered cathodic liquid gave with ammonia a reddish amorphous precipitate, which was dissolved in chloroform, the solution dried, the solvent removed, and the residual syrup dissolved in warm methyl alcohol. This solution was evaporated and the process repeated, in order to remove chloroform completely. On cooling, tetrahydrobrucine crystallised out. By rapid and repeated recrystallisation from hot methyl alcohol it was obtained colourless.

Tetrahydrobrucine, $C_{23}H_{30}O_4N_2$, begins to decompose in an evacuated capillary at 185° C., and melts at 200°—201° C. to a clear yellowish liquid. It is slightly soluble in water, the solution having an alkaline reaction. The base, similarly to tetrahydrostrychnine, forms two series of salts. Nitrous acid does not yield a nitrosamine; its action appears to be oxidising or condensing.

Brucidine, $C_{23}H_{28}O_3N_2$, is not found as a direct product of the electrolytic reduction. It is obtained by heating tetrahydrobrucine at 215°—220° C. in the oil-bath and recrystallising from warm acetic ester. Brucidine is perceptibly soluble in boiling water; the solution has an alkaline reaction.

Quinine, cinchonine, and cinchonidine are much more easily reduced electrolytically than strychnine and brucine. Four atoms of hydrogen are taken up by 1 mol. of alkaloid. No crystalline compound could be obtained from the

[illegible]ts, which are exactly similar to the substance [illegible] by [illegible] Norwall by reducing the alkaloids with [illegible] in amyl alcohol solution (Ber. **28**, 1637; **29**, 803).
—A. C. W.

Thiopyrine and Selenopyrine. Michaelis. Zeits. angew. Chem. 1901, **14**, [41], 1027.

These compounds are obtained by the action of potassium hydrosulphide or potassium selenide (as the case may be) on the so-called antipyrine chloride. Thiopyrine readily combines with methyl iodide, and is characterised by its behaviour towards sulphurous acid. It is also converted by oxidation with chlorine in an aqueous solution into an inert dioxide. The author concludes that both compounds have the same constitution as antipyrine. He also gives particulars of their physiological action.—C. A. M.

Corydalis cava; The Alkaloids of ——. Gadamer and others. Chem.-Zeit. 1901. **25**, [80], 863.

The alkaloids known to be present in the root-nodules of *Corydalis cava* are:—Corydaline, $C_{22}H_{27}NO_4$, m.p. 134·5° C.; corybulbine, $C_{21}H_{25}NO_4$, m.p. 238°—239° C.; corycavine, $C_{23}H_{23}NO_6$, m.p. 216°—217° C.; bulbocapnine, $C_{19}H_{19}NO_4$, m.p. 199° C. corytuberine, $C_{19}H_{25}NO_4$, m.p., 200° C. (Dobbie and Lauder): corydine, m.p. 65°—75° C. The last named is now found to be a mixture of the following crystalline bases:—

Isocorybulbine, $C_{21}H_{25}NO_4$, m.p., 179°—180° C.
Corycavamine, $C_{21}H_{21}NO_5$, m.p., 149° C.
Corydine, $C_{21}H_{25}NO_4$, $C_{21}H_{23}NO_4$, m.p. 129°—130°.

Base, not identical with corydaline, m.p. 135° C., and, in addition, two amorphous bases, one of which forms a crystalline hydrochloride. The alkaloids (eleven in all) fall into three groups in order of basicity.

I. *Weak bases,* giving yellow, berberine-like derivatives (probably quarternary bases) with alcoholic iodine
Corydaline, forming dehydrocorydalin, $C_{22}H_{23}NO_4$.
Corybulbine, forming dehydrocorybulbin, $C_{21}H_{21}NO_4$.
Isocorybulbine (not examined with iodine).

II. *Medium bases,* not acted on by alcoholic iodine, corycavin, and corycavamin.

III. *Strong bases,* bulbocapnine, corydine, corytuberine.

Group I.—The dehydro derivatives, on reduction, yield the inactive forms of the original bases. Attempts were made to split *i*-corydaline (m.p. 135°) into its active components but without success. A small quantity of *r*-corydaline, m.p. 158°—159°, was obtained in preparing the inactive variety. Iso-corybulbine is isomeric with corybulbine, and more readily soluble in alcohol. $[\alpha]_D^{20}$ for corybulbine = +303·3°; for iso-corybulbine = +299·8°.

Group II.—Corycavamine was separated by means of the sulphocyanide compound, which is insoluble in alcohol. It contains no methoxyl or hydroxyl groups, and forms an isomeride (*cf.*, narcotine and gnoscopine), m.p. 216°—217° when heated with acetic-anhydride. It melts at 149° C., is solid at 175° C., and again melts at 216°—217° C.

Group III.—These bases readily form yellow oxidation products in the air. Corydine has three methoxyl groups, and may be dimethyl-bulbocapnine. The optical characters are—

$[\alpha]_D^{20}$ for bulbocapnine = 237°; for corydine = 770·6°.
Mol. rot. for bulbocapnine = 204·35°; for corydine = 721·4°.

Corytuberine, $C_{19}H_{23}NO_4 + 5\ H_2O$, extracted (finally) by chloroform from the ammoniacal extract, crystallises from hot water or hot dilute alcohol as slightly lustrous, white plates which turn grey in the light, melts at 240° C., contains two methoxyl and two hydroxyl groups, and has the value $[\alpha]_D^{20} = 282°·65$ in alcohol. Dobbie and Lauder give the formula $C_{21}H_{25}NO_4$.

Basicity of Berberine.—Berberine is a quarternary base, and reddens phenolphthaleïn, even in very dilute solution. The neutral sulphate is decomposed only by barium hydroxide, and the hydrochloride by silver oxide.
—R. L. J.

Digitalinum germanicum; Process for obtaining all the Valuable Constituents of ——. H. Kiliani. Ber. 1901. **34**, [14], 3561—3562.

The method here given enables the true digitalin and digitonin to be simultaneously obtained. 250 grms. of *digitalinum germanicum* are dissolved in 1 kilo. of 95 per cent. alcohol in a 5 litre flask by means of gentle warming and shaking. After cooling, 1 kilo. of ether (sp. gr. 0·720) is *gradually* added with shaking, the mixture is allowed to stand 24 hours, and the solution poured away from the precipitate. The solution is concentrated by distillation *in vacuo*, and then in a tared dish on the water-bath until a pellicle forms. The syrup is weighed, and washed into a flask with one-and-a-half times its weight of water. The flask is filled to the stopper with ether (0·720), closed, shaken round for a short time (violent shaking or partial filling of the flask gives rise to emulsions) and allowed to stand for several days. The ether abstracts resinous impurities; it is removed, and the treatment repeated until the ether remains colourless. Meanwhile the true digitalin has separated as a thick jelly, which is brought on to a perforated filter plate ("Nutsche") of relatively large surface, where it is allowed to drain thoroughly, it is then washed with small quantities of water containing 5 per cent. of alcohol, an operation which requires many days. The vacuum is applied only quite at the end, after which the precipitate is dried on a porous tile. The more thorough is the washing, the more easy is the subsequent "recrystallisation" of the digitalin from 95 per cent. alcohol (Arch. Pharm. **230**, 252), and the smaller is the loss. The filtrate from the digitalin contains the digitalein (Arch. Pharm. **237**, 458).

The original precipitate produced by ether is *at once* dissolved on the water-bath in 500 grms. of 85 per cent. alcohol, and the solution, without regard to any slight turbidity, allowed to stand in a covered dish for 48 hours. The crystalline digitonin is filtered off, washed with the least possible quantity of 85 per cent. alcohol, and spread out loosely to dry on porous tiles. The yield is 45–50 per cent. The crude digitonin may be recrystallised by the method given in Arch. Pharm. **231**, 460. The mother liquor of the digitonin is carefully saturated with ether and allowed to stand for eight days in a covered vessel; a crystalline crust of digitonin is generally obtained. Almost the whole of the glucoside in the original material is obtained in this manner.—A. C. W.

Iboga; Properties and Composition of ——, *and the Alkaloid it contains.* J. Dybowski and E. Landrin. Comptes Rend. **133**, [19], 748—750.

The natives of the French Congo chew the woody portions, especially the roots, of a plant called *Iboga*: it is said to enable persons to withstand fatigue for long periods, and to lessen the need of sleep. It also acts as an aphrodisiac. The sensations it produces are said to resemble those produced by alcohol, but it does not cloud the reason. The authors have extracted from the roots of the plant, by treatment with milk of lime, evaporation to dryness, extraction by ether, and repeated conversion into sulphate and reprecipitation by soda, an alkaloid, which they call *ibogaïne.* From 1 kilo. of the root they prepared 6—10 grms. of the alkaloid, which is well crystallised, of a light amber colour, insoluble in water, but readily soluble in alcohol, and in most organic solvents. Its solutions turn the plane of polarisation to the left. The substance melts at 152° C. It oxidises readily in the air, and forms salts with great ease when acted on by acids; of these salts the hydrochloride is the only one that crystallises well. The solutions of the salts are precipitated by most of the usual reagents for alkaloids. The formula is $C_{52}H_{66}N_6O_2$; and the physiological action of the alkaloid is the same as that of *iboga.*—J. T. D.

Rhamnus Purshianus (Cascara Sagrada); Essential Oil of ——. H. Haensel's Report. Pharm. Zeit. **46**, [86], 858.

By steam distillation, the bark of *Rhamnus purshianus* yields 0·055 per cent. of a concrete volatile oil of distinctly crystalline structure, having in a marked degree, the peculiar odour of the bark. It melts at 18·5° C. to a deep brown liquid, which gives an alcoholic solution of an intensely yellow colour, the reaction of which is slightly acid. The sp. gr. at 23° C. is 0·9475; it has an aromatic, pungent, slightly bitter taste. With the exception of *Rhamnus frangula*, no other member of the genus *Rhamnus* has hitherto been found to yield a volatile oil.—J. O. B.

Cordia Excelsa; Crystalline Body of ——. Thoms. Pharm. Post. **34**, [40], 634.

The so-called cordianine, of Peckholt, isolated from the fresh bark, and leaves of *Cordia excelsa* by extraction with alcohol, is found to be allantoine $C_4H_6N_4O_3$. It occurs to the extent of 0·266 per cent. in the fresh leaves, and 0·78 per cent. in the fresh bark. By repeated recrystallisation it is obtained in columnar colourless crystals, which melt, with decomposition, at 224° C. On destructive distillation, ammonium cyanide is the chief product. Although first discovered in the ammoti : liquor of animals and in other animal secretions, the base has also been found in vegetable tissue, by Schultze and Barbieri in the young shoots of *Platanus orientalis*, grown in water and by Schultze and Bosshart in the bark of the horse-chestnut. It is probably derived, in these cases, from vegetable albumin, and not from urea or uric acid, since it is doubtful if these bodies occur in the vegetable kingdom; urea has not been found to be present in the excreta of birds which feed solely on vegetable matter, although it is known to occur in that of those which are carnivorous. —J. O. B.

Berberine; Gaze's pure Base. H. M. Gordin and C. G. Merrell. Archiv der Pharm. **239**, [8], 626—637.

Two methods of obtaining pure berberine have been hitherto employed, that of liberating the base by means of barium hydrate, and that suggested by Gaze of heating the insoluble acetone berberine compound for 12 hours under a reflux condenser, with chloroform, by which means it was claimed by the originator that the acetone was split off and the pure base only left. Berberine thus obtained is markedly different both in appearance and in physical and chemical characters from the base obtained by the baryta method, and has not that affinity for CO_2 which, according to E. Merck, renders it impossible to prepare pure berberine except in an atmosphere of hydrogen.

If, however, Gaze's berberine be treated with sulphuric acid, and then precipitated with barium hydrate, the base obtained is identical, in every respect, with that obtained by the other method. Gaze's berberine is also found to be abnormal in behaviour both towards iodine and towards acids; it shows no basic action towards the latter, and with the former, although a precipitate is obtained, no iodine appears to be used up. The authors find that this abnormal behaviour is readily explained, the so-called pure berberine is not the free base, but its hydrochloride $C_{20}H_{17}NO_4.HCl.2H_2O$ formed by the decomposition of the chloroform by berberine acetone according to the equation.

$$4C_{20}H_{17}NO_4.C_3H_6O + CHCl_3 + 4H_2O = 3C_{20}H_{17}NO_4HCl + 2H_2O + C_{20}H_{17}NO_4HCO_2H + C_3H_6O.$$

They find that this interaction between berberine and chloroform invariably takes place, and is quantitative, being analogous to the well known reaction between caustic potash and chloroform. The only other base which has been found to react with chloroform in a similar manner is piperidine.—J. O. B.

Artemisin. P. Bertolo. Atti. R. Accad. dei Lincei Roma, **10**, [5], 111—116. Chem. Centr. 1901, **2**, [17], 937.

Merck has isolated *artemisin*, $C_{15}H_{18}O_4$, from the mother liquors obtained in the preparation of santonin from the seeds of *Artemisia maritima*. Artemisin forms colourless crystals, melting at 200° C., soluble in 3 parts of warm alcohol and 60 parts of boiling water: $[\alpha]_D = -84{\cdot}3°$ (observed with a 10 per cent. solution in 99·2° alcohol). With chloroform it gives an addition compound, $C_{15}H_{18}O_4.CHCl_3$, which loses chloroform at 80° C. On boiling with soda solution, artemisin dissolves to a carmine red solution, which becomes decolorised on cooling. The sodium salt formed in this manner yields artemisin again on treatment with dilute sulphuric acid, but with the concentrated acid, gives a new crystalline compound, melting at 170—171° C. With hydroxylamine, artemisin gives an oxime, $C_{15}H_{18}O_3NOH$, white needles from methyl alcohol, m. pt., 233—234° C., slightly soluble in water, easily soluble in alcohol, ether and chloroform. With phenyl hydrazine, a semi-solid phenyl-hydrazone is obtained. Artemisin appears thus to be analogous to santonin, in that it contains a lactone group and a keto-group.—A. S.

Cantharides: valuation of ——. K. Dieterich. Pharm. Centralhalle, **42**, 674, Apoth. Zeit. 1901, 687.

From the amount of cantharidin obtainable from available commercial "Spanish flies," the author concludes that the requirement of the Ph. G. IV. for a cantharidin content of 0·8 per cent. is too high, and that an average of 0·6 per cent. obtained by the official method of Baudin, is sufficiently stringent. The official process should be further modified by pressing the powdered drug so as to obtain 52 grms. of chloroform extract, and the drying of the cantharidin obtained should be carefully conducted, since it is appreciably volatile at 100° C., at which temperature loss may be incurred by sublimation. In the following experiments the amount of free cantharidin was determined by merely omitting the addition of acid in the process of extraction. The brown beetles (*Mylabris*), were found to yield a well crystallised pure cantharidin in greater quantity than the green beetles (*Cantharis*); from the latter also, the cantharidin was less pure, and partly amorphous. Copper was detected in the ash of cantharides.

—	Green Cantharides (Cantharis vesicatoria).	Brown Cantharides (Mylabris cichorii).
	Per Cent.	Per Cent.
Ash of whole beetles	5·05 to 6·02	3·98 to 5·01
Ash of powdered beetles .	5·23 to 7·47	4·16 to 5·10
Free cantharidin	0·28 to 0·56	0·67 to 1·01
Combined cantharidin ...	0·08 to 0·3	0·136 to 0·95
Total cantharidin........	0·38 to 0·85	0·73 to 1·92
Water, in whole beetles ..	10·06 to 15·94	10·12 to 12·54
Water, in powdered beetles	7·06 to 15·05	7·53 to 11·64

It is recommended, therefore, that *Mylabris*, as well as *Cantharis*, should be recognised as the official source of the vesicant.—J. O. B.

Eucalyptus Oils (New). R. T. Baker. Proc. Linnean Soc. New South Wales, 1900, [2], 303, through Schimmel's Report, Oct. 1901, 27.

Eucalyptus delegatensis (white ash, silver-topped mountain ash), yielded 1·76 per cent. of pale lemon coloured oil, sp. gr. 0·8602; $[\alpha]_D = -68{\cdot}12°$, consisting chiefly of lævophellandrene, and containing neither cineol nor eudesmol.

Eucalyptus intertexta (spotted gum), gave varying quantities of oil, not exceeding 0·64 per cent., which was of a brownish yellow colour; sp. gr. 0·9078; $[\alpha]_D = +10{\cdot}7$ containing much dextropinene, 37 per cent. of cineol, but no phellandrene.

Eucalyptus morrisii (grey mallee), afforded 1·69 per cent. of faintly-coloured oil, with an odour of aldehydes; sp. gr. 0·9097; $[\alpha]_D = +6{\cdot}7°$; it consists of dextropinene and more than 50—60 per cent. of cineol, but contains neither eudesmol nor phellandrene.

Eucalyptus viridis (green, red, or brown mallee), gave 1·06 per cent. of pale brownish yellow oil with an odour recalling that of cuminaldehyde; sp. gr. 0·900 C.; $[\alpha]_D = -8{\cdot}90°$. It yields less than ten per cent. of cineol and some lævopinene, but neither eudesmol nor phellandrene. An aldehyde (cumin aldehyde ?) is present in the higher boiling portion.

Eucalyptus vitrea (white top messmate), yielded 1·48 per cent. of colourless oil, sp. gr. 0·886; $[\alpha]_D = -33{\cdot}92°$. It contains no phellandrene, but from 20 to 26 per cent. of cineol, and in the higher boiling fractions, some citral. —J. O. B.

Eucalyptus Oil; Terpeneless ——. H. Haensel's Report. Pharm. Zeit. **46**, [86], 858.

Australian eucalyptus oil has been found to yield, on an average, 17 per cent. of terpene; the characters of the original oil, terpene, and terpeneless oil being shown in the following table:—

—	Original Oil.	Terpeneless Oil.	Terpene.
Sp. gr. at 15° C.	0·9122	0·9382	0·8677
Opt. Rot. at 20° C.	−1·46	−1·72	−13·07
Refraction index at 20° C.	1·4667	1·4679	1·4766
Zeiss-Wollny Refractometer number.	61·3	63·6	77·2

When cooled to −16° C. partial solidification took place in the terpeneless oil.—J. O. B.

Menthol; Halogen Derivations of ——, *and certain Hydrocarbons therefrom.* N. Kursanoff. Annalen, **318**, [2, 3], 327—344.

Menthyl chloride is a mixture of at least two isomers; one dextrorotatory and easily converted into menthene, the other lævorotatory and much more stable; in addition to these secondary chlorides there may also be a tertiary chloride. The author heated an ethereal solution of menthyl chloride, prepared by the action of phosphorus pentachloride on menthol, with sodium. The fraction of the product, boiling below 200° C., consisted of menthene, $C_{10}H_{18}$, and menthane, $C_{10}H_{20}$; the higher fraction distilled at 195°—197° C. under 30 mm. pressure. After purification, it consisted of two isomeric dimenthyls, $C_{20}H_{38}$, of which the crystalline isomeride melted at 105·5°—106° C. and boiled at 185°—186° C. under 21 mm. pressure, $[\alpha]_D = -51° 18'$. The second isomeride was an oil.

Menthyl iodide, obtained by heating menthol with hydriodic acid, when boiled with sodium in ethereal solution, gave the same products, but the crystalline dimenthyl in much smaller yield than the fluid. Menthyl chloride, similarly prepared by heating menthol with a large excess of hydrochloric acid in sealed tubes, had $[\alpha]_D = -24° 57'$. When boiled with ether it gave about equal yields of the solid and fluid dimenthyls.

Pure secondary menthyl chloride was prepared by heating the chloride, produced by the action of phosphorus pentachloride on menthol, with strong alcoholic potash until the menthyl chloride was no longer decomposed. The residual chloride boiled at 109°—110° C. under 30 mm. pressure; $[\alpha]_D = 50° 57'$. It was unaltered by heating with alcoholic potash in a sealed tube, or by boiling with aniline. The yield of stable chloride is about 25—30 per cent., a lower yield is obtained by boiling with aniline. The menthyl chloride obtained by heating menthol with hydrochloric acid also produced the stable chloride.

Stable menthyl chloride, when heated with sodium, gives the crystalline dimenthyl almost pure and without the oily isomeride. The optical activities of the stable menthyl chloride and of dimenthyl show that the former is a secondary chloride.

Attempts were made to obtain tertiary dimenthyl. Menthene was mixed at 0° C. with acetic acid saturated with hydrobromine acid gas, after standing 36 hours the menthyl bromide was separated and distilled. When boiled with sodium in ethereal solution, it gave a very small quantity of a dimenthyl, which boiled at 199°—202° C. under 21 mm. pressure and was not identical with the previous dimenthyl. Similar results were obtained with tertiary menthyl chloride.

Ethylmenthane was prepared from the stable menthyl chloride by the action of zinc ethyl; it boiled at 209°—210° C., $[\alpha]_D = -12° 15'$.—A. C. W.

Anethol. Schimmel's Report, Oct. 1901.

Although anethol now replaces anise oil in the German Pharmacopœia, [IV.], no reference, in the official test, is made to the optical behaviour; the point is of importance since pure anethol is optically inactive. The figures published by Pancoast and Kebler [Amer. Journ. Pharm. **75**, 356], show that impure anethol is still frequently met with in commerce. All the specimens reported on by them had an exceptionally low freezing point, a slight optical activity, and boiled between the temperatures 210°—235° C. These samples were evidently adulterated, or imperfectly purified. Attention has previously been called to the fact that prolonged storage under unsuitable conditions is detrimental to anethol, due to a process of oxidation, so that ultimately crystallisation becomes impossible. Care should be taken when applying the congealing point test, not to carry the temperature too low quickly. The melting and congealing point, when correctly obtained, are closely approximate. Freshly prepared pure anethol congeals always at 21° C., or a little above, and remelts between 22·5° and 22·7° C.—J. O. B.

Perfumes; New Method of Improving ——. Lavollay and Bourgoin. Rev. Prod. Chim. **3**, [23], 358.

The essential oils to be improved are treated with calcium (or other alkaline earth) manganate, or other insoluble manganates, in presence of an electric current, the operation being conducted in the cold and in a closed vessel provided with an escape for the excess of gas produced. The amount of manganate employed is about 20—50 grms. per hectolitre of essential oil, and the strength of current ranges from 3 to 10 ampères per square metre of electrode surface. The operation should not exceed twenty minutes.

The action of the manganates under these conditions is claimed to be superior to ozone, besides being constant, easily regulated, and less expensive.—C. S.

Vanilla; Formation of the Perfume of ——. H. Lecomte. Comptes Rend. **133**, [119], 745—748.

The author has discovered in many parts of the vanilla plant an oxidising ferment; and those varieties which are in highest esteem are precisely those which contain this oxydase most abundantly. At first it seemed that this ferment must be destroyed by the treatment of the pods, which are plunged for about 20 seconds into water at 80°—85° C.; but the author has found that the interior of the pod under these circumstances never reaches 50° C., so that the ferment, instead of being destroyed, is brought to a temperature very favourable to its activity.

A second ferment has also been found in the plant, which hydrolyses starch; and the author suggests that this ferment transforms coniferin, present in the pod, into glucose, and coniferyl alcohol, the latter of which is converted into vanillin by the action of the oxydase. He hopes to give experimental confirmation of this hypothesis when further material is available.—J. T. D.

Bergamot Oil; A new Crystalline Constituent of ——. H. V. Soden and W. Rojahn. Chem.-Zeit. 1901, **25**, [80], Rep. 282. From Pharm.-Zeit. 1901, **46**, 778.

Bergapten is already known as a crystalline constituent of bergamot oil. The distillation-residue contains *bergaptin*, which crystallises from light petroleum spirit as whitish leaflets, melts at 59·5° C., dissolves easily in ether, chloroform, and alcohol, and readily absorbs bromine. Phenolic and methoxy groups are absent.—R. L. J.

Lavender Oil; the Solubility Test for, of the German Pharmacopœia ——. Schimmel's Report, Oct. 1901, 35.

The German Pharmacopœia [Editio IV.] requires that lavender oil should be soluble in three volumes of dilute alcohol (68 to 69 per cent. by volume). This requirement is found not to be met by certain oils of good quality. An oil having the prescribed ester content (29 to 30 per cent.) gives a clear solution with 3 to 3·5 volumes of 68 per cent. alcohol, and with 3 volumes of 69 per cent. alcohol. But oils having a higher ester content require 3·5 to 4 volumes of 68 per cent., and 3 to 3·5 volumes of 69 per cent. alcohol to give a clear solution. The solution in 68 per cent. alcohol soon becomes turbid, and remains so on adding more of that solvent. The solution in 69 per cent. alcohol remains clear, but shows opalescence on adding more solvent. Oils less rich in esters do not thus separate on further addition of alcohol. It is suggested that the official strength for diluted alcohol should be made less indefinite,

and that exactly 70 per cent. should be the standard trength. All good lavender oils give a perfectly clear olution with 2·5 to 3 volumes of spirit of this strength.
—J. O. B.

Geranium Oil. Schimmel's Report, Oct. 1901, 30—32.

In consequence of the high price prevailing for geranium oil, J. Grec advocates (Reveil agricole, May 26th, 1901) the more extended cultivation of the plant, since it is not only a remunerative crop, but also occupies the land only during six months of the year. It is estimated that an hectare of land will carry 40,000 kilos of herb, which will sell to the distillers for at least 2,000 francs. This profit may be very largely increased if the grower distils his own crop. The plants require much manure and plenty of water. The land under geranium crops in the Grasse district have become exhausted owing to the method of irrigation, and although the amount of manure used has been more than doubled, the crops continue to diminish each season. It is probable, therefore, that the cultivation of geraniums will cease to be conducted in the Grasse districts, and that, like that of violets, it will be moved to Venice and its neighbourhood. *Spanish* geranium oil undoubtedly occupies the highest position with regard to quality, and is in consequence of its fine aroma particularly suited for use in high-grade products, such as are required in the tobacco trade. *French* geranium oil differs so little in quality from that of Algeria that its higher price would seem to be hardly justified. The position of *East Indian* geranium oil is unsatisfactory. The production has not attained expectations. At the commencement of the season, genuine oil of high quality was only obtainable in small quantities, and shortly afterwards only second quality oil could be bought, and the supply of this was exhausted by last March. The exceptional drought which prevailed in the Kandesh district during the harvest is the cause of the failure of the crop. As a consequence, East Indian geranium oil is this season of poor quality, or adulterated with fractions of citronella oil.
—J. O. B.

Ylang-ylang Oil [*Isoeugenol a Constituent of*].
Schimmel's Report, Oct. 1901, 53.

Isoeugenol has been isolated from the constituents of ylang-ylang oil, this being the first instance of the phenol being recorded as occurring in a natural product. On fractionating the phenols removed from the oil by alkali, the portion distilling under 12 mm. pressure at 142—147° C. was found to have a marked odour of isoeugenol. It formed a benzoyl compound melting at 103° to 104° C., identical with that obtained with synthetic isoeugenol, a corresponding acetyl compound melting at 79°—80° C., and a dibromide of methyl isoeugenol melting at 101°—102° C. The lower boiling fractions of ylang-ylang oil appear to contain creosol. The acids present are benzoic and salicylic acids in the form of methyl and benzyl esters. Dextro-pinene has been isolated from the terpenes present, and the oil also contains a body probably a ketone, with a peculiar odour, which boils at 145°—148° C.—J. O. B.

Mandarin Oil; Artificial ——. Schimmel's Report, Oct. 1901, 36.

It having been shown that the characteristic odour of mandarin orange oil is due to the presence of the methyl ester of methyl-anthranilic acid (this Journal, 1900, 848) together with dextrolimonene, and small quantities of dipentene, decylaldehyde, nonylaldehyde, linalool, and terpineol, the synthesis of the oil has now been effected, and artificial mandarin oil is a commercial article. Its odour and physical characters it is claimed that the synthetic oil closely resembles the natural product, while the cost is about one half.—J. O. B.

Rue Oil. Schimmel's Report, Oct. 1901, 46.

In addition to methyl-n-nonylketone (this Journal, 1901, 606) Thoms finds that a condensation product of that body with benzaldehyde, having the formula $C_{18}H_{26}O$, is also present. It occurs in small, greasy crystals melting at 44°—45°, which are readily soluble in alcohol, ether, and chloroform. There is also present in rue oil, a blue fluorescent basic body, which may be extracted by shaking out with acid and is almost certainly the methyl ester of methyl anthranilic acid, which has previously been isolated from mandarin oil (this Journal, 1900, 848).—J. O. B.

Citron Oil. H. E. Burgess. Analyst, 1901, **26**, 260—262.

The author obtained a genuine sample of this oil, and has examined it with the following results:—Sp. gr. at 15° C., 0·8513; refractive index $[N]_D$, 20° C., 1·4750; optical rotation $[\alpha]_D$, 100 mm. = +80°, 13′. On distillation a principal fraction boiling at 170° to 174° C., and having a rotation of +89° was obtained; it was identified as limonene. Another fraction representing about 6 per cent. of the oil gave all the reactions of citral. The original oil had a considerable deposit of resinous and crystalline matter which was filtered off and extracted with chloroform; on standing crystals were formed which when recrystallised from alcohol melted at 115° C., and had the formula $C_{13}H_{18}O_6$.—J. L. B.

Thyme; Some Essences of ——. P. Jeancard and C. Satie.
Bull. Soc. Chim. 1901, **25**, [18], 893—895.

Essence of thyme is valued according to the proportion of phenols it contains, and it is generally assumed that a pure essence ought to contain 25—30 per cent. Having occasion to examine several absolutely pure essences the authors found that the percentages of phenols varied from 5—60 per cent. They have distilled Algerian red thyme and essence of ajowan in a current of steam, and collected the distillate in separate portions. They conclude from their investigations that most of the phenols pass over towards the end of the distillation; the sp. gr. is a function of the phenolic contents, and rises about 0·0014 for each 1 per cent. of phenols, whilst the solubility in dilute alcohol, the surface tension, and the viscosity increase with the amount of phenols present. This behaviour of the essence of thyme on distillation corresponds with that which the authors have already found for essence of lavender; the ether contents of this essence largely depend upon the manner in which the distillation is conducted. Hence the 25—30 per cent. of phenols generally assumed obligatory in a pure essence of thyme is an arbitrary limit, and can at most be taken as a mean value.—T. A. L.

Calamus Oil; Constituents of ——. H. Thoms. Zeits. angew. Chem. 1901, **14**, [41], 1019—1020.

In a previous communication (this Journal, 1901, 606). Beckstroem, and the author stated that the fractions of highest boiling-point contained, in addition to asarone, a crystalline compound (calamus camphor) melting at 158° C., and having the composition, $C_{15}H_{26}O_2$. The same compound was also isolated by Soden and Rojahn (this Journal, 1901, 833). This substance was found to contain an alcohol related to the sesquiterpene alcohols. On boiling calamus camphor with sulphuric acid of 50 per cent. strength, 2 mols. of water are eliminated, and a hydrocarbon, $C_{15}H_{22}$ obtained. This boils at 144° C., under a pressure of 15·5 mm.; and has a sp. gr. of 0·9324 at 23° C., and a specific rotation of $[\alpha]_D$, (26°) = −11·31°. The reverse formation of the alcohol from the hydrocarbon could not be brought about.

After removing the asarone and calamus camphor by crystallisation from the fractions of higher boiling point, the residue was treated with 80 per cent. phosphoric acid, or better with 90 per cent. arsenic acid, and on heating the liquid, a white plastic mass separated out. This, on extraction with petroleum spirit, yielded an oil boiling at 180° C., under 30 mm. pressure, and having the composition $C_{15}H_{24}O$. The white mass rapidly became coloured on exposure to the air. On treatment with water, the whole of the combined arsenic acid was gradually dissolved out, leaving a white amorphous body, which was readily soluble in acetone. On the addition of water to this solution microscopic crystalline needles (m. pt. 173°—181° C.) were deposited. Its formula agreed with that of asarone ($C_{12}H_{16}O_3$), whilst its molecular weight, determined by Beckmann's method, was three times as great. The author therefore concluded that it was a polymer of asarone and gave it the name of parasarone.

That asarone yields a polymeric modication on treatment with 40 per cent. arsenic acid was shown by treating a solution of asarone in pinene, with arsenic acid of that strength, when a white plastic mass was obtained, which yielded a compound with the same properties as the parasarone described above.

On oxidation asarone yields asaryl aldehyde, but this was not formed by the oxidation of parasarone. The latter is for the most part reconverted into asarone, when distilled under reduced pressure.

The substances which have now been found in the higher-boiling fractions of calamus oil are as follows:—Acetic acid, œnanthic acid, palmitic acid, eugenol, calamus camphor, asarone, and an alcohol of the composition, $C_{15}H_{24}O$, which probably stands in a close relationship to the hydrocarbon, $C_{15}H_{22}$, which can be obtained from calamus camphor.—C. A. M.

Copaiba Balsams; Resins of ——. E. Keto. Archiv der Pharm. **239**, [7 and 8], 548—580.

In their general chemical characters the Copaiba oleo-resins are closely allied to the coniferous secretions, consisting mainly of amorphous acid resins, volatile oil, with varying amounts of indifferent resene resins, and small quantities of crystalline acid resins. When the ethereal solutions of these oleo-resins are shaken out with different alkaline solutions according to the method of Tschirch, the various constituents may be isolated.

Pará Copaiba "Balsam."—In addition to volatile oil, resene, and amorphous acid resins a crystalline acid, pará-copaivic acid, $C_{20}H_{32}O_3$ melting at 145°—148° C., soluble in ammonium carbonate solution, was isolated. It occurs in pointed and quadratic leaflets. Another crystalline acid, insoluble in ammonium carbonate solution is also present; this is homo-pará-copaivic acid, $C_{18}H_{28}O_3$, melting at 111°—112° C., and crystallising in pointed needles.

Maracaibo "Balsam."—This contains β-metacopaivic acid, $C_{11}H_{16}O_2$ (or possibly $C_{16}H_{24}O_3$ or $C_{22}H_{34}O_2$) melting at 89°—90° C. separating in pointed prisms. From another sample of balsam, illurinic acid, $C_{20}H_{28}O_3$, was isolated, as hexagonal pyramids melting at 128°—129° C.

Illurin (African) Copaiba Balsam.—African copaiba balsam contains from 2 to 3 per cent. of a strongly lævorotatory, dimorphous, crystalline acid, illurinic acid, $C_{20}H_{28}O_3$ separating in fine hexagonal hemihedral or hexagonal hemihedral crystals, having in alcoholic solution, the specific rotation $[\alpha]_D = -54° 89'$; melting when quite pure at 128°—129° C. It is a powerful acid, and forms crystalline salts with alkalis, with barium and with lead. Its silver salt is amorphous. The crystalline barium salt $(C_{20}H_{27}O_3)_2Ba + (4H_2O ?)$ is characteristic. When an ethereal solution of the acid is shaken with baryta water a few needles appear in a few minutes, and then, suddenly, the whole ethereal layer is covered with a network of fine needles. From the iodine and bromine number the presence of two ethylene groups in the molecule is indicated. This acid is probably identical with the crystalline acid of African copaiba balsam previously described by Umney and by Peinemann, and also closely resembles the oxy-copaivic acid of Fehling. Schweitzer and Rose's copaivic acid and the meta-copaivic acid of Strauss have not been isolated by the author.—J. O. B.

Asarum Canadense; Constituents of the essential oil of ——. F. B. Power and F. H. Lees. Proc. Chem. Soc., 1901, **17**, [242], 210.

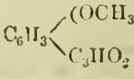
In a previous investigation of this oil by one of the authors (Power, Inaug. Diss. Strassburg, 1880; Proc. Amer. Pharm. Assoc., 1880, **28**, 464) it was found to contain a terpene, $C_{10}H_{16}$: two fragrant alcohols, b. p. 196°—199° and 222°—226°, both having the composition $C_{10}H_{18}O$; a nearly inodorous body, b. p. 254°—257°, which, on oxidation with chromic acid, afforded a crystalline acid, $C_9H_{10}O_4$, the latter having since been shown to be veratric acid by Petersen (Ber., 1888, **21**, 1062), who has also identified the substance affording it as methyleugenol; a deep blue oil collected at 275°—350°; a large amount of acetic acid combined with the alcohols of the oil in the form of esters, and a very small amount of a less solubl oily acid which was believed to contain valeric acid.

The present investigation has shown the oil to have much more complex composition than was at first supposed The authors have now identified the following compounds most of them by well-defined crystalline derivatives. (1) A phenol, $C_9H_{12}O_2$, having a creosote-like odour; (2) pinen (nitrosochloride, m. p. 103°—104°, and nitrolpiperidine m. p. 118°—119°); (3) *d*-linalool (citral and citryl-β naphtho-cinchoninic acid, m. p. 195°—198°); (4) *l*-borneo (camphor, m. p. 175°, $[\alpha]_D = -40·3°$, and oxime, m. p 115°—116°); (5) *l*-terpineol (a ketolactone, $C_{10}H_{16}O_3$, m. p 62°—63°; terebic acid, $C_7H_{10}O_4$, m. p. 173°—174°; an dipentene dihydriodide, $C_{10}H_{18}I_2$, m. p. 80°); (6) geranio (diphenylurethane, m. p. 81°—82°, and citral); (7) methyleu genol (bromomethyleugenol dibromide, $C_6H_2Br(OCH_3)_2·C_3H_5Br_2$, m. p. 78°—79°; it is also shown that methyl*iso* eugenol does not exist in the oil); (8) a blue oil, boilin above 260°, and consisting of oxygenated compounds o undetermined composition but of alcoholic nature; (9) lactone, $C_{14}H_{20}O_2$, having a very aromatic odour, but presen in the oil in very small amount; (10) palmitic acid; (11 acetic acid; (12) a mixture of fatty acids, $C_6H_{12}O_2$ t $C_{12}H_{24}O_2$. The acetic acid is contained in the oil in th form of esters, whilst the higher fatty acids are in a fre state.

A quantitative determination of the principal constituent was made. The amount of methyleugenol, determined b Zeisel's method, was found to be 36·9 per cent. Th amount of esters, calculated as $C_{10}H_{17}·C_2H_3O_2$, is 27·5 pe cent.; the free alcohols, $C_{10}H_{18}O$, 13·3 per cent. Th amount of pinene obtained by direct fractionation of th oil was about 2 per cent., and the amount of high boilin constituents, such as the blue oil, is therefore about 20 pe cent.

Limettin; Constitution of ——. W. A. Tilden and H. Barrows. Proc. Chem. Soc. 1901, **17**, [242], 216.

In a previous communication (this Journal, 1892, 264), i was shown that limettin, $C_{11}H_{10}O_4$, had the followin constitution:



$$C_6H_3 \begin{matrix} \nearrow (OCH_3)_2 \\ \searrow C_3HO_2 \end{matrix}$$

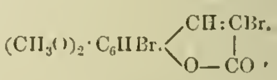
Further experiments have been undertaken, with the objec of determining the structure of the group C_3HO_2.

In the meantime, the publication of a communicatio (Citroptene) by E. Schmidt (this Journal, 1901, 1017) o a substance which he has isolated from oil of lemon an has identified with limettin, and the appearance of a recen note by Burgess (this Journal, 1901, 1745 and 844), rende it necessary to place on record the following results although at present incomplete.

The dibromo compound previously described by Tilde (*loc. cit.*) melts at 297° with decomposition, and not a 257°.

On treatment with 10 per cent. solution of potash, i yields an acid of the composition $C_{11}H_9O_5Br$. Continue treatment with potash does not remove the second atom o bromine.

It is therefore highly probable that the structure of th group C_3HO_2 is similar to that of the ring in coumarin dibromocoumarin behaving in exactly the same way Dibromolimettin may therefore be represented as—



$$(CH_3O)_2·C_6HBr. \begin{matrix} \nearrow CH:CBr. \\ \qquad | \\ \searrow O—CO \end{matrix}$$

Alcohol in Ether; Determination of ——. F. Freyer.

See under XXIII., *page* 1250.

Lemon Oil Industry; The ——. H. Burgess and J. F. Child.

See page 1176.

Clove Oil; Determination of Eugenol in ——. A. Verle and T. Bölsing.

See under XXIII., *page* 1250.

Coca Leaves; Assay of ——. W. R. Lamar.

See under XXIII., *page* 1250.

Guaiacol; Approximate Determination of ——. Adrian.

See under XXIII., *page* 1251.

XXI.—PHOTOGRAPHY.

Sodium Perborate [*Photography*]. J. M. Eder and E. Valenta. Chem. Ind. 1901, **24**, [20], 560.

Sodium perborate, $NaBO_3 + 4H_2O$, is prepared by the electrolysis of a cold concentrated solution of sodium borate. Foutar has recommended it for the removal of residual thiosulphate in insufficiently washed prints. The solution of the salt is stable, and has little action on the silver image. Although alkali persulphates have been used with advantage as photographic reducers, sodium perborate, like the permolybdates, pervanadates, perchlorates, &c., is not suited for this purpose.—A. S.

Developer; New Photographic ——; *and a new Method for the production of Aromatic Oxy-Alcohols.* A. Eichengrün. Zeits. angew. Chem. 1901, **14**, [42], 1070—1071.

The reaction of formaldehyde and salicylic aldehyde in the presence of strong hydrochloric acid, yielding a chlormethyl derivative having the composition $C_6H_3.CHO.OH.CH_2Cl$, has been extended to other oxy-compounds. Thus salicylic acid was made to yield $C_6H_3.COOH.OH.CH_2Cl$, which, by the action of water is converted into the corresponding alcohol. This, on oxidation yielded first a *p* aldehydo-carbonic acid (which with sodium amalgam gave a product identical with that produced by the action of the amalgam on Reimer's *p*-aldehydosalicylic acid), and then 4-oxyisophthalic acid $C_6H_3.COOH.(OH).CO.OH$. The *p*-oxymethylsalicylic acid now produced for the first time, melts at 140° C. The chlorine atom of the chlormethylsalicylic acid and its analogues is very readily displaced, so that esters, ethers, &c. are readily prepared. Phenols may be made to yield such products as *β*-oxynaphthyl-*o*-oxy-*m*-toluyl acid ($C_6H_3.COOH.OH.CH_2.C_{10}H_7.OH$), which is now found on the market under the name "Epikarin," as a remedy for itch and other skin diseases. The chlormethyl derivatives of nitrophenol (and the alcohols yielded by them) can be reduced to amido compounds. Of these the ortho derivative is a weak, the para-derivative ($C_6H_3.OH.CH_2OH.NH_2 = 1:3:4$), an exceedingly powerful photographic developer. The *o*-amidometaoxybenzyl alcohol will shortly be placed on the market under the name *Paramol*. As a developer, this substance stands between those of the phenol class (pyrogallol, hydroquinone, &c.) and those of the amidophenol class, the so-called rapid developers, rodinal and metol. In its action it is nearly equal to the rapid developers. It is, however, more like the phenol developers in developing through more slowly, and in being readily weakened by the addition of sodium bicarbonate. Hence with paramol developers errors of exposure may be rectified, as in the case of pyrogallol, whilst there is less tendency to "fogging," and to staining of the hands and plates, than when pyrogallol is used. In respect to solubility also, paramol stands between the two classes, its solubility being 1:12, whilst that of amidophenol, for instance, is only ½ per cent. Thus, whilst working solutions of the rapid developers must be made with the aid of caustic alkalis, concentrated solutions of paramol may be prepared with alkali carbonates.—W. G. M.

[*Photographic*] *Chrome Pictures; a New Method of intensifying* ——. G. Hauberisser. Phot. Rundsch. 1901, **15**, 200. (Through Chem. Zeit. Rep. 1901, **25**, [83], 304.)

Bichromate of potash mixed with organic matter (*e.g.*, gum arabic) applied to paper, and exposed to light, gives up a portion of its oxygen and becomes the unstable, dark brown, amorphous chromium chromate. By the further action of light, sulphides, photographic developers, or other reducing agents, this compound is still further reduced to Cr_2O_3 or $Cr(OH)_3$. Hydrogen sulphide is the best reducing agent for the purpose (especially if the paper is moist, or is laid in a solution of the gas, yielding very rapidly a clear green, instead of a brown, image where the paper had been exposed to light, thus—

$$4Cr_2O_3.CrO_3 + 6H_2S + 12H_2O = 12Cr(OH)_3 + 3S_2.$$

Eder has shown that potassium bichromate reconverts the hydroxide into chromium chromate, thus—

$$Cr_2O_3 + K_2Cr_2O_7 = Cr_2O_3.CrO_3 + K_2CrO_4.$$

The intensification process is based on these two reactions. From 2 mols. of chromium chromate are produced 3 mols. of chromium hydroxide, which can then be reconverted into 3 mols. of the chromium chromate. By alternations of this treatment, a weak image may be intensified as desired. Further intensification may then be effected in another way, viz., by the addition of a metallic salt, such as $MnSO_4$, or $CuSO_4$, which gives a precipitate with chromate, but not with bichromate of potash, the necessary chromate being produced *in situ* by the action of the bichromate on the hydroxide. The practical use of this method is somewhat restricted, but it possesses great theoretical interest.

—W. G. M.

XXII.—EXPLOSIVES, MATCHES, Etc.

Chlorate Explosives less Susceptible to the Action of Heat; Manufacture of ——. J. Bonnet, Paris. Ger. Pat. 124,237, Sept. 1900. Zeits. angew. Chem. 1901, **14**, [44], 1120.

In the manufacture of explosives, consisting of a solution of aromatic nitro- or azo-compounds in a vegetable oil or fat to which chlorates or perchlorates are added, an advantage is derived by employing the free fat-acids in place of part or the whole of the fat generally used. This advantage lies in the relatively higher melting points of the fat-acids, and consequently the explosive mixtures so prepared resist the action of hot climates without softening.

—J. F. B.

Pyroxylin; Instructions for Making ——. Brit. J. Phot. 1901, **48**, [2162], 643.

Hardwick's instructions of 40 years ago are repeated with modifications; Sulphuric acid (ordinary commercial), 33 oz.; nitric acid of sp. gr. 1·42, 7 oz.; water, 4¼ oz., are weighed out and placed in a porcelain jar; after mixture the temperature is maintained at 150° F., and half an ounce of cotton wool (absorbent) is immersed in pellets of about 30 grains each, the mixture being stirred after each addition; after exactly 10 minutes, the cotton is squeezed into a lump, taken out, violently stirred about in a large vessel of water, washed until free from acid, and spread out to dry without heat. The product should have increased in weight not less than 20 and not more than 30 per cent.; outside these limits the collodion, ultimately made, will be difficult to use; too much water or heat will cause the cotton to be short and broken, and the resulting collodion will be opaque and papery looking; opposite conditions will give a collodion which will set in streaks or ridges.—J. W. H.

Phosphorus Suboxides: Non-existence of the so called ——. *Part II.* C. H. Burgess and D. L. Chapman. Proc. Chem. Soc. **17**, [211], 189.

Substances obtained according to the methods described by Michaelis and Pitsch (Annalen 1899, **310**, 45) and Michaelis and v. Arend (Annalen 1901, **314**, 259) have been prepared and analysed, and shown to contain such a large amount of hydrogen that they cannot be regarded as a suboxide, but as red phosphorus containing hydrogen compounds. The authors show that some of the analytical results of Michaelis and Pitsch indicate that the substances prepared by them contained water, and that the proof of the absence of hydrogen in the substance, described by them as a pure suboxide, is inconclusive.

As red phosphorus is easily soluble in aqueous alcoholic potash, with formation of a red solution, red phosphorus resembles in this respect the so-called suboxide.

The authors conclude that both the properties and the analytical results support the view that the substances hitherto described as suboxides of phosphorus are only impure forms of amorphous phosphorus.

PATENTS

Gunpowder: Improvements in the Manufacture of ——. C. H. Curtis, London, and G. G. André, Argyllshire. Eng. Pat. 19,773, Nov. 3, 1900.

Nitrocellulose powders tend to give varying ballistic results owing to their porous nature. It is claimed that the introduction of nitroglycerin in no greater proportion than is required for the complete filling of the pores produces regularity in ballistic results, a high velocity, moderate pressures, and a minimum erosive effect. In general from 12 to 20 per cent. of nitroglycerin is required, the exact proportion being determined with reference to the tendency of the nitrocellulose employed to produce a porous powder. The nitrocellulose used depends on whether ether-alcohol or acetone is the solvent employed. In the former case a nitrocellulose of 80 per cent. solubility is taken, in the latter one of 20 per cent. solubility is employed. For flake powders the following composition is given:—Nitrocellulose (80 parts), nitroglycerin (20 parts), vaseline (5 parts), while for cords or tubes the proportions are, nitrocellulose (76 parts), nitroglycerin (24 parts), vaseline (5 parts).—G. W. McD.

Priming; Improved ——, *for Detonating and Percussion Caps of various Descriptions.* M. Bielefeldt, Berlin. Eng. Pat. 20,133, Nov. 8, 1900.

It is proposed that such compounds as picric acid, nitronapthalene, nitrocellulose, &c., should be substituted wholly or in part for the fulminate of mercury in detonating or percussion caps. For use with safety explosives, aluminium nitrate is also added to the detonating composition. No proportions are given in the specification.—G. W. McD.

Explosive resembling Dynamite; Process for the Manufacture of a Safety ——. R. Kändler, Dresden. Eng. Pat. 20,799, Nov. 17, 1900.

Nitrate of potash (76 parts) is intimately mixed with a nitrocarbohydrate, nitrocellulose, nitrostarch, &c. (4 parts), and to this is added a nitrohydrocarbon, nitrobenzene, &c. (20 parts). The explosive is said to be safe for use in fiery mines, and when the proportion of saltpetre is increased to 85 per cent., it is specially adapted for coal getting.—G. W. McD.

Explosive Compounds; Improvements in ——. N. Ceipek, Vienna. Eng. Pat. 21,627, Nov. 29, 1900.

The addition of trinitrophenol to the ammonium nitrate class of explosives is said to increase the shattering effect without lowering the standard of safety. The proportions given are:—Ammonium nitrate (80 per cent.), aniline nitrate (10·9 per cent.), trinitrophenol (9·1 per cent.). The dry finely pulverised ammonium nitrate is mixed in a drum with the aniline nitrate and the trinitrophenol then added.
—G. W. McD.

Explosives; Improvements in ——. C. H. Curtis, C. L. W. Smith, D. J. Metcalfe, A. C. Pearcy, London, and A. F. Hargreaves, Roslin. Eng. Pat. 984, Jan. 15, 1901.

The claim is for the use of carbonate of magnesium or carbonate of manganese, preferably the former, for reducing temperature, extinguishing flame, and yet not materially affecting the dynamical power of explosives of the gunpowder type, when used in fiery mines. In ordinary gunpowder in which sulphur is present, there is little or no original safety, judged by the standard required to enable such explosives to be safely used in gaseous mines, and preference is therefore given, for the purpose in view, to explosives containing nitrate of potassium in excess of the amount required to fully oxidise the carbon present. Where saltpetre is present in such proportion that an excess is available for absorbing heat, or other cooling agent is present, it is considered that the proportion of either of the materials which can be effectively used will not be less than 1 per cent. or more than 10 per cent. The best results are obtained with the following mixture:—Nitrate of potassium (84·5 parts), charcoal (12·5 parts), and magnesium carbonate (3 parts).—G. W. McD.

Explosives: New or Improved ——. A. A. da Silva, Rio de Janiero. Eng. Pat. 12,617, June 20, 1901.

The claim is for the combination of guanidine with acid elements of common explosives, examples given being picrate of guanidine which can be incorporated with nitrates or chlorates to form an explosive mixture, and nitrate of guanidine which can be dissolved in alcohol or ether and then incorporated with nitrocellulose to produce a powder. No proportions are stated in the specification.
—G. W. McD.

PATENT.

Protecting the Barrels of Fire-arms from Rust or Corrosion, and for Cleaning the same. Preparations for ——. A. Beck, Graz, Austria. Eng. Pat. 15,078, July 21, 1901.

The preparation claimed consists of an aqueous solution of caustic potash, together with soft soap in Phœnix lye (crude soda, potash, water and partly saponified caustic alkalies, with 60 per cent. total alkalinity and $2\frac{1}{4}$ per cent. fatty acid content.), cleared by "liquid ammonia" or spirits of wine or common salt.—H. I.

XXIII.—ANALYTICAL CHEMISTRY.

APPARATUS, ETC.

INORGANIC CHEMISTRY.—QUALITATIVE.

Radiations; Coloration of Salts by ——. Goldstein. Chem.-Zeit. 1901, **25**, [84], 918. (Paper read at the Hamburg Meeting of the Ges. deutscher Naturforscher und Aerzte.)

The author has observed in other than haloid salts, when melted or strongly heated under the influence of cathode rays, a coloration, similar to that undergone by the haloid salts of the alkali-metals when treated in a cathode-ray tube. The salts become coloured under the influence of ultra-violet light. The grass green coloration of K_2SO_4, the grey of Na_2SO_4, and the rose-red of Na_2CO_3, were especially noteworthy. Exposed for some time to daylight, the salts lose their colours again. Ignited fluor-spar, exposed to cathode-rays, rapidly becomes grey, and, while coloured thus, phosphoresces brilliantly in the dark. The glow gradually dies out but returns strongly when the specimen is placed in hot water. The colour produced with two mixed salts is not merely that produced by a mixture of those of the components. Mere traces of impurities in the salts markedly affect the colours even $\frac{1}{100000}$ NaCl modifies the colour whilst $\frac{6}{100000}$ changes it completely. Absolutely pure oxy-salts show no coloration, but the presence of $\frac{1}{250000}$ of impurity gives rise to an unmistakable colour: hence a purity-test of great sensitiveness is now available. The presence of several impurities in small quantity causes the coloration to vary in course of time, and after exposure, the remanent tints gradually change, since the colours of different substances have different degrees of permanence on exposure to day light. Hence the presence of several impurities may be observed successively. Since oxy-salts show remanent coloration only after fusion, a ready test is at hand to prove whether a mineral has been produced by plutonic or sedimentary agencies. It is probable that, on heating, solid solutions of one salt in another are produced, and that ionisation commences and traces of impurities are dissociated. But, since the haloids of the alkali metals exhibit colours without previous fusion, and also when perfectly pure, it appears that, in the case of these salts, there is always a partial dissociation of the molecule. In course of the discussion it was elicited that aqueous solutions of the coloured salts are not distinguishable from those of the normal salts.—W. G. M.

Pyrite and Marcasite, and Methods of Distinguishing them. H. N. Stokes. Bull. U.S. Geological Survey, 1901, [186], 11—48.

The author sought to devise a chemical method by which the native forms of iron disulphide may be distinguished with certainty, and by which their relative amounts in mixtures of the two may be quantitatively determined. Pyrite and marcasite are usually distinguished by their differences of crystalline form, colour, density and ease of oxidation, but the results are very uncertain. After a large number of experiments, the author arrived at the following conclusions:—There is no well-established evidence of the existence of true paramorphs of pyrite after marcasite or of marcasite after pyrite; and the hypothesis that most natural specimens, even when well crystallised, are intimate mixtures of the two forms, is without foundation. Specimens crystallising in the regular system consist of true pyrite, and those forming rhomic crystals, of true marcasite. When the two are mingled or intergrown, it is generally possible to distinguish each by the colour after cleaning with acid.

The density does not afford a trustworthy means of determining pyrite or marcasite in mixtures of the two.

When pyrite or marcasite is boiled with an excess of a solution of a ferric salt to complete reduction of the latter, the ratio of sulphur oxidised to mineral decomposed is perfectly definite and characteristic of each mineral, provided certain standard conditions are observed. Under the conditions described in the paper, the percentage of sulphur oxidised in pyrite is about 60·4 per cent. and in marcasite about 18 per cent. of the total sulphur. These figures are the characteristic "oxidation coefficients." An empirical curve for the oxidation coefficients of mixtures of pyrite and marcasite can be constructed, by aid of which the composition of naturally occurring mixtures can be quantitatively determined.

In a sample of pyrite containing 3 per cent. or less of copper, it is possible to determine by the oxidation method, whether the copper is present as chalcopyrite or as chalcocite or bornite. Chalcopyrite mixed with pyrite or marcasite can be readily detected, if not in too small amount or too finely divided, by exposing the sample to bromine vapour for half a minute, and then to hydrogen sulphide gas; the chalcopyrite is blackened whilst the iron sulphides remain bright.

It is stated that the principle of the oxidation method, with appropriate modifications, is probably capable of wider application in distinguishing dimorphous minerals, in determining whether a given complex mineral is a mixture or compound of its simpler constituents, and in determining the nature of small amounts of impurities.—A. S.

Chromic Acid in presence of Vanadic Acid; Detection of ——. C. Reichard. Zeits. anal. Chem. 1901, 40, [9], 577—586.

The formation of the blue coloration, due to perchromic acid, produced by hydrogen peroxide in dilute solutions of chromic acid, is prevented by the presence of vanadic acid, or the coloration when obtained is rapidly destroyed, according to the amount of vanadic acid present. This action, which appears to be catalytic, is perceptible when one part of ammonium vanadate is present to 10 parts of potassium bichromate. Sodium phosphate and arsenate prevent the vanadic acid from destroying the coloration, other salts (sodium nitrate and nitrite, ammonium persulphate, potassium iodate and uranium nitrate) are without action. Molybdic and tungstic acids behave in a similar manner to vanadic acid.—A. C. W.

INORGANIC CHEMISTRY.—QUANTITATIVE.

Sulphur in Fuel, Determination of the Total ——. R. Dubois. Bull. Assoc. Belge des Chim. 15, (6), 225—227.

Superior results to those furnished by the Eschka method are yielded by the following modification:—One grm. of the powdered fuel is intimately mixed with manganese dioxide, 4 grms., potassium permanganate, 1 grm., and pure dry sodium carbonate, 2 grms., the whole being placed in a platinum crucible and covered with a thin layer of the same oxidising mixture. After heating gently for half an hour, the cover is removed and the crucible heated to dull redness, thus burning off all the combustible matter in the fuel. All the sulphur is transformed into alkali sulphate. After cooling, the contents of the crucible are washed into a glass with 40—50 cc. of boiling water; the solution is acidified with HCl, filtered, and the sulphuric acid in the filtrate determined by means of barium chloride. The reagents must be free from sulphur, or else the content determined by a blank experiment.—C. S.

Coal and Coke, Arsenic in ——. A. C. Chapman. Analyst, 1901, 26, 253—256.

The author criticises the existing processes for the estimation of arsenic in coals and cokes and suggests the following method:—From 0·5 grm. to 2 grm. of the finely divided fuel is intimately mixed with about 2 grms. of pure calcined magnesia and ½ grm. of dry sodium carbonate in a deep platinum or silver crucible. This is placed in a slanting position and heated by a flame which is just capable of keeping the bottom of the crucible at a dull red heat, the contents being stirred by means of a platinum wire from time to time. At the end of an hour the oxidation will be complete, and ½ grm. of pure ammonium nitrate is then added, and the crucible ignited more strongly for five minutes. The latter treatment is intended to oxidise any traces of sulphides which may have been formed, and which would tend subsequently to form insoluble arsenious sulphide, and so to remove it from the sphere of action in the Marsh apparatus. The powdery mass is washed into a beaker with dilute sulphuric acid and the solution is then concentrated so as to decompose any nitrate that may have remained after the above ignition. The solution is submitted to the modified Marsh-Berzelius method, and the mirror so obtained compared with the standard.

The following results will show that this method is accurate with larger amounts of arsenic than would ever occur in coal or coke. Weighed quantities of arsenical pyrites of known composition were mixed with coal in which the amount of arsenic present was negligible in comparison with that which was added, and the mixture treated as described above, save that the arsenic was determined gravimetrically as sulphide:—

Arsenic.

Taken.	Found.
Grm.	Grm.
0·0050	0·0042
0·0092	0·0096
0·0086	0·0085
0·0063	0·0055

In the subjoined table numbers are given showing the amounts of arsenic present in six samples of coal as well as in the coke made on a large scale from these samples, and in the ash, whilst the percentages of ash, iron and of calcium are also given.

Sample of Coal.	Arsenic in Coal.	Arsenic in Coke.	Ash of Coal.	Arsenic in Ash, calculated on Coal.	Iron in Ash, calculated on Coal.	Calcium in Ash, calculated on Coal.	Alkalinity of Ash.
	Grains. per lb.	Grains. per lb.	Per Cent.	Grains. per lb.	Per Cent.	Per Cent.	
1	1·4	1·7	6·4	0·6	2·27	Trace	Distinct
2	0·5	0·7	16·2	0·3	1·71	,,	Slight
3	0·7	1·0	6·7	0·3	2·62	None	Neutral
4	0·7	0·6	2·1	0·6	0·73	,,	,,
5	0·9	1·1	12·5	0·7	1·96	,,	,,
6	0·8	0·6	12·2	0·3	3·50	1·8	Very distin

There appears to be no definite relation between the amount of arsenic present in the coal and that left in the ash on ignition, the proportion being apparently dependent upon the composition of the ash, as well as upon the manner in which the ignition has been performed. The author considers that arsenic in coal exists almost entirely as a constituent of the pyrites present.—J. L. B.

Potassium Permanganate: Determination of ——, by means of Sodium Thiosulphate. A. Alander. Zeits. anal. Chem. 1901, **40**, [9], 574—577.

The author has quantitatively examined the reaction which occurs when sodium thiosulphate is added to potassium permanganate. The thiosulphate is mainly oxidised to sulphate — $8KMnO_4 + 3Na_2S_2O_3.5H_2O = 3Na_2SO_4 + 3K_2SO_4 + 2KOH + 8MnO_2 + 14H_2O$. A certain small quantity of tetrathionate also appears to be produced.

—A. C. W.

Potassium in Mixtures of Salts; Separation and Determination of Small Quantities of ——. F. H. van Leent. Zeits. anal. Chem. 1901, **40**, [9], 569—573.

Potassium may be quantitatively separated from solutions containing much sodium, calcium and magnesium by means of sodium cobaltinitrite (see this Journal, 1900, 852); the precipitate is, however, not of constant composition, but can be used as an intermediate stage in the determination. The author has employed this method to determine the potassium in sea water, taken at Scheveningen at ebb-tide. The sp. gr. of the sample was 1·0224 at 15° C.; it contained 16·522 grms. Cl in the litre, and was thus not greatly diluted by river water. The filtered water (300 c.c.) was evaporated until sodium chloride began to separate, it was then filtered and the residue washed, when gypsum was left. From another portion of 500 c.c., calcium and magnesium were separated partially by sodium carbonate and the filtrate acidified with acetic acid.

The cobalt reagent contained 9·58 grms. of crystallised cobalt chloride and 25 c.c. of glacial acetic acid in 500 c.c. The nitrite solution contained 90 grms. of sodium nitrite in 500 c.c. Immediately before use equal volumes of these solutions were mixed and 80 or 130 c.c. added to the liquids prepared as above. The mixture was kept at 40—50° C. for 6—7 hours, and then allowed to stand overnight in the cold, the precipitate was several times washed with the reagent, and then with 80 per cent. alcohol until the washings were colourless. The filtrate never gave a further precipitate on treatment with more reagent. The potassium in the dried precipitate is best weighed as perchlorate; for this purpose it was decomposed with hydrochloric acid; the filter was incinerated in a platinum crucible just at a red heat, the ash extracted with water and the extract added to the main liquid, which was evaporated to dryness and again evaporated with dilute hydrochloric acid. Water and 7—10 c.c. of perchloric acid (18 per cent.) were added, and the liquid evaporated until white fumes of perchloric acid was evolved. The disappearance of the hydrochloric acid was recognised by the conversion of the blue cobalt chloride into the red perchlorate. The latter was gently ground with 10 c.c. of 96 per cent. alcohol containing 0·2 per cent. of perchloric acid, the solution of cobalt and sodium perchlorates filtered off, the potassium salt again treated with the alcohol containing perchloric acid and finally washed on the filter with a mixture of equal parts of alcohol and ether to disappearance of acid reaction. The filter was dried at 120°—130° C. to constant weight.

When the platinum chloride method was employed, the precipitate was gently heated in a platinum crucible, and the paper incinerated. In extracting the residue, it was found necessary to add a little sodium chloride to the water, which prevented the cobalt oxide from going through the filter paper. After two evaporations with hydrochloric acid, the residue was taken up with water and precipitated by platinum chloride.

The average result was 0·3947 grm. K_2O per litre of sea water, or 2·39 parts K_2O to 100 parts Cl, which compares with the results of Ehrmann, Dittmar, &c., of 2·42—2·57 parts per 100 parts Cl. Control experiments on a mixture of potassium and sodium chlorides, and these chlorides with magnesium sulphate, gave satisfactory results.

—A. C. W.

Iron, Separation of ——. P. Nicolardot. Comptes Rend. **133**, [18], 686—688.

When to a boiling and not too acid solution of ferric choride an alkali sulphate is added, the iron is precipitated as basic sulphate, and can be thus separated from all the other metals of the group, but the conditions requisite to make the precipitation complete are so difficult of attainment that the method is not a practicable one. If the ferric chloride be heated to 125° C., however, it undergoes a change which greatly simplifies the process. To carry out the author's plan, a quantity of the substance (alloy) containing about 1 grm. of iron is dissolved in *aqua regia*, the solution evaporated to dryness with sufficient hydrochloric acid to expel the nitric acid, and heated to 125° C. for four hours. The residue is dissolved in about 500 c.c. of water, heated to boiling, 1 grm. of ammonium sulphate is added, and the boiling continued for quarter of an hour. As soon as the precipitate has settled a little, the whole is filtered through a close filter. If mercury or cadmium be present, the operation of heating to 125° C. cannot be carried out; in this case the author neutralises the solution with ammonia, adds ammonium sulphate, boils, and filters as above; he then adds ammonia to the filtrate till a slight precipitate of iron appears, boils again, and filters; the separation of the iron is now complete.

Other salts (selenates, phosphates, arsenates, vanadates, molybdates, &c.) will also carry down iron in this manner; and the method thus promises to afford a means of separating selenium, phosphorus, &c., from all metals other than iron.—J. T. D.

Platinum and Iridium; Determination of ——, in Platinum Ores. Leidié and Quennessen. J. Pharm. Chim. 1901. **14**, [8], 351—355.

When only the amounts of platinum and iridium in an ore are required, the following modification of Leidié's method (this Journal, 1901, 45), is recommended:—Five grms. of the ore are repeatedly extracted with hot *aqua regia*, composed of one part of nitric acid (sp. gr. 1·32), and three parts of hydrochloric acid (sp. gr. 1·18) so long as anything is dissolved. The united extracts are evaporated to dryness first on a sand-bath, and then in an oven at 105—110° C., and the residue taken up with a little water and filtered.

The filtrate is heated to about 70° C., and sodium nitrite added until the liquid is neutral to turmeric, after which sodium carbonate is introduced until the precipitate no longer increases. The liquid is then heated to the boiling point, and filtered to separate foreign metals from metals of the platinum group.

The filtrate is rendered alkaline with sodium hydroxide, and a current of chlorine passed through at a temperature of 70°—80° C., in order to expel the osmium and ruthenium in the form of volatile peroxides. The liquid is now neutralised with hydrochloric acid, and more sodium nitrite added to reconvert into nitrites any chlorides of the other metals. In addition to the alkali salts there will now only be present the double nitrites of sodium with platinum, palladium, iridium, and rhodium.

Determination of the Platinum.—At this point, instead of saturating the liquid with ammonium choride, as in the original method, from 30 to 35 per cent. of potassium chloride are added. The rhodium and iridium are precipitated as double nitrites of the metals with potassium, which are insoluble in solutions of alkali chlorides. The liquid is filtered, and the nitrites of platinum and palladium converted into chlorides by means of hydrochloric acid, the saline mass being finally taken up with boiling water. The solution is boiled with a slight excess of formaldehyde, which precipitates the two metals in the metallic form. The precipitate is collected, ignited, reduced in a current of hydrogen, and dissolved in *aqua regia*. This solution is evaporated, the residue taken up with water, the solution treated with a reducing agent to convert palladic chloride into palladous chloride, and the platinum precipitated with ammonium chloride, and determined by any of the usual methods.

Determination of Iridium.—The liquid from which the osmium and ruthenium have been expelled is divided into two parts, of which one can be used for the determination of the platinum as described above. In the other the double nitrites of rhodium and iridium are converted into chlorides by means of *aqua regia* containing but little nitric acid. The iridium is precipitated by ammonium chloride in the form of a chloro-iridate, the precipitate washed with a solution of ammonium chloride, ignited, reduced in hydrogen, and weighed as metallic iridium. It would also be possible to precipitate the iridium with potassium chloride in the form of the double chloride, $IrCl_4.2KCl$, the addition of a little chlorine water accelerating the precipitation. Finally the reduced product is washed with water to remove the potassium chloride, and dried at 115° C. The authors remark in conclusion that this method only gives the available iridium, or, in other words, that which is in combination with the platinum or other metals, and so dissolves in *aqua regia*. Any iridium in the free state or combined with the osmium is insoluble, and remains undetermined in the extracted residue.—C. A. M.

Mercury, Copper, and Zinc; Volumetric and Gravimetric Determination of ——. R. Cohn. Ber. 1901, **34**, [14], 3502—3508.

The methods brought forward by the author depend on the fact that mercury sulphocyanide is almost insoluble in water and undergoes no electrolytic dissociation.

Mercury.—When a dilute aqueous solution of a mercury salt, mixed with ferric alum, is made faintly acid with nitric acid and small quantities of ammonium sulphocyanide are added, the blood-red colour of ferric sulphocyanide does not appear until all the mercury has been converted into the sulphocyanide $Hg(SCN)_2$. The colour change is, however, not sharp so that the best way to carry out the determination is to run into the mercury solution first a measured volume in excess of N/10 ammonium sulphocyanide, then more than sufficient N/10 silver nitrate solution to decolorise the liquid, the excess of silver being afterwards titrated by means of N/10 ammonium sulphocyanide, which is added until the light brown colour persists on shaking the solution for a few minutes. The conditions of the titration are those required by Volhard's silver method.

Copper and Zinc.—When added to solutions of salts of these metals, ammonium mercury sulphocyanide forms insoluble compounds of the formula, $MHg(SCN)_4$. For the precipitation, a solution containing about 27 grms. of mercuric chloride and 32 grms. of ammonium sulphocyanide is prepared, and its exact strength determined by titration with N/10 silver nitrate solution, the reaction being expressed by the equation:—

$$HgCl_2 + 4NH_4.SCN + 4AgNO_3 = \\ Hg(SCN)_2 + 2AgSCN + 2AgCl + 4NH_4NO_3.$$

The copper or zinc is determined as follows: to a definite volume of the copper or zinc solution placed in a dry flask is added a measured excess of the above liquid, the solution being then well shaken, filtered through a dry filter into a dry vessel and an aliquot part of the filtrate titrated with N/10 silver nitrate solution, the reaction being—

$$HgCl_2 + 4NH_4.SCN + CuSO_4 + 2AgNO_3 = \\ Hg(SCN)_2Cu(SCN)_2 + 2AgCl + (NH_4)_2SO_4 + 2NH_4.NO_3.$$

The greatest accuracy is necessary in the titration, since an error of 0·1 c.c. may lead to great inaccuracy in the results. The mean of several determinations should hence be taken, and the individual results controlled by running in excess of silver nitrate and titrating back with ammonium sulphocyanide. A complete determination can, however, be carried out in 10 minutes.

Gravimetric Determination of the Three Metals.—Copper or zinc may be determined by adding to the acidified solution an excess of the liquid containing mercuric chloride and ammonium sulphocyanide described above, the precipitate, after standing for two hours in the cold, being filtered off and washed with cold water. In the case of copper, the filter and precipitate are burnt in a porcelain crucible; if the precipitate is large in quantity, the residue is converted into cuprous sulphide by adding sulphur and reducing in a stream of hydrogen, but smaller quantities are best oxidised by ignition with pure mercuric oxide, and weighed as cupric oxide. The latter method is also applicable to zinc but the filter paper must be previously removed or any reduced zinc may be volatilised. For the gravimetric determination of mercury, the liquid is mixed with a solution containing zinc sulphate (1 mol.) and alkali sulphocyanide (4 mols.) and the precipitate formed treated exactly as in the determination of zinc.

All these methods give good results.—T. H. P.

Mercury in Combination with Chlorine, Iodine, or Cyanogen; Determination of ——, *in Antiseptic Solutions.* G. Meillère. J. Pharm. Chim. 1901, **14**, [8], 356—359.

In the case of the chloride and iodide, the aqueous liquid can be shaken with an excess of ether or ethyl acetate, and the ethereal extract evaporated, leaving the salt in a pure state. In a test experiment 5 c.c. of a solution containing 0·0343 grm. of mercuric chloride left 0·0338 grm. of salt on evaporation of the extract. For the determination of the mercury in the salt thus obtained, precipitation of the free metal by one of the following reagents is recommended, *viz.*, stannous chloride, alkaline hypophosphite, magnesium and hydrochloric acid, or sodium and hydrogen peroxide. The precipitation, washing, and drying are best carried out in the same tube with the aid of centrifugal force.

Cyanide and Oxycyanides.—Mercuric cyanide is usually met with in a sufficient state of purity, and its solution presents little difficulty in analysis. The pure oxycyanide is much less soluble, and the commercial salt is often a mixture in varying proportions of the cyanide and true oxycyanide. The alkalinity of the solution is assured by having a small quantity of mercuric oxide in excess of that required by the formula of the cyanide; or the same result is sometimes attained by the addition of potassium cyanide or another salt until the reaction is alkaline. The mercury in mercuric cyanide can be determined by titration, after being converted into the chloride. The pure salt should contain 79·3 per cent. of mercury, whilst theoretically the oxycyanide contains 85·04 per cent.

Four samples of commercial oxycyanide examined by the author contained from 76·8 to 81 per cent. of mercury.

The cyanogen can be determined by means of standard iodine solution in the presence of an excess of alkali bicarbonate. A direct titration invariably gives incorrect results, and it is therefore necessary to use a large excess of iodine solution, and to leave it in contact with the salt for several minutes before titrating with standard thiosulphate. Owing to the difficulty of dissolving a salt containing the theoretical quantity of oxycyanide, the author advocates the use of a solution of ordinary mercuric cyanide with the addition of borax.

The stock solution should contain:—mercuric cyanide, 500; borax, 100; Orange Poirrier, 1; and water, 6,000 parts. Of this solution 2 parts per 1,000 are used for the sterilisation of instruments. Steel needles can be preserved for several months in such a solution without altering to the slightest degree in length as they do in solutions containing only mercuric cyanide.—C. A. M.

Arsenic Sulphide; The Action of Ammonium Carbonate on ——. L. Vanino and C. Griebel. Zeits. anal. Chem. 1901, **40**, [9], 589—591.

In the ordinary course of analysis the sulphides of arsenic are dissolved in ammonium carbonate, forming arsenite and thio-arsenite, or arsenate and thio-arsenate respectively. Theoretically, the whole of the arsenic should be reprecipitated as sulphides on acidifying, without further addition of sulphuretted hydrogen, but the directions in the text-books vary as to this point. The authors find that hydrochloric acid does not reprecipitate the arsenic quantitatively from saturated solutions of As_2S_3 and As_2S_5 in ammonium carbonate, but that the reprecipitation is complete in the presence of much water in closed flasks.

In separating arsenic from antimony and tin, by treatment with strong hydrochloric acid, vigorous heating is not permissible since Piloty and Stock have shown that arsenic sulphide is volatilised when boiled with strong hydrochloric acid (this Journal, 1897, 764).—A. C. W.

Antimony; Detection and Determination of Traces of ——, *in presence of large Amounts of Arsenic.* G. Denigés. Comptes Rend. **133**, [18], 688—689.

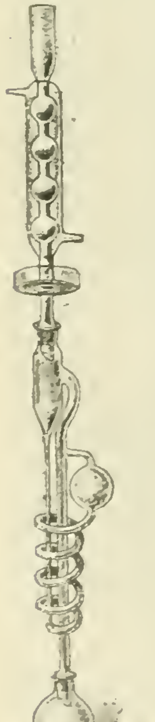
The antimonial or mixed antimonial and arsenical, stain or mirror, is dissolved in nitric acid, evaporated to dryness, dissolved in a drop of hydrochloric acid (1:3), and treated in one or other of the following ways:—1. The drop is placed in a platinum capsule, and a pointed rod of tin made to touch the capsule through the drop; a brown stain of antimony forms, the depth of tint and rapidity of formation depending on the amount present. With 0·002 mgrm. per 0·05 c.c., the stain is very distinct after half an hour. The amount of antimony can be estimated by comparison of the stain with similarly produced stains from known amounts of the metal. Arsenic, under these circumstances, unless the amount present exceeds 0·25 mgrm. per 0·05 c.c., gives no stain. 2. The drop is allowed to come in contact, on a microscope slide, with a drop of reagent prepared by dissolving 1 grm. of potassium iodide and 3 grms. of cæsium chloride in 10 c.c. of water. The formation of yellow or garnet red groups of hexagonal plates of the double cæsium and antimony iodide is easily visible under the microscope. This reaction is not interfered with by arsenic, unless the concentration of the latter be higher than 5 mgrms. per 0·1 c.c.—J. T. D.

Boric Acid and Lactic Acid; Determination of ——. Partheil. Zeits. angew. Chem. 1901, **14**, [41], 1020—1021.

In the method proposed, the boric acid is extracted from its solution in dilute hydrochloric acid by means of ether, the extraction (which requires about 18 hours) being carried out in a special apparatus. The boric acid left on evaporation of the ether is dried *in vacuo* over sulphuric acid, and weighed as H_3BO_3.

Lactic Acid.—Equally good results are obtained with this apparatus in the determination of lactic acid, the error noted by Kunz being reduced to a tenth, and thus only amounting to 0·002 to 0·003 grm., when a quantity of 0·5 to 0·6 grm. is taken for the analysis.—C. A. M.

Boric Acid; Direct Gravimetric Determination of ——. A. Partheil and J. A. Rose. Ber. 1901, **34**, [11], 3611—3612.



This process, which makes use of the apparatus shown in the figure, is carried out as follows:—The boric acid solution, made acid with hydrochloric acid, is placed in the spiral tube which it should fill no higher than the spherical bulb; recently rectified ether is then carefully added, until the bulb is nearly filled. About 20 c.c. of the same ether is added to the small weighed flask, which is then heated, either on the water-bath, or on wire gauze, by means of a small burner, until the ether boils vigorously, and separate drops of the liquid no longer fall from the condenser. The extraction is continued for 18 hours, at the end of which time the weighed flask is replaced by a second, the heating being carried on for two hours longer, to make certain that the extraction is complete. The flask is placed in a vacuum desiccator over sulphuric acid to remove the ether, and the residual boric acid weighed. Two determinations of aqueous solutions of 0·31015 grm. of boric acid gave the values, 0·3105 and 0·31025 grm. respectively, whilst from a solution of borax containing 0·12408 grm. of boric acid, 0·12425 grms. of the acid were extracted. The method has been applied to the analysis of minerals containing boric acid and can also be used for determining the acid in food materials. The boric acid solution should contain neither sulphuric acid, nitric acid, phosphoric acid, nor large quantities of iron; zinc chloride also passes over with ether, and the same is the case with aqueous solutions of arsenious acid. The purity of the acid weighed may be tested by evaporating repeatedly with pure methyl alcohol, the non-volatile residue being weighed, and the weight subtracted from that of the boric acid.—T. H. P.

ORGANIC CHEMISTRY.—QUALITATIVE.

Oils, Drying and Marine Animal; Detection of ——. G. Halphen. J. Pharm. Chim. 1901, **14**, [8], 359—365.

The test here described is a modification of that of Hehner and Mitchell (this Journal, 1899, 77), which is based upon the fact that most of these oils yield insoluble derivatives on treatment with bromine suitably diluted.

The author's reagent is prepared by mixing together 28 parts by volume of glacial acetic acid, 4 parts of nitrobenzene, and 1 part of bromine. In testing an oil, 0·5 c.c. is shaken in a stoppered tube with 10 c.c. of the reagent, and a note taken whether any precipitate is formed.

The following oils gave no precipitate, and the liquid remained clear after standing for an hour:—Olive, almond, castor, earthnut, cotton-seed, poppy, lard, and neatsfoot oils.

With Jaffa sesamé oil and with certain samples of horse-foot oil there was a slight turbidity.

Heavy precipitates were given by nut oil (after 5 to 10 minutes), hempseed and linseed oil of different origin; also by whale oil, seal oil, cod-liver oil, and Japanese fish oil; whilst colza oil produced a turbidity which, on standing, separated, leaving two layers of liquid. In testing for drying oils in colza oil it is advisable to add 10 c.c. of sulphuric ether when a turbidity is produced.

The author describes test experiments to show that it is possible to detect in this way the presence of 10 per cent. and less of these drying oils (with the exception of nut oil) or of marine animal oils in non-drying vegetable oils.

—C. A. M.

Nitromannitol and Nitrocellulose: Distinguishing ——. L. Vignon and F. Gerin. Comptes Rend. **133**, [14], 515—517.

Like nitrocellulose (this Journal, 1898, 794, and 1900, 1039), both penta- and hexanitromannitol reduce Fehling's solution, their reducing power being more than double that of glucose. Unlike nitrocellulose, however, they do not redden Schiff's reagent; so that their reducing action is not attributable to the formation of mannose.

Ferrous chloride reduces nitrocellulose to oxycellulose, which still exerts a reducing action on Fehling's solution; but nitromannitol, treated with ferrous chloride, is completely reduced to mannitol, destitute of any reducing power.—J. T. D.

Sucrose in Plants; Identification of —— *by the Aid of Invertase, and of Glucosides by the Aid of Emulsin.* E. Bourquelot. Comptes Rend. **133**, [18], 690—692.

The alcoholic extract of the plant under investigation is evaporated to dryness, the residue taken up with water saturated with thymol, and filtered. Equal portions of the solution are taken; to one is added a solution of invertase in thymolised water, and to the other an equal bulk of thymolised water alone. After three days the rotatory power and the Fehling reducing power of each are determined. In the case of the rhizome of *Scrophularia nodosa*, the angle of deviation diminished from 1° 43′ to 1° 13′, while the reducing sugar increased from 0·140 to 0·460 per cent. The inversion of 0·320 per cent. of cane sugar exactly agrees with the diminution of dextro-rotatory power; and the amount of cane sugar in the original rhizome is calculated (from the quantities taken) to be 4·054 grms. per kilo. Invertase hydrolyses only gentianose and raffinose besides sucrose, and these two sugars are rare and the products of their inversion easily distinguished from those of the inversion of sucrose.

After the treatment above, if the solution be boiled to destroy the invertase, and emulsin be then added, the dextro-rotatory power and the reducing sugar both increase from the hydrolysis of lævo-rotatory glucosides.

The author is pursuing investigations on these lines.

—J. T. D.

Dehydromucic Acid; Reactions of ——, and a New Method of Preparation. P. A. Yoder and B. Tollens. Ber. 1901, 34, [13], 3446—3462.

The authors prepare dehydromucic acid (furfurane dicarboxylic acid) by heating mucic acid with twice its weight of concentrated sulphuric acid for 40 minutes, at a temperature of 133°—137° C. The product is purified by dilution and conversion into barium salt. About one-third of the mucic acid is converted into dehydromucic acid.

The authors have prepared series of salts and esters of dehydromucic acid, the latter bodies all being crystalline solids.

The authors have also investigated the colour reactions which dehydromucic acid and allied bodies yield when heated with isatin and concentrated sulphuric acid.

In 2 c.c. of pure sulphuric acid, 1—5 mgrms. of the substance, and about an equal quantity of isatin, were dissolved. The mixture was then slowly heated, and the temperature at which a coloration was produced was observed:—

——	Temperature.	Colour Reaction.
	° C.	
Pyromucic acid	80—95	Violet-blue.
Ethyl pyromucate	125—140	,,
Dehydromucic acid	145—155	,,
All the esters of dehydromucic acid.	145—155	,,
Mucic acid	130—140	Green.
Saccharic acid	140—150	,,
Isosaccharic acid	130—140	,,
Metasaccharic acid (double lactone).	150—160	,,
Calcium arabonate	150—160	Violet.
Rhamnohexonic acid lactone	115—130	Wine-red.
Starch, milk-sugar, calcium *d*-mannonate, galactonic acid lactone, calcium gluconate, and rhamnonic acid.	..	No colour reaction; solution charred at 170°—190°.

The colour reactions were studied spectroscopically.

Unsuccessful attempts were made to reduce pyromucic acid with sodium amalgam, and to introduce a second carboxyl group into pyromucic acid, by treating ethyl pyromucate with sodium and carbon dioxide, and pyromucic acid with caustic soda and carbon dioxide.—J. F. B.

Starch; Iodolactic Acid as a Reagent for ——. G. Lagerheim. Svensk. Farm. Tidskr. 1901, [67]; through Pharm. Zeit. 46, [28], 283.

By the addition of a few crystals of iodine to hot syrupy lactic acid, a reagent is obtained which is useful for the examination, *in situ*, of the starch grains of foods and drugs. The lactic acid renders the tissues transparent, while the iodine, tinting the starch grains blue, makes their form more evident. The author states that it is possible, with this reagent, to differentiate between exhausted and genuine tea-leaves. In the former, the starch grains in the cells are seen to be swollen and altered in form, while in genuine leaves they are in their normal condition.—J. O. B.

Creosote for Therapeutic Purposes; Examination of ——. M. E. Merklen. Zeits. anal. Chem. 1901, 40, [9], 621—623.

Merklen detects water in creosote by heating 10 c.c. with 2 grms. of crystallised calcium chloride; when the salt melts, the liquids are mixed and allowed to cool. In the presence of water the calcium chloride does not again solidify. Phenol is detected by heating 4 c.c. of creosote with 1 c.c. of ammonia to 60° C., spreading the mixture over the surface of a large basin, and subjecting it to the action of bromine vapour. If phenol be present, a blue coloration is obtained; pure creosote gives a brown or green colour. Guaiacol may be approximately estimated in creosote as follows:—5 c.c. are mixed with 50 c.c. of alcoholic potash (1 part caustic potash in 5 parts of absolute alcohol). According to the amount of guaiacol, the mixture solidifies in 10—30 or 40 minutes; the crystalline mass is pressed between filter paper, decomposed by warming with 5 c.c. of sulphuric acid (1:10), water added until the mixture of creosol and guaiacol sinks, the aqueous solution poured off, and 4 c.c. of ammonia added. Guaiacol then gives a hard crystalline compound, whilst creosol gives only semi-fluid scales after some time. If the mixture be treated with petroleum spirit, the guaiacol compound remains. According to Merklen, pure creosote should have a specific gravity of 1·080, mix with dilute caustic soda without turbidity, and not act on blue litmus paper.

Béhal and Choay prepared pure guaiacol from pyrocatechol; it was a white substance, melting at 28·5° C., and boiling at 205·1° C. The crystals were hard prisms of the rhombohedric system; they exhibited the phenomenon of superfusion. Strong sulphuric acid gave no red coloration.

Marfori has obtained the following colour reactions with guaiacol prepared from pure potassium guaiacolate:—A solution in ammonia gives a blue coloration on warming with a little sodium hypochlorite; bromine water gives an orange-red precipitate, soon changing to coffee-colour. On heating with equal volumes of caustic potash and chloroform, guaiacol gives a fine red to brownish-red coloration; several other phenols give the same reaction. Guaiacol was found to dissolve in strong sulphuric acid, with a stable purple-red coloration; if traces of creosote be present the solution is a dirty greyish-green. Marfori found that 1 c.c. of guaiacol required 60 c.c. of water for solution.

Fischer determined the solubility of guaiacol in water to be 1 in 200.

Thoms has also examined synthetic guaiacol, which agreed in melting and boiling points with the preparation of Béhal and Choay. The solubility was 1:50. It dissolved in cold strong sulphuric acid to a colourless solution, which went from yellow to green to reddish-brown on warming (compare above). 10 c.c. of a 1 per cent. alcoholic solution of guaiacol at once gave an emerald green coloration with 1 drop of ferric chloride solution; but if the latter was diluted with nine parts of water, a blue coloration was first obtained, which quickly turned green. 10 c.c. of a 0·5 per cent. aqueous solution of guaiacol with one drop of the ferric chloride solution gave a blue coloration, which quickly disappeared and became brownish-red; on further addition of ferric chloride, the liquid became dark brown. A cherry-red coloration is obtained on adding a little permanganate solution to an aqueous solution of guaiacol acidified by hydrochloric acid; the colour slowly changes to brownish-red. Bromine water gives a brown precipitate in the aqueous solution.—A. C. W.

ORGANIC CHEMISTRY.—QUANTITATIVE.

Acetylene and Ethylene; Solubilities of ——. S. A. Tucker and H. R. Moody. J. Amer. Chem. Soc. 1901, 23, 671—674.

In order to devise a convenient method for separating acetylene and ethylene, the authors have examined the solubilities of the two gases in various solvents. Ammoniacal cuprous chloride solution, which is generally supposed to have no solvent action on ethylene, is found to dissolve this gas very readily, both in the pure state and when mixed with acetylene. Also Nordhausen sulphuric acid absorbs both the gases. Ammoniacal silver chloride, however, only dissolves ethylene to a slight extent, 26 c.c. of the gas, when treated with excess of the reagent, diminishing by 0·2 c.c. For the exact determination of acetylene and ethylene in a mixture of the two gases, recourse must be had to absorption by ammoniacal cuprous chloride, with which acetylene forms an insoluble red precipitate of the composition $(Cu_2C_2H)_2O$; this is collected, washed, dissolved in hydrochloric acid, converted into sulphate, and the copper determined electrolytically.

—T. H. P.

Shellac; Analysis of ——. E. J. Parry. Chem. and Druggist, 1901, 59, [1135], 689.

From the results of the examination of numerous samples, the author concludes that by far the greater part of the shellac appearing on the London market is more or less adulterated with rosin. This frequent adulteration is probably the cause of the divergent figures published relating to the analytical constants of shellac. The author has examined a number of specimens of pure shellac of known origin, and gives the results obtained. Oberdörffer has recommended the determination of the specific gravity and the solubility in light petroleum spirit as tests for indicating the presence of rosin, and has suggested the application of these tests for quantitative purposes. The author considers both these tests to be unreliable. The limits of the specific gravity of both rosin and shellac are too wide to allow of any reliable deductions being drawn. The solubility of the two substances in light petroleum spirit certainly differs considerably, but with a mixture of shellac and rosin which have been melted together, the particles, even after reduction to a very fine powder, are so well coated with shellac, they are to a great extent protected from the solvent action of the petroleum spirit. The solubility is useful from a qualitative point of view, as the resinous matter extracted can be examined.

For judging as to the purity of a sample of shellac, the author states that the only determinations upon which reliance can be placed are those of the iodine absorption, free acid, and ester values. The following are the author's results:—

—	Pure Shellac.	Rosin.
Iodine absorption value........	4—10 average 6	105—120 average 110
Acid value..........................	55—65 average 60	150—170 average 162
Ester "	155—175 average 168	Usually less than 20, average 10

—A. S.

Fats and Oils; Use of Iodine Monobromide in the Analysis of ——. J. Hanuš. Zeits. Untersuch. Nahr. Genussm. 1901, **4**, [20], 913—920.

Iodine monobromide is recommended instead of iodine monochloride for the determination of the iodine absorption of fats and oils. The monobromide is prepared by slowly adding 13 grms. of bromine from a tapped funnel to 20 grms. of finely powdered iodine contained in a beaker. During the addition the mixture is well stirred and kept cool (from 5° to 8° C.). At the end of the operation, which should take about 10 minutes, a strong stream of carbon dioxide is passed through the beaker to drive off excess of bromine. Iodine monobromide is a grey crystalline substance, with a metallic lustre. It is soluble in ethyl alcohol and glacial acetic acid, and keeps well in closed vessels. The reagent is prepared by dissolving 10 grms. of the monobromide in 500 c.c. of glacial acetic acid. The exact strength of this solution is determined by titrating 10 c.c. with standard thiosulphate solution after the addition of 15 c.c. of a 10 per cent. solution of potassium iodide. Starch solution need not be added.

For the estimation of the iodine number, from 0·1 to 0·7 grm. of oil is placed in a stoppered flask and dissolved in 10 c.c. of chloroform. 25 c.c. of iodine monobromide solution are then added, and the mixture allowed to stand for 15 minutes. 15 c.c. of potassium iodide solution (10 per cent.) are then added, and the titration carried out with standard thiosulphate solution. With oils having an iodine absorption below 100 per cent., the reaction is complete in 10 minutes. Figures given in the original paper show that the results obtained by this method agree closely with those of the Hübl process.—W. P. S.

Tannin; Report to the International Association of Leather Trades' Chemists on the Methods in use for Determining ——. H. R. Procter. Leather Trades Rev., July 31 and Aug. 7, 1901.

There are at present two standard methods in use for the commercial estimation of tanning matters, *viz.*, that of the International Association of Leather Trades' Chemists, which is almost universally employed in Europe, and that of the Association of Official Agricultural Chemists of the United States, which holds a somewhat similar position in America. With a view to the adoption of a unified standard method, which is desired by both bodies, a careful comparison of the two methods has been made in the Leather Industries Laboratory of the Yorkshire College, of which results are hereinafter summarised.

In the present state of scientific knowledge, it is impossible in some cases to draw a definite line between actual tannins and other matters which are more or less absorbed by hide, and which are, therefore, included under the general head of "tanning matters." The amount of these estimated is to some extent dependent on the method of analysis employed, and, for commercial purposes, the most important point is that the method employed should be uniform, and capable of giving concordant results in the hands of different chemists, the question of whether a method gives high or low results being of secondary importance so long as it is universally adopted.

To ascertain the amount of uniformity which might be expected of the different methods, samples of four selected extracts (*viz.*, a Slavonian oakwood, "Mimosa D," which is a mixed extract, chemically decolorised, a hemlock extract, and a solid quebracho extract), together with hide-powder of batch No. 5 as supplied to English members of the International Association, and the necessary filter papers, were sent to all the English chemists who were willing to undertake the work. Of these, three only are regularly engaged in commercial analysis, the rest being careful and reliable workers, but without an equal amount of special experience. In order to obtain a judgment free from bias on the concordance of the different methods, the "mean error of experiment" was calculated from each series by the method generally used by chemists and physicists. What this really gives is an estimate of the concordance of individual experiments with the average of the series, and it is obvious that where the total number of experiments is small, a single widely divergent result may raise the mean error largely, not only by its own divergence, but by altering the mean of the whole. In all cases in the report, the mean error of the whole series of experiments has been given, but in cases where one or more of the results were widely divergent from the general average, showing the occurrence of some special source of error, a recalculation has been made excluding these results. In this direction some special allowance should be made for the results with the "shake" method of the American Association, which was comparatively new to several chemists, and with which more experience would certainly bring more concordant results.

Passing over the very important question of sampling, on which the American Association give no instructions, the first point of difference from the International is the prescribed strength of solution to be employed, which the A.O.A.C. prescribes as 0·8 grm. of "soluble" matter per 100 c.c., while the I.A.L.T.C. last year adopted 0·35 to 0·45 grm. of "tanning matters" per 100 c.c. In the case of oakwood extracts and many other materials, these two rules practically mean the same thing, but with quebracho and some other materials containing little soluble non-tanning matter, the former gives a solution too strong for convenient use. The change has proved very advantageous.

If the first half of the extract be obtained below 50°, Boegh has shown that the remainder may be extracted in most cases at steam heat without sensible loss.

In the solution of extracts for analysis, the A.O.A.C. prescribes heating to 50°, shaking well, and allowing to cool before weighing, dissolving at a temperature of 80° C., and allowing to cool slowly overnight; the I.A.L.T.C. only prescribes heating the extract when it is too thick to be otherwise effectively mixed, but in other cases it is merely carefully mixed by stirring. The required quantity of extract is then dissolved in boiling water, cooled rapidly under the tap, and made accurately to the required volume. This method possesses the advantage of rapidity, and is somewhat less troublesome; but it has been asserted in America that, in some cases, the insoluble matter of the extract was increased by the rapid cooling, which, if true, is an important objection. After cooling, in both cases the extract is well mixed, and a portion measured off and evaporated, to determine "total solids" and water in the original extract, an alternative method being to dry a small weighed portion of the original extract. The prescribed method of drying slightly differs in the I.A.L.T.C. and A.O.A.C. methods.

The extract solution is next filtered, the I.A.L.T.C. prescribing paper 605 S. and S., and the A.O.A.C. paper 590 S. and S., and permitting an addition of washed barium sulphate in cases where the extract will not filter clear without it. Paper 605 is a dense paper hardened by acid, which in almost all cases gives a clear filtrate, but filters with extreme slowness. Paper 590 is a somewhat expensive porous paper, purified with hydrochloric and hydrofluoric acids, and filters rapidly, but will not alone give a clear filtrate with hemlock and quebracho liquors. As both papers absorb traces of soluble matters, the I.A.L.T.C. prescribes that 200 c.c. must be filtered before taking 50 c.c. for determination of "total soluble," while the A.O.A.C. only requires 150 c.c. The prescribed addition of barium sulphate is little used in America, kaolin being found much more effective and less liable to come through the filter.

It is obvious that in comparing the two methods several points have to be taken into consideration:—

1. Does the heating of the extract to 50° produce any effect in cases where it can be adequately mixed without?

2. Does rapid or slow cooling affect the solubility?

3. By which method and paper can a clear filtrate be most readily obtained, and which produces the least absorption of tanning matters?

4. How far are the results affected by the modes of evaporation and drying?

To answer these questions, each chemist was asked to make the following experiments:—Each of the four extracts was to be dissolved in both ways, the solutions being marked A and B. Separate portions of each of these solutions were to be filtered through 605 paper (A1 and B1), and through 590 paper (A2 and B2); and, in addition, experiments were to be made with barytes and kaolin, 50 c.c. of the filtrates being evaporated and dried in each case according to the rules prescribed by each method.

The following table represents the results of evaporation of the unfiltered solutions, A representing the I.A.L.T.C. method, and B the A.O.A.C.

TABLE I.

——	No. of Determinations.	Average.	Mean Error.	Maximum Difference.
Oakwood:		Per Cent.	Per Cent.	Per Cent.
A	6	41·57	0·62	1·6
B	5	41·58	0·59	1·3
A & B......	11	41·57	0·58	1·6
Mimosa D.:				
A	6	49·90	0·46	1·4
B	5	50·04	0·45	1·1
A & B......	11	49·97	0·45	1·4
Hemlock:				
A	7	40·53	0·43	1·0
B	5	40·92	0·62	1·3
A & B......	12	40·69	0·50	1·4
Sol. quebracho:				
A	8	87·4	0·93	2·3
B	7	88·0	1·11	3·1
A & B......	15	87·67	1·11	3·7

The first point to be noticed is the large mean error of all determinations by both methods, averaging over ½ per cent. This cannot occur in weighing out or dissolving the original sample, but is due either to differences in drying or in weighing the small dried residue. The rapidity with which residues absorb water on the balance is a formidable difficulty when it is reflected that on instance 1 mgrm. on the residue equals 0·2 per cent.

As regards different methods of drying, Dr. A. Turnbull made the following experiments, which are confirmed in regular work. The A.O.A.C. prescribes the use of flat porcelain basins of not less than 6 cm. in diameter. After evaporation to dryness on the water-bath, the basins are dried either for 24 hours in a water-oven, 8 hours in an air-oven at 105°—110° C., or till constant *in vacuo* at 70° C. The I.A.L.T.C. prescribes no definite size or shape of basin, and it became evident that the form of basin is of slight importance, the flat evaporating rather quicker, and the round being less rapidly oxidised. The vacuum oven, where it is available, is decidedly the most satisfactory, but accurate results can be got in the air oven at 105°. At temperatures below 100° the drying of solutions containing catechin is too slow, and probably involves much oxidation.

Returning to the comparison of methods, it will be noted that in every case the average result is slightly higher by the B than by the A method, and most so in the case of the solid quebracho, where heating before weighing is not employed. In the case of quebracho and other very strong extracts, it is probable that a more accurate determination of water and total solids would be obtained by drying, say, 0·5 grm. of the original substance without solution, or at most after the addition of a little alcohol.

Results of experiments on solution and filtration are next given. For each extract there are four sets of experiments, *viz.*, the I.A.L.T.C. method of rapid cooling under tap with 605 paper, the same method with 590 paper, and the A.O.A.C. method of slow cooling with 605 and 590 papers respectively. The following table gives the results:—

TABLE III.

Total Soluble.

I.A.L.T.C.

Extract.	Determination.	Average.	Mean Error.	Maximum Difference.
Oakwood:		Per Cent.	Per Cent.	Per Cent.
Paper 605	5*	40·46	0·195	0·5
„ 590	4*	41·08	0·515	1·1
Mimosa D:				
Paper 605	7	49·34	0·48	1·6
„ 590	6	49·50	0·64	1·8
Hemlock:				
Paper 605.....	6	37·65	0·48	1·5
„ 590.....	6	39·55‡	0·24	0·7
Quebracho:				
Paper 605.....	7	79·45†	1·94	5·5
„ 590.....	5	85·90‡	0·29	2·4

A.O.A.C.

Extract.	Determination.	Average.	Mean Error.	Maximum Difference.
Oakwood:		Per Cent.	Per Cent.	Per Cent.
Paper 605.....	3*	40·3	0·52	0·9
„ 590.....	4*	40·8	0·54	1·2
Mimosa D:				
Paper 605.....	6	49·75	0·57	1·8
„ 590.....	6	49·70	0·63	1·2
Hemlock:				
Paper 605.....	5	37·50	0·48	1·2
„ 590.....	5	38·62‡	0·76	1·2
Quebracho:				
Paper 605.....	4	79·75	0·88	2·0
„ 590.....	5	84·62‡	1·15	2·7

* One chemist omitted on account of very divergent results.
† Solution somewhat turbid in two out of seven determinations.
‡ Solution turbid.

Discussing the results of these determinations, it is noted that the opinion of the American chemists, that slow cooling gives higher results in soluble matters with the same filter paper, is not justified. On the whole, the results are somewhat higher with rapid cooling. It may also be noted that, as far as there is any noticeable difference, rapid cooling gives the smaller mean error, so that the advantage lies decidedly with the I.A.L.T.C. method of cooling, which has at the same time the merit of rapidity and convenience.

Comparing the filter papers, results so far do not indicate a clear course, and experiments are now in progress to establish a more scientific means of correction.

The addition of 3 grms. of purified kaolin to 150 c.c. of the extract solution, which was run through a 590 filter, and a further 50 c.c. filtered for analysis was found to give in every case a clear filtrate, and the time was somewhat shorter than with paper 605 alone, while the absorption by the filter was less, except in the case of mimosa D., which obviously contains some matter easily removed by absorption. The following figures may be given for comparison with Table III., but it must be remembered that they represent single determinations, and have not an equal claim to accuracy with the averages of the table.

Total Solubles Kaolin Filtration.—Oakwood, 41·5 per cent.; mimosa D., 49·0 per cent.; hemlock, 38·7 per cent.; solid quebracho, [illegible]·2 per cent.

There is, therefore, no obivous reason for the rejection of kaolin filtration by the Conference, and it is probably the best method known of obtaining a filtrate free from finely divided suspended matter. It is also evident that absolute clearness (absence even of opalescence) is necessary to concordant results in the case of turbid extracts, with solid quebracho the extreme difference between clear filtrates with paper 605, and with kaolin is only about half per cent., and in favour of the latter; while the turbid filtrates with 590 alone show suspended matter to the extent of 5 or 6 per cent.

There seems no reason for the compulsory adoption of an expensive quantitative paper like 590 for the filtration of extracts—the removal of silicates by hydrofluoric acid is only important where the paper is to be ignited, and it has been shown by Dr. Klenk (Ledermarkt) that paper in an acid condition absorbs more tanning matter than after it has been neutralised, a fact confirmed by experiment by the author.

Detannisation.—The solution in which the "total soluble" has been determined, is deprived of tannin by treatment with hide powder, and the remaining soluble matter again determined by evaporation of a measured quantity, which gives the "soluble non-tanning matter," and by subtraction from the "total soluble" gives the "tanning matters absorbed by hide." Though in all cases the principle is the same, the detailed methods differ considerably. The principle was first announced by Berthold Weiss, of the K.K. Vienna Research Institute. The "filter method" was devised by the writer, and improved in detail by Weiss, and is now the standard method of the I.A.L.T.C.; and the "shake method" of the A.O.A.C. was, I believe, the invention of Dr. Yocum. In addition to these, there is the "Palmer method," invented by Mr. A. N. Palmer, and now official with the I.A.L.T.C. for the analysis of used liquors. In the filter method very finely powdered and absorbent hide powder is placed in a small glass bell fitted with a siphon, and after this has been gradually soaked with the tanning liquor, the siphon is set in action, and after rejection of the first portion, which contains traces of dissolved hide substance, 50 c.c. is evaporated for analysis. In the shake method, the powder is thoroughly washed with water immediately before use, and a weighed portion of the squeezed, but still wet powder, is shaken mechanically for 5 or 10 minutes with a measured portion of the liquor, filtered through a funnel plugged with cotton, and 50 or 100 c.c. evaporated, allowance being made for the water introduced with the wet powder. The Palmer method is a sort of compromise between the two, the powder being washed with a small quantity of the liquor itself, and shaken by hand in a burette with a further portion, which is afterwards passed through the powder in the burette as a filter.

Table IV. gives the average results of the three methods, the liquors used being obtained by mixing the liquors produced by the two methods of solution, so as to obtain a sufficient quantity and a fair average. In certain cases widely divergent results have been rejected, and these figures are marked with a *.

TABLE IV.

Non-Tannins.

—	Filter Method.			
	Determination.	Average.	Mean E.	Max. D.
Oakwood	7	13·95	0·33	1·0
Mimosa........	8	11·09	1·25	3·9
	7*	10·73	0·79	2·3
Hemlock.......	9	12·[illegible]8	0·05	1·9
	8*	12·72	0·33	1·1
Quebracho.....	8	11·36	2·11	7·2
	5*	11·56	0·21	0·5

—	Shake Method.			
	Determination.	Average.	Mean E.	Max. D.
Oakwood	5	15·54	1·04	2·4
	4*	15·08	0·10	0·2
Mimosa........	6	13·10	1·02	3·0
	5*	12·84	0·56	2·2
Hemlock.......	6	11·43	1·11	2·8
	4*	13·77	0·21	0·4
Quebracho.....	7	15·25	1·59	4·1
	5*	14·46	1·09	2·6

—	Palmer Method.			
	Determination.	Average.	Mean E.	Max. D.
Oakwood	4	17·3	0·72	1·7
Mimosa D.......	6	17·2	1·83	4·2
Hemlock........	6	16·3	1·01	2·3
Quebracho......	5	17·9	1·51	3·9

It may be remarked that, in the case of each of these typical extracts, the filter method gives the lowest result in non-tannins, and, consequently, the highest in tanning matters, the shake method averaging 2—3 per cent., and the Palmer method 4—5 per cent. lower. While this is not, in itself, any proof of accuracy or the reverse, it seems probable that the method which shows the largest absorption tends nearest to some fixed maximum which cannot be passed. It is known, however, that this maximum includes other matters than true tannins, so this argument is not of much account, though it carries with it the commercial difficulty that it is always easier to raise than to lower a commercial result, the sellers, on the whole, being more alive to its importance than the buyers! Turning to the point of mean error, the Palmer method shows a decided inferiority to the other two. Between the filter and the shake methods there is not much to choose. To gain some ideal of the accuracy which may be expected under favourable conditions, a series of six parallel estimations of non-tannins were made by Mr. Blockey with Freiberg powder on the oakwood extract by each method.

The results were as follows:—

Filter Method.—Average, 13·61; mean error, 0·059; maximum difference, 0·16 per cent.

Shake Method.—Average, 16·02; mean error, 0·135; maximum difference, 0·38 per cent.

The accuracy is somewhat greater by the filter method, though in both cases the mean error may be neglected. The result in the case of the filter method approaches very nearly to the average obtained with the mixed powder sent out, but by the shake method is about 1 per cent. higher than that of the starred or most probable average of the powder sent out, which agrees exactly with the mean of five determinations made with five different batches of the powder (principally Vienna) supplied by J. G. Parker. The presence of a trace of acid seems essential to the best results in shaking.

In order to test the degree to which the two methods were affected by differences in the powder, five determinations of the non-tannins of the oakwood extract were made by each method by Mr. Blockey, using the five different batches of powder sent out to English chemists by Dr. Parker, with the following results:—

Filter Method.—Average, 13·56; mean error, 0·53; maximum difference, 1·2 per cent.

Shake Method.—Average, 15·08; mean error, 0·22; maximum difference, 0·5 per cent.

The shake method was, therefore, less affected by differences in the (Vienna) powder. In further test of the possibility of working the shake method with very varied powders, an oakwood extract (not that analysed above, but which gave 11·2 per cent. of non-tannins by the filter method), was treated by the shake method with a powder made from the sawdust of raw buffalo hide pickers (a very cheap material) by simply deliming with sulphurous acid, washing repeatedly with water, and drying, first, in cool air, and then in the vacuum oven, and afterwards regrinding and allowing to absorb moisture. This powder was coarse, granular, and so unabsorbent (probably from the presence of a trace of fatty acids) that it was quite impossible to use it in the filter, but quite free from lime and acid. Shaken for 10 minutes it gave a non-tannin result of 22·7, and for 20 minutes of 18·4 per cent, and in neither case could the filtrate be got clear or free from colour. A fresh experiment was now tried, in which 10 c.c. of $N/1$ acetic acid was added to the last litre of wash water, and the powder pressed out as usual. A brilliantly clear filtrate was at once obtained, quite free from colour, and two duplicates, one shaken for 10 and the other for 20 minutes; each gave a result of 15·1 per cent.

The filter and the shake method each claim to be the less troublesome, and this is probably true in both cases, when the latter is carried out as is practically done in America, the shake method being the more rapid where large numbers of simultaneous analyses are made, and the filter where only a few determinations are required. In proof of this Mr. Alsop states that he has made 120 non-tannin determinations in a day with only one laboratory assistant. For this purpose the whole quantity of hide-powder required is washed and pressed at once. With some experience it is easy to decide sufficiently approximately what quantity of the wet hide powder is required for each analysis; the required amount is weighed out and added in each case, the bottles are shaken for five minutes, and in the meantime 10 grms. of the wet powder is dried to determine the correction for water, which is to be applied to all the determinations. On the other hand, with the excellent Freiberg powder, containing cellulose, no special skill is required in packing the filters; the apparatus is cheap, and as many can be set up as required, all can be wetted up and siphoned at once, and no moisture correction is required.

The author states that there is no evidence to justify giving up the filter method, but that more experiments should be made on the effect of small additions of acid either in washing the powder, or direct to the liquor, and this question must be considered carefully in the light of Dr. Paessler's experiments on the analysis of extracts rendered soluble with sulphide or alkalis, which showed that in these cases only a portion of the tannin present could be estimated with a neutral hide powder. For the analysis of used liquors, he is inclined to prefer the shake method very decidedly to the Palmer method, and to propose that it should be accepted as official for this purpose.

The use of chromed-hide powder, the author thinks, does not seem to have reached a completeness which would justify it as an official method.

Quebracho Extract; Analysis of ——. G. Klenk. Chem.-Zeit. 1901, **25**, [80], Rep. 283; from Wissenschaft-techn. Beil. Ledermarkt, 1901, **2**, 60.

The author states that in the analysis of weakly acid or nearly neutral quebracho extracts (soluble in cold water) discrepancies arise, owing to the presence of free hydrochloric acid in the filter paper employed.—R. L. J.

Chromed Hide-powder; Application of —— in Analysis of Tanning Materials. J. Paessler and W. Appelius. Chem.-Zeit. 1901, **25**, [80], Rep. 283; from D. Gerber-Zeit. 1901, **44**, [94], 96.

The results obtained by analysing each of certain materials with different hide-powders, *viz.*, ordinary Freiberg, Vienna, and chromed hide are given in the following table. Thus chromed hide-powder may give nearly the same results as are obtained with Freiberg powder (except in the case of sumach, gambier, and acid liquors), but no cause is indicated for abandoning the use of Freiberg powder.

Tanning Material.	Freiberg.	Vienna.	Chromed Hide.			
			Filter Method.		Shake Method.	
			Dry.	Moist.	Dry.	Moist.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Oakwood extract I.	23·6	23·0	23·5	21·4	22·1	21·6
„ „ II.	23·4	21·0	24·1	23·7	21·8	19·2
Mimosa extract	27·5	..	28·6	27·6	27·0	26·0
„ bark	31·4	..	31·3	31·0	.	31·4
Sumach	21·9	20·7	19·7	23·4	20·2	23·3
Gambier	48·1	53·2	52·3	44·1	44·0	39·8
Tan-liquors:	Results in Grms. per 100 cm.					
(*a*) 0·39 per cent. acid	1·72	1·43	1·55	1·68	1·64	1·46
(*b*) 0·31 per cent. acid	1·31	1·34	1·30	1·19	1·23	1·19

—R. L. J.

Leather [Analysis of ——]; Contributions to the Chemical Study of ——. E. Nihoul. Bourse aux Cuirs de Liège, 1901, September.

The author offers the following remarks upon the analysis of leather, without prejudice to the methods at present officially recognised.

Estimation of Moisture.—Crust leathers are completely desiccated at the temperature of 100°—105° C. only after the expiry of about 11 hours. If, however, after 1½ to 2 hours at this temperature, the oven is raised to 120°—122° C., desiccation is completed in about half an hour without damage to the leather.

Estimation of Fat.—The apparatus now used fails to remove all the fat even after three or four hours' extraction, as the Soxhlet tube never completely empties itself, and often the whole of the leather is not submerged in the liquid used. Better results are obtained if a tap separating-funnel is used, the stem being adjusted to a broad, squat flask which holds the extracting fluid. Some pieces of glass are put in the funnel, and upon them a layer of washed asbestos in a flakey condition; the leather rests upon this filter bed. The funnel is closed at the top by a stopper carrying (*a*) the end of a condenser, (*b*) a tube coiled several times and passing downwards into the distillation flask. The tap of the funnel is closed, and the fluid distilled upwards until the leather is quite covered; it is then completely drained off by opening the tap, and the operation repeated.

Estimation of "Total Soluble."—One litre of water is insufficient to remove all the soluble matter from leather. Appreciable quantities of tannin and non-tannin are dissolved out by a second and a third litre. After this point, however, the extract only contains tannin, indicating that all the uncombined tan-liquor, properly speaking, has been removed; the soluble matter obtained in this fourth and in successive litres is due to a physical dissociation of the leather. The author has therefore extracted with 3 litres in his examination of Belgian leather. Chestnut and pine-bark and sumac contain small quantities of soluble organic nitrogen.

Estimation of Tannin and Non-Tannin in the Leather Extract ("Total Soluble").—If the liquor, during concentration to a strength suitable for analysis by hide-powder, is covered by a funnel, the time of evaporation is so much extended that (*a*) part of the tannin (about 0·2 to 0·5 per cent.) is converted into non-tannin; (*b*) the glass vessel is attacked, alkali is liberated, the ash and non tannin become higher, and organic matter is decomposed. Rapid evaporation is therefore desirable.

Estimation of Hide Substance.—All the well-known modifications of Kjeldahl's process were examined. The following conditions are recommended as most efficient and most economical. 0·6 to 0·7 grm. of the leather (free of fat and soluble matter) is boiled for half an hour with 10 c.c. of concentrated sulphuric acid. The flask is allowed to cool, and a dozen large crystals of potassium permanganate are added. The flask is shaken, heated till the liquid is decolorised, and then allowed to cool. The liquid is made up with water (including washings) to 250 c.c., 150 c.c. of caustic soda solution (30 per cent.) are added and a known quantity of zinc dust, and the ammonia is distilled off for three-quarters of an hour, the speed being such that about 200 c.c. of distillate are obtained. After this time, any traces of ammonia that might be left, affect the result only in the second place of decimals. The use of mercury or copper compounds is not recommended. Nor, under these conditions, more than 10 c.c. of sulphuric acid.

The ammonia distils into excess of $N/5$ sulphuric acid, and is titrated with equivalent soda or potash. Any indicator (except phenolphthalein) one is most accustomed to, may be used.—R. L. J.

Esters: Quantitative Production of ——, and the Determination of Alcohols and Phenols. A. Verley and F. Bölsing. Ber. 1901, **34**, [13], 3354—3358.

A MIXTURE of alcohols or phenols with an acid anhydride only reacts slowly in the cold; the authors have found that an addition of pyridine at once causes a vigorous action. $R.OH + (R'.CO)_2O + Py. = RO.CO.R' + R'.COOH.Py$ The free acid produced at once forms a neutral salt with the pyridine, so that the ester cannot be again saponified. This reaction furnishes a very convenient quantitative method for the estimation of alcohols and phenols. A mixture is made of 120 grms. of acetic anhydride with 880 grms. of pyridine; when water is added, pyridine acetate is formed, which is decomposed by alkalis into pyridine and alkali acetate, both of which substances are neutral to phenolphthalein; the acid may therefore be titrated. In a flask of 200 c.c. capacity, 1—2 grms. of the alcohol are mixed with 25 c.c. of the pyridine mixture; the flask is then heated for 15 minutes on the water-bath without condenser (acetic anhydride is not lost under these conditions). After cooling, about 25 c.c. of water are added, and the free acid titrated by normal or (better) seminormal caustic soda, using phenolphthaleïn as indicator. It is stated to be important to bring the pyridine mixture and standard soda, before measurement of the requisite volumes, to the temperature at which their comparative strength was determined. The following alcohols and phenols have given satisfactory results:—Ethyl and cinnamyl alcohols, phenylglycol, glycerin, phenol, β-naphthol, guaiacol, saligenin, thymol, eugenol, carvacrol, santalol. It is necessary to use a considerable excess of the acetic anhydride mixture with amyl alcohol and menthol, *i.e.*, not to take more than 1 grm. to 25 c.c. of the mixture. The process was applied to a sample of geraniol which the authors imagined to be pure, but not more than 90 per cent. could be esterified by any variation of the conditions; the results were concordant, and the conclusion is that the geraniol contained 10 per cent. of impurities. Terpineol is only slightly esterified under these conditions. Vanillin and salicyl aldehyde react at once, but the ester is decomposed during the titration. It appeared that benzyl alcohol could be esterified only to the extent of 92 per cent. Linalol also gave much too low results.—A. C. W.

Clove Oil; Determination of Eugenol in ——. A. Verley and F. Bölsing. Ber. 1901, **34**, [13], 3359—3362.

THE eugenol in oil of cloves is estimated by Umney by shaking with 10 per cent. alkali solution and determining the volume of the undissolved non-phenols. This method gives too high results; it is better to use caustic soda of 3—4 per cent. strength, but the modified process gives 95 per cent. of eugenol in oils which only contained 80—85 per cent. as shown by the methods of Thoms and the authors.

Thoms' method consists in converting the eugenol into the crystalline benzoate, which is weighed. The results, however, vary with the operator, and the solvent action of the alcohol used to remove the terpenes varies with the temperature.

The authors have applied their process for the estimation of phenols (preceding abstract) to this determination. Synthetic oils containing 85, 90, and 95 per cent. of eugenol gave practically correct results by this process and that of Umney; the results obtained by Thoms' method were 3—4 per cent. too low. The same agreement between the esterification and Umney's method was observed with certain natural oils, which were to be regarded as normal. Other oils, also doubtless genuine, gave 94 and 95 per cent. of eugenol by Umney's method, but only about 80 per cent. by the processes of Thoms and the authors. An oil evidently adulterated with clove oil terpenes gave similar results by Umney's and the authors' processes, but much too low results by Thoms' method. The authors conclude that the quantitative esterification process is suitable if no other alcohol or phenol be present, which may be ascertained by examination of the physical properties.

—A. C. W.

Alcohol in Ether; Determination of ——. F. Freyer. Zeits. landw. Vers.-Wes. Öst. **4**, 955—959. Chem. Centr. 1901, **2**, [16], 900.

THE author has obtained satisfactory results by the application of Adam's method (Oesterr. Chem.-Zeit. **2**, 241), which is based upon the action of acetyl chloride on alcohol. Previous to the actual test, 20 c.c. of the sample of ether are shaken with a saturated solution of calcium chloride, the diminution in volume of the ether giving the amount of alcohol + water present. For the actual test, the quantity of ether taken must not contain more than 1 grm. of alcohol + water. 25 c.c. of the ether, or a smaller quantity diluted with anhydrous ether to this volume are placed in a strong-walled Erlenmeyer flask of $\frac{1}{4}$ litre capacity with 50 c.c. of a 10 per cent. chloroform solution of acetyl chloride. The flask is closed with a rubber stopper carrying a separating funnel of $\frac{1}{4}$ litre capacity containing 100 c.c. of water. After 1 hour, the stopcock of the funnel is opened and some water allowed to enter the flask. The mixture is shaken and when decomposition is complete, the free acid is titrated with twice normal alkali and phenolphthalein. A blank test is made with 50 c.c. of acetyl chloride solution, and the amounts of anhydrous ether and water used in the actual determination, and from the difference in the quantities of alkali used, the amount of alcohol can be easily calculated as acetyl chloride forms 1 molecule of free acid with alcohol and 2 molecules with water.—A. S.

Coca Leaves: Assay of ——. W. R. Lamar. Amer. J. Pharm. 1901, **73**, 125; through J. Pharm. Chim. 1901, **14**, [8], 365—366.

THE author attributes the divergent results obtained by different chemists to a want of the recognition of the instability of the different alkaloids which are present. Cocaine, cinnamyl-cocaine, and isatropyl-cocaine are all methyl esters of ecgonine, and the methyl group attached to the carboxyl is readily split off, yielding, in the case of cocaine, benzoyl-ecgonine which has alkaloidal properties, but is insoluble in the liquids ordinarily employed for the separation of alkaloids from an alkaline solution. To obviate this it is essential to add only sufficient alkali to just liberate the alkaloids.

The author considers petroleum spirit as the most suitable solvent for dissolving the alkaloid without taking up much of the foreign substances. He recommends the following modification of Squibb's method: 25 grms. of the powdered coca leaves are treated with 25 c.c. of a 2 per cent. solution of ammonium hydroxide, and allowed to stand for 30 minutes, with occasional agitation, care being taken that the odour of ammonia is still perceptible. After the addition of 75 c.c. of petroleum spirit the mixture is again left for an hour or more, and shaken every 10 to 15 minutes during the interval.

The contents of the flask are now transferred to a percolator, and the mass continually washed with petroleum spirit until 450 c.c. of liquid in all have been collected. This extract is shaken in a separating funnel with 25 c.c. of $N/10$ hydrochloric acid, the acid layer withdrawn, and the extraction twice repeated with the same quantities of acid. The acid extracts are united, and shaken first with 20 c.c., and then with 15 c.c. of ether, in order to remove the last traces of petroleum spirit and colouring matter.

The united ethereal extracts are shaken with two portions (5 c.c.) of water, and the aqueous layers added to the original acid liquid. The latter is now rendered very slightly alkaline by means of ammonium hydroxide, and the alkaloids extracted with successive portions of 100 c.c. of ether. The ethereal extract is evaporated at 30°—35° C., and the residue dried at 60° C. until constant in weight.

As a check on this determination, the solution may be titrated by adding an excess of N/20 sulphuric acid, and titrating the uncombined acid with N/20 alkali, turmeric being used as indicator. Each c.c. of the N/20 acid corresponds to 0·0154 grm. of coca alkaloids. According to the author, coca leaves of good quality yield by this method not less than 0·7 per cent. of total alkaloids.

—C. A. M.

Guaiacol; Approximate Determination of ——. Adrian. Zeits. anal. Chem. 1901, **40**, [9], 624—625.

The permissible limits to the solubility of guaiacol are 1·2—1·5 per cent.; 1·602 grm. of pure guaiacol gives a clear solution in 100 grms. of water. Guaiacol may be approximately estimated by conversion into pyrocatechol; 100 grms. are heated with 10 c.c. of water for one hour in a current of hydrobromic acid gas, the residue, which contains the pyrocatechol and homopyrocatechol, is taken up in ether, the solvent removed, and the residue treated with benzene, in which only the pyrocatechol dissolves. From the weight of the pyrocatechol after recrystallisation, the percentage of guaiacol may be calculated to within 5—6 per cent.

The colorimetric process is as follows: 0·5 grm. of the guaiacol is dissolved in water and 10 c.c. of alcohol, and the solution made up to 1,000 c.c., 20 c.c. of this solution are mixed in a test-tube with 1 c.c. of sodium nitrite solution (1 : 100) and 1 c.c. of dilute nitric acid (1 : 200). A characteristic reddish-brown coloration is obtained, which is compared within 10 minutes with the colorations given by suitable standard solutions (see Creosote, page 1245).

—A. C. W.

Carbolic Acid; The Determination of Crude ——. G. Schacherl. Zeits. anal. Chem. 1901, **40**, [9], 615—616; and Zeits. d. allgem. österr. Apotheker-Ver. **46**, 794.

The following process is proposed:—100 c.c. of a crude carbolic acid, which is little soluble in caustic soda, or 50 c.c. of a better quality, are shaken with 100 c.c. of caustic soda (sp. gr., 1·1). The alkaline layer is run into a litre flask, the oil again shaken with 100 c.c. of caustic soda, and a similar treatment continued with 50 c.c. until no drops of oil separate on acidifying with hydrochloric acid. The united alkaline liquid, which contains all the phenol, small quantities of hydrocarbons and varying amounts of empyreumatic resins, is diluted with an equal volume of water and distilled until the distillate runs off quite clear. The residue is acidified with strong hydrochloric acid and again distilled; when 200 c.c. have come over, the water is returned to the distilling flask and the phenol transferred to a measuring cylinder. This operation is repeated until drops of oil are no longer seen in the distillate. The last distillate, which must not exceed 60—70 c.c., is also transferred to the measuring cylinder, a slight excess of common salt added, the cylinder well shaken and allowed to repose until the volume of phenol can be read off. The resins entirely remain behind in the distilling flask.

In the case of crude carbolic acid of high strength, completely soluble in caustic soda, the proper quantity is dissolved in 300 c.c. of caustic soda (sp. gr. 1·1) and treated as above.—A. C. W.

Carbolic Acid; The Determination of Crude ——. F. Seiler. Zeits. anal. Chem. 1901, **40**, [9], 618.

In this process 100 grms. of the crude substance are heated for 1 hour in a beaker on the water-bath, with frequent stirring with 100 grms. of milk of lime (1 part quicklime, 5 parts water). An equal volume of water is then added; the resins separate as insoluble soaps, whilst the hydrocarbons evaporate, so that on the addition of water an almost pure solution of calcium cresylate is obtained. The cresols are separated by acidifying and adding common salt; they are then weighed without further purification. The author has found in so-called crude carbolic acids of 25—30 per cent., 2—3 per cent. of cresols; 40—60 per cent., 3—5 per cent. of cresols; 80 per cent., 50 per cent., of cresols and in 90—100 per cent., 80 per cent. of cresols.

—A. C. W.

Creosote; Determination of ——. B. Hafner and W. Kreissl. Zeits. anal. Chem. 1901, **40**, [9], 625—626.

The active constituents of creosote all contain methoxyl groups, whilst the less valuable monatomic phenols do not. The authors recommend an estimation of the methoxyl group by means of Zeisel's method, using potassium arsenite as the washing liquid (Glücksmann, Monatsh. 1898, 142) and determining the silver iodide in the manner given by Gregor (this Journal, 1898, 609). The following are to be regarded as minimum limits:—sp. gr. at 15° C., 1·07; 75 per cent. to boil between 200° and 220° C.; methoxyl 12 per cent., corresponding to 18 per cent. of guaiacol.

—A. C. W.

Formaldehyde; Determination of ——. L. Vanino and E. Seitter. Zeits. anal. Chem. 1901, **40**, [9], 587—589.

Formaldehyde is determined by H. M. Smith (Analyst, **21**, 148) by means of potassium permanganate in alkaline solution; the end-point is difficult to recognise. The estimation is readily performed in strong sulphuric acid solution, when the aldehyde is oxidised to carbon dioxide and water. The process is as follows:—35 c.c. of N/5 permanganate are mixed in a stoppered flask of 250 c.c. capacity with a cooled mixture of 30 grms. of sulphuric acid and 50 grms. of water, and 5 c.c. of formaline solution (10 c.c. of formaline diluted to 400 c.c.) are slowly dropped in with constant shaking. After standing 10 minutes with occasional shakings, the excess of permanganate is titrated by N/10 hydrogen peroxide. The method gave 37·3 per cent. of formaldehyde as a mean of 3 concordant analyses, compared with 37·08 per cent. by Romijn's method, which is: 30 c.c. of N caustic soda are mixed in a stoppered 500 c.c. flask with 10 c.c. of dilute formaline solution (12·5 c.c. of formaline in 500 c.c.); 45 c.c. of N/5 iodine are slowly added from a burette with constant shaking, until the liquid is deep yellow. After well shaking for 1 minute, 40 c.c. of N hydrochloric acid are added and the excess of iodine titrated by thiosulphate after standing some time.

—A. C. W.

XXIV.—SCIENTIFIC & TECHNICAL NOTES.

Patent Laws in Chemical Industry; The Question of ——. J. Ephraim. Zeits. angew. Chem. 1901, **14**, [36], 897—904; [37], 918—922.

The subject is fully discussed under the following headings:—

(1) Previous publication for chemical patents; (2) patentability of analytical processes; (3) methods for the preparation of intermediate products.—A. S.

Radium; Chemical Effects produced by Radiation from ——. H. Becquerel. Comptes Rend. **133**, [19], 709—712.

Berthelot has recently indicated some endothermic reactions produced by radium. These serve as a means of roughly measuring the energy of the radiation, which is of the order of magnitude of 5·1 ergs per second per sq. cm. But exothermic reactions of radium have also been recorded, such as its action on a gelatin bromide plate, the colours produced by it on glass, porcelain, and paper, rock salt and sylvine. The author has found that if phosphorus be melted under water, and a tube containing radium in an inner sealed tube wrapped in aluminium be immersed so as to be level with the phosphorus, a slow conversion of yellow to red phosphorus occurs, which ceases after the tube of radium is removed. A repetition of this experiment without the aluminium screen showed practically no difference in the intensity of the effect. A similar tube of radium immersed in a solution containing mercuric chloride and oxalic acid produced, in the dark, a gradual precipitation of calomel. The action of radium on organic tissues was examined by exposing to its radiation seeds of cress and of white mustard: 24 hours' exposure produced no sensible effect, but those seeds which had been exposed for a week or more failed in all cases to germinate when planted, though [illegible] out of every 10 of those not so exposed germinated.—J. T. D.

Dithionic Acid; Formation of ——. J. Meyer. Ber. 1901, **34**, [14], 3606—3610.

The author shows that the action of sulphur dioxide on manganese dioxide suspended in water, resulting in the formation of manganese dithionate, proceeds according to the equations—

$$2MnO_2 + 3H_2SO_3 = Mn_2(SO_3)_3 + 3H_2O + O;$$
$$Mn_2(SO_3)_3 = MnSO_3 + MnS_2O_6;\ MnSO_3 + O = MnSO_4.$$

Ferric hydroxide and sulphurous acid also yield a dithionate, the ferric sulphite first formed decomposing into ferrous sulphite and dithionate: $Fe_2(SO_3)_3 = FeSO_3 + FeS_2O_6$; cobalt and nickel hydroxides behave in a similar manner. Sulphurous acid yields sulphuric acid and barium sulphate with hydrogen and barium peroxides respectively, while the peroxides of lead, sodium and magnesium and mercuric oxide are unaltered. Barium and sodium dithionates give the normal molecular weights in freezing water. Measurements were made of the molecular conductivity of the barium salt.—T. H. P.

Liquefied Gases; New Method of manipulating —— *in Sealed Tubes.* H. Moissan. Comptes Rend. **133**, [20], 768—771.

For cooling the apparatus, a bath of solid carbon dioxide, and acetone is used, in a Dewar's vacuum vessel. When the evaporation of the dioxide is hastened by a current of air at the ordinary temperature of the laboratory, the temperature of the bath is about −98° C.; and if the air be previously cooled to about −80° C., by passage through a spiral tube immersed in a similar bath, the mixture may be further cooled to −110° C. For still lower temperatures, liquid air, or liquid oxygen, may be employed. The investigation of the action of a liquefied gas on a solid is carried out by bringing the liquefied gas into a tube, cooling it till it has solidified, adding the solid, exhausting the tube by the Sprengel pump, and then carefully sealing it. On gradually allowing the temperature to rise, the gas liquefies, and (provided the temperature reached is below its critical point) remains liquid under the pressure of its vapour. The author has kept ammonia, chlorine, and hydrogen sulphide in such tubes, of 10 mm. external and 6 mm. internal diameter; acetylene and hydriodic acid in tubes of 7 mm. external and 3 mm. internal diameter; and, in cases where the pressure may reach 300 atmospheres, used tubes of 6 mm. external and 1·5 mm. internal diameter. When the action is over, the tubes are cooled again so as to solidify the contents, connected with the mercury pump, the sealed ends carefully broken, and the temperature is allowed gradually to rise. Great care must be taken that all the materials used are free from moisture; and actions evolving hydrogen should not be carried on in sealed tubes. It is to be remembered, too, that glass which has been cooled to such low temperatures is apt to become brittle and untrustworthy, even when very gradually warmed again. Under the most favourable circumstances, there is considerable danger in these experiments, and all suitable precautions against accident should be taken.—J. T. D.

Calcium-Ammonium and Lithium-Ammonium; Decomposition of ——, *by Ammonium Chloride.* H. Moissan. Comptes Rend. **133**, [19], 715—717.

Ammonia was condensed at −40° C. into a U-tube containing calcium, when the calcium-ammonium formed dissolved in the excess of liquid ammonia. On cooling to −80° C., and then introducing some ammonium chloride, immediate evolution of gas occurred. Measurement and examination of this gas and analysis of the remaining liquid showed that the reaction was—

$$2NH_4Cl + Ca(NH_3)_4 = CaCl_2 + 4NH_3 + (2NH_3 + H_2).$$

No indication of the production of ammonium, NH_4, was given. Lithium-ammonium behaved in exactly the same way.—J. T. D.

Borimide, $B_2(NH)_3$. A. Stock and M. Blix. Ber. 1901, **34**, [12], 3039—3047.

The reaction between boron bromide and hydrogen sulphide, which results in the formation of a hydrosulphide of boron sulphide, B_2S_3, H_2S, proceeds briskly at first, but afterwards slackens. The authors find that this is due to the formation of a crystalline compound of the composition B_2S_3, BBr_3, which can be more readily obtained by dissolving the boron sulphide hydrosulphide in excess of boron bromide, and evaporating the solution to dryness in a vacuum. It forms colourless crystals, melting above 100°, and decomposing into its components on strong heating or on boiling its carbon bisulphide solution. A similar compound of the composition B_2S_3, BCl_3, has also been prepared.

When ammonia is liquefied in a specially constructed tube containing boron sulphide hydrosulphide, and the tube sealed off and shaken at the ordinary temperature for several hours, the hydrosulphide is completely dissolved, yielding a deep yellow liquid. After opening the tube at a low temperature, and allowing the ammonia to evaporate at 0°, a yellow liquid remains, which, at the ordinary temperature of the air, gives off large quantities of ammonia and hydrogen sulphide, and deposits at the same time intensely yellow twin crystals of the composition $B_2S_3, 6NH_3$. This compound, probably identical with one obtained by Moissan from boron trisulphide and ammonia, is decomposed by water, while on heating it splits up, yielding ammonium hydrosulphide and borimide, according to the equation $B_2S_3, 6NH_3 = 3NH_4.SH + B_2(NH)_3$. The borimide thus obtained contains appreciable quantities of sulphur, a purer product being obtained by passing ammonia in a slow stream over boron sulphide hydrosulphide heated to 75°. As thus prepared, borimide is a light white powder which is decomposed by water with evolution of much heat and formation of boric acid and ammonia. When heated, borimide begins to evolve ammonia at 125°—130°, and at higher temperatures is decomposed quantitatively according to the equation—

$$B_2(NH)_3 = 2BN + NH_3.$$

—T. H. P.

Ferric Oxide and its Hydrates. O. Ruff. Ber. 1901, **34**, [13], 3417—3430.

The author has examined the formation of hydrated ferric oxide, with respect to the influence of (1) the pressure of the water vapour; (2) time; (3) pressure; (4) saturated magnesium chloride solution; and (5) crystalline form. His results lead to the following conclusions:—(1) The red colloidal ferric hydroxide, when subjected to a high pressure under water, is transformed in a relatively short space of time into a true hydrated oxide; at about 42·5° C. it passes into a form practically identical with that of brown ironstone, $Fe_2O_3 + 1\frac{1}{2}H_2O$, at 42·5—62·5° into Göthite ($+ H_2O$) and at higher temperatures into hydrohaematite ($+ \frac{1}{2}H_2O$). The nature of the hydrate is hence dependent only on the magnitude of the tension of the water vapour. (2) The yellow modification of ferric hydroxide, obtained by the oxidation of ferrous oxide or its hydrate or of ferrous carbonate, is not a true colloid, since under high pressure, its water content scarcely varies with a change of temperature of 40°—70°. (3) Under ordinary pressure and temperature, red colloidal ferric hydroxide passes very slowly into anhydrous oxide, which at the same time gradually absorbs water and is transformed into the hydrate containing $1\frac{1}{2}H_2O$, and this latter is the only form stable under ordinary conditions. (4) The form of ferric oxide contained in pure red iron ore can only be produced from its hydrate at high temperatures, as, for instance, when in contact with granite, but it can be produced under favourable circumstances by the dehydration of the colloid.—T. H. P.

Copper Oxide; Simultaneous Reaction of Carbonic Acid and Salts of the Alkali Metals on ——. O. Kühling. Ber. 34, [12], 2849—2852.

By leading a stream of carbon dioxide through a solution of sodium chloride in which is suspended copper oxide (freshly precipitated and dehydrated at as low a temperature as possible), there is obtained after 2—3 days a gray-green amorphous insoluble powder of the formula—

$$Cu_7Cl_3O_{11}H_{11}(CuCl_2.CuClOH.5Cu(OH)_2).$$

At 240 C. this substance gives off water and oxygen, leaving a blackish-brown residue of formula $Cu_7Cl_3O_8$. Even prolonged boiling with water does not remove the whole of its chlorine (as hydrochloric acid) from the green substance.

If for sodium chloride be substituted, in the above process, sodium nitrate, a bright green amorphous basic cupric carbonate, $CO(OCu.OH)_2$, is obtained; and there is no formation as there is in the former case, of sodium bicarbonate.

Neither in the differing solubilities of the two alkali-salts, nor in the dissociation-constants of their solutions, can there be found an explanation of their very different behaviour: and the facts that sodium bromide, though reacting similarly to the chloride, does so very much more slowly, and that the corresponding potassium salts react very much more slowly than the sodium salts, show that the explanation of the reactions is yet to be sought.—J. T. D.

Antimony; Localisation and Dissemination of ——, in the Organism. G. Pouchet. Comptes Rend. 133, [14], 526—527.

After death from antimony poisoning, the metal in notable quantity was found only in the intestines, traces were found in the bones, kidneys, liver, skin and fur, and muscles; doubtful indications in the heart, lungs, and blood, and none whatever in the brain.

The addition of a little arsenic does not modify the distribution of the antimony in the tissues (though the toxic action of the arsenic seems to be increased by its association with the antimony). After death in these cases, arsenic, but no antimony, was found in the brain and spinal cord, muscles, and liver; arsenic with a trace of antimony in the bones; arsenic and antimony in more notable quantity in the skin and fur, and much more antimony, with but little arsenic, in the digestive organs.

The administration of potassium bromide simultaneously with the antimony seems to modify both the symptoms of its action and its distribution in the body.—J. T. D.

Mercury: its Alteration in Volume on Melting, and its Thermal Expansion when Solid. L. Grunmach. Chem.-Zeit. 1901, 25, [84], 919—920. Paper read at the Hamburg Meeting of the Gesellschaft deutscher Naturforscher und Aerzte.

The research was conducted by testing an ordinary alcohol thermometer with an arbitrary scale at various temperatures against a standard alcohol thermometer, and determining thus the value of each degree of the (arbitrary) scale. This thermometer was then half filled with mercury and half with alcohol, and the new values of the degrees were determined and compared with the first. The results obtained with the instrument employed were:—

Condition of Hg.	Range of Temperature.	Value of 1°.	
		Alcohol alone.	Half Alcohol. Half Mercury.
	° C. ° C.		
I. Solid.....	−78·2 to −38·5	1·9321	1·0527
II. Melting..	−38·5 „ −33·7	1·9160	8·4375
III. Liquid...	−33·7 „ 0	1·8998	1·0777

Deducting from the alcohol-mercury value of the several degrees half the corresponding alcohol values, the numbers relating to the expansion of the mercury alone are:—I., 0·0867; II., 7·4795; III., 0·1278. Hence, during the melting of the mercury, its expansion per degree is 58·68 times as great as it is when liquid, and 86·5 times as great as when solid; and the coefficient of expansion of solid mercury is approximately two-thirds (actually 0·6784) that of liquid mercury. So 1 c.c. of solid mercury occupies a volume of 1·05098 c.c. when melted.

—W. G. M.

Silver Oxide; Action of Hydrogen Peroxide on ——. Berthelot. Comptes Rend. 133, [16], 555—569.

A new series of calorimetric experiments. When silver nitrate and sodium hydroxide in dilute solutions are mixed in molecular proportions, the reaction is complete in a very few seconds, and the heat-evolution is 17·3 cal. for the precipitation of a molecule of Ag_2O. When dilute nitric acid is now added in molecular proportion, and the solution is agitated, the whole of the precipitate is dissolved in less than three minutes, with a heat-evolution of 10·32 cal. Sulphuric and lactic acids effect the solution of the silver oxide with almost equal rapidity; the heat-evolutions being respectively 18·75 and 8·4 cal.

When, after the precipitation of the silver oxide as above, hydrogen peroxide is added in quantity sufficient to supply 1 atom of oxygen for each molecule of Ag_2O, the precipitate becomes perfectly black, and oxygen is evolved. The amount of this oxygen, as also the accompanying heat-evolution, correspond exactly with the decomposition of one molecule of peroxide into water and oxygen; and, since no undecomposed peroxide remains in the solution, it would appear as though the silver oxide had played no part in the action. On now adding nitric, sulphuric, or lactic acid, however, there is practically no heat-evolution, or only a very slow and gradual one, the substance behaving qutie differently from ordinary silver oxide; while if the precipitate be heated with dilute sulphuric acid, it partly dissolves, leaving behind metallic silver equivalent to exactly half that taken into solution as sulphate.

The author considers that these experiments confirm his previously expressed views (this Journal, 1901, 625) of the reactions involved, which may be summarised in the equations:—

$$6Ag_2O + 6H_2O_2 = 6Ag_2O_2 + 6H_2O;$$

$$6Ag_2O_2 = 2Ag_2 + 3O_2 + 2Ag_4O_3.$$

—J. T. D.

Unsaturated Hydrocarbons; Conversion of Alcohols into —— by the Action of Oxalic Acid. N. Zelinsky and J. Zelikow. Ber. 1901, 34, [13], 3243—3256.

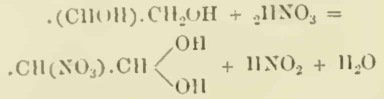
The authors have made use of the dehydrating action of oxalic acid for the preparation of a number of unsaturated hydrocarbons from alcohols. The oxalic acid was employed in the anhydrous state, but the authors have found that the hydrated acid also acts as a dehydrator, although in some cases it gives somewhat different products. The hydrocarbons obtained from the various alcohols examined are as follows:—Pinacoline alcohol yields tetramethylethylene; cyclohexanol (synthetical), tetrahydrobenzene (naphthylene); β-methylcyclohexanol, methylcyclohexene; menthol, menthene; dextro-borneol with hydrated oxalic acid gives an optically active terpene, melting at 3°—4°, and having an $[\alpha]_D$ of 8·12°, whilst with the anhydrous acid two different terpenes are obtained; lævo-borneol gives an optically active terpene; 1:3-dimethyl-3-cyclohexanol yields a hydrocarbon of the formula C_8H_{14}, which boils at 126°—127°, and has an $[\alpha]_D$, + 95°; 1-methyl-3-ethyl-3-cyclohexanol, a compound, C_9H_{14}, boiling at 148°—149°, and having $[\alpha]_D$ = + 56·8°; 1:3-dimethyl-4-isopropyl-3-cyclohexanol, a hydrocarbon boiling at 180°—182°, and having $[\alpha]_D$ = 88·53; and methylfenchylalcohol gives a compound which boils at 172°—173° C., has an $[\alpha]_D$, + 19·68°, and may be regarded as the first known methyl-terpene of the formula $C_{11}H_{18}$ (methylfenchene).—T. H. P.

Arabitol and Rhamnitol; Nitro-derivatives of ——. Constitution of certain Nitric Esters. L. Vignon and F. Gerin. Comptes Rend. **133**, [17], 641—643.

On reducing *d*-arabinose and rhamnose, the arabitol and rhamnitol formed were found to have no reducing action on Fehling's solution, but on completely nitrating these products, the nitro-derivatives had a strong reducing action.

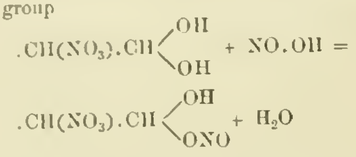
The authors suggest the following explanation of the fact that Fehling solution is reduced by the nitro-derivatives of *n*-hydric alcohols, where *n* is not less than 4. It is known that aldehydic hydrates are readily formed where the rest of the molecule is acidic or electro-negative in its character —thus $CCl_3.CH(OH)_2$ (chloral hydrate) is stable, while $CH_3.CH(OH)_2$ is non-existent. The action of nitric acid on these alcohols, then, is in the first place to nitrate the CHOH groups, and to oxidise the terminal CH_2OH group :—

$$.(CHOH).CH_2OH + {}_2HNO_3 =$$



$$.CH(NO_3).CH\left\langle\begin{matrix}OH\\OH\end{matrix}\right. + HNO_2 + H_2O$$

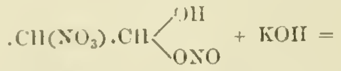
the nitrous acid so formed immediately reacts on the $CH(OH)_2$ group



$$.CH(NO_3).CH\left\langle\begin{matrix}OH\\OH\end{matrix}\right. + NO.OH =$$

$$.CH(NO_3).CH\left\langle\begin{matrix}OH\\ONO\end{matrix}\right. + H_2O$$

and the potash of the Fehling's solution converts this into an aldehydic group, which then reduces the Fehling—



$$.CH(NO_3).CH\left\langle\begin{matrix}OH\\ONO\end{matrix}\right. + KOH =$$

$$.CH(NO_3).CHO + KNO_2 + H_2O.$$

Unless there be at least two internal $.CHONO_2$ groups, the acidity of the molecule is insufficient to allow of the formation of the terminal $.CH(OH)_2$ group. Tollens' pentaerythritol, which contains only CH_2OH groups, and the nitro-derivative of which, $C(CH_2ONO_2)_4$, though containing four ONO_2 groups, does not reduce Fehling, lends support to the authors' view.—J. T. D.

Albumin; Formation of an Isatin-Derivative of ——. J. Gnezda. Comptes Rend. **133**, [14], 517—518.

By reacting on albumin with hypochlorous acid, reducing the product with zinc and hydrochloric acid, distilling with steam, and extracting the distillate with ether, a whitish crystalline product is obtained, which after long desiccation over sulphuric acid, gives brown needle-shaped crystals of a neutral substance, insoluble in water, but soluble in alcohol or ether. This substance gives the distinctive reactions of chlorisatin. The yield is very small.—J. T. D.

Oxide of Hydrogen higher than the Dioxide; Supposed Formation of an ——. W. Ramsay. Proc. Chem. Soc. **17**, [241], 197.

Bach (this Journal, 1900, 863) has stated that evidence can be obtained of the existence of a peroxide of hydrogen higher than the dioxide, by comparing the amount of oxygen evolved from peroxide on treatment with permanganate with the weight of the peroxide present in solution, as determined by titration with permanganate. It was suggested by Armstrong (Proc. Chem. Soc. 1900, **16**, 154) that the discrepancy should be attributed to the formation of persulphuric acid and Caro's acid, due to the action of the peroxide on the sulphuric acid present, during the titration. The author now shows that if peroxide be added to a mixture of sulphuric acid with permanganate, all the oxygen is evolved, but that if the permanganate be added to a mixture of peroxide with sulphuric acid, only a partial evolution of oxygen takes place, for neither persulphuric acid nor Caro's acid is readily attacked by permanganate. On the other hand, if acetic acid be substituted for sulphuric acid, the amount of oxygen evolved corresponds exactly with the amount of permanganate added, whether the latter be added to a mixture of peroxide and acetic acid, or whether the peroxide be added to a mixture of permanganate and acetic acid.

Trinitrobenzene and Trinitrotoluene; Reduction of —— with Hydrogen Sulphide. J. B. Cohen and H. D. Dakin. Proc. Chem. Soc. 1901, **17**, [242], 214.

By the reduction of 1:3:5-trinitrobenzene and 2:4:6-trinitrotoluene in alcoholic solution with hydrogen sulphide in presence of a trace of ammonia, the corresponding dinitrohydroxylamine compounds are formed—

$$C_6H_3(NO_2)_3 + 2H_2 = C_6H_3(NO_2)_2NHOH + H_2O.$$

Dinitrophenylhydroxylamine is an orange crystalline substance, m. pt. 114°—116°, soluble in alcohol, benzene, and in hot dilute hydrochloric acid; *dinitrotolylhydroxylamine* crystallises from benzene in yellow rhombohedrol crystals and from dilute hydrochloric acid in needles, m. pt. 143°—145°. Both compounds reduce alcoholic silver nitrate and Fehling's solution; they are slowly decomposed on boiling with dilute, more rapidly with concentrated hydrochloric acid, yielding the amino-compounds and losing oxygen—

$$C_6H_3(NO_2)_2NHOH = C_6H_3(NO_2)_2NH_2 + O.$$

In the case of trinitrotoluene, the nitro-group in the ortho-position undergoes reduction, a curious fact, seeing that ammonium sulphide effects the reduction of the para-nitro-group. The 2:4-dinitro-6-toluidine, obtained by the action of strong hydrochloric acid on dinitrotolylhydroxylamine, is a colourless substance crystallising in needles and melting at 212°—213°.

Research Scholarship.

Iron and Steel Institute.

A research scholarship or scholarships, of such value as may appear expedient to the Council of the Iron and Steel Institute, from time to time, founded by Mr. Andrew Carnegie (Vice-President), who has presented to the Iron and Steel Institute 64, 1,000 dol. Pittsburg, Bessemer, and Lake Erie Railroad Company 5 per cent. debenture bonds for the purpose, will be awarded annually, irrespective of sex or nationality, on the recommendation of the Council of the Institute. Candidates, who must be under 35 years of age, must apply, on a special form, before the end of March, to the Secretary of the Institute.

The object of this scheme of scholarships is not to facilitate ordinary collegiate studies, but to enable students who have passed through a college curriculum, or have been trained in industrial establishments, to conduct researches in the metallurgy of iron and steel and allied subjects, with the view of aiding its advance or its application to industry. There is no restriction as to the place of research which may be selected, whether university, technical school, or works, provided it be properly equipped for the prosecution of metallurgical investigations.

The appointment to a scholarship shall be for one year, but the Council may at their discretion renew the scholarship for a further period, instead of proceeding to a new election. The results of the research shall be communicated to the Iron and Steel Institute in the form of a paper to be submitted to the annual general meeting of members, and if the Council consider the paper to be of sufficient merit, the Andrew Carnegie Gold Medal shall be awarded to its author. Should the paper in any year not be of sufficient merit, the medal will not be awarded in that year.

By Order of the Council,
Bennett H. Brough,
Secretary.

Prizes.

Institution of Mining and Metallurgy.

The Council of the Institution of Mining and Metallurgy have pleasure in announcing that a gold medal and premium of the value of fifty guineas, presented by the Consolidated Gold Fields of South Africa, Ltd., will be awarded annually by the Institution on the following conditions, namely :—

1. The award will be made by a committee of three gentlemen who will be nominated by the Council of the Institution.

2. The first award will be made in June 1902, and succeeding awards in June in each year.

3. The gold medal and premium will be awarded to the author of the paper of highest merit contributed to the Transactions by any member, associate, or student of the Institution, during the preceding session, upon the mining, treatment, or reduction of gold ores.

Whilst the Council do not deem it expedient to specify any exact subject within the limits above stated, a list of suggestions of suitable subjects is sent herewith for the assistance of those intending to submit papers.

By Order of the Council,
C. McDermid,
Secretary.

The following subjects are suggested as suitable for papers in connection with the Annual Gold Medal and Premium, of the value of Fifty Guineas, to be awarded by the Institution of Mining and Metallurgy :—

The comparative merits of Wet and Dry Crushing.
Crushing Machinery.
Ore Sampling Apparatus and Methods.
Design, construction, and erection of Stamp Batteries.
Milling practice and amalgamation.
The Relative Value of Diamond and Electric Rock Drills.
Boring.
The testing, upkeep, and life of Winding Ropes for deep level Shafts.
Shaft-sinking ; Timbering ; Plant ; sizes for deep level Shafts, &c.
Hoisting Engines for deep level Mines.
Ventilation of deep level Mines.
Explosives.
Lighting.
Pumping : electric, steam, hydraulic, and air.
The Geology of the Rand, with special reference to the extension of the Main Reef Series east and west of present known boundaries.
Methods of prevention of over-winding.
The merits of Compressed Air, as compared with Electricity, for transmission of power.
The transmission of energy, by electricity, in Gold-milling.
The best method of Laying-out a Mine and of Stoping the Reefs when dipping at a slight angle.
Mine Sampling and Estimation of Ore Reserves.
Sorting Appliances, and advantages of sorting.
The influence of Crushing on the Rand Conglomerates.
Recent developments in Cyaniding and in Chlorination.
Methods of treatment of Slimes.

New Books.

The Laboratory Companion to Fats and Oils Industries. By Dr. J. Lewkowitsch, Consulting and Analytical Chemist and Chemical Engineer, &c. Macmillan and Co., Ltd., London. 1901. Price 6*s.* net. The Macmillan Company, New York.

8vo volume, containing preface, table of contents, and 141 pages of text, with, finally, the alphabetical index. The work is divided into three parts :—Part I. System and Examination of Fats and Waxes. This again is subdivided into : A. System of Fats and Waxes. B. Saponification of Fats and Waxes ; and C. Examination of Fats and Waxes. Following this, are tables of the Glycerides, Waxes, Fatty Acids, &c., with their various constants, values, and chief properties, and finally their occurrences. Part II. is devoted to the Fats, Oils, and Waxes, and the Commercial Products derived therefrom. It comprises a series of tables wherein at a glance is seen any specific value, property, use, or occurrence. A. Fats, Oils, Waxes, and their Constants and Variables. B. Commercial Products of the Fats and Oils Industries. Under these we have 1. Lubricants. 2. Wool Oils, Cloth Oils. 3. Sod Oils—Dégras. 4. Oxidised Oils. 5. Vulcanised Oils. 6. Candle Making. 7. Soap Manufacture. 8. Glycerin. Part III. A series of General Tables, principally referring to Thermometric Scales, Hydrometer Degrees, and Specific Gravities of Acids, Common Salt Solutions, and Alcohol.

Ferments and their Actions. By Carl Oppenheimer, M.D., Ph.D. Translated by C. A. Mitchell, B.A. Chas. Griffin and Co., Ltd., Exeter Street, Strand. 1901. Price 7*s.* 6*d.* net.

This work, commencing with author's and translator's prefaces, and a table of contents, fills 304 pages. Then follows a systematic bibliography of works, treatises, and papers bearing upon the general subject. These are classified as follows :—I. Text-books. II. Ferments and Fermentations in general. Nature of Ferments, &c. III. Mode of Action of Ferments, &c. IV. Physiological Action. V. Distribution. VI. Digestion and Proteolytic Ferments generally VII. Pepsin. VIII. Trypsin. IX. Decomposition of Proteids. X. Papaïn. XI. Rennet. XII. Diastase. XIII. Cytase, &c. XIV. Ferments of Disaccharides. XV. Ferments decomposing Glucosides. XVI. Other Hydrolytic Ferments. XVII. Lactic Acid Fermentation. XVIII. Alcoholic Fermentation. XIX. Oxydases. XX. Oxidising Fermentations. XXI. Miscellaneous References.

After this follows a list of abbreviations and the alphabetical indexes of subjects and authors. The work itself is subdivided into General and Special Parts. The General Part, after its introduction, runs the following course. I. Definition of a Ferment. II. Chemical Nature. III. Influence of External Factors on Ferments. IV. Mode of Action of Ferments. V. Physiological Action. VI. Secretion of Ferments. VII. Importance of Ferments to the Vital Process. Special Part. A. The Hydrolytic Ferments. B. The Oxidising Ferments.

Die Brennstoffe Deutschlands und der übrigen Länder der Erde, und die Kohlennoth. Von Dr. Ferd. Fischer, Professor an der Universität Göttingen. Friedrich Vieweg und Sohn, Braunschweig. 1901. Price M. 3.00.

8vo volume, containing preface, table of contents, and subject-matter filling 107 pages. The subject of this work is treated under three principal heads. I. The Fuels of Germany. II. Demand for Coal in the remaining Countries of the World. III. The Coal Famine. Germany is described as the richest country of Europe in coal, the demand during the last year, 1900, representing a money value of over one milliard of marks. England, it is said, in fifty years, will be threatened with a partial exhaustion of coal supply. As fuel, Germany at present, it is said, counts upon wood and peat as well as coal, and the author strongly advocates scientific economy, in order that these indispensable treasures may be extended as far as possible to future generations.

Die Normalelemente und ihre Anwendung in der Elektrischen Messtechnik. Von Dr. W. Jaeger, Kaiserl. Professor, Mitglied der Phys.-Tech. Reichsanst. in Charlottenburg. William Knapp, Halle a. S. 1902. Price M. 6.

Following the preface and table of contents are 117 pages of text, illustrated with 38 wood engravings. Then follow an appendix with tables for the Electromotive Power of the Clark's and the Cadmium Element in int. Volt, between 10° and 30° C., a bibliographic list, and finally the alphabetical indexes of authors and subject-matter. The work is divided into four parts. I. Definition and

Arrangement of the Normal Elements. II. Theory of the Normal Elements. III. Description, &c. of the Elements Individually. IV. Appropriation as to Standard and Energy, of the Normal Elements.

Prospecting for Gold. A Handbook of Practical Information and Hints for Prospectors, based on Personal Experience. By Daniel J. Rankin, formerly Manager of The Central African Company and Leader of African Gold Prospecting Expeditions. Crosby Lockwood and Son, 7, Stationers' Hall Court, Ludgate Hill, London. 1901. Price 7s. 6d.

Small volume arranged as a pocket-book. A frontispiece illustrates the Prospectors' Camp Cabinet, designed by the author. The aim of the compiler, it is stated, is to furnish the prospector, in a portable form, with information, all-important in his quest for the gold, but hitherto spread through a number of volumes, the bulk of which makes their carriage in such expeditions all but impracticable. After the preface and table of contents follow 178 pages of subject-matter and the alphabetical index. The subject-matter itself is subdivided as follows:—I. Kinds of Rocks. II. Condition, Structure, and Arrangement of Rock Masses. III. Minerals associated with Gold. IV. Gold in Africa, Banket Formation. V. Methods for the Preliminary Determination of Gold in Quartz and Ores. VI. Prospecting for Alluvial Gold or Placer Deposits. VII. Prospecting for Auriferous Veins and Rocks. VIII. Tables of Characteristics of Mineral Ores, also of Blowpipe Analyses of Ores. Addenda. Parton's Test for Gold. Gold Assay by the Touchstone. Estimation of Gold in Alloys.

Chemisch-Technisches Repertorium. Uebersichtlicher Bericht über die neuesten Erfindungen, Fortschritte und Verbesserungen auf dem Gebiete der technischen und industriellen Chemie, mit Hinweis auf Maschinen, Apparate und Literatur. Herausgegeben von Dr. Emil Jacobsen. 40. Jahrgang. 1901. Erstes Halbjahr. Erste Hälfte. R. Gaertner's Verlagsbuchhandlung, Hermann Heyfelder, Schönebergerstr. 26, Berlin, S.W. 1902.

This is the number of the "Repertorium" for the first half of the first half-year of 1901, and it treats of the following subjects of chemical technology:—I. Building Materials. II. Dyestuffs, Dyeing, and Printing. III. Fats, Oils and Illuminants, and Fuels. IV. Fermented Liquors. V. Tanning, Leather, and Glue. VI. Textiles. VII. Glass and Earthenware. VIII. Wood and Horn. IX. India-rubber and Gutta-percha. X. Cements and Adhesives, &c. XI. Spirit and Oil Varnishes, and Paints. XII. Metals.

Subject List of Works on certain Chemical Industries, including Destructive Distillation, Mineral Oils and Waxes, Gas Lighting, Acetylene; Oils, Fats, Soaps, Candles, and Perfumery; Paints, Varnishes, Gums, Resins; Paper, and Leather Industries,—in the Library of the Patent Office. Patent Office Library Series No. 7. Bibliographical Series No. 4. Printed for His Majesty's Stationery Office, by Darling and Son, Ltd., 34–40, Bacon Street, London, E. Published at the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C. 1901. Price 6d.

Introduction to the Study of Chemical Philosophy. The Principles of Theoretical and Systematic Chemistry. By William A. Tilden, D.Sc., F.R.S., Professor of Chemistry in the Royal College of Science, London. 10th edition, completely revised and re-arranged, with answers to problems. Longmans, Green, and Co., 39, Paternoster Row, London. Also New York and Bombay. 1901. Price, 5s. 6d., or without answers, 5s.

Small 8vo volume containing prefaces, table of contents, and 359 pages of subject-matter, 3 pages of exercises, index of names and subjects, and 24 pages of answers to problems. The work is subdivided into three sections:—I. Chemical Combination and Chemical Compounds. II. Classification (Elements, Metalloids, Metals, The Periodic System, and Classification of Compounds). III. Chemical Kinetics (Conditions of Chemical Change, Thermal Effects of Chemical Action, Heat of Combination and Combustion, Electro-Chemical Decomposition, &c., Solution).

Trade Report.

I.—GENERAL.

Patent Law Amendment.

Standard, Dec. 14, 1901.

Sir Herbert Jekyll, replying to the Memorial of the Association of Chambers of Commerce on the subject of the Amendment of the Patent Laws, says:—

"I am directed by the Board of Trade to advert to your letter of the 16th October, addressed to the President, transmitting a copy of resolutions adopted by the Association of Chambers of Commerce of the United Kingdom, at its recent conference at Nottingham, in favour of the Amendment of the Patent Law in certain particulars, and in reply, I am to say that Mr. Gerald Balfour has given instructions for the drafting of a Bill to give effect to the recommendations of Sir Edward Fry's Committee, and that His Majesty's Government will consider in due course whether the Bill shall be introduced next Session."

The Council of the Association have resolved to apply to the President of the Board of Trade to receive a deputation in support of the resolution adopted at the autumnal meeting.

Patent Law Reform.

Chem. Trade J., Dec. 14, 1901.

At a meeting of the Board of Directors of the Manchester Chamber of Commerce, on the 11th inst., it was intimated that the Council of the Association of Chambers of Commerce had decided to arrange for a deputation to the President of the Board of Trade, for the purpose of urging the importance of introducing, in the next session of Parliament, a Bill for the reform of the Patents Act, 1883, on the lines of the resolution passed by the representative conference held in Manchester last June, and afterwards adopted by a general meeting of the Association. It is expected that the deputation will include delegates, not only of various Chambers of Commerce, but also of several powerful bodies specially representing the leading industries of the country.

Mineral Production of India.

Imp. Inst. J., Dec. 1901.

The production of petroleum in Burma has rapidly advanced, being nearly twice as great, in 1899 and 1900, as in 1897 and 1898. In 1900, Burma yielded 36,974,000 galls., and Assam, 753,000 galls. In spite of the large increase in output, the supply is insufficient for the needs of the Indian market, and two-thirds of the requirements have to be imported. Saltpetre is largely produced for export, especially in Behar, though it is less in demand than formerly, owing to a decline in its use for gunpowder, food preservation, and manure. The shipments from Calcutta, in the last five years, have averaged about 20,000 tons. Madras exports, mainly to England, a considerable quantity of manganese ore. The extraction of mica has gone on for many years in Bengal, and this mineral has recently been obtained in increasing quantities from Madras. Tin mining is carried on by Chinese in Lower Burma.

II.—FUEL, Etc.

Petroleum in Canada.

Chem. Trade J., Nov. 23, 1901.

According to a report of the Ontario Bureau of Mines, there was a slight decrease in the output of crude petroleum in 1900, as compared with 1899, the figures being 23,381,783 imperial galls., in 1900, as against 23,615,967 galls., in 1899. The total value of the substances refined from the oil was considerably larger, being 1,869,045 dols., as compared with 1,747,352 dols. The following table gives details:—

——	1899.	1900.
	Dols.	Dols.
Illuminating oil	1,059,485	1,076,242
Lubricating oil	189,294	232,805
Benzine and naphtha	148,963	174,346
Gas and fuel oils and tar	213,544	209,931
Paraffin wax and candles	136,066	184,718
Total	1,747,352	1,869,045

There was a diminution in the quantity of gas and fuel oils, as compared with 1899, and an increase in the production of paraffin wax and candles. The falling off in gas oils is due to the fact that crude oil is now used instead of gas oil in the making of gas. For a long time crude oil could not be employed to advantage for this purpose, because too much free carbon was generated in the retorts, ultimately choking up the mains, and blackening the ceilings and walls of rooms. This difficulty has now been overcome, and gas producers, on equal terms, now prefer crude, to the product of crude, gas oil.

Gas and Oil Industry in Germany.

J. f. Gasbeleucht. 1901, **44**, [41], 751—755.

The German Association of Gas and Water Managers addressed a memorial, on Dec. 31, 1900, to the Federal Council of Germany, praying for the importation of duty-free mineral oil for the manufacture of carburetted water-gas. The memorial drew attention to the fact that the Council was empowered, under par. 1 of No. 29 of the Customs laws, to allow mineral oil, destined for industrial uses, other than the manufacture of lubricating or burning oil, to pass free of import duty. It then referred to the recent increase in the cost of gas coal, and the consequent desirability of processes for the manufacture of illuminating gas, other than the coal-gas process, being available for adoption in gasworks. Among such processes, that of carburetted water-gas manufacture has been adopted in America, England, and Belgium, where the mineral oil residues required are obtainable duty-free, and at a low price. In Germany the existing scale of Customs duties imposes an import duty of 6 or 10 marks per 100 kilos., according to the specific gravity, on such oil residues, and as there is no good native substitute for them, the manufacture of carburetted water-gas is thereby precluded. The residues, or oils suitable for that manufacture, are by-products in the production of burning oil from crude petroleum, and hence are produced chiefly in America and Russia, though also in Galicia and Roumania. Of late years, large quantities have passed through Germany from Galicia, for use in carburetted water-gas manufacture in Belgium. The high Customs duty, however, prevents their use in Germany. The percentage of residues or heavy oils obtained from crude petroleum varies with its origin, and is, for the chief varieties, as follows:—Pennsylvania, 10—20; Ohio, 35—50; Baku, 36—60; Galician, 30—45; and Roumanian, 25—35. Great quantities are consumed as fuel, and some is worked up in the manufacture of lubricating oil and paraffin. In America, however, so much is used in making carburetted water-gas, that many towns are supplied entirely with that gas instead of coal-gas. In Europe, especially England, great quantities of American and Russian oil residues are now used in carburetted water-gas manufacture, but the residues from the Galician and Roumanian distilleries, which could more readily be brought to Germany, are at present used as fuel at the place of production. There is an annual output of about 26,000 metric tons of petroleum from Alsace and Hanover, but there seems no prospect of this being increased, or of there being other supplies of native German petroleum. Residues, or gas oils, amounting to about 12,000 metric tons annually, are produced in the manufacture of burning oil, &c., from lignite, in Saxony-Thuringia and at Messel, but these are almost wholly used for making oil-gas for carriage lighting. Notwithstanding such unfavourable conditions for the production of carburetted water-gas, the process has been adopted recently at Hamburg, Bremen, and Posen, but its further adoption in Germany is precluded by the inadequate supply of native oils, and the high rate of duty on imported oils. At Königsberg and Erfurt, owing to the difficulty of obtaining oil residues, water-gas has been carburetted by the addition of vapour of benzol, but such gas can only be used in limited proportion, in admixture with coal-gas, owing to the tendency of the benzol to condense, and cause stoppages in the supply pipes in the cold season, which is the time when there is the greatest demand for gas.

The memorial then points out that the interests of the lamp-oil traders and of the home petroleum industry would not be prejudicially affected by the removal of the Customs duty on oil residues destined for use in the manufacture of carburetted water-gas, and that any other use of the residues exempted from duty could readily be prevented. The residues might be defined, in order to avoid confusion with burning and lubricating oils, as oils having a specific gravity at 15° C. exceeding 0·830, and a flashing point above 70° C. The memorial prayed that such oils might be allowed to pass duty-free, when destined for use in public gas works in Germany.

Oil gas is applied universally for lighting railway carriages, lighthouses, beacons, and buoys, but a more extended use of it in Germany is hindered by the Customs duty on imported mineral oil. This duty, which ostensibly protects the small group of oil producers in Germany, amounts to 6 marks on all mineral oil except lubricating oil, on which it is 10 m. per 100 kilos., including the weight of the barrels. If imported in bulk, 25 per cent. is added to the duty, calculated, according to the above scale, on the net weight of oil, as an allowance for the weight of barrels. Oil of higher specific gravity than 0·830 is classed as lubricating oil, and as the specific gravity of the cheap gas oils exceeds this limit, they are subjected to the higher duty. Hence, whereas petroleum residues suitable for gas making could be bought for about 3½ m. per 100 kilos. in 1898, the import duty amounted to 12½ m., or three to four times their value. In 1898, the German gas oils cost 8 m., but they now sell for 12 to 14 m., and are inferior for gas making to the foreign petroleum residues, which are now worth 4 to 5 m. per 100 kilos. exclusive of duty.

The German State railways use about 12,000 metric tons of gas oil per annum for making oil gas, and there is no doubt that they now pay for it 7 to 8 m. per 100 kilos. more than they would if the foreign petroleum residues were admitted duty-free, and so competed on equal terms with the home products. The recent rise in the price of oil has almost ruined German oil-gasworks, which supply gas under contract, as, though the foreign oils have risen only 1½ m. in value, the German oils, owing to the protective duty, have risen at least 8 m. per 100 kilos.

Actually, burning oil, paying the lower import duty of 7½ m. per 100 kilos. *net*, is obtainable in Germany for 16 m., at which price it comes into competition, for gas making, with the intrinsically less valuable gas oils of home production, and the foreign petroleum residues, which pay the higher rate of duty. A moderate duty of 2 to 3 m. on these residues might be justified, as a protection of the home petroleum industry, but as the other products of that industry fetch good prices, it seems unnecessary to protect the gas oil by any duty on imported residues. The German oil works are earning good dividends, while the oil-gas works, in which fully as much capital is invested and more men are employed, are hampered by the duty on imported gas oil, and are falling behind similar works in other countries. Moreover, cheap oil is urgently required for the manufacture of carburetted water-gas (*c.f.* preceding abstract). Practically none of the oil, classed as lubricating oil, at present imported into Germany, is used for gas making, consequently the removal of the import duty on oils imported for that purpose would not prejudicially affect the Customs returns under that heading.—J. A. B.

III.—TAR PRODUCTS, PETROLEUM, Etc.

Coal-Tar Pitch in Germany.

U.S. Cons. Reps., Dec. 4, 1901.

The James Stevenson Aktien Gesellschaft, of Stettin, [illegible] buy coal-tar pitch. The article must be almost [illegible] not to exceed one-half of 1 per cent. of ash. The present supplies of the firm come from Great Britain, and the cost is about 10s. (9·72 dols.) per ton, c.i.f. Stettin.

IV.—COLOURING MATTERS, Etc.

United States Customs Decision.

Bd. of Trade J., Nov. 28, 1901.

The following dyes are free of duty, under par. 469 of the Tariff, as "alizarin (natural or artificial) and dyes derived from alizarin or from anthracene":—

Alizarin grey
,, ,, F F
,, blue B R 3 G
,, ,, H R
,, ,, S A P
,, ,, S A C
,, ,, S A E
Alizarin blue S A F
,, fast black
,, ,, S P
,, black B
,, ,, 1 A
,, ,, 3 B

The following are dutiable at the rate of 20 per cent. *ad val.*, under par. 15 of the Tariff, as products of coal tar, not colours or dyes:—"Binitrotoluol, reduced," and "sodium salt of amido naphthol sulpho acid."

The following are dutiable at the rate of 30 per cent. *ad val.*, under par. 15 of the Tariff, as "coal-tar dyes or colours, not specially provided for:—

Alizarin brown G
,, ,, W
,, ,, R
,, blue G C
,, ,, S G R
,, ,, S 5 R
,, ,, 5 R
,, ,, B A R
,, ,, S 3 R
,, ,, C B B
,, black (Bayer) 1 B
,, ,, S G
,, ,, 2 B
Alizarin black V B
,, ,, N V B L
,, ,, F
,, ,, G A
,, yellow
,, ,, A
,, ,, C D
,, ,, C R X
,, ,, 3 G P
,, green
,, ,, S S
,, ,, P extra

VII.—ACIDS, ALKALIS, AND SALTS.

Carbonate of Baryta, precipitated.—
U.S. Customs Decision.

Bd. of Trade J., Dec. 12, 1901.

The exemption of carbonate of baryta from duty, under par. 489 of the Tariff, extends only to the natural mineral product known as "witherite." The artificial product, known as "carbonate of baryta, precipitated," is dutiable as a chemical salt or compound, under par. 3 of the Tariff, at the rate of 25 per cent. *ad val.*

Sulphur in New Zealand.

Eng. and Mining J., Dec. 7, 1901.

The New Zealand Mines Department reports the output of sulphur in the colony, in 1900, at 1,692 tons, an increase of 165 tons over the previous year.

VIII.—GLASS, POTTERY, AND ENAMELS.

Lead Poisoning in the Potteries: Home Office Arbitration.

Chem. Trade J., Nov. 23, 1901.

The arbitration between the Home Office and the manufacturers on the proposed new special rules for the pottery trade, which was opened on Nov. 7, at Stoke, was concluded on Nov. 12. The substance of the decision of the umpire (Lord James of Hereford) is as follows:—

Lord James said that the State had taken upon itself the duty of interference with trades that were dangerous to health and destructive of life, and it was in the performance of that very important duty that these rules had been framed. On the other hand, the Home Office recognised that interference with a trade which was a trade of the country, and which affected the community as a whole, should not take place if it could be avoided. Bearing these two principles in view, as this arbitration had proceeded, it seemed to him that the decision, if not well considered, might effect an injury which possibly could be avoided.

The witnesses for the Home Office had admitted that the most important rules—Nos. 1 and 2—which dealt with fritting and the 2 per cent. of soluble lead, would require considerable modification, and that their terms would have to be remodelled before they could be accepted. The employers admitted that they had undertaken, in regard to the use of frit, a burden which they now said they could not bear. Endeavouring to protect the interests of all parties, the practical course he suggested was, that the substance of the rules should come into effect in a reasonable time, with the exception of Nos. 1, 2, and 6. With respect to these, dealing respectively with the exclusive use of fritted lead, with the maximum of 2 per cent. of soluble lead, and with the monthly medical examination of adult males, since the rules of 1898 came into force, great progress had been made in diminishing the evil. The percentage of lead-poisoning cases had been reduced from 12 to 3·5. Experiments had been made by the employers in order to see how they could lessen the amount of lead, and the evil effects of it, in their manufactures, and those experiments were still proceeding. If nothing were done, the diminution of the evil would be certain and progressive, and when the new rules, as now revised, came into existence, that natural progress would continue. What he now proposed was, not to let that arbitration go on at present. He proposed to adjourn it, as regarded rules 1, 2, and 6, for 18 months, with power then, if necessary, still further to adjourn it. The result would be that those three rules would not come into operation for over 18 months at least. He appealed to the employers first, in the interests of themselves—who must look forward to the dealing with these rules in 18 months' time—to do all that they could in the matter. They could do a great deal more by extending the system of fans, making more general those water cisterns into which dust dropped; and some of the older factories, by better flooring and better cleansing of the floors; the use of overalls, &c., should be general, and they should always be kept in a cleanly state. He appealed to the manufacturers also to see whether they could not reduce the quantity of soluble lead used. He congratulated them that they could make goods of such a quality that they could compete with a 60 per cent. tariff, but he asked them also to look to their foreign brethren, and see if they could not learn something from them in regard to lessening the dangers of the trade. He would recommend the Home Office to consider whether a rule could not be made, which should provide that, upon application made by any employer, showing that the lead used in his factory had been reduced, say, to 2 per cent. of solubility, the Home Office should exempt such manufacturer from other rules which seemed to press hardly upon him. If, by any system they could reduce the lead used to a low test of solubility, then the necessity of the prohibitive rules would be obviated.

With regard to the operatives, he also appealed to them. There were two classes of them, the adult males, and those who could not protect themselves so much—the women and young people. He asked the former not to think so much of themselves, but to think of others in the factory, and to do all that they could in every way to see that a state of things existed that was conducive to long life. It would be a very great advantage if some arrangements could be come to between the two, by which the employer would take upon himself the burden of the Compensation Act, in regard to sickness brought on by poisonous ingredients used in the trade. That must be a matter of agreement. Every employer would then desire that his factory should be in such a condition, that no compensation would have to be paid. He hoped that the course he had taken would, first, in the cause of humanity, be sufficient; and, secondly, would not impose the least burden upon a trade which, he thought, was conducted with credit to the country. (See also this Journal, 1901, 475.)

China Clay in the Province of Florence (Italy).

Foreign Office Miscellaneous Series, No. 570.

In the china factories of this province, the principal material employed is china clay, imported from the United Kingdom, and then Italian kaolin, pegmatites, felspars, quartzes, and other silicious minerals and earths. The Italian clays have hitherto proved inferior to the French (Bollène and St. Yrieix), and especially to the British kaolins (Cornwall). In Sardinia, numerous lodes of china clay are said to exist, but the clay obtained near the surface is impure. If the lodes were dug to some depth, better results might be obtained.

IX.—BUILDING MATERIALS, Etc.

Cement: Valuation Tariff in Egypt.

Bd. of Trade J., Nov. 20, 1901.

The Egyptian *Journal Officiel* for the 16th November, contains a Valuation Tariff* in use by the Egyptian Customs Authorities, for the purpose of assessing duties on cement. This Tariff, which was to come into operation on the 13th inst., and to remain in force for 12 months, or until denunciation, is as follows:—

Description.		Valuation † per 1,000 kilos.
		£ E‡
Artificial Portland cement, English ...	in barrels	2·250
	in bags ..	2·000
Artificial Portland cement, all other kinds..............................	in barrels	1·870
	in bags ..	1·620
Natural cement of all descriptions....	in barrels	1·625
	in bags ..	1·375
"Valentin Roquefort" and "Gris Bedoule" cement	in barrels	1·350
	in bags ..	1·100

* For particulars as to the nature of these Egyptian Valuation Tariffs, see *Board of Trade Journal* for 28th February last, p. 517.

† Duty is levied on these valuations at the rate of 8 per cent. *ad val.*

‡ £E = 1*l.* 0*s.* 6*d.*

Mica Scrap: U.S. Customs Decision.

Eng. and Mining J., Dec. 7, 1901.

Small pieces of mica, which fall off in the process of thumb-trimming mica, do not constitute waste, but being still mica, used as such, and not having lost their character as merchantable mica, are dutiable under par. 184, Act of July 24, 1897. Such merchandise is not known as mica waste, nor is there any trade understanding or meaning of the term "mica waste," and it is, therefore, not dutiable, under provisions of par. 463, for waste not otherwise provided for.

X.—METALLURGY.

Lead Mining in England.

Chem. Trade J., 23 Nov. 1901.

At a meeting of the Manchester Geological Society, Mr. J. Dickinson read a paper, in which were given particulars of the lead mining districts of the North of England and Derbyshire. To show the change that has come over lead mining, the output of lead ore in Derbyshire, in 1858, was 6,277 tons. In 1878, it diminished to 2,090 tons, from which figures it had somewhat revived (mainly by the output of one mine), the output, in 1900, being 4,395 tons. In the four northern counties, in 1900, the production of lead ore was 7,176 tons. Of this, Cumberland produced 1,321, Durham 3,849, Northumberland 520, and Westmoreland 1,486, tons. All these figures indicate a great falling off, as compared with the output in olden times. In the three years ended 1768, the average annual output of the Alston Moor mines alone was 8,244 tons, being more than six times the present production of the whole of Cumberland, and considerably more than the present production of the whole of the four counties. The diminution had been general throughout the whole of the United Kingdom. According to the reports of His Majesty's inspectors of mines, the total production of lead ore, in 1900, was only 32,010 tons, whilst, during the ten years ended 1882, it averaged yearly 73,357 tons. Had the diminished production been confined to isolated places, it might be attributed to local mismanagement, but being national, except at a few favoured mines, it must apparently be set down to causes over which this country had no control. One of the main causes seemed to be the import at low prices from foreign silver and other mines, where lead was a residual product.

Platinum in Canada.

Eng. and Mining J., Nov. 30, 1901.

The *Bulletin* of the Ontario Government Assay Office says: "The commercial use of metallic platinum is being so widely extended at present, and the consumption is increasing at such a rate, that ingot platinum is now quoted at 21 dols. per ounce, platinum in the ore being worth about 17 dols. per ounce, according to assay value. The value of platinum is not likely soon to decrease; hence any ore carrying platinum capable of being extracted commercially is in constant demand. The rise in value of platinum is caused by increased consumption in photographical work, electric lighting, incandescent lighting mantles heated by burning gas, instrument-making, and various apparatus made entirely or in part of platinum, and other uses in the arts.

"Platinum is principally found in the native form, occurring generally in alluvial sands, associated with garnets, magnetite, topaz, corundum, zircons, native gold, and other heavy minerals. Platinum metals are found as small grains or scales of a tin-white colour when cleaned with nitric acid. The scales are generally too fine to catch the eye, and collect with a heavy fine sand, as streaks of brown or lead-coloured particles, which are very heavy, and can be concentrated by washing with running water or by panning. The ordinary riffles in a gold-saving sluiceway will not save all of the platinum metals to be found in alluvial sand, as some of the values creep over and are lost. Nor will the platinum metals amalgamate with mercury without special treatment. There are several satisfactory methods of concentrating alluvial sands so as to save the platinum metals.

"Platinum occurs in the Sudbury mining district as sperrylite, which is a combination of platinum and arsenic found in the gossan of the Vermilion nickel mine. The matte formed by smelting the nickel-copper bearing pyrrhotites of the Sudbury district contains platinum, which is saved in the process of refining the metallic contents. It is possible that closer search of placer sands will result in finding more of this valuable metal in paying quantities for working by hydraulic methods."

Lead and Zinc in Austria.

Eng. and Mining J., Nov. 16, 1901.

In 1900, the Austrian mines produced 14,314 metric tons of lead ore, of which 10,904 tons were from the mines of Carinthia. As compared with 1899, there was an increase of 735 tons. The output of metallic lead was 10,650 tons, an increase of 914 tons over 1899. In addition to this, a production of 1,288 tons of litharge is reported, being 239 tons less than in 1899.

The production of zinc ore, during 1900, amounted to 38,243 metric tons, an increase of 1,142 tons over 1899. Of this ore, 21,421 tons were mined in Carinthia. The production of metallic zinc was 6,742 tons, or 450 tons less than in 1899. Of the zinc produced in 1900, Galicia turned out the largest proportion, 3,365 tons; whilst the works in Steiermark turned out 2,958 tons.

Chrome, Coal, Silver-Lead, and Antimony Mines in Salonica and Kossova (Turkey).

Bd. of Trade J., Nov. 28, 1901.

The British Vice-Consul at Uskub states that the chrome and coal mines at Elleshan, the first station on the Uskub [illegible] and the silver-lead and antimony mines, [illegible] the market.

[illegible] mine at Elleshan, if really as rich as it is [illegible], would prove a valuable investment, with [illegible] attendant risks in Turkey than in any other country.

The chrome mine of Elleshan, and Junuz Bey's silver-lead and antimony mines are also considered of great value, owing to their comparative proximity to Uskub and Elleshan and their situation in a more or less civilised part of the country. The chrome is said to exist in enormous blocks. Some years ago, the mine was energetically worked and the output was very large, but only a small percentage of the ore which was discovered could be extracted owing to the sudden inrush of a stream which would need diverting from its actual channel, and the cost, though insignificant, was more than the owner could bear.

In the case of both these mines, capital is, according to report, alone required to open up a great store of wealth.

MANGANESE ORE IN ITALY.

Eng. and Mining J., Nov. 16, 1901.

In 1900 the production of manganese ore in Italy was 6,014 tons, against 4,356 tons, in 1899, showing an increase of 1,658 tons last year.

TIN IN ALASKA.

Bd. of Trade J., May 12, 1901.

According to the *British Columbia Review* of 30th Nov., a deposit of oxide of tin, containing $78\frac{1}{4}$ per cent. of metallic tin, has been discovered near York, in Alaska. It is an alluvial deposit and looks like magnetic iron, except that it is whiter. Miners can easily detect it, as the iron minerals make a red powder, whilst the tin mineral makes a white powder.

The discoverers report that they got 150 to 200 lbs. of the ore to the cubic yard. It can be saved by very little extra trouble, as it exists in auriferous gravel, and accumulates in the sluice boxes.

XII.—FATS, OILS, Etc.

EARTH-NUTS GUM, AND RUBBER IN SENEGAL (W. AFRICA).

Foreign Office Annual Series, No. 2725.

The exports for 1900 are valued at 1,317,285*l.*, being 375,428*l.* in excess of the previous year. The increase is mainly due to the large output of earth-nuts, of which 138,708 tons, valued at 969,612*l.* were shipped to Europe.

The exports were distributed among the various countries as follows:—France received earth-nuts, gum, rubber, &c.; Holland took earth-nuts, 85,318*l.*; Germany, earth-nuts, 55,218*l.*; Belgium, earth-nuts, 24,134*l.*; gum, 373*l.*; rubber, 4,365*l.*; the United Kingdom, earth-nuts, 1,212*l.*; gum, [illegible]85*l.*; rubber, 6,476*l.*

Earth-nuts, the chief product of the country, are grown largely between Dakar and St. Louis. Their cultivation is simple. At the commencement of the rainy season, about June, the seed is planted, and by November or December the crop is fully matured. Rubber, growing in three varieties, viz., the *Ficus Vogelii*, the *Landolphia Fomentosa*, and the *Ceara* tree, is receiving the attention of the Government, as it is regarded as the future resource of the colony in the event of the failure of the earth-nut trade. With this view many plantations have been laid out at Casamance and in the region of Mayes, near the coast, between Dakar and St. Louis, where the soil is most favourable. Producers are encouraged to prepare only the best qualities for the market.

SOAP IN THE PROVINCE OF FLORENCE (ITALY).

Foreign Office Miscel. Series, No. 570.

The Soap and Perfumery Company (*Industria dei Saponi e Profumi*) has in the commune of Sesto Fiorentino, an important factory, employing 87 hands. The motive-power is supplied by two steam engines of 20 h.-p.

Another factory of scented soaps, employing eight workmen, is situated at Castello, in the commune of Sesto Fiorentino. There are also five small factories of common soap there, and two employing 64 hands, in the commune of Florence.

XIII. A.—PIGMENTS, PAINTS, Etc.

CRUDE COLOUR, UNWROUGHT EARTH: U.S. CUSTOMS DECISION.

Bd. of Trade J., Nov. 28, 1901.

An unwrought earth which is used as a colour is dutiable at the rate of 30 per cent. *ad val.*, under par. 58 of the Tariff, as a "colour not specially provided for," and not under par. 93, as an unwrought and unmanufactured earth.

XIII. B.—RESINS, VARNISHES, Etc.

XANTHORRHŒA RESIN IN GERMANY.

Färber-Zeit.; through Imp. Inst. J., Dec. 1901.

The resin occurs in two forms, the yellow and red varieties; both are employed in Germany in the preparation of spirit lacquers for coating metals, and their potash and soda solutions for sizing paper.

The red xanthorrhœa resin is used as a substitute for dragon's blood, and the yellow variety, instead of gamboge, for colouring shellac varnishes. Solutions of the resin in alcohol have also replaced the ordinary gold lacquer used for painting the brass parts of scientific instruments, and possess the advantage of not bleaching, even after long exposure to light. A concentrated xanthorrhœa varnish, mixed with a little castor oil or copaiba balsam, to prevent cracking, when painted on glass, leaves a perfectly transparent, slightly yellow coating; by appropriate staining this can be changed to a fine ruby colour, and glass so tinted has been employed for the manufacture of cheap photographic red-light lanterns. In combination with copal and shellac, these resins form excellent wood varnishes, which leave a lustrous transparent coating. Xanthorrhœa has the further advantage of dissolving easily in spirits, and such solutions clear themselves rapidly by deposition; further, they can be applied to metals without previous warming of the surface to be varnished. (See also this Journal, 1898, 163).

SCAMMONY RESIN: U.S. CUSTOMS DECISION.

Bd. of Trade J., Nov. 28, 1901.

Scammony resin, an article prepared from gum scammony or scammony root, and used principally in the compounding of medicinal preparations, and not as a medicine, is dutiable as a drug advanced in value or condition, under par. 20 of the Tariff, at the rate of $\frac{1}{4}$ cent per lb., and 10 per cent. *ad val.*

GUM AND RUBBER IN SENEGAL (W. AFRICA).

Foreign Office Annual Series, No. 2725.

See under Class XII. above.

XIV.—TANNING; LEATHER; GLUE, Etc.

TANNERIES IN THE PROVINCE OF FLORENCE (ITALY).

Foreign Office Miscellaneous Series, No. 570.

The tanneries number 86, seven of which are furnished with machinery. The good quality of the water, the large quantities of skins on the spot, the abundance of tanning material, and the good quality of the leather obtained, have been the cause of the increase in the number of tanneries of late years. The production of leather is therefore considerable, and as it chiefly consists of strong sole leather from oxen, calves, and cows' skins for which a short preparation is required, even tanners of small means may yield a considerable production. The total number of hands employed in the tanneries of the province of Florence is 1,026.

XVI.—SUGAR, STARCH, Etc.

Dutch Sugars: Countervailing Duties on:—U.S. Judicial Decision.

Bd. of Trade J., Nov. 28, 1901.

With reference to the notice which appeared on p. 24 of the *Board of Trade Journal* for the 4th April last, relative to the countervailing duties leviable in the United States on bounty-fed sugars produced in the Netherlands, the Board of Trade are now in receipt of information to the effect that the payment of these duties has been disputed by certain importers, on the ground that Holland does not grant bounties on sugar. This question having been brought before the Circuit Court of Appeals, it has now been judicially decided as follows:—

"A so-called 'deduction,' which concededly is a bounty or grant, or premium, is paid" (in the Netherlands) "for the production of raw sugar, of 2·50 florins per 100 kilogs., for the year in question, and for the production of refined sugar therefrom, a further bounty of 0·34 florins per 100 kilogs., a total of 2·84 florins per 100 kilogs. The amount of such premium or bounty is placed to the credit of the person to whom it is due, in his excise account; and it is provided that if it 'should cause the credit to exceed the debit, the difference shall be paid to the manufacturer or refiner from the revenue from the excise of the year of which the deduction takes place.' In view of the great disparity between the bounty and the excise tax (there is a similar disparity for all kinds and grades of sugar), it is quite evident that there can be no excess 'paid' from the Government's revenues to any one who is liable for the excise tax. Finally, it is provided that sugar withdrawn for exportation to a foreign country, and actually exported, shall be exempt from the excise tax. That tax being thus eliminated from the debit side of the account, the manufacturer or refiner receives from the Government the excess of credit over debit, which is the precise amount of the bounty. Undoubtedly, this premium or 'deduction' is called a bounty on production, and is a bounty on production; but the other provisions of the law have the practical effect of making it, from the standpoint of other countries, a bounty on exportation. The result of the whole Act is no different, so far as the foreign country is concerned, from what it would be had it provided: All sugar producers shall receive a bounty paid in cash from the revenues of the Government of so much per 100 kilogs. Those who export their sugar may keep this bounty, those who do not export it must forthwith return it to the Government."

Countervailing duties will consequently continue to be levied on Dutch sugars, in accordance with the provisions of section 5 of the United States Tariff Act of 1897.

XVII.—BREWING, Etc.

Sucramine in Beer: Official Prohibition.

London Gazette, Dec. 7, 1901.

Prohibition, under Section 5 of "The Customs and Inland Revenue Act, 1898," of the use in Beer of a certain substance.

Whereas it appears to the satisfaction of the Lords Commissioners of His Majesty's Treasury that the chemical or artificial product, commonly called or known by the name of "Sucramine," is capable of being used in the manufacture and preparation for sale of beer, and that the use of the said product is calculated to affect prejudicially the interests of the Revenue.

Now, the said Lords Commissioners, under the power conferred upon them by Section 5 of "The Customs and Inland Revenue Act, 1888," do hereby prohibit the use of "Sucramine" in the manufacture and preparation for sale of beer.

Dated this 7th day of December, 1901.

N.B.—A penalty of 50*l.* is imposed by the said Section for any breach of this prohibition.

W. H. Fisher.
H. T. Anstruther.

(See also this Journal 1901, 1046.)

Herbs in Alcohol: U.S. Customs Decision.

Bd. of Trade J., Dec. 12, 1901.

Herbs in alcohol, being articles manufactured by uniting or combining two elements or ingredients, are essentially compounds, and, as they contain alcohol, are dutiable at the rate of 60 cents per lb., and 15 per cent. *ad val.*, under par. 2 of the Tariff. Alcoholic extracts of herbs are dutiable at the same rate.

XIX.—PAPER, PASTEBOARD, Etc.

Paper Industry of the Province of Florence (Italy).

Foreign Office Miscellaneous Series, No. 570.

There are seven paper mills at present working in the province of Florence, five being situated in the commune of Pistoria, and one in each of the communes of Reggello and S. Marcello.

A mill, at Gello, is fitted with a steam boiler of 30 h.p., two hydraulic and one steam engine, of a total of 60 h.p. and 122 hands.

The extensive mills, known as the "Cartiere della Lima" are situated in the valley of the Lima. By using the water of the torrent of the Lima, these mills have a constant motive power of 400 hydraulic horse-power. They are furnished with three boilers giving 85 h.p. for heating, drying, and boiling the rags, and with 13 hydraulic motors giving 300 h.p. and three machines "sans fin." The rags are obtained locally. The quantity used per annum is about 394 tons, worth 2,000*l.* The kaolin is procured from Carnovaghi. The cellulose employed is 492 tons per annum, and the wood pulp, 1,476 tons per annum. The number of hands varies from 230 to 240. The wages paid to the men is 2 to 3 lire, females 1 lire, per diem. Printing and writing paper of various qualities, as well as ordinary paper, amounting to 2,160 tons per annum, and valued at 40,000*l.*, are produced. Of the three machines "sans fin," two are of British manufacture and one is Italian.

XX.—FINE CHEMICALS, Etc.

Camphor in Formosa (Japan).

Foreign Office Annual Series, No. 2728.

The value of camphor exported, in 1900, was 253,574*l.*, an increase of nearly 40,000*l.* over 1899, whilst there was a decrease of nearly 20,000*l.* in the value of the oil exported during the same period. Nearly half of the camphor export went to Japan, as did the whole of the camphor oil.

The amount and value of the camphor and camphor oil bought by the Government, during 1900, were as follows:—

——	Quantity.	Value.
	*Catties.	£
Camphor, 1st class	2,608,983	77,089
" 2nd class	701,158	18,696
" 3rd class	168,038	4,073
Total	3,478,179	99,858
Camphor oil	2,362,108	34,591
Grand total	5,840,287	134,449

The amount and value of prepared camphor and oil sold by the Goverment, during 1900, were as follows:—

——	Quantity.	Value.
	Catties.	£
Camphor, Class A	1,007,800	131,725
" Class B	2,677,700	241,830
" oil	1,227,694	18,103
Total	4,913,194	391,658

* 1 catty = 1·33⅓ lb. (avoir.).

The figures for refined camphor were not obtainable, but the amount was not large.

The Government has shown great energy in establishing plantations, the first being made in 1896. When the camphor monopoly was established, in 1899, fresh plantations were made. The cultivation of camphor trees has lately been attended with very successful results, the number of young trees suitable for transplantation reaching more than 1,000,000.

The camphor refinery at Taihoku is capable of turning out 1,800 lb. of refined camphor, and 5,800 catties of Class A camphor per day.

There is a branch office of the camphor bureau at Kobe, to which a refinery is also attached. This factory is capable of turning out 1,000 lb. of refined camphor and 2,000 catties of Class A camphor per day.

ICHTHYOL: UNITED STATES CUSTOMS DECISION.

Bd. of Trade J., Nov. 28, 1901.

Ichthyol, in par. 626 (free list) of the Tariff, means only ichthyol *oil*. All other ichthyol preparations or salts are dutiable at the rate of 25 per cent. *ad val.*, under par. 3 of the Tariff, as chemical compounds and salts not otherwise provided for.

OIL OF RHODIUM MANUFACTURE IN FRENCH GUIANA.

Chem. and Druggist, Nov. 30, 1901.

According to *La Quinzaine Coloniale*, this oil is distilled in three small factories—two at Cayenne and one at Sinnamary. These factories exported, in 1900, essential oil to the value of 52,000 frs., against 19,000 frs., in 1899. Besides this, 243 tons of rosewood (valued at 19,000 frs.) were shipped to France. This industry is capable of considerable development, and should attract capital from France. Rosewood is found everywhere in the interior of the colony, and it can easily be transported in small vessels to the factories situated on the mouth of the rivers. One ton of rosewood yields about 10 kilos. of essential oil; the price of the wood is about 80 frs. per ton, and that of the oil about 28 frs. per kilo. The product obtained from 1 ton of the crude material has, therefore, a value of about 280 frs. Fuel of great caloric value is obtainable in unlimited quantity, and there is no difficulty in securing, in the villages, free grants of land near the rivers for the erection of factories. Sinnamary, Montsinery, and Tonnégrande, situated on deep rivers, in districts where rosewood is abundant, are said to be excellent positions for establishing this industry.

PERFUMES OF THE PROVINCE OF FLORENCE (ITALY).

Foreign Office Miscellaneous Series, No. 570.

In the commune of Florence, the Officina Profumo Farmaceutica di S. M. Novella produces various specialities of scents and odoriferous essences, employing a gas motor and 11 workmen. Another small factory of the same kind gives work to five hands. Before 1842, orris root was thrown away as a useless plant. For the last 20 years, its cultivation has been greatly extended, especially in the Chianti, Val di Pesa, and Piano di San Paolo districts. At present, this industry is a source of moderately good profits, the production of orris root being more than 5,905 cwts. per annum.

XXI.—PHOTOGRAPHY.

PHOTOGRAPHIC SUPPLIES IN BRAZIL.

U.S. Cons. Reps., Dec. 4, 1901.

Plates.—The plates used are all imported, the Lumière, which has the largest sale, coming from France, and the Ilford and Marion from Great Britain. U.S. plates are unknown. A plate of metric measurement is wanted, 9 by 12, 13 by 18, 18 by 24, and 24 by 30 centimetres, which can stand climate similar to that of the Gulf States, with a temperature seldom above 90° F., but with more than 85° humidity. The plates should be capable of being worked without ice in the developer, without frilling or softening after being washed with water of 65° to 75° F., and should be of good speed and rich in silver.

Papers.—The papers in use are gelatin printing-out paper, both plain and matte, and a quick-printing developing paper. These papers come from England and France, in bundles of 1 and 2 doz. sheets of cut sizes. They are first wrapped in several sheets of paper impervious to moisture, and finally placed in non-actinic envelopes and sealed.

Much albumin paper and a little platinum paper is employed by professionals, who import the paper and sensitise as needed. A little ferro-prussiate paper in cut sizes has come from the United States, packed in sealed tin tubes, and also another water-development paper, which has met with fair success.

Good gelatin and collodion papers are needed, which will keep fresh for a few months, do not need complicated formulas for toning and fixing, and can with safety be washed in water of 65° to 75° F. The paper should make prints which will not soon fade, provided they have been properly manipulated. There should be a good market for development papers which give platinum and carbon effects. Water-development platinum and other papers should take well with amateurs.

Paper and plate makers entering this market should have their formulas printed in Portuguese, or, in lieu of that, Spanish or French; directions in English can be read by very few.

Developers.—Professional photographers have been using iron developer, but now they prefer metol and hydroquinone. Two are relying chiefly on pyrogallol. The amateur uses metol and hydroquinone, either separate or combined, whilst a few are using glycin.

The developing agents are almost exclusively of German manufacture. But with such chemicals as hyposulphite, the various forms of potash and soda, gold, platinum, sugar of lead, &c., the United States might compete with England and France, who now enjoy the trade.

In chemicals, the anhydrous preparations of sodium carbonate, sodium sulphite, potassium carbonate, &c., are imported, because the duty charge is by weight. Such preparations do not require much care, and do not deteriorate in this climate, whilst the crystalline preparations soon spoil. (See also this Journal, 1901, 1049.)

BOARD OF TRADE RETURNS.

SUMMARY OF IMPORTS.

Articles.	Month ending 30th Nov.	
	1900.	1901.
	£	£
Metals	2,972,915	2,745,563
Chemicals and dyestuffs	400,357	423,356
Oils	1,102,777	972,007
Raw materials for non-textile industries.	10,170,831	9,649,379
Total value of all imports	14,646,880	13,790,395

SUMMARY OF EXPORTS.

Articles.	Month ending 30th Nov.	
	1900.	1901.
	£	£
Metals (other than machinery)	3,659,401	3,408,346
Chemicals and medicines	707,079	774,299
Miscellaneous articles	3,227,428	3,279,568
Total value of all exports	7,593,908	7,462,213

Imports of Chemicals and Dyestuffs for Month ending 30th November.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Bleaching materials Cwt.	27,724	25,026	13,362	8,319
Soda compounds... „		18,387		5,078
Borax, &c. .... „	37,871	40,830	18,706	17,000
Brimstone .... „	29,951	11,059	7,980	2,942
Nitrate of potash.. „	18,368	18,537	15,900	16,334
Chemicals, other. Value £	..	..	131,281	135,678
Cutch and gambier. Tons	1,526	2,096	30,031	35,209
Dyes:—				
Alizarin.......Value £	..	..	13,297	17,529
Aniline and other „	..	..	53,923	56,587
Indigo .... Cwt.	67	1,649	2,268	28,884
Bark............... „	25,828	25,815	7,474	9,122
Valonia .... Tons	2,490	1,388	24,433	15,741

Imports of Raw Material for Non-Textile Industries for Month ending 30th November.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Bark, Peruvian .. Cwt.	1,511	3,787	3,938	12,558
Caoutchouc ...... „	39,505	41,492	481,281	479,888
Gum:—				
Arabic .... „	10,471	8,521	18,043	15,148
Lac, &c. .... „	4,406	2,828	11 220	18,667
Gutta-percha .... „	8,533	7,964	154,181	143,653
Hides, raw:—				
Dry............ „	24,304	23,862	64,186	66,715
Wet .... „	70,922	77,656	164,189	182,075
Ivory .... „	603	554	19,626	24,370
Manure:—				
Guano .... Tons	279	945	1,054	6,845
Bones.......... „	4,556	8,103	18,069	26,997
Paraffin.......... Cwt.	91,140	138,203	133,965	140,875
Linen rags .... Tons	1,241	1,307	12,602	12,719
Esparto .... „	12,989	14,700	58,301	59,772
Pulp of wood..... „	39,418	38,305	248,338	187,754
Rosin............. Cwt.	234,417	172,195	60,876	42,128
Tallow and stearin „	4,616	4,235	181,340	114,886
Skins:—				
Goat .... No.	518,981	1,167,679	55,219	105,188
Sheep.......... „	999,576	1,189,423	111,766	135,892
Nitrate of soda... Tons	20,201	2,215	171,536	23,169
Phosphate of lime „	25,120	20,490	39,198	27,925

Imports of Miscellaneous Articles for Month ending 30th November.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Cement.......... Tons	12,178	18,191	22,948	29,595
China and Earthenware. Cwt.	32,737	37,336	79,942	94,337
Drugs .... Value £	..	..	99,634	122,595
Glass:—				
Sheet .... Cwt.	44,163	136,647	27,796	76,464
Plate .... „	16,799	39,844	18,435	44,325
Flint .... „	42,719	59,452	80,880	104,654
Bottles .... Gross	128,323	133,509	58,912	58,635
Other.......... Cwt.	26,305	25,476	47,322	50,765
Glue and Gelatin „	17,447	20,464	34,964	40,735
Leather, unmanufactured. „	124,245	104,926	696,617	673,874
Oil-seed cake .... Tons	35 053	26,639	243,148	177,805
Paints and Pigments. Value £	..	..	113,620	99,714
Paper, Pasteboard Cwt.	515,837	531,793	365,616	372,552
Scientific instruments. Value £	..	..	54,425	58,674
Soap and Soap powder. Cwt.	14,713	25,031	18,913	27,372
Zinc manufactures. „	44,449	32,482	53,856	37,496

Imports of Metals for Month ending 30th November.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
Copper:—			£	£
Ore............. Tons	8,739	6,789	119,530	87,540
Regulus .... „	7,229	7,858	276,355	309,668
Unwrought..... „	5,575	6,801	418,193	467,423
Lead, pig and sheet „	17,249	21,751	297,302	252,226
Pyrites .... „	58,336	11,906	99,495	65,836
Quicksilver .... Lb.	416,500	50,865	50,890	6,350
Silver ore....... Value £	..	..	90,938	90,434
Tin .... Cwt.	32,201	70,379	408,260	401,968
Zinc.............. Tons	5,270	5,781	102,161	97,191

Imports of Oils for Month ending 30th November.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Cocoa-nut....... Cwt.	54,154	32,570	64,319	42,767
Olive........... Tuns	340	458	13,270	18,124
Palm .... Cwt.	70,326	76,636	78,999	87,950
Petroleum:—				
Illuminating.. Gall.	27,540,261	24,153,238	526,732	487,217
Lubricating... „	3,267,915	3,268,187	103,019	100,363
Seed........... Tons	4,134	4,410	113,595	118,929
Train, &c. ...... Tuns	1,879	1,790	36,921	34,276
Turpentine ..... Cwt.	58,269	48,863	89,370	63,713

Exports of Metals (other than Machinery) for Month ending 30th November.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Brass............ Cwt.	9,680	10,898	52,786	53,936
Copper .... „	70,886	93,850	276,707	341,998
Lead............. Tons	2,418	2,696	47,507	39,506
Plated wares... Value £	..	..	56,565	54,465
Tin .... Cwt.	10,229	8,319	68,192	49,909
Zinc............. „	11,040	14,955	10,567	11,726

Exports of Miscellaneous Articles for Month ending 30th November.

Articles.	Quantities.		Value.	
	1900.	1901.	1900.	1901.
			£	£
Gunpowder..... Lb.	479,000	Cwt.6,733	12,651	17,956
Candles......... „	2,391,200	2,474,800	49,300	41,490
Caoutchouc..... Value £	..	..	120,524	92,776
Cement......... Tons	21,329	20,751	40,322	37,861
Products of Coal. Value £	..	..	167,107	104,554
Earthenware ... „	..	..	163,510	150,560
Stoneware ...... „	..	..	14,267	15,293
Glass:—				
Plate .... Sq. Ft.	179,412	Cwt.7,272	11,626	11,528
Flint .... Cwt.	10,072	8,193	25,518	20,482
Bottles .... „	73,031	71,455	35,053	34,714
Other kinds ... „	18,615	27,825	19,723	30,569
Leather:—				
Unwrought .... „	12,556	11,078	130,328	117,630
Wrought...... Value £	..	..	48,246	49,896
Seed oil .... Tons	4,021	4,195	105,341	108,255
Floorcloth....... Sq. Yds.	1,924,300	2,025,700	92,685	98,796
Painters' materials Val. £	..	..	163,043	165,352
Paper............. Cwt.	96,937	92,563	150,988	138,721
Rags.............. Tons	4 362	5,435	23,891	27,698
Soap .... Cwt.	74,759	63,929	77,762	71,748

Exports of Drugs and Chemicals for Month ending 30th November.

Articles.		Quantities.		Value.	
		1900.	1901.	1900.	1901.
				£	£
Alkali	Cwt.	293,527	..	91,927	..
Bleaching materials	"	110,764	109,386	34,415	36,314
Copper sulphate ..	Tons	758	339	17,816	7,193
Chemical manures	"	31,815	34,535	184,836	202,283
Medicines	Value £	..	..	107,959	123,811
Soda compounds :—					
Ash.............	Cwt.	..	127,186	..	27,576
Caustic	"	..	113,062	..	56,349
Bicarbonate	"	..	27,067	..	9,425
Crystals	"	..	20,269	..	3,282
Sulphate........	"	..	68,995	..	4,945
Other sorts	"	..	33,323	..	13,081

Monthly Patent List.

* The dates given are the dates of the Official Journals in which acceptances of the Complete Specifications are advertised. Complete Specifications thus advertised as accepted are open to inspection at the Patent Office immediately, and to opposition within two months of the said dates.

I.—PLANT, APPARATUS, AND MACHINERY.

Applications.

23,277. H. Koppers. Improvements in wall constructions for coke ovens by means of a particularly shaped stone. Complete Specification. Nov. 18.

23,533. G. Hohoff.—From D. Hoffsümmer, Germany. An improved photometer. Nov. 20.

23,614. W. R. Lysaght and F. G. Treharne. Improvements relating to the manufacture of annealing pots and similar apparatus. Nov. 21.

24,150. A. F. Spooner.—From J. B. F. Loubriat, Russia. Apparatus for charging and discharging furnaces, ovens, and the like. Nov. 27.

24,399. J. A. Elsner and G. F. Knox. Improvements in apparatus employed for refrigerating by compression. Complete Specification. Nov. 30.

24,568. H. C. Owens. A method of separating damp from air, and apparatus for that purpose. Dec. 3.

24,699. J. G. Aeeles and F. H. de Veulle. Improvements in and relating to carburetters. Dec. 4.

24,822. G. Wilton. Improvements in apparatus for the distillation of ammoniacal liquors. Dec. 5.

24,840. H. H. Lake.—From the firm of C. A. Schuppmann, Germany. Improvements in and relating to kilns or furnaces. Dec. 5.

24,928. O. Lindemann.—From E. Körting, Germany. Improvements in and relating to liquid fuel furnaces. Complete Specification. Dec. 6.

25,376. F. A. Woolley. Improvements in and relating to hydro-extractors and like centrifugal machines. Dec. 12.

25,157. J. Hargreaves. Improvements in the condensation of vapour, and in the concentration of solutions, and in the means and apparatus employed therein. Dec. 13.

Complete Specifications Accepted.*

1900.

22,836. H. A. Vachell. Water-distilling apparatus. Dec. 18.

23,044A. P. Naef. Apparatus for stirring or injecting fluid into fuel in gas producers or into other solid material. Dec. 4.

1901.

1393. G. C. Marks.—From A. Hannetelle-Chapius, France. Concentrating apparatus, applicable to acids, saline solutions, and in general to other liquids capable of concentration. Nov. 27.

2109. H. Ruelle and E. Montagne. Smoke-consuming apparatus for furnaces and the like. Dec. 18.

2775. H. C. Austey. Evaporators. Dec. 18.

5568. J. J. Friedrich. Centrifugal separators. Dec. 11.

6216. J. Birkett and J. Thornton. *See* Class XVII.

17,555. O. Fraucke. Non-conducting material for coating steam pipes or the like. Dec. 4.

17,884. V. Schwauinger. Apparatus for raising fluids. Nov. 27.

19,071. W. F. Singer. Compressors. Nov. 27.

21,727. A. F. Kécheur and W. A. B. Heerey. Carburetting apparatus. Dec. 4.

II.—FUEL, GAS, AND LIGHT.

Applications.

23,260. H. Schild. A new and improved process of manufacturing coal or the like fuel cakes. Nov. 18.

23,277. H. Koppers. *See* Class I.

23,278. H. Koppers. Improvements in regenerative coke ovens with separate distribution of gas and air to the heating flues. Complete Specification. Nov. 18.

23,478. C. S. Ball. Acetylene headlight. Nov. 20.

23,480. D. Boyde. Preventing escape of gas and noxious fumes from the incandescent gas light when the by-pass is burning. Nov. 20.

23,543. D. Losfeld. Improvements in apparatus for generating acetylene gas. Complete Specification. Nov. 20.

23,733. W. T. Sugg. Improvements in the production of surfaces for use in incandescent gas lighting. Nov. 22.

23,764. W. B. Hartridge. Improvements in and relating to combustion of fuel. Nov. 22.

23,895. H. J. Dowsing. Improvements in apparatus for electrically producing radiant heat. Nov. 25.

23,904. O. G. Blunden, J. W. Malden, and A. Malden. Improvements connected with the manufacture of fuel briquettes. Nov. 25.

23,908. E. W. Sprott. Improvements in apparatus for gas purification. Nov. 25.

23,910. A. McLean. Improvements in the mode of and apparatus for treating peat. Nov. 25.

23,945. The Star Patent Fuel Company, Ltd., and T. E. Heath. Improvements in apparatus for use in the manufacture of artificial fuel. Nov. 25.

23,960. H. J. McBride and H. W. McBride. An improved smoke-preventing composition to be applied to coals. Nov. 26.

24,030. J. Heaton and N. T. Worthley. Improvements in acetylene gas generating apparatus. Complete Specification. Nov. 26.

24,085. R. Gilmour. Improvements in and relating to incandescent gas burners for lighting purposes. Nov. 27.

24,218. J. L. Muller and J. Bonnet. Improvements relating to machines for the manufacture of mantles employed in incandescent lighting. Complete Specification. Nov. 28.

24,287. W. B. Cowell. Water or producer gas. Improvements in their manufacture for motive lighting and heating purposes. Nov. 29.

24,304. W. P. Houze. Carbureter. Nov. 29.

24,386. A. E. Sutton. Improvements in and relating to incandescence gas lighting. Nov. 30.

24,484. W. T. Sugg. Improvements in gas lamps for incandescent gas lighting. Dec. 2.

24,491. A. Dobson. Improvements in method of drying peat. Complete Specification. Dec. 2.

24,514. R. Thomson. Improvements in and relating to the combustion of fuel. Dec. 2.

24,532. T. Dunne. An improved method for the manufacture of fire-lighters from peat. Dec. 3.

24,570. A. McIntosh. Improvements in and relating to apparatus for generating and storing acetylene gas. Dec. 3.

24,577. M. Toltz and A. Sipschutz. Acetylene gas lighting system. Complete Specification. Dec. 3.

24,691. J. S. Kemp-Welch. Improvements relating to producer gas apparatus. Dec. 4.

24,837. S. T. Wellman and C. H. Wellman. Improvements in coke ovens. Complete Specification. Filed Dec. 5. Date applied for May 22, 1901, being date of application in United States.

24,903. O. H. Bayldon and H. E. Morriss. An improved generator of gas from paraffin oil for heating purposes. Dec. 6.

24,960. W. J. Crossley and J. Atkinson. Improvements in gas cleaning and cooling apparatus. Dec. 7.

25,092. A. J. Boult. — From F. M. Hille, Germany. Improved method of regulating gas generators, and apparatus employed in connection therewith. Dec. 9.

25,157. G. Davidson and The Fietz Preliminary Syndicate, Ltd.—From C. Fietz, Italy. Improvements in the manufacture of illuminants. Dec. 10.

25,173. H. H. Lake.—From Koale Sava Manufacturing Company, United States. An improved composition for use with coal to increase its efficiency. Complete Specification. Dec. 10.

25,180. E. W. Phelps and T. Nadeau. Improvements in incandescent gas burners. Complete Specification. Dec. 10.

25,226. C. Rainey. Improvements in or relating to carburettors. Dec. 10.

25,281. F. B. Passmore. Improvements in atmospheric gas burners. Dec. 11.

25,493. E. D. Holmes.—From O. N. Guldin, of The Western Gas Construction Company, United States. *See* Class III.

25,494. E. D. Holmes.—From O. N. Guidin, of The Western Gas Construction Company, United States. A duplex valve for gas purifiers and for other purposes. Dec. 13.

25,495. E. D. Holmes.—From O. N. Guldin, of The Western Gas Construction Company, United States. Improvements in the mouthpieces and lids of gas retorts, also applicable to the lids of other receptacles. Complete Specification. Dec. 13.

25,516. W. P. Warren. Improvements in and relating to processes and apparatus for the generation of acetylene. Dec. 13.

25,590. A. J. Boult.—From J. Braunstein, Germany. Improvements in or relating to incandescent gas burners. Dec. 14.

25,604. G. J. Suclus. *See* Class X.

25,616. E. Helbing. An improved process of manufacture of peat briquettes. Complete Specification. Dec. 14.

Complete Specifications Accepted.

1900.

15,108. W. H. Dargue. Apparatus for the production of acetylene gas. Nov. 27.

21,511. T. Rathmell. Apparatus for generating acetylene gas for household lighting purposes. Nov. 27.

22,618. W. Harris. Shock-proof fitting for use in conjunction with incandescent gas lighting in particular. Dec. 4.

22,782. W. W. Clark and G. Bone. Apparatus for generating acetylene gas. Dec. 18.

22,960. J. Shackleton and A. Ross. Acetylene generators. Dec. 18.

23,044. P. Naef. Apparatus for recovering products from fuel. Dec. 4.

1901.

240. J. A. Burgess. Acetylene gas generators. Dec. 4.

1525. J. W. Ward. Burners for incandescent gas lighting. Dec. 4.

2225. W. J. Crossley and J. Atkinson. Heat interchanger for use in connection with gas producers. Dec. 11.

15,005. J. Y. Johnson.—From The Wellmann-Seaver Engineering Company, United States. Apparatus for charging and discharging coke ovens or retorts. Dec. 4.

15,846. J. J. Hendler. Apparatus for the manufacture of acetylene and other gases. Dec. 4.

17,292. T. H. Oswald and F. E. Bowman. Gas-producing plant. Nov. 27.

19,857. V. Powers and The Bevois Patent Lighting Company, Ltd. Apparatus for the generation, storage, and purification of acetylene and like gases. Nov. 27.

20,001. L. Stöckmann. Process for increasing the heating value of fuel. Nov. 27.

20,760. H. Praetorius. Process and apparatus for mixing liquid fuels of different specific gravities.

21,376. J. Radcliffe. Manufacture or production of combustible gas. Dec. 4.

21,377. J. Radcliffe. Apparatus suitable for the manufacture or production of combustible gas for calcining or roasting ores and other substances, and for other purposes. Dec. 4.

21,534. C. Killing. Incandescent gas burners. Dec. 4.

22,486. J. F. Henderson and C. W. Clayton. Automatic carbonic acid gas generator and holder. Dec. 11.

III.—DESTRUCTIVE DISTILLATION, TAR PRODUCTS, PETROLEUM.

Applications.

23,296. H. J. Spooner. A new and improved vacuum still for the distillation of petroleum, and liquid fuel furnaces for the same. Nov. 18.

25,493. E. D. Holmes.—From O. N. Guldin, of The Western Gas Construction Company, United States. Improvements in apparatus for extracting tar from illuminating gas. Dec. 13.

Complete Specification Accepted.

1901.

2105. J. Meikle. Distillation of tar, and apparatus therefor. Dec. 4.

IV.—COLOURING MATTERS and DYESTUFFS.

Applications.

23,944. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. The manufacture and production of new colouring matter, of colouring matter lakes, and of intermediate products for use therein. Nov. 25.

24,354. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Improvements in the manufacture and production of colouring matters of the anthracene series, and the employment of colouring matters of the anthracene series in dyeing. Nov. 29.

24,400. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of new acridinium compounds. Nov. 30.

25,009. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of yellow to orange-yellow dyestuffs of the acridine series. Dec. 7.

25,089. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of new substituted auramines. Dec. 9.

25,100. G. W. Johnson.—From C. F. Boehringer und Soehne, Germany. Improvements in the reduction of aromatic nitro-compounds to the corresponding amines. Complete Specification. Dec. 9.

25,393. C. D. Abel. — From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of new colouring matters belonging to the triphenylmethane series. Dec. 12.

25,6[illegible]8. P. Jochum. Improvements in the preparation and use of colours for chemical printing on fabrics and other textile materials. Dec. 14.

Complete Specifications Accepted.

1900.

22,297. H. H. Lake.—From K. Oehler, Germany. Manufacture and production of new sulphonic acids and of colouring matters therefrom. Dec. 11.

22,797. H. H. Lake.—From K. Oehler, Germany. Manufacture and production of new colouring matters and of intermediate products for use therein. Nov. 27.

22,989. B. Willcox.—From Badische Anilin und Soda Fabrik, Germany. Manufacture and production of new products for use in the manufacture of colouring matters, and of colouring matters therefrom. Nov. 27.

23,419. R. B. Ransford.—From L. Cassella and Co., Germany. Manufacture of hydroxylated acridines. Nov. 27.

23,887. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of naphthalene compounds and their employment in dyeing and printing. Dec. 18.

1901.

330. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of a black colouring matter directly dyeing cotton. Dec. 11.

999. J. Imray.—From La Société Anonyme des Matières Colorantes et Produits Chimiques de St. Denis, France. Manufacture of substantive black colouring matters. Dec. 4.

1357. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of colouring matters of the anthraquinone series. Dec. 18.

1358. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture and production of colouring matters of the anthracene series. Dec. 11.

1766. F. Ullmann. Manufacture of diphenyl derivatives. Dec. 1.

2188. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Manufacture of colouring matters directly dyeing cotton. Dec. 4.

2339. J. Imray.—From La Société Anonyme des Matières Colorantes et Produits Chimiques de St. Denis, France. Manufacture of blue dyestuffs. Dec. 11.

V.—PREPARING, BLEACHING, DYEING, PRINTING, AND FINISHING TEXTILES, YARNS, AND FIBRES.

Applications.

23,434. H. H. Lake.—From Farbwerke Mühlheim vorm. A. Leonhardt and Co., Germany. Improvements in and relating to the dyeing and printing of vegetable fibre. Nov. 19.

23,556. W. H. Perkin, jun., and Whipp Bros. and Tod, Ltd. Improvements in the treatment of raw cotton and cotton goods, to reduce the inflammability thereof. Nov. 20.

23,557. W. H. Perkin, jun., and Whipp Bros. and Tod, Ltd. Improvements in the treatment of raw cotton and cotton goods to reduce the inflammability thereof. Nov. 20.

23,695. R. J. Urquhart.—From Chemische Fabriken vorm. Weiler ter Meer, Germany. Improvements in the process of dyeing piece goods with sulphur dyes. Complete Specification. Nov. 22.

24,323. E. Bottelli. Improvements in and relating to the dressing and finishing of fabrics. Filed Nov. 29. Date applied for April 30, 1901, being date of application in Italy.

24,697. R. B. Ransford.—From L. Cassella and Co., Germany. Improvements in dyeing and printing with sulphur colours. Dec. 4.

24,856. A. Born. An improved process and apparatus for cleansing, scouring, and removing oil from wool, hair, bristles, and other materials. Complete Specification. Dec. 5.

24,902. W. T. Forbes and G. P. J. Leclercq. A process and apparatus for ungumming, cleansing, and bleaching vegetable fibre. Complete Specification. Dec. 6.

25,162. F. J. Hill. Improvements in or relating to the treatment of fabrics. Dec. 10.

25,248. E. Knecht and P. Spence and Sons, Ltd. Improvements in the method of and means for preventing or resisting the local production of colour in the printing of textile fabrics. Dec. 11.

25,338. J. W. W. Shaw. Improvements in the process of and apparatus for bleaching certain textile fabrics and fibrous material. Dec. 12.

25,365. D. R. Choksey. Improved means for extracting aloe and other fibres. Complete Specification. Dec. 12.

25,404. J. W. Peet and J. H. Peet. Improvements in dyeing vessels or kiers. Dec. 12.

Complete Specifications Accepted.

1900.

21,073. F. V. M. Raabe. Treatment of certain textile fibres preparatory to their conversion into yarn. Nov. 27.

22,033. H. W. Church. Dyeing machines. Dec. 11.

1901.

1042. J. E. Prestwich. Method of and apparatus for treating textile yarns and threads with liquids. Dec. 11.

1140. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Process for dyeing paper fabrics. Dec. 4.

1160. J. E. Bousfield, of the firm of G. F. Redfern and Co.—From F. Cantù, G. Miglioretti, and G. Maffei, Italy. Manufacture of sheets, waterproof fabrics, imitation linen goods, and the like from casein. Dec. 4.

1834. J. Skoupil. Process and apparatus for dyeing, bleaching, and finishing textiles and fibres. Nov. 27.

2927. R. B. Ransford.—From L. Cassella and Co., Germany. Preventing the deterioration of dyed cotton. Dec. 18.

11,942. J. Wezel. Preparation of art, chromo, and other colour printing papers. Dec. 18.

18,562. H. Ryder. Machines for making manilla rope. Dec. 11.

VI.—COLOURING WOOD, PAPER, LEATHER, Etc.

Complete Specification Accepted.

1900.

20,940. C. L. Burdick. Apparatus for facilitating the application of colours or liquids to surfaces such as paper, porcelain, cloth, wood, and the like. Nov. 27.

VII.—ACIDS, ALKALIS, and SALTS.

Applications.

23,747. A. S. Plews. Process for the manufacture, direct from the ore, of white oxide of antimony and compounds thereof. Nov. 22.

23,817. J. Boulton and B. A. Spaull. Improvements in and relating to the manufacture of potassium cyanide and sodium cyanide. Nov. 23.

24,156. G. Craig. Improvements in obtaining hydrocyanic acid from ferrocyanides, and in apparatus therefor. Dec. 2.

24,684. G. F. Berry and J. B. Lawes and Co., Ltd. A new or improved method or process for the recovery, collection, and utilisation of waste carbonic acid gas given off in the manufacture of certain acids and acid salts. Complete Specification. Dec. 4.

24,832. G. Wilton. *See* Class I.

24,904. W. Feld. Improvements relating to the production of hydrocyanic acid. Dec. 6.

24,920. W. Feld. Improvements relating to the production of hydrocyanic acid. Dec. 6.

25,046. H. R. Angel. Improvements in the manufacture of caustic soda as a by-product from the reduction of refractory and other ores. Dec. 9.

25,299. J. Jeffreys. Improvements in the utilisation of chloride of calcium and the production of valuable products thereby. Dec. 11.

25,444. J. E. Riley and J. Barnes. Improvements in the recovery of arsenic and sulphur from precipitated sulphide of arsenic. Dec. 13.

Complete Specifications Accepted.

1900.

22,121. G. Craig and R. M. Paterson. Production or purification of alkaline cyanides. Dec. 4.

1901.

601. P. L. Martin. Manufacture of anhydrous caustic baryta. Dec. 4.

754. R. Wolffenstein. Manufacture of peroxide preparations. Nov. 27.

1904. J. Y. Johnson.—From The Badische Anilin und Soda Fabrik, Germany. Manufacture of sulphuric acid. Dec. 4.

2342. H. Precht. Process for the production of potassium magnesium carbonate. Dec. 4.

2368. O. Imray.—From Farbwerke vormals Meister, Lucius und Brüning, Germany. Manufacture of sulphuric anhydride by the contact process. Dec. 18.

VIII.—GLASS, POTTERY, AND ENAMELS.

Applications.

23,563. W. W. Pilkington. Improvements in glass manufacture, and apparatus therefor. Nov. 20.

24,319. C. M. White. — From C. W. Foster, United States. Improvements in apparatus for delivering melted glass. Complete Specification. Nov. 29.

24,324. H. Brooke. Improvements relating to apparatus for dividing molten material, chiefly designed for use with molten glass. Complete Specification. Nov. 29.

24,328. G. W. Laybourn. Improvements in or relating to the deposition of metals on earthenware bodies. Complete Specification. Nov. 29.

24,333. H. Brooke. Improvements relating to receptacles for containing molten material, chiefly designed for use in connection with glass furnaces. Complete Specification. Nov. 29.

24,468. O. Imray. — From J. A. Chambers, United States. Improvements in the manufacture of glass articles, and apparatus therefor. Complete Specification. Dec. 2.

24,780. A. J. Boult.—From O. Leprouz, France. Improvements in or relating to the decoration of earthenware, china, and the like. Dec. 5.

24,927. C. Boucher. Improvements in or relating to machines for making bottles and other articles of blown glass. Dec. 6.

Complete Specification Accepted.

1900.

20,940. C. L. Burdick. *See* Class VI.

IX.—BUILDING MATERIALS, CLAYS, MORTARS, AND CEMENTS.

Applications.

23,313. W. P. Thompson. Improvements in or relating to mastic or other cement compositions, concrete, artificial asphalt, waterproofing material, and the like, and in the process of manufacturing the same, and articles manufactured therefrom or therewith. Nov. 18.

23,443. C. von Forell. Improvements in the manufacture of cement. Complete Specification. Nov. 19.

23,962. C. A. Burghardt, C. F. Hall, and W. A. Jones. Improvements in tiles, plates, or slabs for walls, ceilings, and for use in the construction or decoration of buildings generally. Nov. 26.

24,072. J. Burn. An improved treatment of impure clay for use in the manufacture of bricks, and articles of a like nature, made or manufactured from clay. Nov. 27.

24,092. J. Tuckwell. Improvements in the manufacture of artificial marble and the like. Nov. 27.

24,393. J. B. Sangwin. Improvements in or in connection with the manufacture of artificial stone. Nov. 30.

24,580. W. S. Wilkinson. Improvements in the manufacture of materials for pavements. Dec. 3.

24,683. G. F. Berry and J. B. Lawes and Company, Ltd. Improvements in or relating to cements or plasters and in the manufacture of bricks, tiles, slabs, artificial stone, and the like. Complete Specification. Dec. 4.

24,841. F. Oberschulte. Improvements relating to the manufacture of artificial sandstone. Dec. 5.

24,923. G. C. F. Boivie. Improvements in the manufacture of artificial stone. Complete Specification. Dec. 6.

24,998. A. Vickery. Improvements in the manufacture of cements, waterproof coatings, artificial stone, and the like. Dec. 7.

25,239. C. Heap and T. Oddy. Improvements in the manufacture of Portland slag cement and hydraulic lime. Dec. 11.

25,512. E. Rott. Improvements in the manufacture of bricks or blocks of artificial stone. Dec. 13.

Complete Specifications Accepted.

1900.

22,139. L. Hatschek. Process for the manufacture of slabs, plates, and other suitable articles of artificial stone. Dec. 4.

23,718. W. W. Hewitt. Cement kilns and drying chambers. Dec. 4.

1901.

801. J. S. Rigby. Kiln for the manufacture of Portland cement or lime. Dec. 11.

2409. H. E. Rüsager. Manufacture of Portland cement. Dec. 18.

2499. J. Wilkinson. Manufacture of slabs or plates suitable for use as building material and for other purposes. Dec. 11.

20,891. S. Höyer-Ellefsen. Fire-proof floors and the like. Dec. 4.

X.—METALLURGY.

Applications.

7084A. D. Bates and G. W. Peard. Improvements in and connected with the annealing of metals. Filed Dec. 4. Date claimed April 4, 1901.

23,422. W. H. Martin and The Thames Mining Machinery Company, Ltd. An improved process and means for the extraction of gold from sea water. Nov. 19.

23,531. J. T. Pagan and W. Buckley. Improvements in the production of metal castings. Complete Specification. Nov. 20.

23,654. W. F. L. Frith. An improved process for toughening or annealing steel and other metals. Nov. 21.

23,790 A. Lamberton. Improvements in and relating to crushing and amalgamating machinery for the reduction of quartz and the recovery therefrom of the precious metals and the grinding or pulverising of other substances. Nov. 23.

23,840 W. L. Wise.—From C. H. Homan, Norway. Improvements in the treatment of titaniferous ores. Nov. 23.

[illegible] [illegible] and The Automatic Gem and [illegible] Ltd. An improved apparatus [illegible] ores, substances held in slimes, [illegible] Nov. 25.

[illegible] L. Frith. A new process for toughening [illegible] steel, iron, and other metals. Nov. 25.

[illegible] F. I. Mumford. Improvements in the method [illegible] apparatus for the recovery of precious metals [illegible] slimes. Nov. 26.

[illegible] C. A. Keller. Improvements in the obtainment of metals and alloys, and in furnaces to be employed therein. Complete Specification. Filed Nov. 28. Date applied for July 6, 1901, being date of application in France.

24,235. C. A. Keller. Improvements in the manufacture and treatment of alloys. Complete Specification. Filed Nov. 28. Date applied for July 6, 1901. being date of application in France.

24,361. S. Cowper-Coles and Co., Ltd., and S. Cowper-Coles. Improvements in and relating to aluminium welding. Nov. 30.

24 427. C. Billington, J. Newton, and C. Billington, jun. Improved metallic alloys. Dec. 2.

24,524. C. Billington, J. Newton, and C. Billington, jun. Improved metallic alloys. Dec. 3.

24,734. T. C. Hamilton. An improvement in coating metals. Dec. 4.

25,046. H. R. Angel. *See* Class VII.

25,187. A. G. Brookes.—From C. Casper and F. Oertel, Germany. Improvements in the manufacture of chromic silicon steel or steel alloyed with silicon and chrome. Dec. 10.

25,476. W. B. Johnson.—From N. McConnell, United States. Improvements in the manufacture of steel. Dec. 13.

25,604. G. J. Snelus. An improved method of and apparatus for purifying and enriching blast-furnace gas. Dec. 14.

Complete Specifications Accepted.

1900.

21,358. G. G. M. Hardingham.—From R. Davey, Italy. Rotary furnace applicable for use in roasting or calcining ores. Nov. 27.

22,570. H. F. Kirkpatrick-Picard. Recovery of zinc from sulphide ores. Dec. 18.

1901.

331. J. C. Butterfield. Obtaining antimony and separating gold from antimony ores. Dec. 11.

430. R. Langhans. Process of metallising with precious metals. Dec. 11.

510. W. J. Foster. Method of keeping cool the tuyères of blast and like furnaces and forges, and of heating the air or blast used. Nov. 27.

1738. W. Pethybridge. Treatment of telluride gold ores. Dec. 4.

2756. H. Leyendecker. Process for diminishing the solubility of lead in acids and other chemical compounds. Dec. 18.

18,149. D. Laird. Furnace for the cupellation of precious metals, and for oxidising and reducing ores. Dec. 11.

20,169. J. Tennett. Casting of chill rolls. Nov. 27.

20,566. E. Knudsen. Process and apparatus for smelting and concentrating unroasted sulphide ores. Dec. 11.

21,097. C. Rogers and A. M. Oswald. Process for the extraction and recovery of zinc from sulphide ores or tailings. Nov 27.

22,753. H. J. Haddan.—From the Meteorit Gesellschaft, G. m. b. H., Germany. Process for improving the quality of aluminium. Dec. 18.

XI.—ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

Applications.

24,012. R. W. James.—From The Mica Insulator Company, United States. Improvements in or relating to compound insulating material for electrical purposes. Nov. 26.

24,277. C. S. Kaufmann. Improvements in and relating to plates for electric storage batteries. Nov. 29.

24,511. A. Bainville. Improvements in or relating to electrodes for electric accumulators or batteries. Complete Specification. Dec. 2.

24,627. L. M. G. Rosée d'Infreville. Improvements in electric batteries. Complete Specification. Dec. 3.

24,834. R. Pearson. An improvement in primary batteries. Dec. 5.

24,992. A. P. T. Tully. Improvements relating to electric primary cells or batteries. Dec. 7.

25,182. G. Brewer.—From E. R. Taylor, United States. Improvements in electric furnaces, and in the production of chemicals in such furnaces. Complete Specification. Dec. 10.

25,282. F. E. Elmore.—From J. O. S. Elmore, India. Improvements in apparatus for the generation and electrolytic application of electric currents. Dec. 11.

25,395. E. Geisenberger. Improvements in or relating to the manufacture of soda and other substances by the aid of electrolysis. Filed Dec. 12. Date applied for May 25, 1901, being date of application in Belgium.

Complete Specifications Accepted.

1900.

21,566. C. A. von Welsbach. Accumulators or secondary batteries. Dec. 4.

21,886. L. E. Lacroix, jun. Electrical storage or accumulators. Dec. 11.

22,019. A. Meygret. Storage batteries. Dec. 4.

22,902. E. Edser and M. Wilderman. Electrolytic methods and apparatus. Dec. 18.

23,543. W. E. Ayrton and A. W. Fithian. Plates for secondary or storage cells. Nov. 27.

1901.

1890. J. T. Niblett. Electric storage batteries or accumulators. Dec. 4.

1981. J. T. Niblett. Electric storage batteries or accumulators. Dec. 4.

2587. G. Rosset. Electric batteries. Dec. 11.

17,480. Siemens Bros. and Co., Ltd.—From Siemens and Halske Actiengesellschaft, Germany. Aluminium electrolytic cells. Dec. 1.

20,072. T. A. Edison. Accumulators. Dec. 4.

21,294. A. Tribelhorn. Electric accumulator batteries. Nov. 27.

XII.—FATS, OILS, AND SOAP.

Applications.

24,603. H. J. Haddan.—From E. R. Edson, United States. A new or improved process of reducing or rendering fish-waste or fish and other oil-yieldable material to obtain oil. Complete Specification. Dec. 3.

24,821. W. P. Thompson.—From A. N. Nielsen, Newfoundland. Improvements in the bleaching of whale and seal oil. Complete Specification. Dec. 5.

24,850. A. E. Iveson. Apparatus for pressing animal fat, especially applicable for use in preparing fat in a "granular form" for cooking purposes. Dec. 5.

25,425. F. V. Speltie. A new or improved process and apparatus for extracting oil from fish and obtaining dried residues serving as "guano." Complete Specification. Dec. 12.

Complete Specifications Accepted.

1901.

759. W. F. Haywood. Means or apparatus to be employed in the manufacture of soap. Dec. 18.

19,029. F. C. Thiele, J. M. Parker, and J. F. Finke. Refining of crude mineral oils and their distillates. Dec. 4.

XIII.—PAINTS, PIGMENTS, VARNISHES, RESINS, INDIA-RUBBER, Etc.

Applications.

23,470. J. Deborde. The manufacture of an elastic insolubilised gelatinous compound. Nov. 20.

23,718. R. Walker. Improvements in the manufacture of whiting, and accessory plant therefor. Nov. 22.

24,370. J. F. Allen and R. G. Brooke. An improved anti-corrosion paint. Nov. 30.

24,590. A. Gentzsch. Improved manufacture of a substitute for gutta-percha. Complete Specification. Dec. 3.

25,608. P. Jochum. *See* Class IV.

Complete Specifications Accepted.

1901.

10,696. C. Wallis and R. E. M. Lagerwall. Roller mills applicable for the manufacture of paint, white lead, pigments, printing ink, confectionery, or the like. Dec. 18.

11,533. A. Thilmany. *See* Class IV.

17,555. O. Francke. *See* Class I.

22,201. H. H. Lake.—From Vereinigte-Gummiwaaren Fabrik Harburg-wein vormals Meiner J. N. Reithoffer, Germany. Manufacture of rubber-sponge. Dec. 11.

XIV.—TANNING, LEATHER, GLUE, AND SIZE.

Applications.

24,342. R. W. Barker.—The International Lactayne Company, United States. Artificial glue or size. Nov. 29.

24,604. H. J. Haddan.—From E. R. Edson, United States. Improvements in obtaining a congealable glue-yieldable or gelatine-yieldable material from fish-waste or fish and other material. Complete Specification. Dec. 3.

25,063. G. Klenk. Improvements in the manufacture or treatment of tannin extracts to increase their utility of tanning leather. Dec. 9.

25,071. A. Jeffrey. Improvements in apparatus for melting and applying marine glue and other convenient substances. Complete Specification. Dec. 9.

XV.—MANURES, Etc.

Applications.

23,959. W. Milligan. Improvements in and connected with the manufacture of manure, the same being also applicable for the destruction of worms, slugs, and such like. Nov. 26.

25,425. F. V. Speltie. *See* Class XII.

Complete Specifications Accepted.

1901.

2035. C. Beyer. Machine for the distribution of artificial manure. Nov. 27.

3178. J. Hughes. Treatment of superphosphate for fertilising purposes. Dec. 18.

XVI.—SUGAR, STARCH, AND GUM, Etc.

Applications.

23,911. J. R. Hatmaker.—From J. A. Just, United States. Casein adhesive. Nov. 25.

24,569. C. A. Spreckels and C. A. Kern. Improvements in the purification of sugar-bearing materials, and cleansing compositions for that purpose. Dec. 3.

24,847. F. Scheibler. Improvements connected with the manufacture of cube-sugar or analogous forms of sugar. Dec. 5.

Complete Specifications Accepted.

1900.

21,256. R. Harvey. Continuous defecators for the clarification of sugar juice and other liquids. Nov. 27.

1901.

2294. G. W. Johnson.—From M. Leconte and Compagnie Electro-Sucrière, France. Manufacture of rice-starch and other amylaceous compounds. Dec. 4

XVII.—BREWING, WINES, SPIRITS, Etc.

Applications.

24,146. Spiritine, Ltd.—From Jules Drapier and P. Dubois, France. Improvements in or relating to solidified spirit. Nov. 27.

24,243. W. Ackroyd and F. Buckley. Improvements in and relating to malt kilns. Nov. 29.

24,477. E. H. Josephi. A new or improved beverage. Dec. 2.

Complete Specifications Accepted.

1901.

2501. A. de Schepper. Machines for malting purposes. Dec. 18.

6216. I. Birkett and J. Thornton. Kilns for malt or the like. Nov. 27.

10,015. H. J. Haddan.—From J. C. Riley, United States. Process for ageing liquors. Dec. 18.

XVIII.—FOODS, SANITATION, Etc., AND DISINFECTANTS.

Applications.

A.—Foods.

25,037. C. Ollendorff. Improvements in pasteurising apparatus. Complete Specification. Dec. 9.

25,295. A. F. S. Kent and W. G. Barnfield. An improved process for the sterilisation and preservation of eggs. Dec. 11.

25,599. J. Meinl. An improved process of manufacturing cocoa substitutes. Dec. 14.

B.—Sanitation; Water Purification.

23,469. J. C. Haller and R. H. Machell. Improvements in the treatment of sewage, and apparatus therefor. Nov. 20.

24,602. H. J. Haddan.—From E. R. Edson, United States. Improvements in apparatus for reducing or rendering fish-waste, fish, and other material. Complete Specification. Dec. 3.

Complete Specifications Accepted.

A.—Foods.

1900.

19,343. A. Büttner and C. Meyer. Process and apparatus for drying fruit and other vegetable matter. Dec. 4.

23,377. P. Mongiraud and H. Labranche. Apparatus for the sterilisation and aseptic transfer or storage of milk. Dec. 11.

B.—Sanitation; Water Purification.

1901.

517. F. Candy. Treatment of sewage and other polluted liquids, and apparatus for use in connection therewith. Dec. 18.

16,547. J. Howden and J. H. Hume. Refuse destructors. Nov. 27.

C.—*Disinfectants.*

1901.

[illegible]402. B. J. B. Mills.—From E. D. Taylor Company, United States. Apparatus for producing formaldehyde gas for fumigating, disinfecting, and sterilising purposes. Dec. 18.

XIX.—PAPER, PASTEBOARD, Etc.

Applications.

23,510. C. Smith and The Globe Manufacturing Company, Ltd. Improvements in the manufacture of celluloid. Nov. 20.

23,841. B. Guerrin and G. G. Leflère. Improvements in and relating to the production of antiseptic paper. Nov. 23.

24,381. J. White. Improvements in apparatus for straining paper pulp and like material. Complete Specification. Nov. 30.

Complete Specification Accepted.

1900.

22,418. The Westfield Paper Co., Ltd., and G. Stewart. Surfacing of paper. Dec. 4.

XX.—FINE CHEMICALS, ALKALOIDS, ESSENCES, and EXTRACTS.

Applications.

23,585. W. E. Corrigall. Improvements in or relating to menthol cones. Nov. 21.

23,645. J. E. Kistruck. Improvements in or connected with devices for extracting the juice of lemons and other fruit. Nov. 21.

24,321. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in the manufacture or production of pharmaceutical compounds. Nov. 29.

25,444. J. E. Riley and J. Barnes. *See* Class VII.

Complete Specifications Accepted.

1900.

23,418. R. B. Ransford.—From L. Cassella and Co., Germany. *See* Class IV.

1901.

18,733. R. H. Page. Production of organic peroxides. Dec. 4.

XXI.—PHOTOGRAPHY.

Applications.

23,292. H. E. Newton.—From The Farbenfabriken vormals F. Bayer and Co., Germany. Improvements in the manufacture or production of flash lights for photography. Nov. 18.

23,299. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Improvements in photographic roll films. Nov. 18.

23,551. Société Anonyme des Produits Photographiques M.-Y. Improvements relating to the manufacture of photographic films. Filed Nov. 20. Date applied for May 3, 1901, being date of application in France.

24,025. K. A. Pallin. Improvements in and relating to photographic films. Nov. 26.

24,255. L. C. Login. Improvements in stereoscopic photography. Nov. 29.

24,469. C. D. Abel.—From Actiengesellschaft für Anilinfabrikation, Germany. Improvements in coating photographic films, and in apparatus therefor. Dec. 2.

XXII.—EXPLOSIVES, MATCHES, Etc.

Applications.

23,284. M. Fiedler. Improvements in explosives. Complete Specification. Nov. 18.

23,740. F. L. Nathan and R. Robertson. An improvement in the manufacture of explosives. Complete Specification. Nov. 22.

23,889. M. Bielefeldt. Improvement in priming compositions or charges for percussion caps and detonators. Nov. 25.

24,372. L. Davies. Improvement in explosives. Nov. 30.

Complete Specification Accepted.

1900.

23,064. J. Ramsden and W. R. Hirst. Matches. Dec. 4.

XXIII.—GENERAL ANALYTICAL CHEMISTRY.

Applications.

25,037. C. Ollendorff. *See* Class A.

25,469. J. H. Müller. Improvements in the process of and in the apparatus for fractional distillation. Complete Specification. Dec. 13.

PATENTS UNCLASSIFIABLE.

Complete Specifications Accepted.

1901.

10,926. K. Koch and A. Stelling. Article of manufacture consisting of felt manufactured from metal. Dec. 11.

15,153. A. E. Cummer. Process of treating hydrous compounds. Nov. 27.

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